COMPUTER STUDIES
for
UGANDA

SIXTH EDITION 2018

BY

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SALES AND MARKETING BY

Mpeirwe Nobles

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Above all we thank the **Almighty God** for having granted us the knowledge, strength and persistence that has enabled us to publish the book.

PREAMBLE

There has been a demand for a correspondence course and resource that makes students participate, and understand the intention of learning computer studies.
All practitioners of ICT and our students need to ask one another, what will Information Technology and ICTs help them and our country Uganda in the future?
As we all know, it is becoming almost impossible to work in the administrative and business, to Education, Research, and Communication sectors without a great skill in Computer systems.

ICT is becoming more and more pivotal than before in whatever aspect of thing we do per second of our time. Offices are becoming paperless, you no longer need to line up at a bank queue, a teacher does not need to be present for a lesson delivery, and we have started to live in cashless societies where one needs better mobile equipment. This therefore means that Information Technology has started and will continue to steer every facet in our day to day lives in the third world countries as it is in first world.
In this book, we have arranged all content in an easy to read mode to enable students read ahead, there are a number of activity based exercises, Multiple Choice Questions, essay questions, and practical exercises to enable our students be possessed with enough activity to do.

Teachers will find this book very helpful, especially those with big classes in terms of dividing theory and practical lesson time appropriately. This book is designed for students doing Computer Studies at O' level, but it is also useful to students doing Subsidiary ICT at Advanced Level and Computer Literacy at Higher Institutions of Learning.

BOOKS IN THE for *Uganda Series* BY THE SAME AUTHOR

- ✓ Computer Studies *for Uganda*
- ✓ Computer Practical Applications Lab Activities *for Uganda*
- ✓ ICT Revision Questions and Answers *for Uganda*
- ✓ Computer Studies Revision Questions and Answers *for Uganda*
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LIST OF COMPUTER STUDIES ABBREVIATIONS (ACRONYMS)

ADC	Analog-to-Digital Converter
ADSL	Asymmetric Digital Subscriber Line
ALU	Arithmetic / Logic Unit
ARPANET	Advanced Research Projects Agency Network
ASCII	American Standard Code For Information Interchange
ATA	Advanced Technology Attachment
BASIC	Beginner's All-purpose Symbolic Instruction Code
BCC	Blind Carbon Copy
BIOS	Basic Input/Output System
BMP	Bitmap; Applied To Image Format As .bmp
CAA	Computer Assisted Assessment
CAL	Computer Assisted Learning
CAI	Computer Assisted Instructions
CAD	Computer-Aided Design
CC	Carbon Copy
CD	Compact Disc
CD-R	Compact Disc Recordable
CD-ROM	Compact Disc Read-Only Memory
CD-RW	Compact Disc Re-Writable
COBOL	COmmon Business Oriented Language
CMOS	Complementary Metal Oxide Semiconductor
CMYK	Cyan Magenta Yellow Black
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CSS	Cascading Style Sheet
DAC	Digital-to-Analog Converter
DBMS	Database Management System
DMA	Direct Memory Access
DNS	Domain Name System
DOS	Disk Operating System
DPI	Dots Per Inch
DRAM	Dynamic Random Access Memory
DSL	Digital Subscriber Line
DVD	Digital Versatile Disc
DVD-R	Digital Versatile Disc Recordable
DVD-RW	Digital Versatile Disk Rewritable
DVI	Digital Video Interface
EDI	Electronic Data Interchange
EBCDIC	Extended Binary Coded Decimal Interchange Code
EEPROM	Electrically Erasable Programmable Read Only Memory
FAQ	Frequently Asked Questions
FAT	File Allocation Table
FDD	Floppy Disk Drive
FTP	File Transfer Protocol

GIF	Graphics Interchange Format; Applied To Image Format As .gif
GIGO	Garbage In, Garbage Out
GUI	Graphical User Interface
HTML	Hyper-Text Markup Language
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transport Protocol Secure
I/O	Input/Output
IC	Integrated Circuits
ICS	Internet Connection Sharing
IDE	Integrated Device Electronics (/Development Environment)
IGP	Integrated Graphics Processor
INTERNIC	Internet Network Information Center
IP	Internet Protocol
IPX	Internet Packet Exchange
IRC	Internet Relay Chat
IRQ	Interrupt Request
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
JPEG	Joint Photographic Experts Group; Applied To Image Format As .jpeg
KBPS	Kilobits Per Second
LAN	Local Area Network
LCD	Liquid Crystal Display
MAC (ADDRESS)	Media Access Control Address
MBPS	Megabits Per Second
MIDI	Musical Instrument Digital Interface
MIPS	Million Instructions Per Second
MPEG	Moving Picture Experts Group; Video Format
NIC	Network Interface Card
NTFS	New Technology File System
OCR	Optical Character Recognition
OMR	Optical Mark Recognition
OLE	Object Linking And Embedding
OOP	Object-Oriented Programming
P2P	Peer To Peer
PC	Personal Computer
PCI	Peripheral Component Interconnect
PDA	Personal Digital Assistant
PDF	Portable Document Format
PHP	Hypertext Preprocessor
PMU	Power Management Unit
PNG	Portable Network Graphic; Image Format
PNP	Plug And Play
PPI	Pixels Per Inch
PPM	Pages Per Minute

PROM	Programmable Read Only Memory
RAM	Random Access Memory
RGB	Red Green Blue
ROM	Read-Only Memory
RTF	Rich Text Format
SATA	Serial Advanced Technology Attachment
SDRAM	Synchronous Dynamic Random Access Memory
SDSL	Symmetric Digital Subscriber Line
SEO	Search Engine Optimization
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SOAP	Simple Object Access Protocol
SPX	Sequential Packet Exchange
SQL	Structured Query Language
SRAM	Static Random Access Memory
SRGB	Standard Red Green Blue
TCP/IP	Transmission Control Protocol/Internet Protocol
TIFF	Tagged Image File Format; Applied To Image Format As .tif
UNC	Universal Naming Convention
UPS	Uninterruptible Power Supply
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
USB	Universal Serial Bus
VGA	Video Graphics Array
VLSI	Very Large Scale Integration
VRAM	Video Random Access Memory
WAN	Wide Area Network
WI-FI	Wireless Fidelity
WWW	World Wide Web
XHTML	Extensible Hypertext Markup Language
ZIF	Zero Insertion Force

S1 - TOPIC 1: INTRODUCTION TO COMPUTER STUDIES

UNIT ONE: COMPUTERS TODAY

UNIT INTRODUCTION

Computers are necessary in today's society. We live in a fast-moving world where almost everything must come to us instantly. Many times, we depend on the computer to help us complete tasks, and to solve problems. The digital age has affected all of our lives and today's society is no longer able to function without computer technology.
Therefore, we can say computers are vital in today's society as they make life much easier for everyone.

A) DEFINITION AND CHARACTERISTICS OF MODERN COMPUTERS

WHAT IS A COMPUTER?

A computer is an electronic device that accepts user input (data), processes it under special instructions (programs), to produce the desired meaningful output (information).
Alternatively, a computer can be defined as a programmable machine that receives input, stores and manipulates data, and provides output in a useful format.

MAIN CHARACTERISTICS OF MODERN COMPUTERS

There are seven common characteristics associated with modern computers, these include;

Speed Computers operate at extremely high speeds. Their speed is measured in millions of instructions per second (MIPS).

- **Automatic (Spontaneous)** the computers are automatic. They do not need any supervision in order to do tasks when instructed.
- **Accuracy** Computers are very accurate. The errors in made computing are due to the users but not technological weakness. If a user enters wrong data, the computer gives wrong Information. This trend is described as GIGO (Garbage In, Garbage Out)
- **Versatility:** Modern Computers can perform different kinds of tasks at the same time. For example you can play music while typing a document at the same time. This is also known as **multi-tasking**.
- **Diligence (Endurance)** Computers have the ability to perform the same task for a long time without getting tired. This is because a computer is a machine, and so does not have human behaviors of tiredness and lack of concentration. For example: Computers which are used for controlling the satellites.
- **Artificial intelligence:** Computers are artificially intelligent i.e. They can be programmed to assume capabilities such as learning, reasoning, adaptation, and self-correction. For example computers can respond as if they were thinking by playing chess, recognize handwriting and speech. However, the computers themselves cannot think. The artificial intelligence is only supported by the power of the programs installed in them.
- **Storage:** For a computer to be able to work, it must have some form of work space where data is stored before being processed. All information is stored on a hard disk or in the Random Access Memory (RAM).
- **Communication:** Most computers today have the capability of communicating with other computers. We can connect two or more computers by a communication device

such as modem. These computers can share data, instructions, and information. When two or more computers are connected, they form a network.

- **Adaptability:** Modern Computers can be adapted to comply with different settings and environments. For example, they can be used as personal computers, for home use, banking, communication, entertainment, weather forecasting, space explorations, teaching, railways, medicine etc.
- **Need User input:** Computers cannot initiate themselves and make the decisions. They need instructions from users to enhance the process. After all, a computer is only a machine.
- **Reduction of cost:** Computers are a short term investment in order to achieve a long term gain. Though the investment is high, they reduce the cost in the long run. They reduce man power and lead to a neat and efficient way for solving various tasks.

B) TERMINOLOGIES AND BASIC CONCEPTS

There are many terminologies used in the field of computing. Below are some of the basic ones:

Data

This refers to the raw facts and figures, which are entered into the computer by the user in a form suitable for processing.

Data may consist of characters, symbols, sounds and graphics, videos etc.

Information

It refers to the processed data that makes meaning and is useful. For example the figure 10082006 may be input as data, but once this same figure is converted to the format 10/08/2006, you realize that it's a date.

Information and communication Technology (ICT)

This term combines three items i.e. [information, communication, and technology]

Communication in this regard refers to the electronic transfer of data from one point to another. Technology refers to the technique and way of doing something.

Information and Communication Technology (ICT) refers to the broad range of hardware, software, network infrastructure and media that enable the processing, storage and sharing of information among humans and computers, locally and globally" ICT devices range from radio, television, cellular phones, compact disks, Fax machines, computers, biometric devices, internet and network hardware and software platforms, satellite systems and so on. It involves to all means which facilitate information or data capture processing storage and output.

Data entry

It is the act of in putting data into the computer. This is done by the help of input devices like keyboard, mouse etc.

Byte

A byte is a unit of computer memory or digital information that consists of eight binary digits (bits).

NB. 1 byte stores 1 character.

Binary

The number system used to represent digital information in computers where data is expressed by combinations of the digits 0 and 1, corresponding to power states "off" and "on" respectively.

RAM (Random Access Memory) refers to computer working memory that acts as a temporally store for data and instructions during processing.

C) WHY DO WE DO COMPUTER STUDIES AS A SUBJECT?

1. To promote creative knowledge for problem solving: Computing develops a sense of deeper imagination, to create practical hands-on solutions for problem solving.
2. To get jobs in future: Computing offers a wide range of highly rewarding careers. Also, computer studies provide a foundation that serves as a competitive advantage in other careers, in whatever field one chooses.
   Examples of such computing careers include: Typists, IT Tutors, Computer operators, Computer technicians, System analysts, Computer programmers, Software engineers, Computer engineers, Database administrators, webmasters, Graphic designers, etc.
3. To promote critical and analytical thinking: Computing drives innovation in the sciences such as vaccine research, environmental protection, business, entertainment and education. Through computer studies, one can make a positive difference in the world.
4. To create awareness in a learner about the developments and emerging issues concerning computing and society: Computing is one of those highly evolving fields where it is almost impossible to predict what will happen in the future.
5. To acquire skills in the use of IT for enhanced productivity and development: This is because the dimensions of computing are part of the necessary skills set for an educated person in the 21st century.
6. To empower a learner as a computer literate and capable citizen who can develop, communicate and handle ICT challenges.

ACTIVITY

1. What is a computer?
2. Have you ever used a computer? If yes, what did you do on your encounter with the computer?
3. Mention any five activities that people in your home town commonly do with computers.
4. Discuss with your friends some of the difficulties that a computer illiterate person is likely to face in the developed ICT world.

UNIT TWO: EVOLUTION OF COMPUTERS

UNIT INTRODUCTION

The word Evolution comes from Latin word, '**ēvolvō**' which means; to 'unroll', or to 'unfold'.

Evolution of computers refers to the historical developments through which computers and technology have passed, from the time they started to exist in ancient forms to their current state. Knowledge about the history/evolution of computers gives us a deeper understanding of the origin and the gradual Mechanical to Electro-mechanical to Electronic technological changes, which have brought about the kind of computers we see today, and helps us to predict how they will be in future.

ORIGIN OF COMPUTING (COUNTING AND CALCULATING USING DEVICES)

The origin of computing started with the early man who used fingers, stones, sticks, marks on walls, sand, etc. The word 'compute' was derived from two Latin words; '***com'***, which means 'together' and '***putare'***, which may means 'add, calculate, count, or estimate'.

Over the centuries, people have developed an amazing variety of data processing tools and techniques. Examples of ancient counting and calculating devices include: The abacus, Napier's bones, the Slide rule.

THE ABACUS (3000 BC)

The beginning or foundation of computing devices is the abacus, which was developed in 3000 BC by Chinese (about 5000 years ago).

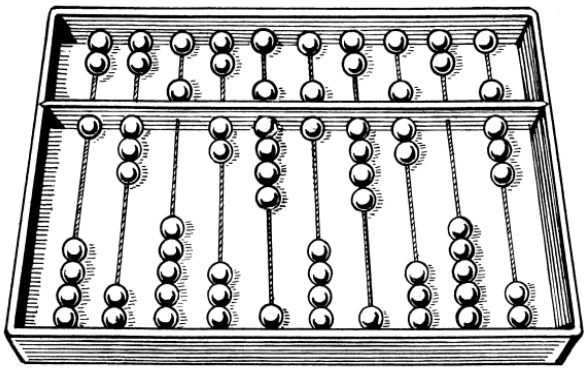
It was built out of wood and beads.

It has two decks. Each bead in the upper deck is equal to 5 units while each bead in the lower deck is equal to 1 unit. Only beads dragged to the middle position are counted.

The abacus helps people keep track of numbers as they do the computing. It is quick but has limited storage capabilities

The abacus is still in use today by schools and shopkeepers in Asia. Blind children are taught to use the abacus to perform calculations.

The abacus is an excellent substitute for memorization of multiplication tables and teaching other base numbering systems, since it easily adapts itself to any base.



The figure here represents the number 1,352,964,708.

NAPIER'S BONES (1617)



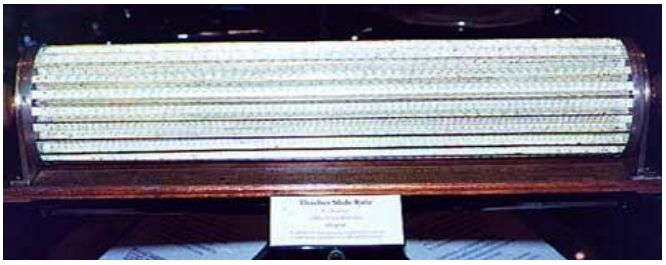
John Napier was a Scottish mathematician and inventor. Napier is famous for creating the decimal point. In 1617, the last year of his life, Napier invented a tool called "Napier's Bones".

Napier's bones was a multiplication table written on strips of bones, ivory, silver, or wood. The invention was used for simplifying multiplication, division, and taking square roots and cube roots. It had a set of rods, allowing computations up to 100,000,000. The left (or "index") rod is fixed to the case. It is numbered from 1 to 9.

The movable rods are numbered at the top. The numbers down them rods show the product of the number at the top times the corresponding numbers on the index rod.

WILLIAM OUGHTRED'S SLIDE RULE

In 1622, William Oughtred created the slide rule (originally circular) based on logarithms. It was the primary calculator of engineers through the 19th and early 20th centuries. With a common accuracy of only three digits, the slide rule, an analog device, provided sufficient accuracy, but was not suited to situations where accuracy was needed such as in accounting.



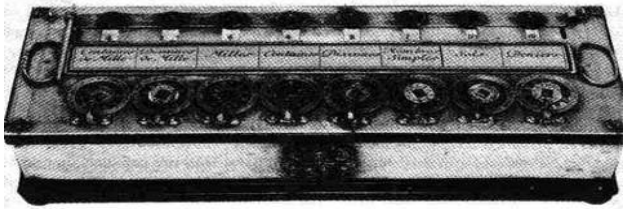
THE MECHANICAL COMPUTERS ERA (1642 - 1890)

Before 1642, all computation was done by humans. Manual devices used then could just aid the users to keep track of numbers as they did the computing. In the Mechanical Era (Period) however, machines and gears did the computations. The popular mechanical developments of computers in this period include the following:

BLAISE PASCAL'S CALCULATOR (1642)



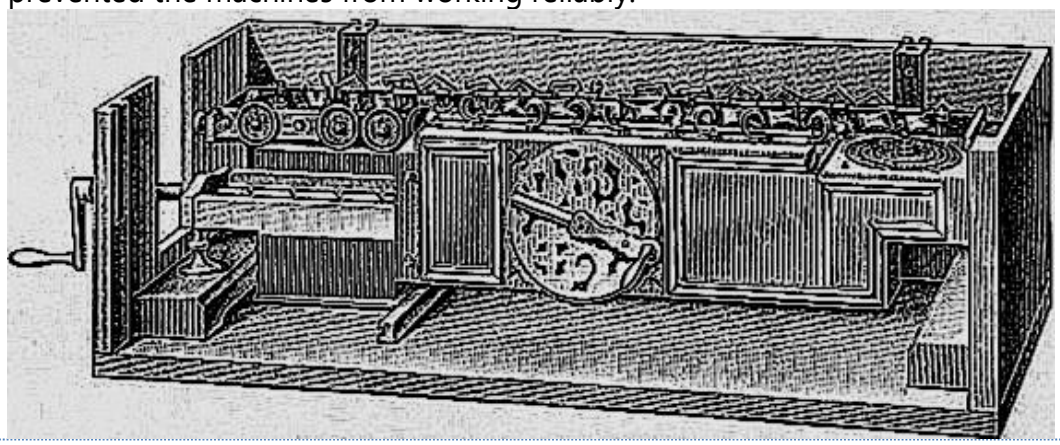
Pascal, Blaise (1623-62), was a French philosopher, mathematician and physicist. In 1642, at the age of 18, he invented the first mechanical calculator to speed arithmetic calculations for his father, a tax official. Numbers are dialed in on the metal wheels on the front of the calculator. The solutions appear in the little windows along the top.



LEIBNIZ'S STEPPED RECKONER (1694)



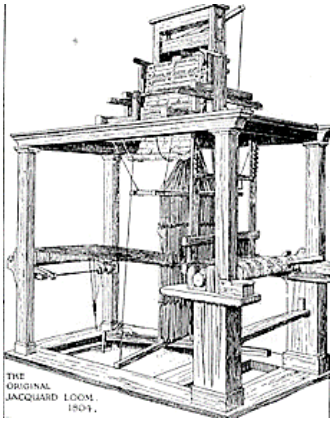
The Stepped Reckoner was a digital mechanical calculator invented by German mathematician Gottfried Wilhelm Leibniz around 1672 and completed in 1694. It was the first calculator that could perform all four arithmetic operations: addition, subtraction, multiplication and division. Its complex gear work, however, was a bit beyond the manufacturing technology of the time. Mechanical problems, in addition to design defects in the carry mechanism, prevented the machines from working reliably.



JACQUARD'S LOOM (1801)



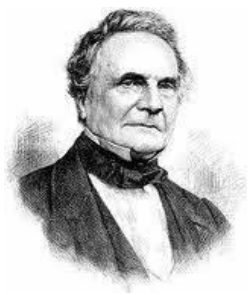
In 1801, Joseph Marie Jacquard (1752-1834) of France made the first successful automatic draw loom by means of a series of instructions given to the threads by a **punched card** system.

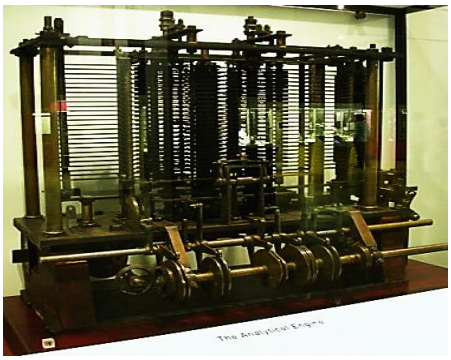


The loom could produce complex patterns and pictures in silk and other materials. By 1812, the punched card device was attached to 18,000 looms in Lyons. The Jacquard loom was a technological break- through. J. M. Jacquard even received a pension from Napoléon for his invention.

CHARLES BABBAGE'S ANALYTICAL & DIFFERENCE ENGINE (1834)

The concept of today's computers (Input - Process - Output) was first visualized by Charles Babbage in 1834 in England. He is therefore regarded as the **father of computers**. His idea for the Analytical Engine consisted of 4 parts: an input device, a mill (processing unit), a storage device, and an output device. It used punched-card system derived from the jacquard loom for input, processing and output. Variable cards transported numbers back and forth from the mill. It decided what operation to use, addition, subtraction, multiplication, or division.





THE FIRST COMPUTER PROGRAMMER



Ada Byron Lovelace (1815-1852) was the world's first computer programmer. She was fascinated with numbers and mathematical patterns and sequences. She took careful time to study all of the parts of Charles Babbage's Analytical Engine and connections until she understood their various purposes.

In 1842, Ada was asked to write a scientific interpretation of the Analytical Engine and its operations. In these writings about the Engine, Ada often added her own notes, with Babbage's permission. These notes where of concepts she envisioned for future programmable components that someday could happen with the advancement of the Analytical Engine.

These extensive writings on the Analytical Engine later became known as the first explanation of computer programming. In 1964 a computer language was named after her, *Ada*, supported by the Ada Joint Program Office.

THE ELECTRO-MECHANICAL COMPUTERS ERA (1890 - 1946)

Before 1890, Electricity was not used by computers. As Electricity availability was becoming widespread, it was involved in the use of computational devices.

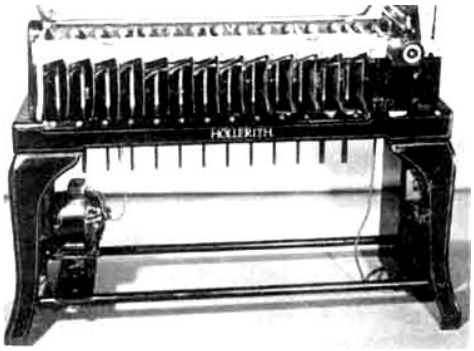
The popular developments of computers in the Electro- mechanical era include:

1. Hollerith's tabulating machine (1890)
2. Howard Aiken's Harvard Mark I (1944)
3. Program "debugging"

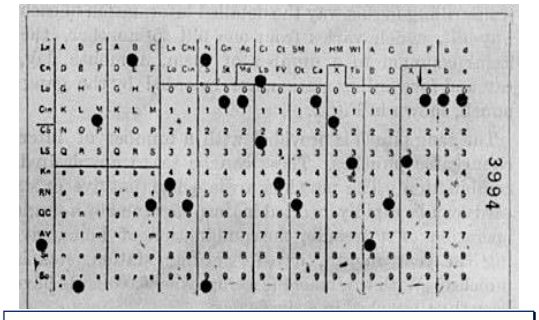
HOLLERITH'S TABULATING MACHINE (1890)



Herman Hollerith (1860 –1929) was an American statistician who developed a mechanical tabulator based on punched cards to rapidly tabulate statistics from millions of pieces of data.



He decided to use punched cards to represent the data gathered for the USA population census of 1890, and to read and collate this data using an automatic machine.



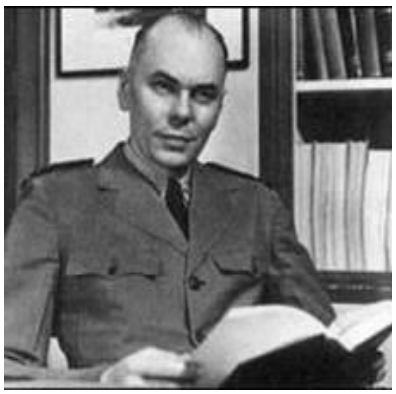
A typical Hollerith punched card

Hollerith's machine used a set of spring loaded wires suspended over the punched card reader. When the wires were pressed onto the card, punched holes allowed wires to complete electric circuits.

The cards were coded for age, state of residence, gender, and other information. The census

results were "... finished months ahead of schedule and far under budget".

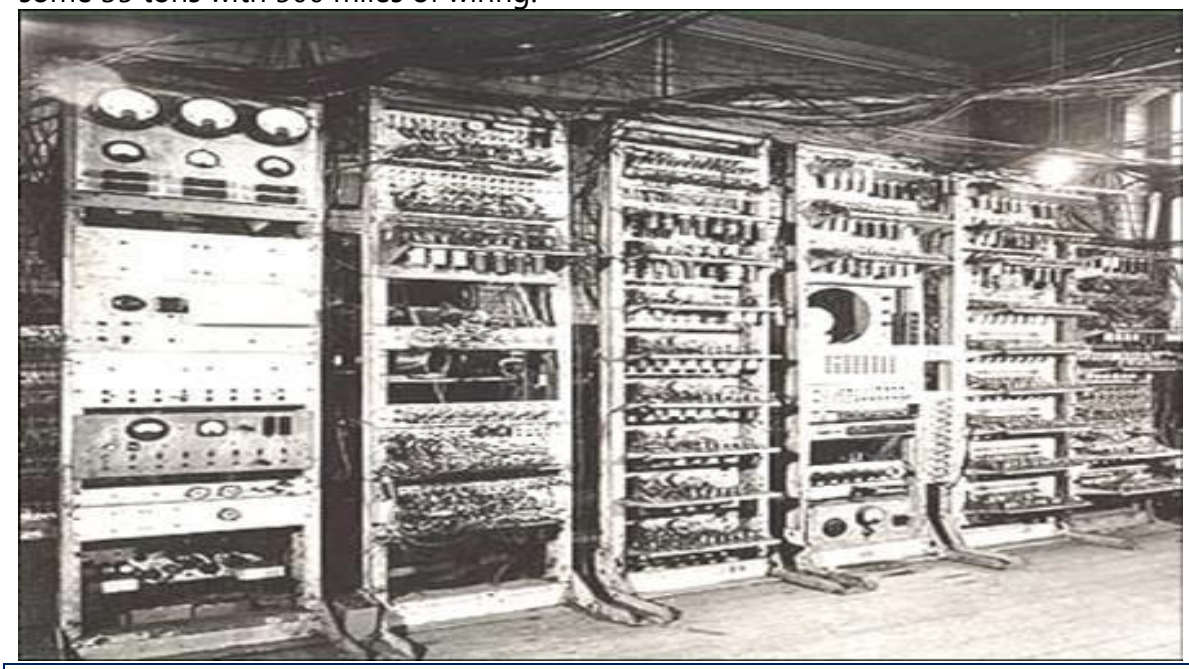
HOWARD AIKEN'S HARVARD MARK I (1944)



While a professor of Physics at Harvard University, Howard Aiken was supported by IBM to build an electro-mechanical computer which began computations for the U.S. Navy Bureau of Ships.

The computer was called the Automatic Sequence Controlled Calculator – (ASCC) by IBM, but Harvard renamed it the Mark I. It was very reliable, much more so than early electronic computers.

The computer had mechanical relays (switches) which flip-flopped back and forth to represent mathematical data. It was huge, weighting some 35 tons with 500 miles of wiring.



The Harvard Mark I.

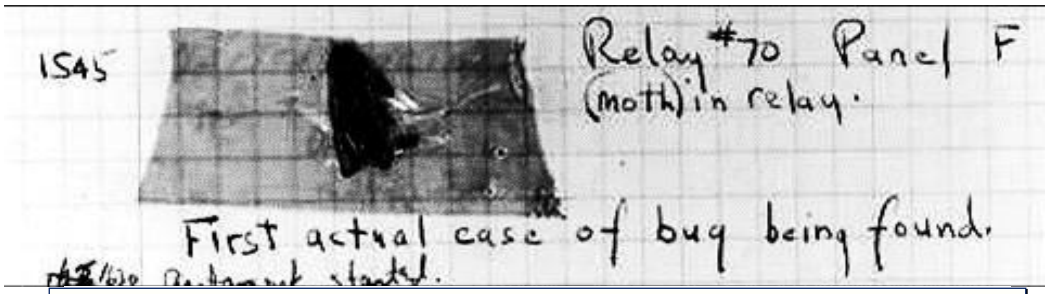
THE FIRST COMPUTER DEBUGGER



Dr. Grace Murray Hopper was a lady in the U.S. Navy Bureau of Ships, who worked with Howard Aiken from 1944 and used his machine for gunnery and ballistics calculation

One day, the program she was running gave incorrect results and, upon examination, a moth was found blocking one of the relays.

The bug was removed and the program performed to perfection. Since then, a program error in a computer has been called a bug.



The first computer bug was kept in a museum in the US till today.

Debugging is a process of finding and correcting errors, in a computer program or a piece of electronic hardware.

ELECTRONIC ERA OF COMPUTERS (1946 – TO DATE) INCLUDING THE COMPUTER GENERATIONS

Application of mechanical gears in Computers stopped in the Electro-mechanical era. Computer evolution since 1946 has been categorized into five generations, namely;

- The First Generation (1946 -1958)
- The Second generation (1958 - 1964)
- The Third Generation (1965 - 1970)
- The Fourth Generation (1971 –to-date)
- The Fifth Generation (Today-to-Future)

Each of the computer generations above had or has a major characteristic or development (commonly referred to as a **Hallmark**) and distinct characteristics in terms of Physical setup, Technology, Software, and Set-backs of the computers in the generation. The General trend is that from one generation to another, there is decrease in size but increase in speeds as you will discover along.

Definition: A Computer Generation is a period in the history of computer development in which computers had similar characteristics and technologies.

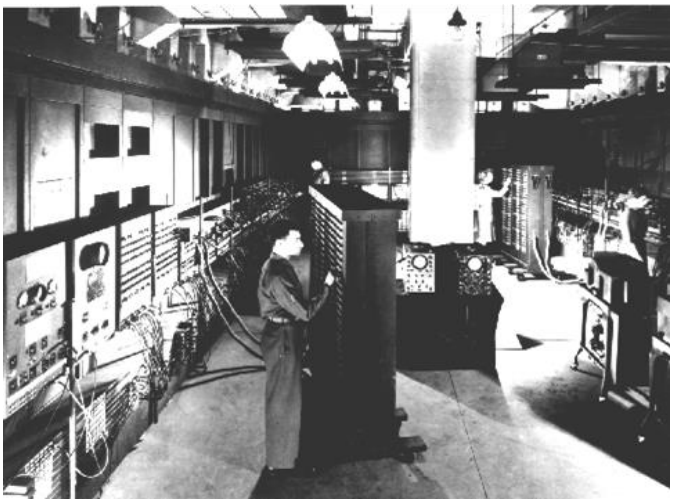
THE FIRST GENERATION (1946 – 1958): VACUUM TUBES

HALLMARK



The computers used vacuum tubes. The vacuum tube was an extremely important step in the advancement of computers. Its purpose was to act like an amplifier and a switch.

Without any moving parts, vacuum tubes could take very weak signals and make the signal stronger (amplify it).



PHYSICAL SETUP:

Physically, First generation computers were very large. Machines with hundreds of thousands of vacuum tubes were built, taking up space of several floors in big buildings. They weighed about 30 tons.

TECHNOLOGY:

- They used punched cards and paper tape for input.
- They used magnetic drums for memory.
- They had memory size of approximately 2kilobytes of RAM.
- They used binary numbering system for data representation.
- Speed was about 10,000 instructions per second.

SOFTWARE:

First generation computers used machine language, the lowest-level programming language understood by computers

SETBACKS:

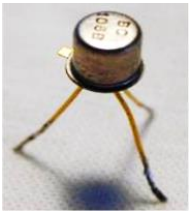
- They broke down frequently (Required standby technicians)
- Needed very may people to operate due to their huge size.
- High level of training was required before use
- They produced a lot of heat and burned out.
- They consumed a lot of power
- They produced a lot of noise.
- They had limited primary memory, and so they were very slow.
- They were very expensive to buy, setup and maintain.
- They were not portable
- Manual assembly of individual components into one functioning unit required.
- Air conditioning required

EXAMPLES OF FIRST GENERATION COMPUTERS:

1. ENIAC - Electronic Numerical Integrator and Computer (1946) was the first electronic digital computer. It had over 18,000 vacuum tubes.
2. EDVAC - Electronic Discrete Variable Automatic computer (1947) was built for the U.S. Army's Ballistics Research Laboratory
3. The UNIVAC (1951) (UNIVersal Automatic Computer) was the first general-purpose electronic digital computer designed for commercial use.

THE SECOND GENERATION (1958 – 1964): TRANSISTORS

HALLMARK:



A transistor is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of semiconductor material,

The invention of the transistor in the mid-50s replaced the vacuum tube and paved the way for smaller and cheaper computers.



PHYSICAL SETUP:

The computers reduced in size as compared to first generation computers, and could now fit in one room. A typical second-generation computer contained 10,000 transistors hand soldered and connected by wires.

TECHNOLOGY:

- They still used punched cards for input and printouts for output
- Memory size expanded to approximately 32kilobytes.
- The computers increased in processing speed and reliability - Speed was about 30,000 instructions per second.
- Transistors consumed less power as compared to vacuum tubes
- Memory moved from a magnetic drum to magnetic core technology, in which Hard disk storage was now available. (see figure)

SOFTWARE:

Second generation computers used assembly and other high level programming languages such as FORTRAN (FORmula TRANslator) which allowed programmers to specify instructions in words.

SETBACKS:

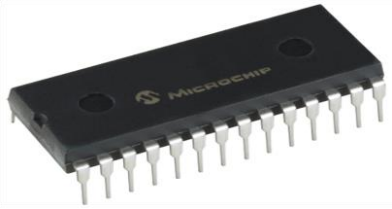
- They produced less noise but their cost was still very expensive.
- High level of training was required before use.
- Transistors gave much heat that could damage other components.
- Commercial production was difficult and costly.
- The computers could still run only one application program at a time (Multi-tasking was not possible)
- Air-conditioning was required.
- Manual assembly of individual components into a functioning unit was required.

EXAMPLES OF SECOND GENERATION COMPUTERS:

1. IBM 305 RAMAC.(1956), was the first commercial computer that used a moving head hard disk drive (magnetic disk storage) for secondary storage. RAMAC stood for "Random Access Method of Accounting and Control".
2. The IBM 1401, - was a variable word length decimal computer that was announced by IBM on October 5, 1959
3. The CDC 6600 was a mainframe computer from Control Data Corporation, first delivered in 1964. It remained the world's fastest computer from 1964–1965.

THE THIRD GENERATION (1965 – 1970): INTEGRATED CIRCUITS

HALLMARK



The computers used Integrated Circuits. An integrated circuit (IC) was just a combination of thousands of transistors and tiny wires onto a small "chip" made of semi-conductor material such as silicon.

PHYSICAL SETUP



- The computers extremely reduced in size — thousand times smaller than discrete circuit.
- It is because of fabrication of various circuit elements in a single chip.
- As a result, the computer could now fit onto a desk and the monitor became the largest visible part of the computer.
- For the first time, Electronic computers became accessible to a mass audience because they became cheaper.

TECHNOLOGY:

- The third generation of computers saw the production of the first microprocessors
- The keyboards and monitors replaced punched cards for input and output.
- Magnetic hard disks were developed for storage purposes.
- Memory size expanded to approximately 2 megabytes of RAM
- The computers became more reliable because of elimination of soldered joints and need for fewer inter-connections.
- Speed increased to 5 million instructions per second
- Integrated Circuits consumed a lower electric power.
- The noise produced by the computers reduced drastically.

SOFTWARE:

- Simple programming languages like BASIC were introduced
- Multi-tasking was now possible. (Users interfaced with an operating system which could run different applications at the same time.)

SETBACKS:

- Highly sophisticated technology required for the manufacture of IC chips.
- They required Air-conditioning in many cases due to the heat produced.
- If any component in an IC fails, the whole IC has to be replaced the new one.
- Operations at low voltage as ICs function at fairly low voltage.
- Quite delicate in handling as these cannot withstand rough handling or excessive heat.

EXAMPLES OF THIRD GENERATION COMPUTERS:

Popular developments in the third generation include:

- The PDP-8 was the first commercially successful minicomputer. It sold more than 50,000 systems for $18,000.
- The HP-2115 which was made by Hewlett-Packard (HP)
- Fast minicomputers such as IBM 360 series and ICL 19000 series
- Another very good development that came up in this generation (1969) was The Advanced Research Projects Agency Network (ARPANET),the world's first operational packet switching network

The **ARPANET** is the core network of a set that came to become the global Internet. The network was created by a small research team at the United States Department of Defense.

THE FOURTH GENERATION (1971 – TO DATE): MICROPROCESSORS.

HALLMARK:



Microprocessors are VLSI devices. Very-Large-Scale Integration (VLSI) is the process of creating integrated circuits by combining thousands of transistors into a single chip.

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits we rebuilt onto a single silicon chip.



At the heart of all personal computers and most workstations sits a microprocessor.

PHYSICAL SETUP:

The physical size of computers kept on reducing generation to generation.

With the development of micro-chips, what in the first generation filled an entire room could now fit in the palm of the hand.

TECHNOLOGY:

- The fourth generation computers saw the development of the mouse and handheld input devices.
- The Fourth generation computers were more powerful, they could be linked together to form networks.
- A vast variety of Storage memory media used such as Floppy disks (1971), Optical Compact Discs (1982), USB flash drive disks (2000), etc.
- Memory size progressively expanded up to more than 8 Gigabytes of RAM
- The computers became very reliable. Computers which could hardly finish an hour before breakdown can now remain in operation for a full year continuously.
- There has been development of extremely fast computers referred to as super computers with speeds over 100 million instructions per second.
- Further developments in this fourth generation include the following merging of Telecommunication and Computing Technology.
- They don't require air conditioning because they have inbuilt cooling mechanisms.
- This generation also saw the development of Laptop and Palmtop computers which were portable and suitable for business.

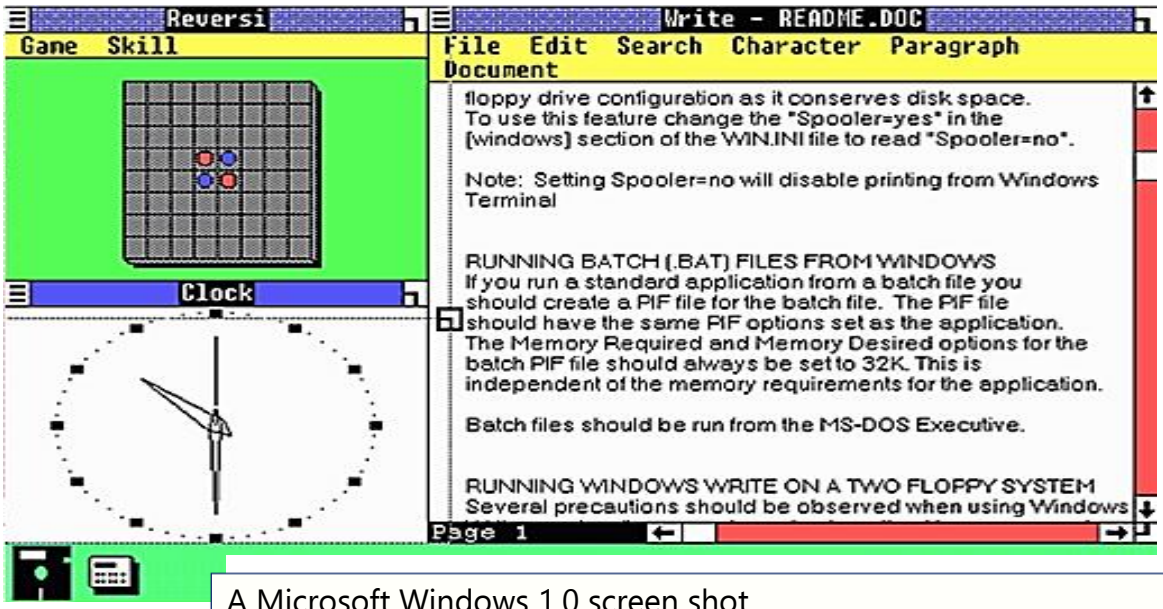
SOFTWARE:

Operating systems based on the Graphical User Interface (GUI*) were developed.

A wide variety of Graphical User interface operating systems and application software have been developed.

Microsoft Windows 1.0 was released by Microsoft Corporation on November 20, 1985.

*A GUI is a user Interface in which visual images such as menus, icons and buttons are used to issue commands.



A Microsoft Windows 1.0 screen shot.

SETBACKS:

- Highly sophisticated technology required for the manufacture of VLSI chips.
- In a microprocessor chip, the various components are part of a small semi-conductor chip and the individual component or components cannot be removed or replaced, therefore, if any component in a microprocessor fails, the whole microprocessor has to be replaced by the new one.
- Operations at low voltage as microprocessors function at fairly low voltage.
- Quite delicate in handling because microprocessors cannot withstand rough handling or excessive heat.

EXAMPLES:

- The Xerox Alto (1973) was an early personal computer developed at Xerox PARC in 1973. It was the first computer to use the desktop metaphor and graphical user interface (GUI).
- The IBM 5100, the first commercially available portable computer, appeared in September 1975.
- The Apple Macintosh (1984) was a mouse-driven computer with a graphic user interface at a much cheaper price.

THE FIFTH GENERATION (TODAY TO FUTURE): ARTIFICIAL INTELLIGENCE AND ROBOTICS.

HALLMARK:



Artificial intelligence (AI) is the ability of machines to have human capabilities, such as the five senses (to See, hear, feel, taste, smell), plus, understanding, communication, reasoning, learning, learning from past experiences, planning, and problem solving.

In the future, computers may even drive cars for us! We also could see them in every imaginable place at home, like gates, that open up for us automatically.

PHYSICAL SETUP:

The physical size of computers in this generation can be customized to any shape of interest – be it as small as a pen or in the shape of a human being.

Technology:

- The fifth generation of computers will be very powerful, like never before.
- We shall see the development of many handheld gadgets like remote control and optical input devices.
- Unlimited expandable Storage Hard disk drives.
- Working Memory size to expand to more than 20 Gigabytes of RAM
- More development of Notebook, Tablet PCs, and Personal digital assistant computers which can store power for a long time, hence becoming too mobile.



- More networking containing millions of interconnected 4th Generation computers.
- Diligent Robots will be highly used in many areas such as factories where repetitive tasks are done.
- The computers to become 99% reliable, to the extent that computers will carry out dangerous operations in Hospitals.
- There will be use of parallel coordinated processing technology, where by computers will use multiple microprocessors being used side by side.
- Molecular computers expected, Composed of millions of DNA (Deoxyribo Nucleic Acid) strands in plastic tubes. THERE IS A POWERFUL computer hidden inside humans beings. It's not the brain but it's DNA. Information-processing tools-such as enzymes and proofreading mechanisms are going to be taken in large numbers of DNA molecules and used as biological computer processors.
- The future will also see the development of Quantum Computing which relies on qubits (quantum bits) that represent the superposition of data nanotubes.

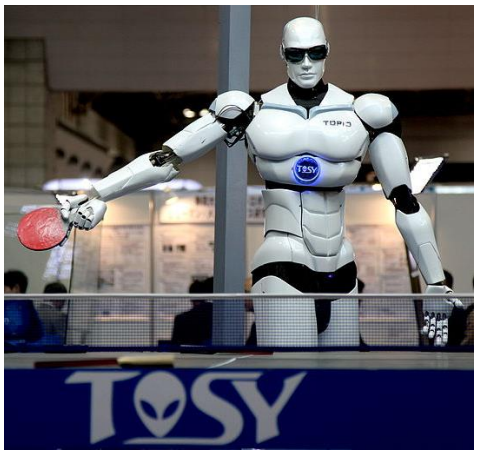
SOFTWARE:

- Fifth-generation programming languages (5GLs) will be used.
- 5GLs are based around solving problems using controls given to the program, rather than using an procedure written by a programmer,
- They contain visual tools to help develop the programs.
- Visual Basic is an example of a 5GL.
- There will be a wide variety of computer Application programs designed to solve specific tasks in a user-friendly manner.

SETBACKS AND DEMERITS OF FIFTH GENERATION COMPUTERS:

- Highly sophisticated technology required for developing artificially intelligent computers and robots.
- Obsession with computers is seriously spoiling the writing and thinking abilities of human beings because the computers will be the ones thinking for people.
- Robotics in the fifth generation will cause unemployment as machines take on the jobs people could do,
- There are many dangers that are to come with the sophisticated technology.

EXAMPLES OF FIFTH GENERATION COMPUTERS:



1. TOPIO (2007) ("TOSY Ping Pong Playing Robot") is a bipedal humanoid robot designed to play table tennis against a human being.
2. Hospital Robots - Robots are becoming ever-more useful to hospital staff, from supporting surgeons to paying bedside visits to patients.
3. The iPad (2010) is a tablet computer designed and marketed by Apple Inc., with a flat touch screen. It is primarily operated by touching the screen rather than using a physical keyboard. On June 29, 2007, Apple Computers released its new touch screen smart phone called the iPhone generation.



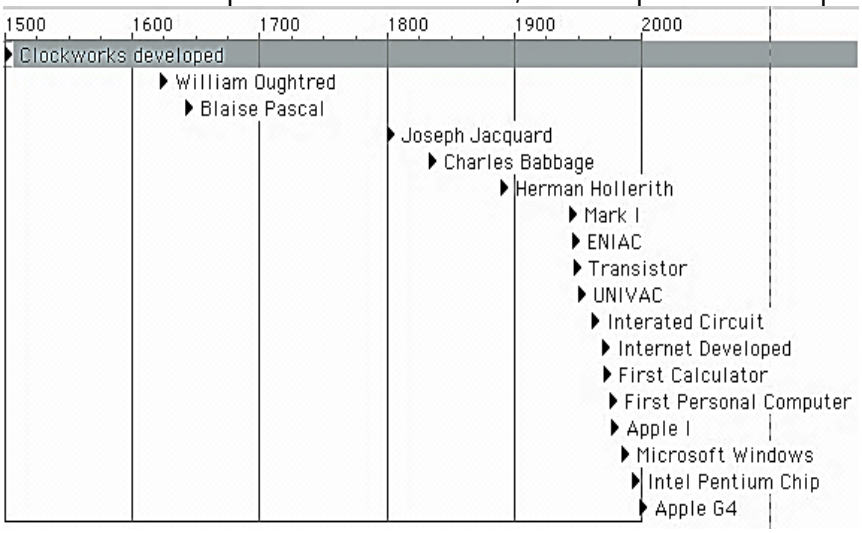


The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

COMPARISON AND SUMMARY OF THE DIFFERENT DEVELOPMENTS IN THE EVOLUTION OF COMPUTERS

COMPARISON USING TIMELINE

If you look at a list of dates and events you may not easily understand which event was first and which was last. A Timeline is a graphic representation of the relationship of events in comparison to each other, over a specified time period.



Question

What does the above time line tell us?

A. Computers were developed mostly by men
B. Computers were mostly developed within the last 250 years
C. The first computer was developed in 2000 BC in China
D. Computers were mostly developed within the last 50 years[†]

SUMMARY TABLE FOR THE ELECTRONIC ERA

GENERATION (Period)	1ST (1946-1958)	2ND (1958-1964)	3RD (1964-1971)	4TH (1971 To Date)	5TH (Today To Future)
Hall mark	Vacuum Tubes	Transistors	Integrated Circuits (LSI devices)	Microprocessors (VLSI devices)	Artificial Intelligence and Robotics
Physical Size	Could fill entire floor of Large Buildings	Could fit in a single room	Could now fit onto a desk	Mobile Computers Could fit in the palm of the hand.	Can be customized to any shape of interest
Input	Punched Cards	Punched Cards	Keyboard	Keyboard, Mouse	Voice Recognition, Touch, Sensors, e.tc.
Primary Memory (RAM)	2Kilobytes	32Kilobytes	2Mega Bytes	Continued increasing. Up to 8GB	Will continue to increase to 16, 32, 64,128 etc.
Secondary Storage	Magnetic Drum	Magnetic Core	Magnetic Hard Disks	A variety of Storage media eg, Floppy Optical Compact Discs and USB flash drives	Hard disks with a lot (Terabytes) of Memory, Internet hard drives, Micro memory *cards*

[†] Answer: D. Computers were mostly developed within the last 50 years

Processing Speed	10,000 instructions per second.	30,000 instructions per second	5 MIPS	100MIPS	Multiprocessors, with Billions of instructions per second.
Software	Machine Language	Assembly and high level programing languages	Simple programming languages like BASIC	Operating systems with a Graphical User Interface (GUI) were Developed.	Fifth-generation programming languages (5GLs)
Multitasking	Not possible	Not possible	Possible	Possible	Possible
Noise, Heat, Power consumption	Too much	Noise & Power consumption reduced.	Air conditioning still required to reduce heat.	Computers now have internal cooling mechanisms.	No noise, little power consumption, no heat!
Examples	ENIAC, EDVAC UNIVAC	IBM 305 RAMAC IBM1401, CDC6600	PDP-8 HP-2115	Xerox Alto, IBM 5100 Apple Macintosh	iPad, Hospital Robots TOSY

UNIT THREE: USES AND FUNCTIONS OF COMPUTERS

UNIT INTRODUCTION

Computers have always assisted to solve the problems faced by the mankind. Although the word 'computer' means 'something which adds, counts, estimates or calculates', a computer today is not merely a "calculator". Computers perform a vast variety of jobs with tremendous speed and efficiency. Today people use computers in almost every walk of life.

However, along with these advancements of science there arises the dilemma of development of technology as it affects human individuals. They have come with both positive and negative impacts to our society.

Computers are applied in the areas of

1) Education
2) Research
3) Business
4) Health
5) Communication
6) Military/security
7) Home
8) Entertainment / leisure
9) Astronomy and
10) Transport.

USES OF COMPUTERS IN THE AREA OF EDUCATION

a. In teaching, we use Computer Assisted Instruction (CAI) by use of Interactive whiteboards, and projectors, in class.
b. Computer Aided Learning (CAL) gives access to On-screen learning materials. Students learn at their own pace, and can repeat a lesson they didn't understand.
c. Computer Aided Assessment (CAA) helps teachers to reduce the time and the labour to mark students' books and answer scripts.
d. Error free School Timetables can be generated using special timetable computer software.
e. With Use of School Administration and Management Systems. (SAMS) Records management is made easier because all details of learners can be held on computer, and easily retrieved, reducing administrative costs.
f. Students' Progressive Report Cards can be produced electronically by use of computers instead of hand written ones.
g. Distance learning through computer based training. People get award such as degrees without going to class.
h. Teachers use simulation software to perform difficult or dangerous experiments in class.
i. Use of special facilities for students with disabilities like text to speech and speech recognition to help blind students.
j. Interactive Multimedia packages on DVDs can clearly demonstrate and explain abstract concepts.
k. Schools use computers to create school websites for sharing information with the public.
l. Productivity tools like desktop publishing and presentation software are used in projects and other school activities.
m. Computers are used for calculating mathematical arithmetic by students and teachers in class.
n. Digital computers are also used for telling and managing time in schools.

USES OF COMPUTERS IN THE AREA OF RESEARCH

a. They have made searching the literature and references easier through use of electronic databases on the World Wide Web. For example an online encyclopedia such as Wikipedia has over 15 times as many words as compared to any printed Encyclopedia and dictionaries.
b. Computers have tools such as Spell checking, cut-and-paste, etc., which make compiling and editing research work easier.
c. A lot of statistical software is available for **performing calculations** and analysing the collected research data.
d. **Data Storage**: The data obtained from the research is easily stored in softcopies in computers as word documents or excel spread sheets.
e. **Research publishing**: The research work can be converted to **P**ortable **D**ocument **F**ormat (**PDF**) and published to the World Wide Web.

USES OF COMPUTERS IN THE AREA OF BUSINESS

a. Computers enable people to Working from home, using a computer connected to the employer's network or via the Internet. This is known as **Telecommuting**.
b. Computers have created more jobs such as Computer technicians, Computer teachers, etc.
c. Buying and selling Computers and its components is a source of income to individuals, and companies.
d. Through, **C**omputer **A**ided **D**esign (**CAD**), scale drawings, and excellent designs can be created easily.
e. Computers are used for sending and receiving Mobile Money and making world-wide money transfers.
f. Banks use Computers to manage transactions and **A**utomatic **T**eller **M**achines **ATMs** for 24 hours banking.
g. Computers help in Business Advertisement through creating websites, internet, flyers, brochures and billboards.
h. Computers are used in typesetting business for production of document printouts and publication of Books for sale.
i. Through **C**omputer **A**ided **M**anufacture (**CAM**), computers can be used to control the production of goods in factories.
j. Computers are used for E-Commerce: the sale of goods and services over the internet.

USES OF COMPUTERS IN THE AREA OF HEALTH

a. Hospitals use computers for managing and storing Records electronically, rather than paper files.
b. Hospital Administration is also aided by printing labels, allocating beds, make appointments, staff rotas, etc.
c. Internet helps us get Web sites for information on health care, treatments, conditions, etc.
d. Monitoring/Diagnosis such as Heart rate, blood pressure, etc. is aided by Computer Expert systems.
e. Medical Training is facilitated by Simulation software and on-line data sources.

USES OF COMPUTERS IN THE AREA OF COMMUNICATION

a. E-mail: Electronic Mail sent from one person to another using connected computers helps a lot in the area of communication.

b. Video Conferencing enables people in different locations to conduct meeting as if they are in the same location.
c. Computers are used for Faxing: Sending an image of a document electronically.
d. Computers enable people to send voice, image, text and data though telephones and mobile cell phones.
e. Social Networks such as Facebook, and Twitter enable people to stay in touch with their relatives, friends and interests.

USES OF COMPUTERS IN THE AREA OF SECURITY/MILITARY

a. Computers aid monitoring security through cameras, Automatic number plate recognition, etc.
b. Communication systems are widely used in the military to coordinate the personnel.
c. Some computer systems can detect temperatures and alarm in case of danger of fire outbreaks.
d. Computers are used for capturing data for Police National Computer Databases –, vehicle number plates, criminals fingerprints, etc.
e. Computers are used to detect presence of illegal devices such as bombs.
f. Computers are also used for controlling dangerous weapons such as missiles.

USES OF COMPUTERS AT HOME

a. Computers are used for doing School Assignments (Home Work)
b. Computers are used for Managing household finances
c. Computers are used for Accomplishing Work related tasks
d. Computers are used to access the Internet for Email / news / information.
e. Computers are used for playback of Digital Media such as Video/Music/Family Pictures at home
f. Programs for Children such as Computer Games at home

USES OF COMPUTERS IN THE AREA OF ENTERTAINMENT / LEISURE

a. Computers introduced completely new type of entertainment like Computer games.
b. Computers are also used in Cinema halls and podiums for faster instant audio and video playback and presentation though projectors.
c. Computers are used in the entertainment industry to produce Music, Video editing, CD burning, etc.
d. Computers are used for instant audio playback functions such as parties.

USES OF COMPUTERS IN Offices

a. Computers are used for preparation of documents and printing.
b. Computers are used for record keeping and storage of information.
c. Computers facilitate communication through use of internet services like e-mail.
d. Computers are used for scheduling office activities and managing routines

USES OF COMPUTERS IN THE AREA OF ASTRONOMY.

a) Astronomy is the study of the sun, moon, stars, planets and other objects and phenomena in space. Computers can offer great help to astronomy which include;
b) Computers are responsible for the rockets
c) Computers are essential tools to study the behaviour of the complex systems in space as regards to their movements, interactions etc.

d) Good mathematical models and powerful computers can help predict the evolution of stars, planets, galaxies etc. computers can be used to simulate and predict processes.
e) Computers perform Telescope pointing and tracking (including error correction), Camera operation, image download and storage, Image reduction (the measurement of the image), and Data processing.

USES OF COMPUTERS IN THE AREA OF TRANSPORT

a. Monitoring highway traffic.
b. Computers are used to tell schedules of water vessels, train, buses to their respective stations. You only need to use your PDA device or cello phone and check it out.
c. Computers are used very extensively in design of roads. Roadways and bridges are designed using software programs like CAD etc.
d. Coordinate timing of street traffic lights to traffic conditions.
e. Providing current traffic alerts/emergency calls/etc.
f. Computer systems are installed in transportation vessels to security.
g. Manage cargo at airports.
h. Data manipulation at transportation centres such as Airports, car parks among others.

DEMERITS OF USING COMPUTERS IN SOCIETY

- For these who spend many hours in front of computer, there is a risk of addiction. Many people don't care about anything except for the computers.
- Eye strain: Using computer for many hours during a day can be very harmful for eyes.
- Our creativity, skills and reasoning can decrease when we are too dependent to the computer. For instance, with email replacing the hand-written letter, onscreen art designing instead of hand drawing art etc.
- Computer can destroy the culture of a certain group of people in the society, especially youths.
- In spite of continuously reducing prices, computers are still costly because the initial costing and maintenance cost of a computer are very expensive.
- Use of computers requires additional efforts in form of learning to use computers and their programs.
- There is dehumanizing of people. Excessive use of computer for communication with others threatens to reduce the intensity of personal bond that often develops between people. For instance, by making telephone calls.
- Computers have led to unemployment of people such as Tellers, shop workers, postal workers; since many manual/repetitive jobs have been replaced by computers like ATMs
- Electronic fraud: Stealing money electronically through practices like Credit card cloning
- Impact on Environment: Computer manufacturing processes and computer waste are depleting natural resources and polluting the environment.
- Hacking: Unauthorized access into computers possibly to access information, compromising privacy. e.g. Wikileaks
- Software Piracy: Stealing software, not paying for licenses through cracking.
- Presence of Viruses: You may lose all your programs, files, documents folders and other data on your computer because of virus infection on the computer.

- Moral Decay: The internet has websites with content such as pornography, which have a bad impact on the users especially the young children.
- Computers are delicate and they must be given a great care.

UNIT FOUR: KEYBOARD AND NAVIGATION

UNIT INTRODUCTION

In this unit, we shall be familiarized to the keyboard and the mouse – the main computer input devices. Much of the time will be given for practical work.
The following will be done:

- Utilizing word pad and typing tutors, to develop skills of typing.
- Using Tools like Paint, to help students to develop skills in navigating and using the mouse.
- As many examples of key-combinations especially the most important (2-key & 3-key combinations) as possible.

THE MOUSE

A mouse is a pointing device which allows users to move the cursor and make selections on the computer screen. A pointing device is any piece of hardware that is used to allow a user to input spatial data to the computer.
Just as you would use your hands to interact with objects in the physical world, you can use your mouse to interact with items on your computer screen.
You can move objects, open them, change them, throw them away, and perform other actions. You can do all that by Pointing, clicking, and dragging Clicking (single-clicking) Double-clicking Right-clicking and dragging with your mouse.

BASIC PARTS OF A MOUSE

A mouse typically has two buttons: a primary button (usually the left button) and a secondary button (usually the right button). You will use the primary button most often. Most mice also include a scroll wheel between the two buttons.

HOLDING AND MOVING THE MOUSE

- Place your mouse beside your keyboard on a clean, smooth surface, such as a mouse pad.
- Hold the mouse gently, with your index finger resting on the primary button and your thumb resting on the side.
- To move the mouse, slide it slowly in any direction.
- Don't twist it—keep the front of the mouse aimed away from you. As you move the mouse, a pointer on your screen moves in the same direction.
- If you run out of room to move your mouse on your desk or mouse pad, just pick up the mouse and bring it back closer to you.
- Hold the mouse lightly, keeping your wrist straight.

THE MOUSE PAD



A mouse pad or mouse mat is a surface for placing and moving a computer mouse.

- A mouse pad improves the usability of the mouse.
- It enables higher speed, more precision, and comfort for the user, compared to using a mouse directly on a table.
- A secondary benefit was keeping the desk or table surface from being scratched,
- It also reduces/prevents debris under the mouse.

POINTING

Pointing to an item on the screen means moving your mouse so the pointer appears to be touching the item. When you point to something, a screen tip often appears that describes the item. For example, when you point to the Recycle Bin on the desktop, a screen tip appears with this information: "Contains the files and folders that you have deleted."The pointer can change depending on what you're pointing to. For example, when you point to a link in your web browser, the pointer changes from an arrow to a hand with a pointing finger.



CLICKING (SINGLE-CLICKING)

To click an item, point to the item on the screen, and then press and release the primary button (usually the left button).Clicking is most often used to select (mark) an item or to execute a command with a command button. Clicking is also called single-clicking or left-clicking.

DOUBLE-CLICKING

To double-click an item, point to the item on the screen, and then click twice quickly. If the two clicks are spaced too far apart, they might be interpreted as two individual clicks rather than as one double-click.

Double-clicking is most often used to open items on your desktop. For example, you can start a program or open a folder by double-clicking its icon on the desktop.

RIGHT-CLICKING

To right-click an item, point to the item on the screen, and then press and release the secondary button (usually the right button).Right-clicking an item usually displays a pop up menu with a list of things you can do with the item.

For example, when you right-click the Recycle Bin on your desktop, Windows displays a menu allowing you to open it, empty it, delete it, or see its properties. Whenever you are unsure of what to do with something, right click it.

DRAGGING

You can move items around your screen by dragging them. To drag an object, point to the object on the screen, press and hold the primary button, move the object to a new location, and then release the primary button.

Dragging (sometimes called dragging and dropping) is most often used to move files and folders to a different location and to move windows and icons around on your screen.

SCROLLING

If your mouse has a scroll wheel, you can use it to scroll through documents and windows instead of using scroll bars.

To scroll down, roll the wheel backward (toward you). To scroll up, roll the wheel forward (away from you).

The scroll wheel helps you move up or down through documents, windows and Webpages more easily. On some mice, the scroll wheel can be pressed to act as a third button. Advanced mice might have additional buttons that can perform other functions.

TIPS FOR USING YOUR MOUSE SAFELY

- Always ensure a clean, smooth surface, such as a mouse pad
- Place your mouse at elbow level. Your upper arms should fall relaxed at your sides.
- Don't squeeze or grip your mouse tightly. Hold it lightly.
- Move the mouse by pivoting your arm at your elbow. Avoid bending your wrist up, down, or to the sides.
- Use a light touch when clicking a mouse button.
- Keep your fingers relaxed. Don't allow them to hover above the buttons.
- When you don't need to use the mouse, don't hold it.
- Take short breaks from computer use every 15 to 20 minutes.

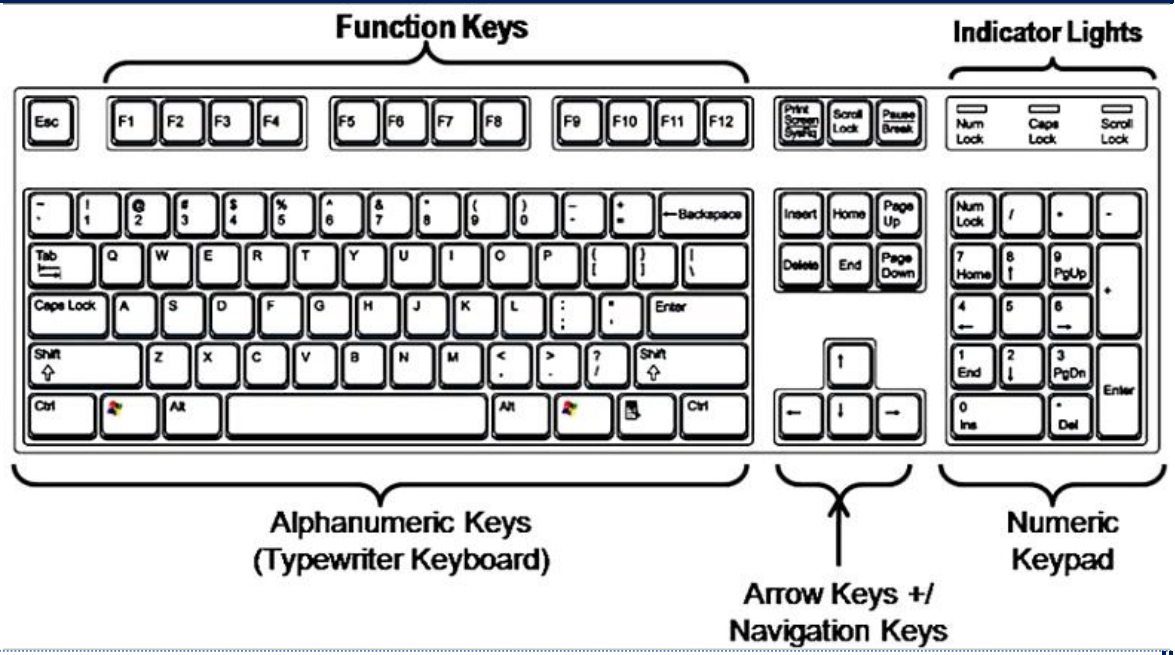
THE KEY BOARD

A keyboard is the set of typewriter-like keys that enables you to enter data into a computer.

Whether you're writing a letter or calculating numerical data, your keyboard is the main way to enter information into your computer. But did you know you can also use your keyboard to control your computer?

Learning just a few simple keyboard commands can help you work more efficiently.

THE STRUCTURE OF A STANDARD KEYBOARD



SECTIONS OF THE KEYBOARD & THEIR USES

The **alphanumeric keys** include the same letter, number, punctuation, and symbol keys found on a traditional typewriter.

The **Numeric keypad** is handy for entering numbers quickly. The keys are grouped together in a block like a conventional calculator or adding machine.

Navigation keys are used for moving around in documents or web pages and editing text. They include the arrow keys, Home, End, Page Up, Page Down, Delete, and Insert

The **Function keys** are labeled as F1, F2... up to F12. The functionality of these keys differs from program to program.

TYPING TEXT

Whenever you need to type something in a program, e-mail message, or text box, you'll see a blinking vertical line.

That's the cursor, also called the insertion point. It shows where the text that you type will begin. You can move the cursor by clicking in the desired location with the mouse, or by using the navigation keys.

In addition to letters, numerals, punctuation marks, and symbols, the typing keys also include Shift, Caps Lock, Tab, Enter, the Spacebar, and Backspace.

ROLES OF SPECIAL KEYS

1. Press Shift in combination with a letter to type an uppercase letter. Press Shift in combination with another key to type the symbol shown on the upper part of that key.
2. Press Caps Lock once to type all letters as uppercase. Press Caps Lock again to turn this function off. Your keyboard might have a light indicating whether Caps Lock is on.
3. Press Tab to move the cursor several spaces forward. You can also press Tab to move to the next text box on a form.
4. Press Enter to move the cursor to the beginning of the next line. In a dialog box, press Enter to select the highlighted button.
5. Press Backspace to remove the character before the cursor (on the left of the insertion point), or the selected text.
6. Press Delete to remove the character after the cursor (on the right of the insertion point), or the selected text.
7. Press the Spacebar to move the cursor one space forward.
8. Press the Esc key to cancel the current task.
9. Application key - Equivalent to right-clicking the selection.

USING NAVIGATION KEYS

1. **Left Arrow, Right Arrow, Up Arrow, or Down Arrow** - Move the cursor one line in the direction of the arrow (in case of down and up arrow keys). Right and left arrow keys move the cursor one step in the direction of the key.
2. **Home** - Moves the cursor to the beginning of a line or moves to the top of a page.
3. **End** - Moves the cursor to the end of a line or moves the cursor to the bottom of a page.
4. **Page up/Down** - Moves the page up or down by one screen.
5. **Turn Insert mode off or on**. When Insert mode is on, text that you type is inserted at the cursor. When Insert mode is off, text that you type replaces existing characters.

USING THE NUMERIC KEYPAD

The numeric keypad arranges the numerals 0 through 9, the arithmetic operators + (addition), - (subtraction), * (multiplication), and / (division), and the decimal point as they would appear on a calculator or adding machine.

These characters are duplicated elsewhere on the keyboard, but the keypad arrangement allows you to rapidly enter numerical data or mathematical operations with one hand.

To use the numeric keypad to enter numbers, press Num Lock. Most keyboards have a light that indicates whether Num Lock is on or off. When Num Lock is off, the numeric keypad functions as a second set of navigation keys

THREE ODD KEYS

Let's explore the three most mysterious keys on the keyboard: PrtScn, Scroll Lock, and Pause/Break.

Pressing PrtScn captures an image of your entire screen (a "screen shot") and copies it to the Clipboard in your computer's memory. From there you can paste it (Ctrl+V) into Microsoft Paint or another program.

Pressing Scroll Lock changes the behavior of the arrow keys and the Page Up and Page Down keys; pressing these keys causes the document to scroll without changing the position of the cursor or selection.

In some older programs, pressing the Pause/Break key pauses the program.

SOME KEY COMBINATIONS & THEIR USES

1. Press Alt+PrtScn to capture an image of just the active window, instead of the entire screen
2. Press Ctrl Home to Moves to the top of a document and
3. Press Ctrl End to Moves to the End of a document.
4. Alt+Tab Switches between open programs or windows
5. Ctrl+A Selects all items in a document or window
6. Alt+F4 Closes the active item, or exit the active program
7. Ctrl+S Saves the current file or document.
8. Ctrl+C Copies the selected item
9. Ctrl+X Cuts the selected item
10. Ctrl+V Pastes the selected item
11. Ctrl+Z To undo an action
12. Pressing Ctrl+Esc or Windows logo key (Win) displays the start menu.
13. Press Win+E to open My computer window.
14. Press Win+M to open minimize windows.
15. F1 – Get help
16. F2 to rename a selected item.

NB: Find more keyboard combination lists in the next Topics.

TIPS FOR USING YOUR KEYBOARD SAFELY

- Using your keyboard improperly can cause soreness or injury to your wrists, hands, and arms, particularly if you use your computer for long periods of time. To avoid this:
- Place your keyboard at elbow level. Your upper arms should be relaxed at your sides.
- Center your keyboard in front of you. If your keyboard has a numeric keypad, you can use the spacebar as the centering point.
- Type with your hands and wrists floating above the keyboard, so that you can use your whole arm to reach for distant keys instead of stretching your fingers.
- Avoid resting your palms or wrists on any type of surface while typing. If your keyboard has a palm rest, use it only during breaks from typing.
- While typing, use a light touch and keep your wrists straight.
- When you're not typing, relax your arms and hands.
- Take short breaks from computer use every 15 to 20 minutes.

ACTIVITY

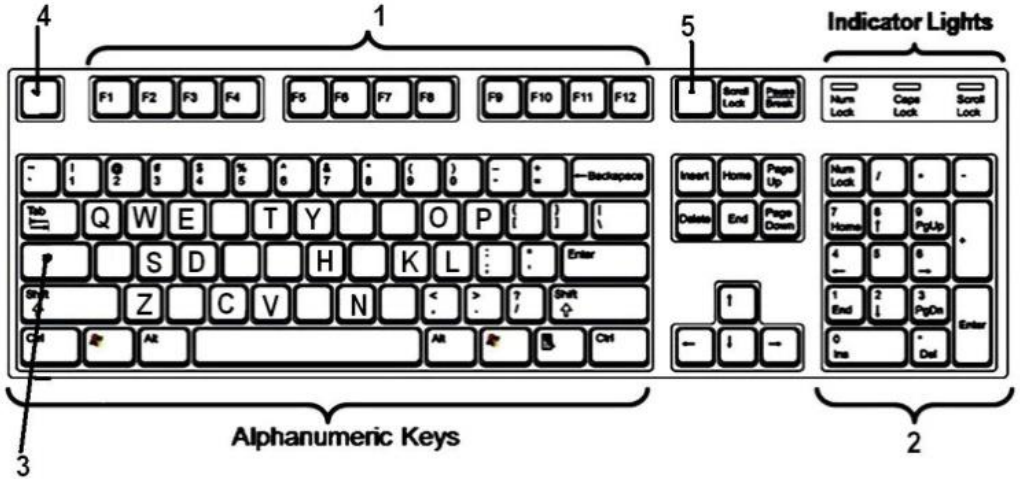
1. The long key on a keyboard which is used when you want to separate one word from another when writing, is called the:
2. The key you press once to write in UPPER-CASE/CAPITAL letters, is called the:
3. A key that begins with 'C' that is used for shortcuts in applications, is called the:
4. A key that is used to make multiple spaces/indent in a text document, is called the:
5. A key that is used to remove a letter/space which is in front of the cursor on the screen is called the:

EXERCISE

1(a) What is a mouse? (*1 mark*)

(b) State any 4 uses of a mouse. (*4 marks*)

2. The figure below shows the structure of a standard key board.



(a) Fill in the missing alphabetical keys within the figure. (*5 marks*)

(b) Name the regions and the keys labeled 1-5. (*5 marks*)

(c) State the practical importance of the following key combinations: (*5 marks*)

Ctrl + X .....

Ctrl + A.....

Ctrl + Z.....

Ctrl + S.....

NAVIGATING THE WINDOWS ENVIRONMENT

YOU SHOULD BE ABLE TO:

- Start Windows and tour the desktop
- Explore the Start menu
- Run software programs, switch between them, and close them
- Manipulate windows
- Identify and use the controls in menus, toolbars, and dialog boxes
- Navigate your computer with Windows Explorer and My Computer
- Change the view of the items in your computer
- Get help when you need it
- Shut down Windows

STARTING THE COMPUTER:



- Make sure all the plugs are well connected.
- Switch on the electricity socket and the Uninterruptible Power Supply Unit.
- Press the power button on the computer monitor first. It should show signal.
- Press the power button on the system unit.
- The computer should now start to boot and load windows.
- If the welcome screen appears, select your username and enter the password.
- The Desktop should now appear.
- Give it time to load the elements and start up programs.

THE DESKTOP:

- Area that appears on the screen when Windows XP starts. It is a workspace for projects and tools
- Uses default settings when the computer is first started preset by the operating system, but its appearance can be changed by the user

ELEMENTS OF THE DESKTOP

- Icon
- Pointer
- Desktop
- Date/Time control
- Taskbar
- Start button
- Notification area

SCREENTIPS

- Screen tips appear when the mouse pointer is positioned over certain objects.
- They display the purpose or function of the object.

START MENU

Appears when the Start button is clicked. It provides access to programs, documents, etc. Pointing to an object and then click on the object. A selected object is highlighted.

WORKING WITH FILES AND FOLDERS

Folders on a computer provide a storage system similar to folders in a filing cabinet. Folders can contain files and other subfolders. Windows provides a number of default (personal) folders to start your computer filing system. A folder is typically represented by a folder icon. To open a file, folder, or program:
Double-click on the file, folder, or program icon. The folder name is under the icon.
To create a new folder, right click on the desktop background area Point to the New option in the pop up menu, and select the Folder command. Specify a name before clicking away.



My Documents folder provides a place to store all of your files. When you save a document, the default save location is the My Documents folder:

THE RECYCLE BIN

When you delete a program, file, or folder, it is moved to the Recycle Bin. The Recycle Bin gives you the opportunity of later retrieving your deleted items if you change your mind. Items in the Recycle Bin still take up hard disk space. When the Recycle Bin is full,

Windows automatically cleans out enough space to accommodate the newest deleted items. By default, the Recycle Bin is located on your desktop:



- To Empty the Recycle Bin,
- Right-click on the Recycle Bin.
- From the pop-up menu, select Empty Recycle Bin:

To Restore Items from the Recycle Bin

- Double-click on the Recycle Bin on the desktop.
- This opens the Recycle Bin window.
- Select the item you want to restore.
- Click the Restore this item link in the Recycle Bin Tasks area.

COPYING, CUTTING, AND PASTING FILES AND FOLDERS

Copying files and folders is useful if you want to copy (duplicate) a file or folder, and place it in another location. Cutting a file or folder is useful if you want to move a file or folder to another location.

To copy or cut files and folders:

- Right-click on the file or folder you want to copy or cut.
- From the pop-up menu, select Copy or Cut.
- Open the location you want the copied or cut item to be placed.
- Right-click in the location and select Paste from the pop-up menu.

Renaming Files and Folders

- Right-click on the file or folder you want to rename.
- From the pop-up menu, select Rename.
- Type a new name and press the Enter key on your keyboard.
- Deleting Files and Folders
- Right-click on the file or folder you want to delete.
- From the pop-up menu, select Delete.

CREATING SHORTCUTS FOR FILES AND FOLDERS

Creating a shortcut is useful when you frequently access a program, folder, or file, or when you want to place a program, folder, or file in the Start menu. The desktop is a convenient location to place shortcuts.

To create a shortcut from a program, file, or folder, Right-click on the program, file, or folder for which you want to create a shortcut.

From the pop-up menu, select Create Shortcut.

Cut and paste the shortcut to the location you want.

STARTING AND CLOSING A PROGRAM

A program must be started before it can be used. To start a program, Click the Start button, locate and click the program's name in the submenus.

Program button appears on the taskbar for each open program. Click to switch between open programs. Close button is located in the upper-right corner of the program window. Click to close the program

MULTITASKING

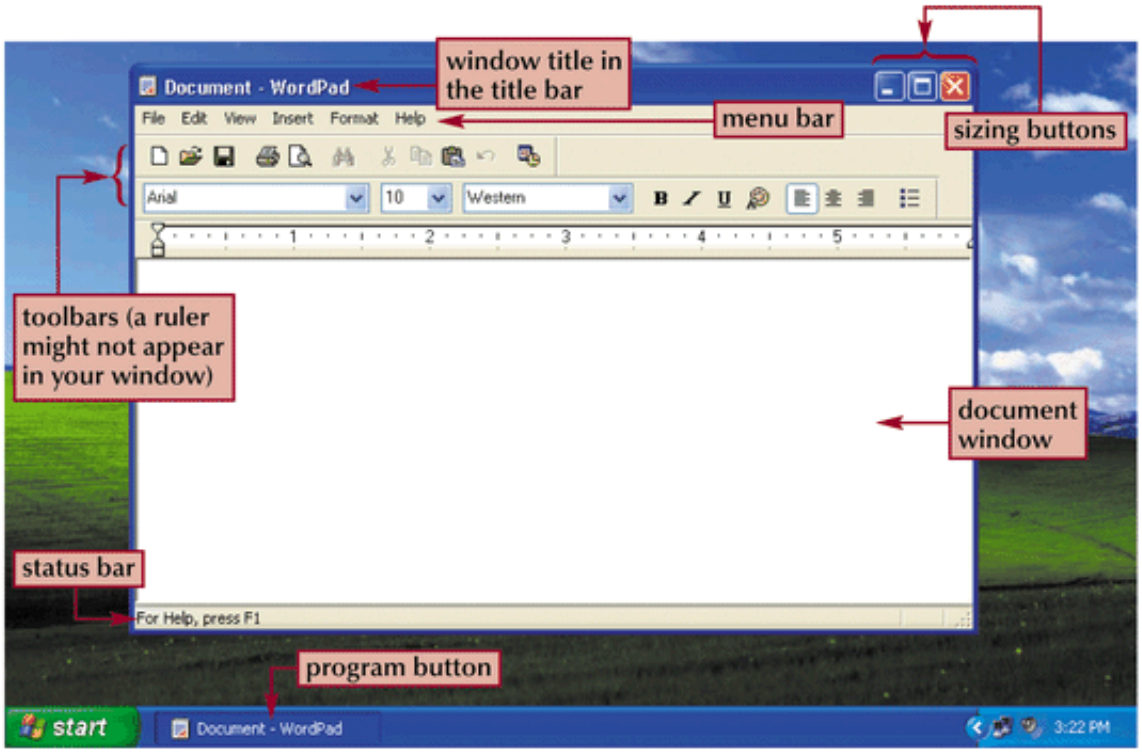
Ability to run multiple programs on Windows at the same time. Allows the user to work on more than one project at a time.
The active program is the one you are currently using. The inactive programs window appears dimmed.

USING THE TASKBAR

The taskbar displays opened files, folders, and programs. When multiple windows are open, You can click on file, folder, or program buttons in the taskbar to switch between windows.
The taskbar also contains a notification area where the current time and Windows Messenger program are displayed by default. The notification area is at the very right of the taskbar:

ANATOMY OF A WINDOW

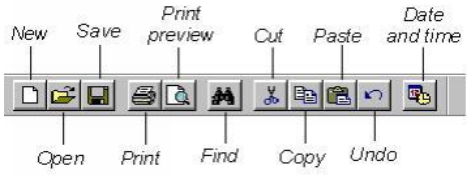
A rectangular area of the screen that may contain a program, Text, Graphics, and Data



MENU ITEMS OR COMMANDS

- Choices for a menu appear when a menu name is clicked. When clicked, they immediately carry out an action. Show submenus ask the user for more information about the desired action.

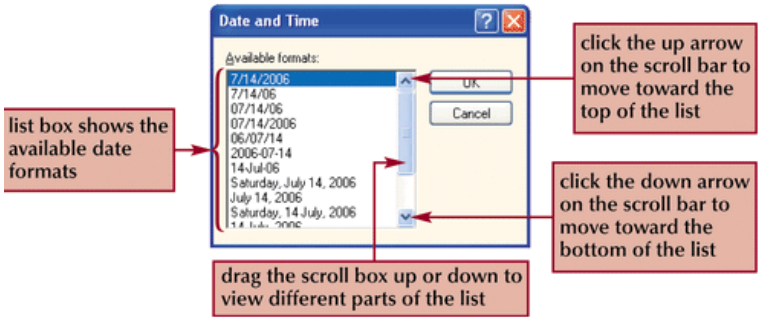
TOOLBARS IN THE PROGRAM WINDOW



- Provide one-click access to frequently used commands. They have buttons grouped and organized by tasks. To perform a command, select a toolbar button by clicking it.

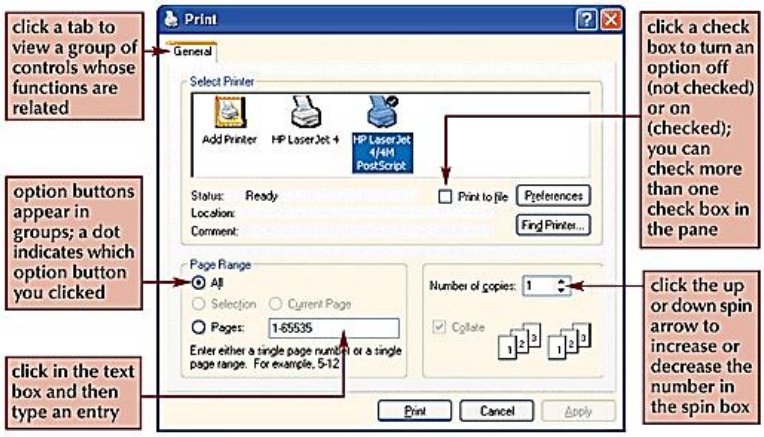
LIST BOX

- Displays a list of available choices. It usually includes array buttons, a scroll bar, and a scroll box.



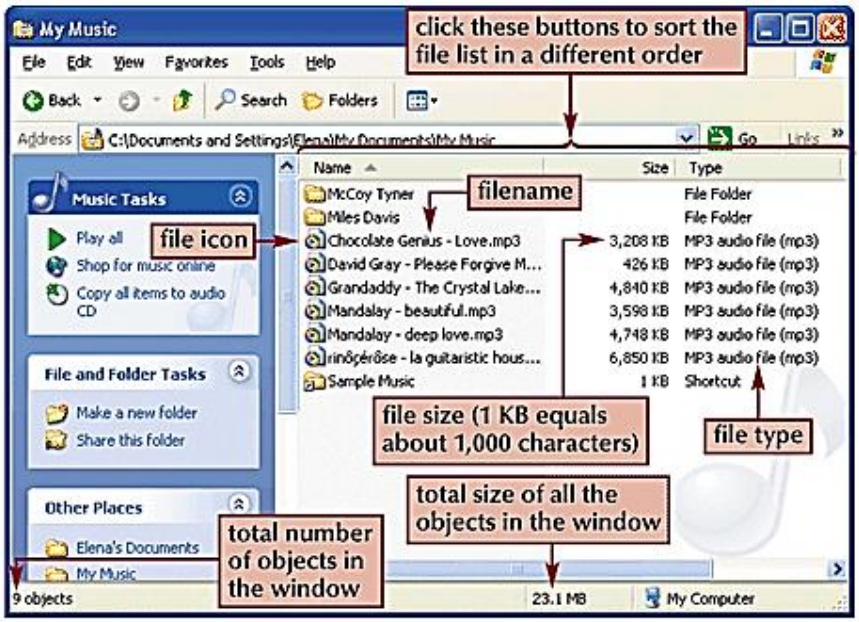
DIALOG BOX

- Opens when a menu command or item followed by an ellipsis is selected.
- A dialog box is a feature of a GUI that allows the user to provide more information about how a program should carry out a task.
- Groups different kinds of information in tabs and panes. Panes are the bordered rectangular areas in a dialog box.



CHANGING FILE AND FOLDER VIEWS

- Change the view by selecting an option from the View menu on the menu bar. When viewing files and folders within a folder, files and folders can be viewed as: Details, Icons, List, Thumbnails, Tiles, etc.



SHUTTING DOWN WINDOWS

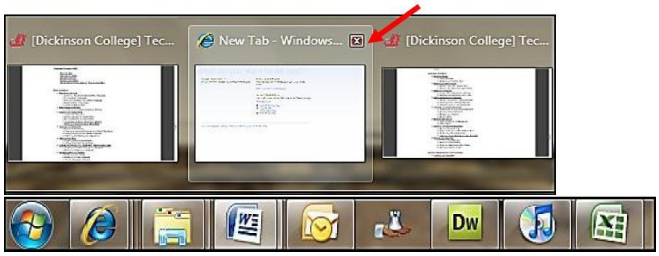
Turn Off Computer option is Located on the Start menu. The Turn Off Computer dialog has the Turn off the computer, Standby / Hibernate, and Restart Option.
Log Off and Switch User options are also located on the Start menu.



NAVIGATING WINDOWS 7

Windows 7's taskbar is greatly improved in two ways. First, you can pin programs to it indefinitely for easy quick launch. Second, on a crowded desktop covered with windows, using the new Aero Peek feature, you can preview individual windows from grouped taskbar applications, and even close documents from the thumbnails themselves.

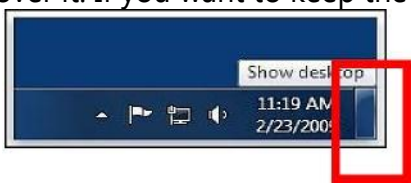




When you pin a favorite program to the taskbar, you can always see it there and easily access it with a single click.

SHOW DESKTOP

Show desktop on far right corner, but you don't need to click, just put your mouse over it. If you want to keep the desktop & minimize the files, just click it.



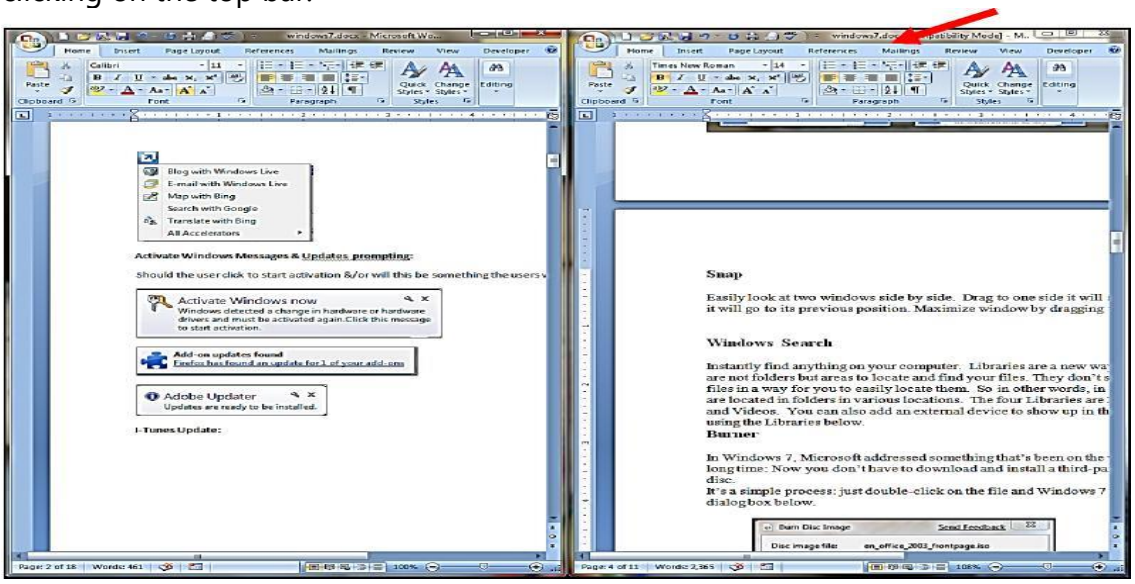
START MENU

In Windows 7, you have much more control over the programs and files that appear on the Start menu. The Start menu is essentially a blank slate that you can organize and customize to suit your preferences. Find a program you want you just start typing its name in the search box on the start menu.

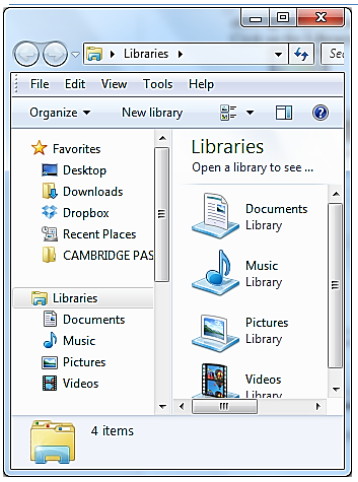
SNAP

Easily look at two windows side by side. Drag to one to the side till it will snap into place. Drag back and it will go to its previous position. Maximize window by double

clicking on the top bar.



LIBRARIES



Libraries are a new way to see your files. Libraries are not folders but areas to locate and find your files.
They don't store your files but gather the files in a way for you to easily locate them. So in other words, in the library are your files that are located in folders in various locations. The four Libraries are Documents, Music, Pictures and Videos. You can also add an external device to show up in the Libraries. Click on the Library Icon found on your taskbar.

GADGETS

Right click desktop and drag over to your desktop what Gadgets you would like, the news, your pictures and the phases of the moon, right on your desktop. Here are some examples:



PREVIEWS IN FOLDERS

Once you find your file you can preview it right inside the folder without opening up the program. Select the file you want to Preview, and then click on the Preview Pane button. The common files that can be previewed include pictures, documents such as .doc, .xls, .ppt, .pdf, e.t.c.

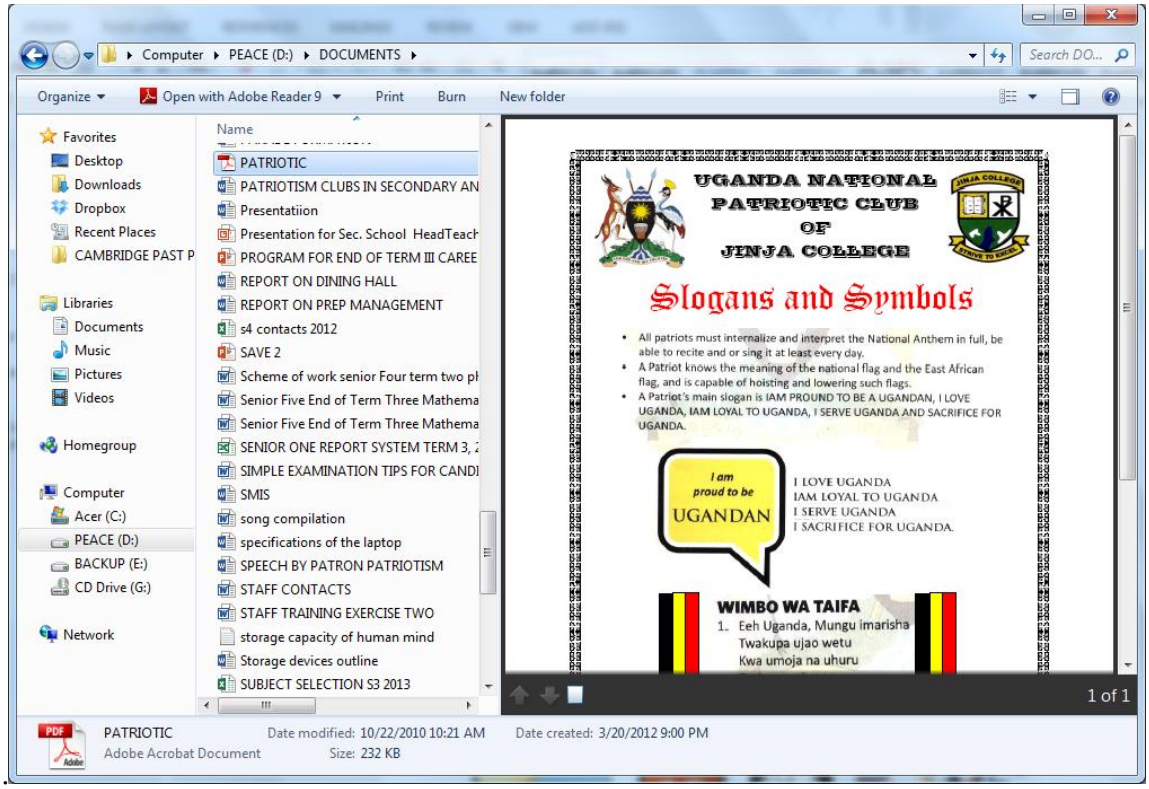
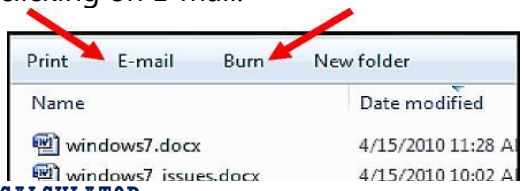


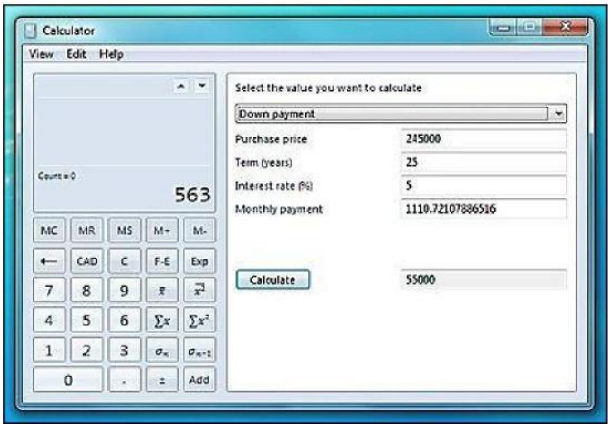
Figure showing a pdf file being previewed in a folder.

BURN TO A CD OR SEND AS EMAIL

In Windows 7 you can burn a file to a CD. Select the files you want to burn & click on the Burn button found on the toolbar within the Library area. You can also send a document as an email attachment by clicking on E-mail.



CALCULATOR



At first glance the Windows 7 calculator basic but it's you'll see powerful new Statistics and Programmer views. Try the Options menu find different unit conversions (length, weight, volume and more), date calculations (how many days between two dates), and spreadsheet-type templates to help you calculate vehicle mileage, mortgage rates & more.

ACTIVITY

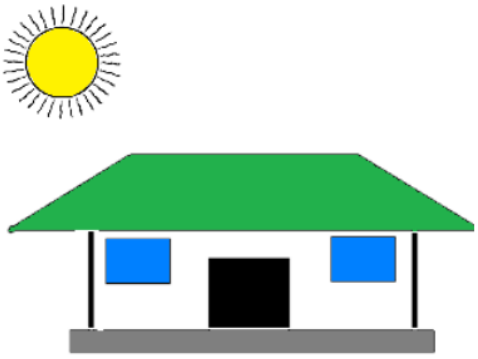
In the following activity you are required to perform tasks and answer questions associated with operating and using your computer. You will be asked to create a folder structure to organize documents and folders for your personal and business use. You will then carry out various operations associated with manipulating files and folders within this structure.

Task 1: Connect your computer, start it and log on to the windows desktop.

Task 2: Create two new shortcuts on the desktop: One for the Paint Program, and another for the Word Pad Program.

Task 3: Create a folder entitled by YOUR NAME under the My Documents Directory.

Task 4: Create TWO NEW subfolders within the YOUR NAME folder.
Name the sub-folders Personal and Business.
Task 5: Create THREE subfolders within the Personal folder and name them, Letters; Addresses and Finance.
Task 6: MOVE the TWO Shortcuts Paint and WordPad from the Desktop to the Personal folder.
Task 7: Select the THREE sub-folders (Letters; Addresses and Finance) that are in the Personal folder and DUPLICATE them in the Business folder.
Task 8: In the Business folder change the names of the duplicated folders:
Letters to Reports, Addresses to Invoices and Finance to Brochure.
Task 9: Launch the Word Pad program using your shortcut. In it, type the definition of a computer. Increase the font size of all text to 20 point.
Task 10: Save the word pad document with the file name Computing in the Reports folder.
Task 11: Launch the Paint Program using your short cut, and draw the graphic below.
Task 12: Change the fill color of the roof to brown, the windows and door to Blue and the sun to yellow.
Task 13: Save the Graphic in the Addresses Folder with the file name Home.
Task 14: Move the whole YOUR NAME folder from the My documents directory to the **root** of the Hard disk Partition D:\
Task 15: Log off the computer.



UNIT FIVE: CATEGORIES OF COMPUTERS

UNIT INTRODUCTION

Computers can be categorized according to the process they use to represent data. People communicate through speech by combining words into sentences. Human speech is analog because it uses continuous (wave form) signals that vary in strength and quality. Most computers are digital.

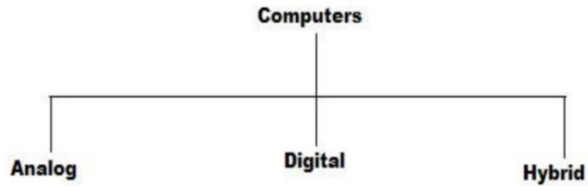
Computer categories are basically three:

1. Digital computers
2. Analog computers
3. Hybrid computers



The Polish analog computer

ANALOG COMPUTERS

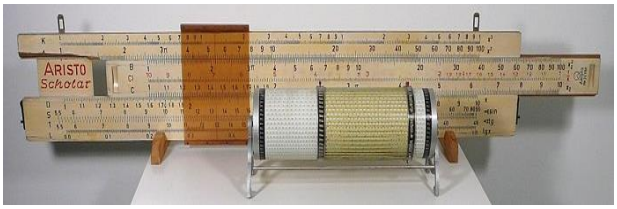


Analog computers are computers in which numerical data are represented by measurable physical variables, such as electrical voltage, temperature etc.

It generally deals with physical variables such as temperature, weight, voltage, pressure, speed, etc.
The results given by the analog computers are approximate since they deal with quantities that vary continuously.
Almost all of the measuring devices are "Analog computers".

EXAMPLES OF ANALOG COMPUTERS

Thermometers, Voltmeters and Ammeters, Speedometers, Barometers, Traditional automatic watches, etc.
The slide rule is a hand-operated analog computer for doing multiplication and division, square roots, cubes and cube roots etc.



DIGITAL COMPUTERS



These are computers that present data as discrete (discontinuous) values of 0 and 1.The binary digits simply mean the presence or absence of an electric pulse/ voltage. The state of being on is represented by 1 and off is represented by 0.
Although digital representations are discrete, the information represented can be either discontinuous, such as numbers, and letters, or continuous, such as sounds, images, and other measurements of continuous systems.
Digital computers are more accurate and work at a very fast rate.
Examples of Digital Computers Include: all Personal computers (PCs), Laptops, Digital Watches

HYBRID COMPUTERS

A hybrid computer combines the desirable features of analog and digital computers.
A hybrid computer accepts analog signals and converts them to digital for processing.
It is mostly used for automatic operations of complicated physical processes and machines.
Now-a-days analog-to-digital and digital-to-analog converters are used for transforming the data into suitable form for either type of computation.
Hybrid computers are mainly used for specialized tasks.

EXAMPLES OF HYBRID COMPUTERS:

- Digital petrol pumps are an example of hybrid computers. They measure physical quantities and represent its values in digital form.
- In Hospitals' Intensive care units, analog devices measure the patient's temperature, blood pressure and other vital signs.
- Hybrid meters that measure analog quantities like electricity usage, speed (digital speedometers), e.t.c.

These measurements which are in analog are then converted into numbers and supplied to digital components in the system.





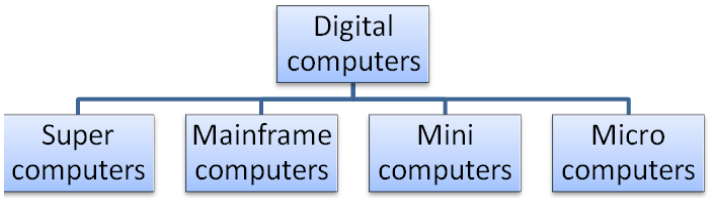
UNIT SIX: CLASSIFICATION OF COMPUTERS

UNIT INTRODUCTION

In the previous unit, we looked at Analog, Digital and Hybrid as the categories of computers based on how they represent data. Those categories of computers are sometimes referred to as classifications of computers by process or by nature.
In this unit, we are going to further classify digital computers according to their size, their purposes, functions and processing power.

CLASSIFICATION COMPUTERS BY SIZE/CAPACITY

According classification of computers by size, we consider the physical size, and the number of people the computer can accommodate at the same time. Digital computers can be grouped into four classes as follows:



SUPER COMPUTERS

- Super Computers have the highest processing capacities and the most expensive ones.
- These computers can process billions of instructions per second.
- They are used for applications which require intensive numerical computations such as weather forecasting.
- They have a high storage capacity and are huge in size.
- They generate large amounts of heat and therefore need complex cooling systems.
- A supercomputer channels all its power into executing a few programs as fast as possible.
- Super computers are the most expensive ones.



The Cray 2 Super Computer (1985)



The Roadrunner supercomputer (2007)

MAINFRAME COMPUTERS (ALSO KNOWN AS BIG IRON)

- These are powerful computers used mainly by large organizations for bulk data processing such as census, and financial transaction processing.
- They are also called central processors because they process data centrally.
- These computers are used in places where processing needs to be done in bulk such as banks.
- They can store a lot of information
- They support a wide range of peripheral devices
- They have many users connected via dumb terminals.

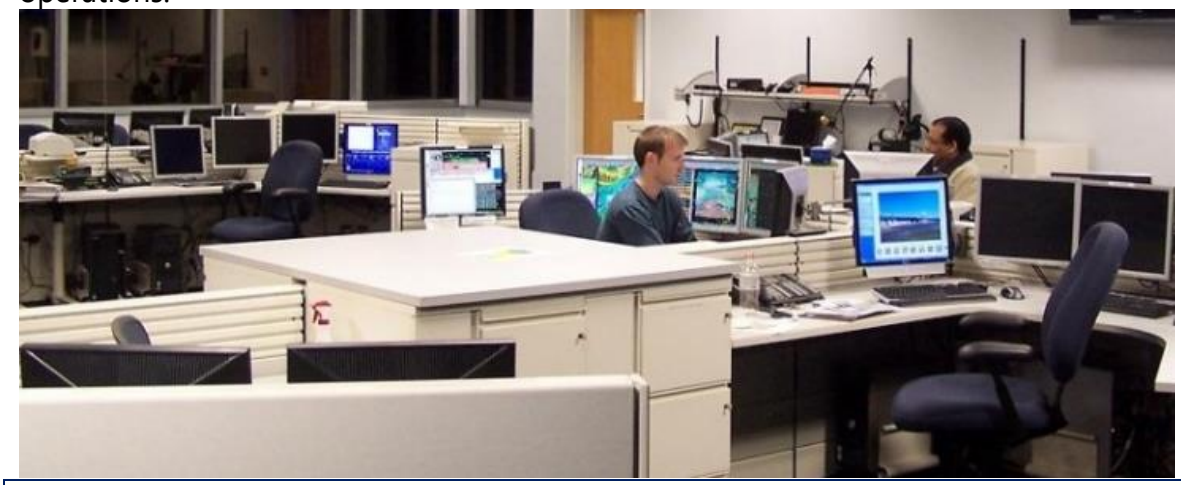
What are Dumb Terminals?

Dumb terminals are display and input devices which don't process data, instead they transmit input to a computer to which it is connected and display the resulting output.

Dumb terminals have no 'intelligence' (data processing power) and depend entirely on the (intelligent) computer to which they are connected for computations, data storage, and retrieval.

What are intelligent terminals?

An intelligent terminal contains processing power because it includes memory and a processor in additional to a keyboard and monitor used to perform special display operations.



Main frame computers are commonly used as central processing units connecting many dumb terminals in offices.

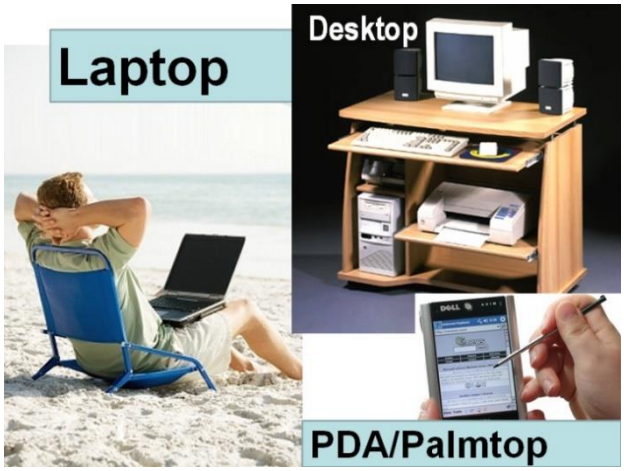
MINI COMPUTERS (MIDRANGE COMPUTERS)

A minicomputer is a class of multi-user computers that lies in the middle range between mainframe computers and the smallest single-user systems (microcomputers or personal computers).

They are similar to main frames but they are smaller in size, support a limited number of peripheral devices connected to them, Have a lower speed, have lesser storage capacity, and support fewer numbers of users at the same time than as compared to main frames.

MICRO COMPUTERS (A.K.A. PERSONAL COMPUTERS –PCS)

A microcomputer is a computer with a microprocessor as its central processing unit. They are single user (they support one person at a time) and are the most widely used computers in our everyday life.



Micro computers are relatively cheap, smaller in size and support fewer peripheral devices.

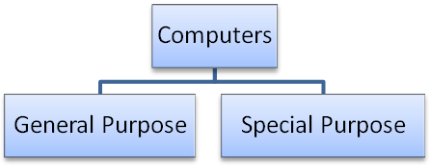
Micro computers are further classified into:

a) Desktop computers: Designed to be stationed in one place probably on top of a desk.
b) Laptop computers: These are more portable and suitable for mobile computing.
c) Palmtops/Personal Digital Assistants (PDAs): These are handheld digital computers.

CLASSIFICATION OF COMPUTERS BY PURPOSE

According to Purpose, we base on the variety of problems that a computer can help to solve.

Computers can be grouped into two classes as follows:



SPECIAL PURPOSE COMPUTERS

A special purpose computer is designed to operate on a restricted type of problems. They have instructions permanently stored in them to perform the given task quickly and efficiently. Most special purpose computers have the capability of performing just one task. They are commonly referred to as "**dedicated computers,"**

Examples of Special Purpose Computers

- Automatic Teller Machines (ATM),
- Pocket calculators,
- Computers that operate lifts.
- NB: Most analog computers are special purpose computers.

GENERAL PURPOSE COMPUTERS

General-Purpose Computers are designed to solve a wide range of problems. They are also able to act in response to new programs created to meet different needs.

A general-purpose computer is one that has the ability to store different programs of instruction and thus to perform a variety of operations. Most PCs (Desktops, laptops and palmtops) are general purpose.

CLASSIFICATION COMPUTERS BY FUNCTION

According to Function, we base what computers do and how they do it.

We have the following classifications of computers by function:

i. Networked Computers
ii. Stand-alone Computers
iii. Real-time Systems
iv. Integrated Systems

NETWORKED COMPUTERS

These are computers connected by channels to other computers so that they can communicate with each other and share resources like data, internet connection, printers, etc.

STAND-ALONE COMPUTERS

This is a computer that operates and does everything independently.
Stand-alone computers do not have any internet connection or a connection to the outside world.
A fax machine is a stand-alone device because it does not require a computer, printer, modem, or other device.
A printer, on the other hand, is not a stand-alone device because it requires a computer to feed it data.

REAL-TIME SYSTEMS

These are systems that respond to an event that has occurred within a certain specified time frame.
Real-time means that after an event has occurred, a system or application has to react to that event within a certain time period or deadline.
For example, computers for a banking system are real time systems.

INTEGRATED SYSTEM

An integrated system is a group of interconnected units that form a functioning computer system. An integrated system has separate programs that perform separate functions but they all contribute to the same output.

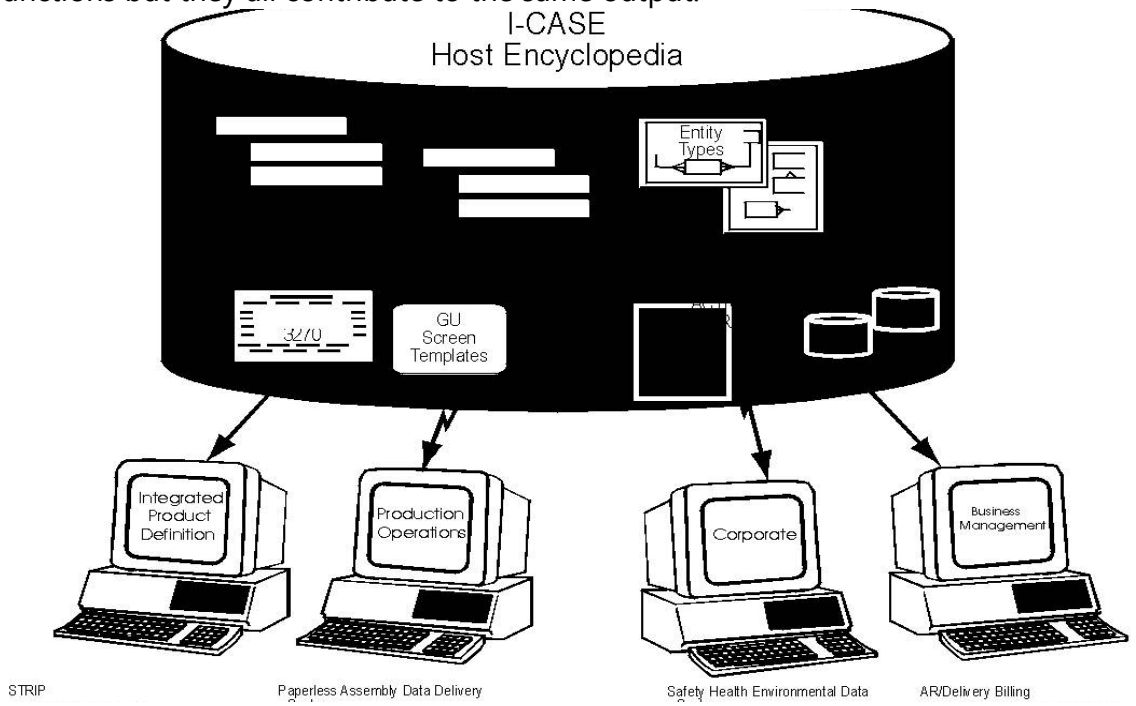


Illustration of the Boeing Integrated Defense Computer System (1995)

CLASSIFICATION OF COMPUTERS BY PROCESSING POWER

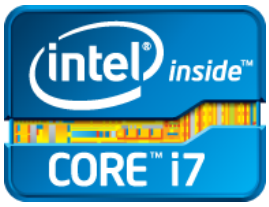
Micro Computers can be classified by their microprocessor model name or model number. The leading processor chip manufacturers for personal computers are Intel, AMD, IBM, and Motorola. Due to the rapid changes in technology, processor power is also rapidly increasing. Computers are getting faster and faster each time a new microprocessor chip is introduced.

EXAMPLES OF MICROPROCESSORS

The most common types of processor power are:-

• 80286, • 80386, • Pentium I, • Pentium II, • Pentium III, • Pentium IV, Pentium Duo core,	• Celeron, • Xeon, • Opteron, • Athlon, • Itanium • Core 2 Quad, • Intel CORE i3 • Intel CORE i5 • Intel CORE i7 etc





The unit for measuring the processing power is the Hertz. For example, Celeron processors' speed ranges from 266MHz – 2.8 GHz.

UNIT SEVEN: THE COMPUTER SYSTEM

UNIT INTRODUCTION

A system is a collection of inter-related interacting components that work together to achieve a common goal.

A Computer System is a collection of the required hardware (input, output, storage, and processing) devices, Software, and Human ware required for the computer to perform as expected.

Failure of one of the system components may imply failure for the whole system. Since computing requires input, processing, storage and output, there are many items that do something specifically at each of the stages. The computer system basically consists of hardware, software, human ware. Other components are data and, communication.

COMPUTER HARDWARE

This is a term used to describe all the various physical devices of a computer.

Computer hardware components are tangible (they can be touched).

Computer hardware includes.

- Input devices like the keyboard and mouse,
- Processing devices like the Microprocessor Chip,
- Storage devices like the Hard disks and the CDs,
- Output devices like the monitor and the printer.

COMPUTER SOFTWARE

Software is a term for electronic instructions that tell the computer how to perform a task. These are a series of programs (instructions) that tell the computer what and how to work.

Computer software can be grouped into System software and Application software.

System software like the Operating system (such as Windows, Linux, UNIX, DOS, Mac Os etc.) are used to manage and coordinate all the computer resources and activities.

Application software (such as Games, Calculator and Media Player, Word Processors, etc.) solve the specific or exact needs of the user.

COMPUTER HUMAN WARE /USERS

This is the most important component of a computer system.

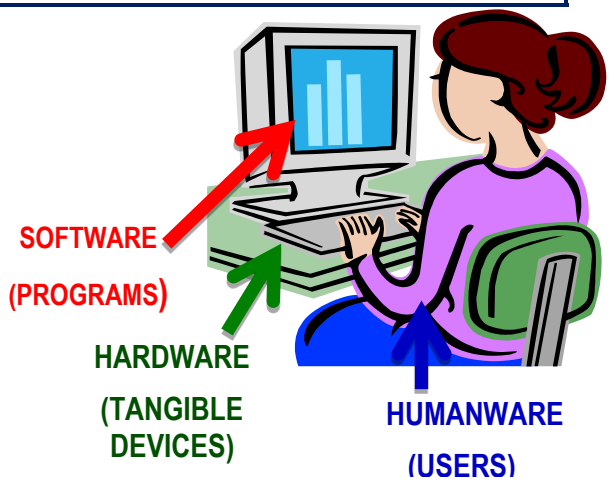
Human ware refers to the people who operate and initialize instructions to the computer system. They are the users of the computers.

They design and develop computer systems, operate the computer hardware, create the software, and establish procedures for carrying out tasks.

KINDS OF COMPUTER USERS

There are two kinds of Computer Users:

- **Ordinary user** - is someone without much technical knowledge of computers but uses computers to produce information for professional or personal tasks, enhance learning, or have fun. Ordinary users include Computer students, Typists (Secretaries), etc.
- **Professional user** -is a person in a profession involving computers who has had formal education in the technical aspects of computers; Examples include Computer programmers, webmasters, etc.



PROCEDURES

Procedures are the policies, standards and methods to be followed in using, operating, and maintaining an information system. Specifications for the use, operation and maintenance of information systems are collected in help facilities, user manuals, and similar documentation, and are commonly delivered in electronically.

COMPUTER DATA

Data refers to raw facts and figures that are processed into information.
Data is anything in a form suitable for input into a computer for processing.
Data can also be grouped into two:
Unprocessed data Like Letters, digits and symbols (e.g., a, b, c, &, ...), Musical notes, etc.
Processed data (Information) Like a words (e.g. boy), a mathematical formula, grades, a piece of music, a song etc.

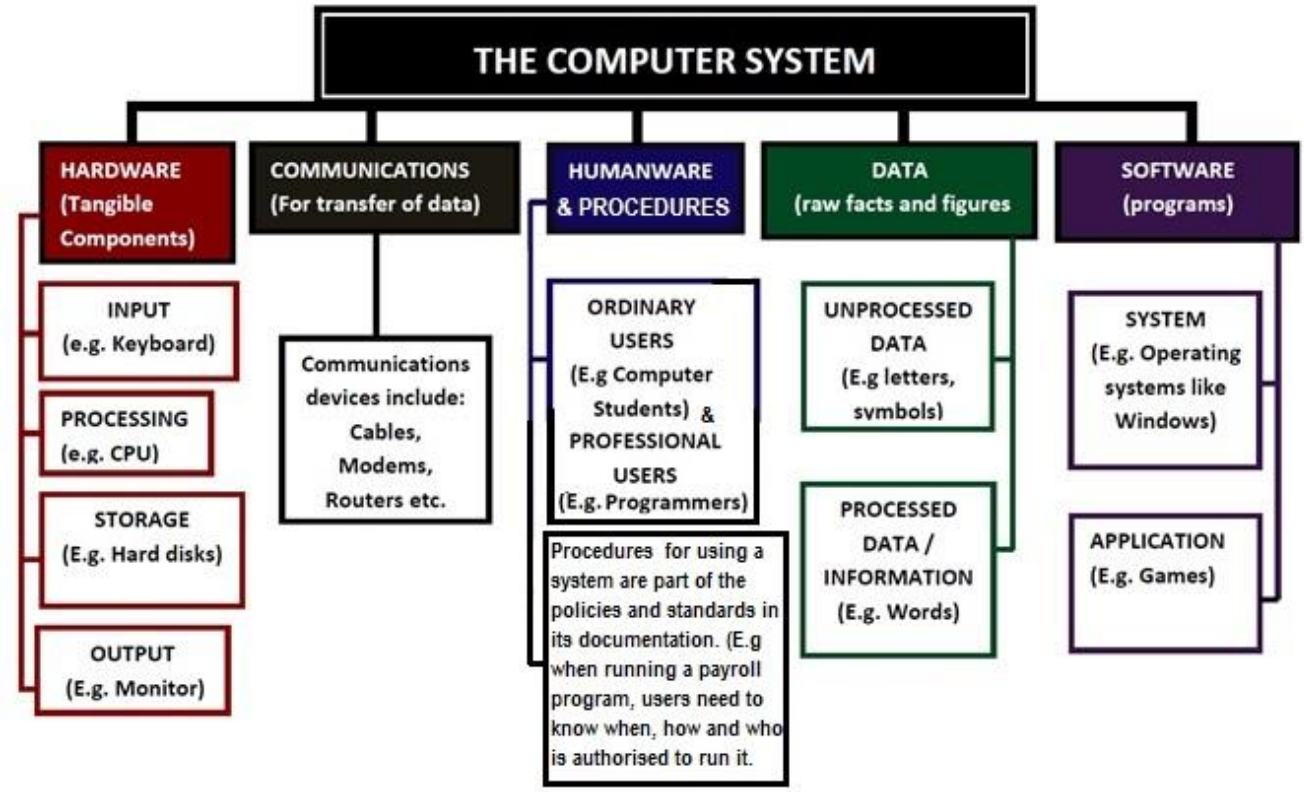
COMPUTER COMMUNICATION

Computer communication is the transmission of data and information over a channel between two computers.
Computer communication allows sharing of hardware, software and transfer of data and information stored among computers in a network like Internet.
It also facilitate communications between people e.g. through e-mail.
Communications devices are used for enabling computer communication.
They include Cables, Switches, Routers Modems, etc. See more in Topic 8.

ACTIVITY

1. Differentiate between the following terms:
(a) Hardware and Software
(b) Input and Output
(c) Data and Information
(d) Application Software and System Software
2. Give four reasons why Human ware is regarded the most important part of the computer system.

SUMMARISING ILLUSTRATION



UNIT EIGHT: COMPUTER CARE AND SAFETY

UNIT INTRODUCTION

Computer care and safety involves rules, measures and guidelines regarding the proper use of computers.

Computers, like any other piece of electronic equipment, need special care and attention in order to perform properly and safely.

There are many tasks that should be done, and caution that should be taken to ensure proper working, and safety of all components of the computer system.

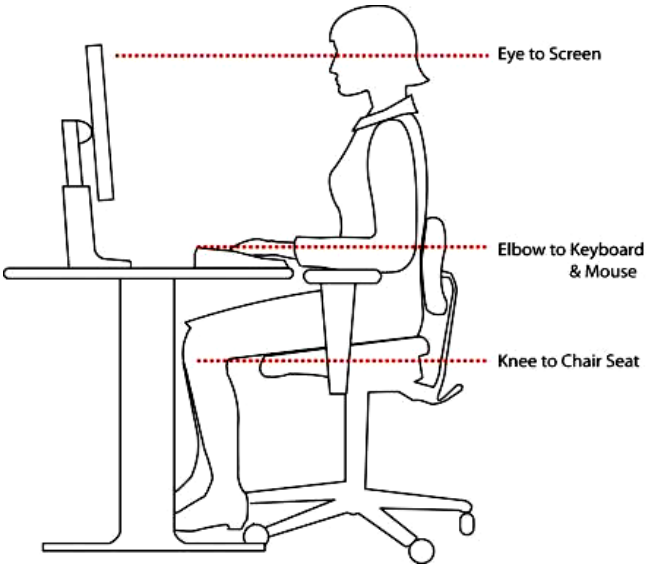
In this unit, we shall concentrate on some daily do's and don'ts and precautions that any one in a computer laboratory.

A **computer laboratory** is a building where computers are set up for safe use.

THE COMPUTER LABORATORY RULES AND REGULATIONS

a. Computer components should be kept **dust-free**. Avoid smoking and exposing computers to dust.
b. **Never try to remove the cover** on your computer or touch inside the system unit. There are many sensitive components. Instead, take it to a qualified technician.
c. Keep all **liquids and food** items away from your computer, Liquids and food crumbs can cause rusting and corrosion and damage electronic circuits. Also, mixing liquids and electronic components can cause serious electrical shock!
d. Never use your computer during a **storm**. The computer is connected to electricity and that means that lightning could be conducted to the computer.
e. Physically, be careful, **avoid knocking** and **dropping** any hardware to the ground as this could cause any of the delicate components to break or be damaged and stop working.

f. Be careful when using the internet. Do not accept **downloads** from Internet sites that you don't know and trust, And never open an email attachment unless you know and trust the person who sent it.
g. Avoid making hardware connections to the **motherboard when the computer is on** e.g. keyboard, monitor and mouse connections.
h. Don't bring **magnetic devices** to the lab. The computer has magnetic disks which can be spoilt if they come near other magnetic fields.
i. Handle **delicate storage devices with care**. Don't touch the inner surface of Compact disks and Floppy disks. Safely remove Flash disks from the system.
j. Avoid excessively **bright and flickering** computer monitors. The brightness of the computer monitors should be adjusted to avoid eye strain.



k. **Always sit** upright to avoid muscle pains and back aches caused by poor sitting posture.
l. **Proper shut down** of computers should be followed to avoid disk and system failure (avoid abrupt switching off).

MANAGEMENT OF COMPUTERS AND THEIR ENVIRONMENTS

After the establishment of the computer laboratory, a number of precautions should be observed to provide a safe conducive environment for teaching and learning as seen below:

a. Avoid direct sunlight and high Temperatures that may damage hardware components.
b. Always use surge protectors, Uninterruptible Power supply (UPS) or voltage stabilizers to **ensure steady power supply** to safeguard their system.
c. Protection against fires. A computer room should have **fire extinguishers** of carbon dioxide but not water or powder.
d. **Proper cable installation** and placement. Cables should be preferably along walls, avoiding danger of exposing the use to electric shock
e. **Burglar proofing** avoid unauthorized access to computer room.
f. Fit strong locks, doors, windows and roofing. Security should be good around computer room to avoid thefts.
g. **Overcrowding** of either machines or people should be avoided.
h. Always install lightening **conductors** to the computer laboratory to protect the machines and the users of the computers.

Ventilation should be good. Good aeration enables the computer to cool and hence avoids overheating

i. Minimize Electrical noise / interferences in the computer environment.
Definition: **ELECTRICAL NOISE** refers to externally radiated signals or electrical that cause undesirable additions to the current voltage.



Electrical noise is commonly generated by devices like Fluorescent lights of high frequency, Motors, Battery Chargers, Inverters, Radios, television, and Cell phones.

(i) **Dust control**. When setting up the computer laboratory, consider a location away from excessive dust. The room should have special curtains and computers should remain covered using dust covers when not in use.

(ii) **Dump Control**: Humidity must be regulated in the computer laboratory to remain at an optimum 50%. Low humidity may cause static electricity to build and damage sensitive components. High Humidity of over 70% may cause rusting of the metallic parts of the computer system.

(iii) A computer room should have **enough light** avoid eyestrain, and headaches.

(iv) **Radiation filter screens** should be fitted to reduce the light that reaches the eye.

(v) **Standard furniture**: The table on which a computer is placed must be strong and wide enough to bear the weight and accommodate all the peripheral devices

MAINTENANCE OF COMPUTERS IN GOOD WORKING CONDITIONS

Computer Maintenance is the testing and cleaning of equipment.

The following measures should always be carried out to keep computers in good working conditions:

- **Regular servicing** should be done for hardware and software updates to ensure proper working conditions of the computers
- Computers require **special cleaning** even on the outside including hardware parts such as the mouse and keyboard to perform correctly.
- Always use **optimizer utilities** that modify programs to make computers to improve performance and make them to run more quickly.
- Always use and regularly updated **antivirus software**. Viruses and worms are horrible computer-unfriendly programs that can crash your system and cause damage.
- Avoid **Installation Marathons.** Sometimes; installing a new program can cause conflicts within your system.
  It is therefore advisable to use the computer long enough to see how your system responds to the installation before installing the next program.
- Carry out **Disk Defragmentation** when necessary.
  A computer is a storehouse for large amounts of data and so, having a disorganized computer slows down the processing time. Defragmentation organizes files in a way where the computer can easily access everything.
  - **Definition**: Disk Defragmentation is the process in which scattered pieces of individual files and free space are reorganized and stored in an adjacent manner (next to each other) on the disk.

THE ETHICS AND INTEGRITY IN COMPUTER USE

Computer Ethics Computer Ethics are human values and moral conduct for computer users. OR

Computer Ethics refers to the right or wrong behavior exercised when using computers.

Computer Integrity refers to the loyalty or faithfulness to a principled set of laws regarding computer use.

In 1991, the **C**omputer **E**thics **I**nstitute (**CEI**) held its first National Computer Ethics Conference in Washington, D.C.

The Ten Commandments of Computer Ethics were first presented in Dr. Ramon C. Barquin's paper prepared for the conference,

"IN PURSUIT OF A 'TEN COMMANDMENTS' FOR COMPUTER ETHICS."

The Computer Ethics Institute published them as follows in 1992:

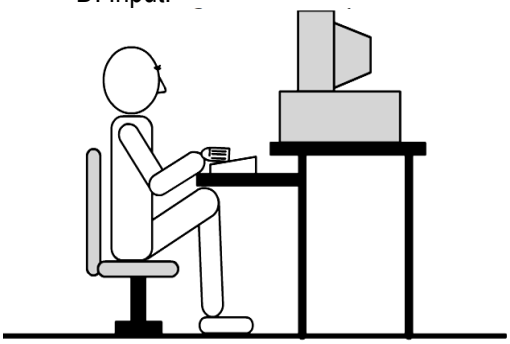
1. Thou Shalt Not Use a Computer to Harm Other People.
2. Thou Shalt Not Interfere with Other People's Computer Work.
3. Thou Shalt Not Snoop around in Other People's Computer Files.
4. Thou Shalt Not Use a Computer to Steal.
5. Thou Shalt Not Use a Computer to Bear False Witness.
6. Thou Shalt Not Copy or Use Proprietary Software for Which You Have Not Paid.
7. Thou Shalt Not Use Other People's Computer Resources without Authorization or Proper Compensation.
8. Thou Shalt Not Appropriate Other People's Intellectual Output.
9. Thou Shalt Think about the Social Consequences of the Program You Are Writing or the System You Are Designing.
10. Thou Shalt Always Use a Computer in Ways That Insure Consideration and Respect for Your Fellow Humans.

CEI WEBSITE: http://computerethicsinstitute.org

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC ONE

1. The American statistician who developed a mechanical tabulator based on punched cards to rapidly represent data gathered for the USA population census of 1890 was:
   A. Howard Aiken.
   B. Dr. Grace Murray Hopper.
   C. Herman Hollerith.
   D. William Oughtred.
2. Which one was the first calculator that could perform all four arithmetic operations: addition, subtraction, multiplication and division?
   A. The Abacus.
   B. The Slide Rule.
   C. The Stepped Reckoner
   D. Pascal's Calculator
3. What does the term Artificial Intelligence mean as used in computer science?
   A. Knowledge about artificial devices that are being produced today.
   B. Programming of devices to assume human capabilities such as learning and self-correction.
   C. Fast thinking and cleverness of machines.
   D. Brainpower of computers that is greater than our Natural Intelligence as human beings.
4. Which of the following characteristics will be associated with future computers?
   A. Expensive computers.
   B. Advanced robotics.
   C. Big sized system units.
   D. Inadequate storage systems.
5. A graphical representation of the relationship of events in comparison to each other, over a specified period is known as:
   A. Evolution.
   B. Timeline.
   C. History.
   D. A Record.
6. The term "Program Debugging" as used in ICT generally refers to:
   A. Removing insects from a computer that might bite the wires and make it stop working.
   B. Correcting a mistake made in a computer.
   C. Finding errors in a computer program.
   D. Finding and correcting errors in a computer program to make it work as expected.

7. Computer based Simulations help teachers to
   A. Use projectors instead of chalk and blackboards.
   B. Stimulate learners to be more attentive and active in class.
   C. Demonstrate difficult or dangerous experiments in class
   D. Draw accurate science pictures using computers
8. The use of computer software to control machine tools and related machinery in the industries is known as:
   A. CAD.
   B. CAM.
   C. CAA
   D. None of the above.
9. The three categories of computers; Analog, Digital and hybrid are computer classifications by:
   A. Process
   B. Size
   C. Purpose
   D. Power
10. What is the odd man out?
   A. Thermometer
   B. Pocket Calculator
   C. Voltmeter
   D. Slide rule
11. Main frame computers have many users connected via
   A. Connected Computer monitors
   B. Integrated computer systems
   C. Work stations
   D. Dumb terminals
12. GIGO in full stands for:
   A. Garbage In Garbage Out.
   B. Garbage Inside Garbage Outside.
   C. Garbage In-front Garbage Out-front.
   D. Garbage Inside Garbage Offside
13. Disk defragmentation
   A. Organizes the contents of the disk to store the pieces of each file close together and contiguously.
   B. Slows the processing time for normal every day functions.
   C. Arranges all files on a hard disk in ascending order by name.
   D. Removes all viruses from a hard disk for safe storage of data and information.
14. Without any …… devices a computer would simply be a display device and not allow users to communicate with it, much like a TV set.
   A. Output.
   B. Storage.
   C. Processing.
   D. Input.



15. You are sitting at a computer as shown in the ***Figure.*** After a while, your neck becomes sore. Which of the following should you do before continuing?
   A. Raise the height of the chair.
   B. Sit upright without bending the neck.
   C. Swallow some medicine (pain killers) and put a scarf around your neck.
   D. Adjust the brightness of the screen.
16. Which of the following is the correct order of keys on the home row of the QWERTY keyboard layout?
   A. q, w, e, r, t, y, u, i, o, p
   B. a, s, d, f, h, g, j, k, l, ”
   C. a, s, d, f, g, h, j, k, l, ;
   D. z, x, c, v, b, n, m, ,
17. The following are negative effects of computers on our society except
   A. Moral Decay.
   B. Addiction.
   C. Electronic Fraud.
   D. Telecommuting.
18. Backing up of computer data is the process of:
   A. Reversing the files stored on the hard drive.
   B. Putting your computer in the back of the room.
   C. Raising up the back part of the computer’s system unit.
   D. Storing an extra copy of the data onto an external storage device.
19. Makerere University has a large science and research facility. They hope to improve their systems performance and simulations. The types of computers they should acquire are:
   A. Supercomputers.
   B. Terminals.
   C. Main Frame computers.
   D. Microcomputers.
20. The difference between a micro-computer and a mini-computer is
   A. Processing speed .
   B. Memory size.
   C. Number of users.

D. All the above.

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 1

1. What is a computer?
2. State any four careers in the ICT field.
3. Kolya Exclaimed 'Computers are useless in the health sector'. Advise him accordingly.
4. State any behaviors that often affect the proper functioning of the mouse.
5. Explain why computers use the binary number system.
6. Distinguish between mainframe and minicomputers.
7. A computer system comprises of hardware, software, user, data and communication. With examples, describe each of the components.
8. What does the term computer Generation mean?
9. Before the invention of computers a number of devices were used to manage information, Name six computational devices that predate the computer.
10. Write short notes on the following: - ENIAC, UNIVAC1, MARK1
11. Describe the main characteristics of the electro mechanical era computers
12. With examples, explain the difference between Analog and digital computers.
13. Distinguish between computer Ethics and Computer Integrity.
14. Outline any four measures that should be done to ensure safety in a computing environment.
15. State any three activities that should be carried out to maintain computers in good working conditions.
16. Define the term Electrical Noise.
17. State any four devices that commonly generate electrical noise.
18. What is a hybrid computer?
19. Mention any two examples of hybrid comput
20. What are special purpose computers?
21. Mention four differences between a mainframe and a minicomputer.
22. Define the term computer research.
23. Give any three ways how computers are used in the area of research.
24. Apart from research, mention any other five areas of application of computers in our society today.
25. State any two elements found on the windows desktop.
26. What is a folder?
27. Give any two differences between a Window and a Dialog Box.
28. (i) CRT, (ii) EDVAC, (iii) VLSI, (iv) UPS, (v) PDF (v) KB, (vii) CEI, (viii)PC, (ix) CA
29. (a) Define E-commerce.
    (b) Mention and two advantages and disadvantages of using E-commerce.
30. (a) What are computer simulations?
    (b) Give two advantages of using computer simulations in classrooms

S1 - TOPIC 2: COMPUTER HARDWARE

Computer hardware refers to the all the tangible components of the computer system. Every time, new devices are invented and used for different purposes. Computer hardware equals the collection of physical elements that comprise a computer system. Computer hardware refers to the physical parts or components of a computer such as monitor, keyboard, hard drive disk, mouse, printers, graphic cards, sound cards, memory, motherboard and chips, etc. all of which are physical objects that you can actually touch.

UNIT ONE: INPUT DEVICES

UNIT INTRODUCTION

Input devices are used to enter data or commands in a form that the computer can use.

They send the data or commands to the processing unit. According to the type of data they input, they can be grouped into the following:

* Text input devices
* Pointing input Devices
* Imaging input Devices
* Gaming input Devices
* Audio input Devices
* Biometric input Devices
* And Other Specialized input devices.

A. TEXT INPUT DEVICES

Text is a general word for all characters such as letters, numerical digits, symbols and marks that combine to form words, sentences, paragraphs and so on. Text input devices are all the devices that are used for entering text into the computer. There is a variety of devices that help us to input text into a computer.

Text input devices include:

* The Keyboard,
* Voice Recognition Equipment
* OMR and Barcode readers
* OCR and Optical readers
* MICR readers
* RFID readers
* Magnetic Strip Card Readers, etc.

1. THE KEYBOARD

Definition: A keyboard is an input device, consisting of a set of keys used to operate a computer.

Each press of a key corresponds to a single written character of text, but to produce some symbols requires pressing and holding several keys simultaneously. Usually a standard keyboard has between 80 and 110 keys. A keyboard is the main and most reliable computer input device. The QWERTY is referred to as the "Universal" keyboard.

The name "QWERTY" comes from the first six letters in the top alphabet row (the one just below the numbers). There are other setups also available such as Dvorak, ABCDE, GKOS, QWERTZ and AZERTY

Keypads, Keyers and chorded keyboards have fewer keys, specially designed for devices such a pocket sized computers. Christopher Latham Sholes was an American newspaper publisher. In 1866, he invented the first practical typewriter and the QWERTY keyboard layout still in use today.

ADVANTAGES OF KEYBOARD

* Keyboards are very common (commonly supplied with computers)
* Entering data and commands with keyboard is faster as compared to the mouse
* Keyboards are more reliable

DEMERITS OF KEYBOARD

* It takes a lot of time to practice in order to type quickly
* Keys can easily become faulty due to dust.
* Some keyboards keys are very hard to press, causing fingers to hurt.

2. VOICE RECOGNITION EQUIPMENT

Voice Recognition Equipment (Speech recognition) converts spoken words to text.

Computers with Speech recognition do not actually understand speech, but they are programmed to recognize a vocabulary of words, which can range from two words to millions of words.

ADVANTAGES

* No typing of data is necessary.
* Voice recognition can be used by people whose hands are disabled.
* Dictating text is faster than typing.
* Voice Recognition systems are also ideal for the blind.

DEMERITS OF TEXT INPUT BY SPEECH RECOGNITION

* Error rate is high, depending on user's accent.
* Words with the same pronunciations (Homophones) like see and sea cannot be distinguished
* Speech Recognition does can't work in noisy environment
* The Voice Recognition software must be trained to recognize more words.
* It requires the user to speak in a writing style, i.e. even pronouncing the marks such as comma.



3. OPTICAL MARK RECOGNITION (OMR)

Optical mark recognition (OMR) devices read hand-drawn marks such as small circles or rectangles. A person places these marks on a form, such as a test, survey, or questionnaire answer sheet.

The OMR device first reads a master document, such as an answer key sheet for a test, to record correct answers based on patterns of light; the remaining documents then are passed through the OMR device and their patterns of light are matched against the master document.



4. BARCODE READERS

A *bar code reader is an optical* reader that uses laser beams to read bar codes that are printed on items usually in super markets.

A bar code is an identification code that normally consists of a set of vertical lines and spaces of different widths. The bar code represents some data that identifies the item and the manufacturer.

5. OPTICAL CHARACTER RECOGNITION (OCR)

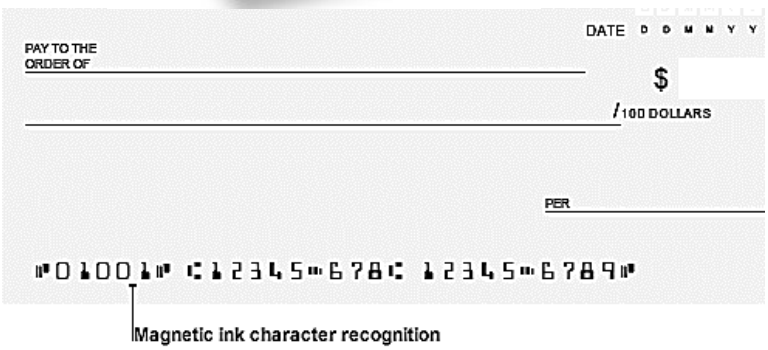
Optical character recognition (OCR) is a technology that involves reading typewritten, computer-printed, or handwritten characters from ordinary documents and translating the images into a form that the computer can understand.

OCR devices include a small optical scanner for reading characters and sophisticated software (OCR software) for analyzing what is read.

6. MICR READERS

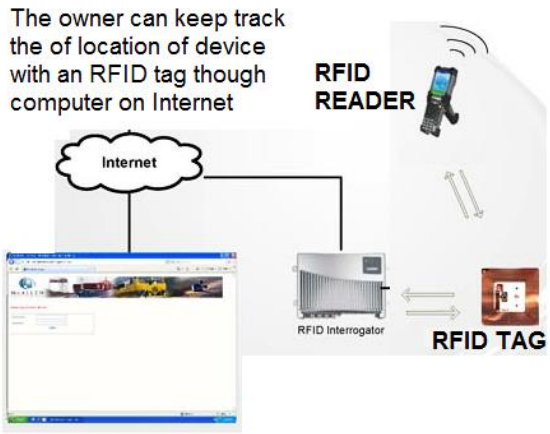


Magnetic-ink character recognition (MICR) reader is used to read text printed with magnetized ink. MICR readers are mainly used by the banking industry for processing checks. Each check is inserted into an MICR reader, which sends the check information to a computer for processing.



7. RFID READERS

Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, attached to an object, through a reader for the purpose of identifying and tracking the object. RFID can work over a long distance. An RFID tag can be affixed to cars, computer equipment, books, mobile phones, etc.



8. MAGNETIC STRIP CARD READERS

A magnetic stripe card reader reads the magnetic stripe on the back of credit cards, bank ATM cards, and other similar cards. Exposure to a magnet or magnetic field



can erase the information and contents of a card's magnetic stripe.

B. POINTING DEVICES

A pointing device is an input device, which allows users to move a pointer and make selections on the computer screen. A pointing device is any piece of hardware that is used to input spatial data into a computer.There are many examples of pointing devices such as:

* Mouse
* Stylus pen & digitizing tablet
* Cordless Mouse
* Trackball
* Touchpad
* Light pen
* Touch Screen
* A Track Point

1. THE MOUSE

Mouse - The mouse is a hand held input device that lets you point to and make selections of items on your screen. In a PC mouse there are mostly 2-3 buttons. A ball under the mouse senses movement. An **optical mouse** uses a light-emitting diode and photodiodes to detect movement relative to the underlying surface.

2. STYLUS PEN & DIGITIZING TABLET



Stylus pen- The pen lets you draw on what is called a digitizing tablet that mirrors the surface area of the computer screen. The pen can be used as a standard mouse (without wires connected to it) or also as a free flowing drawing device. The pen is useful for drawing since drawing graphics with a mouse tends to be somewhat difficult.

3. CORDLESS MOUSE



Cordless Mouse - The cordless mouse is a lot better than a normal mouse. It reduces the amount of work space needed to move the mouse around.
This mouse runs on a battery. When you move the mouse it sends an infrared beam to a sensor which interprets it causing the pointer to move.

4. TRACKBALL



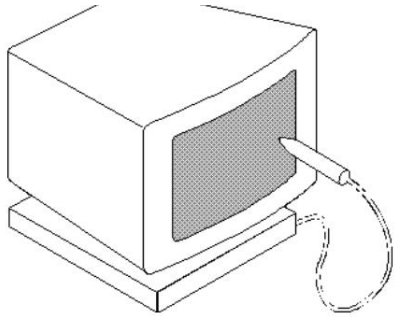
Trackball - The trackball is an upside-down mouse that remains stationary on your desk. It is the same principle as the mouse except that the rollers are reversed and the ball is on top. This ball does not need as much attention as the normal mouse because the only thing that touches it is your hand as the normal mouse touches a surface.

5. TOUCHPAD



Touchpad - The touchpad has sensors that sense your touch. When they sense your touch they send a signal to the computer to move the mouse pointer to that location on the screen. Common on laptop computers.

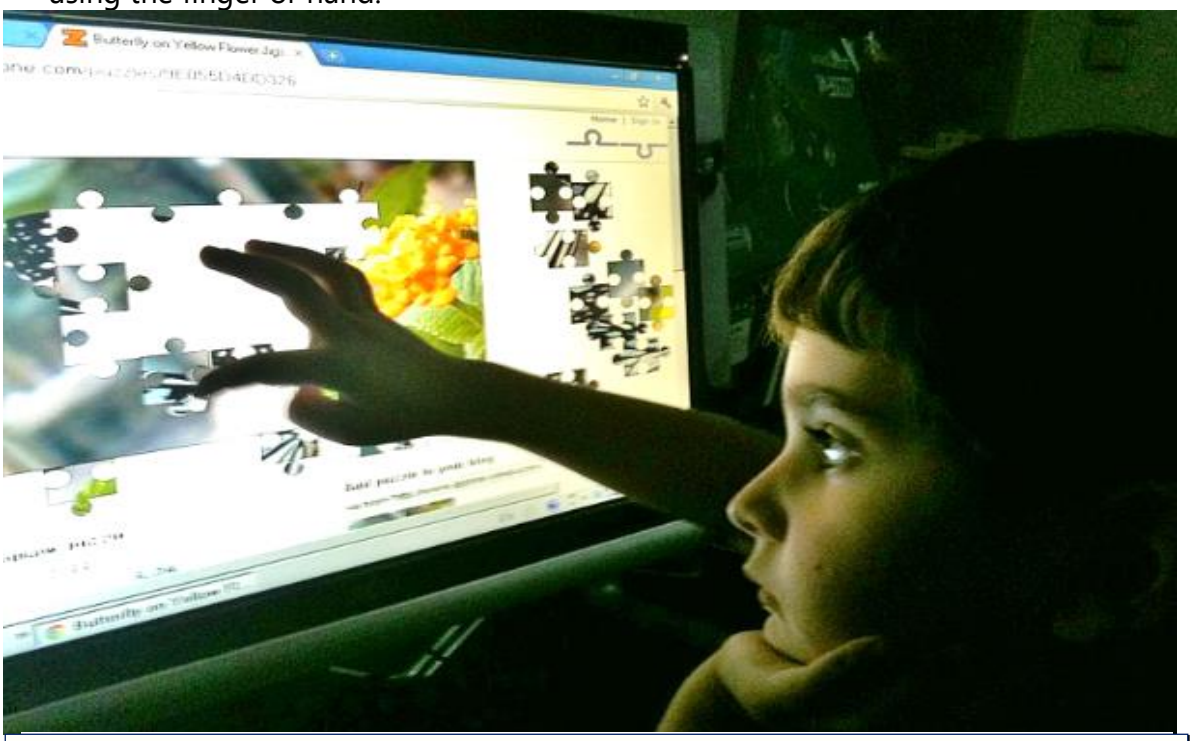
6. LIGHT PEN-



Light pen- is a form of a light-sensitive wand used in conjunction with a computer's CRT TV set or monitor. It allows the user to point to displayed objects, or draw on the screen, in a similar way to a touch screen but with greater positional accuracy. A light pen can work with any CRT-based display, but not with LCD screens, projectors and other display devices

7. TOUCH SCREEN-

Touch Screen- The touch screen lets the user touch the area to be activated by using the finger or hand.



A child solving a computerized puzzle using a touchscreen.

8. TRACK POINT



A Track Point, also called a pointing stick, is a cursor control device located in the middle of the keyboard between the G, H, and B keys. The control buttons are located in front of the keyboard toward the user. The Track Point is operated by pushing in the general direction the user wants the cursor to move. Increasing pressure causes faster movement.

C. IMAGING DEVICES

Imaging input Devices are devices that input images such as still photos, motion pictures, graphics, video etc. into the computer for processing. Common Imaging devices include:

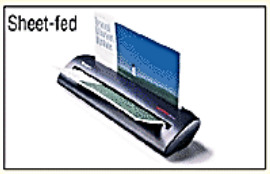
* Image scanner
* Digital Camera
* Digital video (DV) camera
* Camcorder
* Web cam

1. IMAGE SCANNER

A scanner is a light-sensing input device that converts hardcopy documents, drawings, or pictures to an electronic version (softcopy), which can then be stored on a disk. The electronic version of scanned material is in the form of rows and columns of dots called a *bitmap.* Each dot on a bitmap consists of one or more bits of data.

Common types of scanners include:

* Flatbed scanner
* Pen or handheld scanner
* Sheet bed scanner
* Drum scanner.

Scanner	Method of Scanning/ Use
 Flatbed	• Similar to a copy machine • Scanning mechanism passes under the item to be scanned, which is placed on a glass surface
 Pen or handheld	• Move pen over text to be scanned, then transfer data to the computer • Ideal for mobile users, students, researchers • Some connect to a handheld computer
 Sheet-fed	• Item to be scanned is pulled into a stationary scanning mechanism • Smaller and less expensive than a flatbed scanner
 Drum	• Item to be scanned rotates around a stationary scanning mechanism • Very large and expensive • Used in the publishing industry

2. WEB CAM



A Web cam, also called a PC video camera, is a type of digital video camera that usually sits on top of the monitor. Some laptop computers have built-in Web cams.

Webcams enable users to:

* capture video and still images,
* send e-mail messages with video attachments,
* add live images to instant messages,
* broadcast live images over the Internet, and
* make video telephone calls.

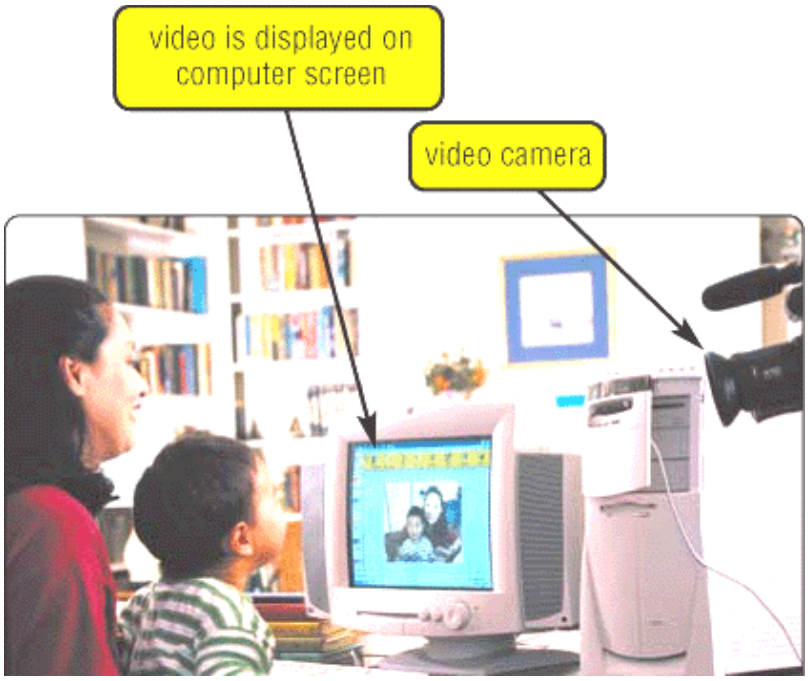
3. DIGITAL CAMERA

A digital camera allows users to take pictures and store the photographed images digitally instead of storing on a traditional film. When you take pictures, the images are electronically stored in the camera. Later, you transfer a copy of the stored pictures to your computer or printer by connecting a cable between the digital camera and your computer.

4. DIGITAL VIDEO (DV) CAMERA



A digital video (DV) camera, by contrast records video as digital signals instead of analog signals. To transfer recorded images to the computer hard disk, users connect DV cameras directly to a port on the system unit. After saving the video on a storage medium, you can play it or edit it and burn it to a DVD using software programs on the computer.



5. CAMCORDER



This is a light weight easily portable video camera that records data in digital form onto a storage device such as a hard disk or a videotape.

D. GAMING INPUT DEVICES

Gaming input devices are devices specifically designed to be used for playing computer games.

Examples Include:

* Gaming keyboard
* Joysticks and wheels
* Game pad
* Light guns

* Dance pad
* Motion sensing game controllers

1. GAMING KEYBOARD



Gaming keyboards typically include programmable keys so that gamers can customize the keyboard to the game being played. The keys on gaming keyboards light up so that the keys are visible in all lighting conditions. Some have small displays that show important game statistics, such as time to targets remaining.

2. GAMING WHEELS

A gaming wheel is a steering wheel-type input device. Users turn the wheel to simulate driving a vehicle using programs on a computer.





Most gaming wheels also include foot pedals for acceleration and braking actions. Gaming wheels include buttons, called triggers that you press to initiate certain events.

3. JOYSTICK



Joystick- Consists of a stick that pivots on a base and reports its angle or direction to the device it is controlling. Joysticks are often used to control video games, and usually have one or more push-buttons whose state can also be read by the computer.
Joysticks can also be used as pointing devices.

4. GAMEPAD





A gamepad controls the movement and actions of players or objects in video games or computer games. On the gamepad, users press buttons with their thumbs or move sticks in various directions to trigger events.
Gamepads communicate with a game console or a personal computer via wired or wireless technology.

5. LIGHT GUNS



A light gun is used to shoot targets and moving objects after you pull the trigger on the weapon.
Instead of emitting light, most light guns work by detecting light. When the user pulls the trigger, the screen uses one of several techniques to send light, which is received by a receptor in the barrel of the gun.

6. DANCE PAD

A dance pad is a flat electronic device divided into panels that users press with their feet in response to instructions from a music video game.
These games test the user's ability to step on the correct panel at the correct time, following a pattern that is matching with the beat of a song.



7. MOTION SENSING GAME CONTROLLERS

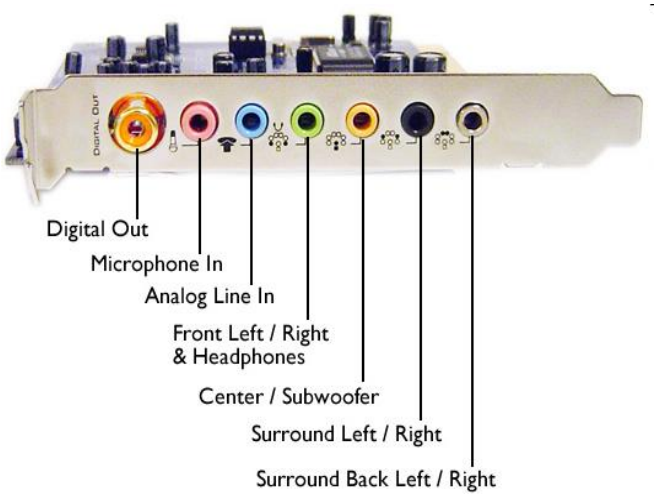
These are devices that allow the user to guide onscreen elements by moving a handheld input device in predetermined directions through the air.
Examples include the power glove, play station move gadgets, among others.



E. AUDIO INPUT DEVICES

Audio input is the process of entering any sound into the computer such as speech, music, and sound effects. To enter sound into a computer, it must have a sound card. Audio input devices are plugged into a port on the sound card.
Examples of audio input devices include

* Microphones,
* Tape players,
* CD/DVD players,
* MIDI devices
* Dictaphone, etc.



SOUND CARD

It is a device that can be slotted into a computer to allow the use of audio components for multimedia applications. Without a sound card, Audio input and output is not possible.

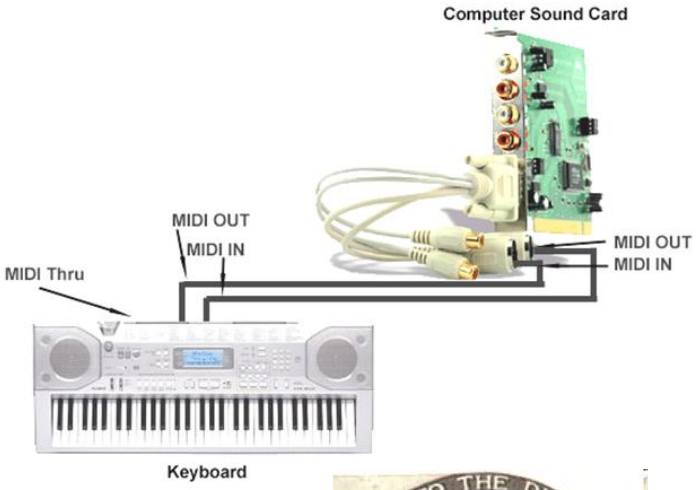
1. MICROPHONES



A microphone is an instrument for converting sound waves into electrical energy variations, which may then input into the computer for processing, recording or audio playback. Various types of Microphones available. Microphones are connected to the sound card in the system unit.

2. MIDI DEVICES

MIDI (musical instrument digital interface) is the standard that defines how digital musical devices represent sound electronically. MIDI devices such as electronic pianos allow users to record and edit music e.g. you can set the beat speed, and add notes, to produce sound.



3. DICTAPHONE

This the earliest device most commonly used to record speech for later playback or to be typed into print. It was established by Alexander Graham Bell in Washington, D.C. in 1881.



F. BIOMETRIC INPUT DEVICES

A biometric device translates a biological personal characteristic into a digital code that is stored or compared with a digital code stored in the computer. Common biometric devices include:

* Fingerprint scanner
* Face Recognition systems
* Hand geometry systems
* Signature verification systems
* Iris Recognition systems



1. FINGERPRINT SCANNER

A fingerprint scanner captures curves and indentations of a fingerprint. Some grocery and retail stores now use fingerprint readers as a means of payment, where the customer's fingerprint is linked to an account or credit card.

2. FACE RECOGNITION SYSTEMS

A face recognition system captures a live face image and compares it with a stored image to determine if the person is a legitimate user. Some buildings use face-recognition systems to secure access to rooms.

3. HAND GEOMETRY SYSTEM

Biometric devices measure the shape and size of a person's hand using a *hand geometry system. Some* large companies use this system as time and attendance devices or as security devices. Day-care centers use this system to verify parents who pick up their children.

4. SIGNATURE VERIFICATION SYSTEMS



A signature verification system recognizes the shape of your handwritten signature, as well as measures the pressure exerted and the motion used to write the signature. Signature verification system uses a specialized pen and tablet.

5. IRIS RECOGNITION SYSTEM



These are devices that use *iris recognition technology* to read patterns in the iris of the eye. These patterns are as unique as a fingerprint. Iris recognition systems are used by government security organizations, the military and financial institutions that deal with highly sensitive data.

G. OTHER SPECIALIZED INPUT DEVICES

There are many other special input devices that are used for doing special customized tasks. Some of them include: Remote Control, Sensors, Etc.

1. REMOTE CONTROL

Remote control devices emit a beam of infrared light, which carries data signals. Remote control is commonly used with TVs but many laptop computers being produced come with remotes and a form of input device, which allow you to operate the laptop from a distance.



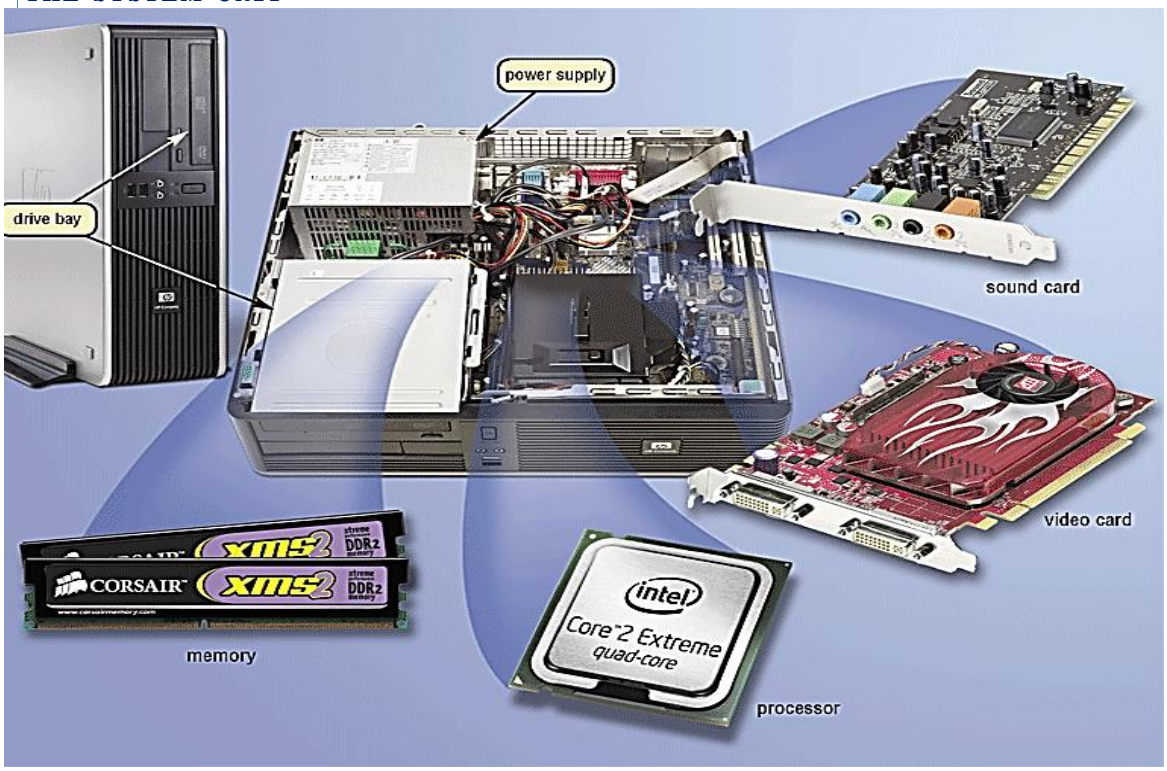
2. SENSORS

Chemical responses to the physical environment or movement can be converted to electrical signals by devices known as sensors, which input them it to the computer for processing.
Various sensors can be used to measure heat, light, pressure, acidity, oxygen concentration, water flow, etc.



UNIT TWO: PROCESSING DEVICES

THE SYSTEM UNIT

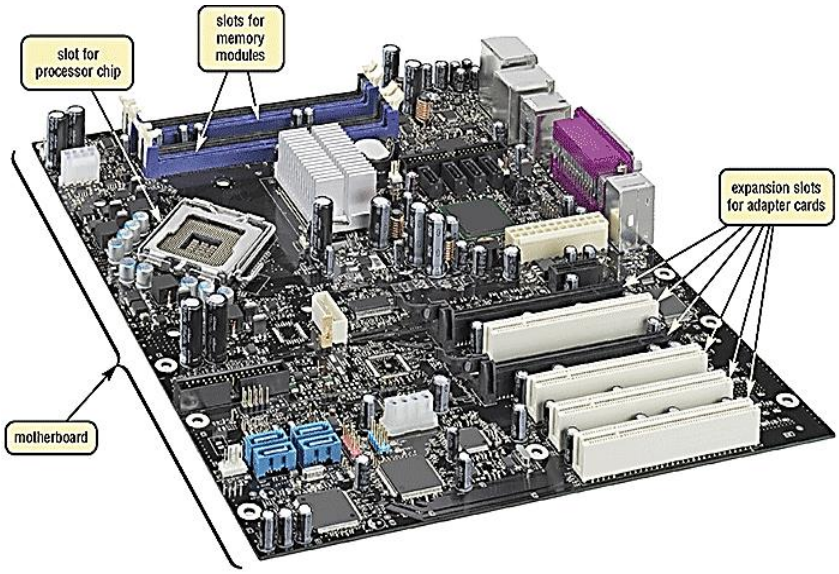


Processing devices are the computer electronic components and chips housed in the system unit. The system unit is a box-like case that houses the motherboard, the disks and drive bays, the power supply and cooling systems.

The components in the system unit are connected to the *motherboard.* Two major components on the motherboard are the CPU and internal memory. A drive bay is a rectangular opening that typically holds disk drives.

THE MOTHERBOARD

The motherboard is a single circuit board that provides the path through which the processor communicates with internal and peripheral devices. The motherboard is also called the *system board.* The components attached to the motherboard include the processor chip, memory chips, buses, and Expansion Slots for Adapter Cards.



BUSES



The BUS is a common electrical path that enables data flow between the various system components.

A bus allows the various devices inside and attached to the system unit to communicate with each other. All buses consist of two parts:

* The data bus which transfers actual data bits and
* The address bus which transfers information about where the data should go in memory.

EXPANSION SLOTS AND ADAPTER CARDS

An expansion slot is a socket on the motherboard that can hold an adapter card. An adapter card, also called expansion card, is a circuit board that increases the capabilities of the system or provides connections to peripherals.
Some motherboards include all necessary capabilities and do not require adapter cards. Adapter cards are used for many supplemental capabilities, such as more memory, higher-quality sound devices, a modem, extra ports, or graphics capabilities.

PURPOSES OF COMMON ADAPTER CARDS

Adapter Card	**Purpose**
Sound card	Connects speakers or a microphone
MIDI card	Connects musical instruments
Network interface card (NIC)	Connects other computers
Video card	Connects a monitor
USB card	Connects USB devices
TV tuner card	Allows viewing of television channels
Video capture card	Connects a video camera
Modem card	Converts telephone or cable analog signals to digital and vice versa
FireWire card	Connects FireWire devices

PLUG AND PLAY (PNP)

In the past, installing a card was not easy and required you to set switches and other elements on the motherboard. Today, many computers support *Plug and Play.* PnP refers to the computer's capability to automatically configure adapter cards and other peripherals as you install them when the computer is still running.

PORTS

A port is the point at which a peripheral attaches the system unit. Through a port, the peripheral can send data to or receive information from the computer. A peripheral device, such as a keyboard, monitor, printer, mouse, digital camera, and microphone, often attaches by a cable to a port on the system unit.

COMMON PORTS

A **Serial port** is a physical interface through which information transfers in or out one bit at a time.
A **parallel port**, also known as a printer port or Centronics port, allows several bits to be transmitted simultaneously; and commonly provides the interface for such devices as high-speed printers.

Type	Picture	Type	Picture
Audio in		Monitor	
Cable TV		Mouse	
Center Surround Sound/Subwoofer		Network	
Composite video in		Printer	
Digital Video Interface (DVI)		Rear Surround Sound	
eSATA port		Serial	
FireWire		Side Surround Sound	
FM reception		S/PDIF	
HDMI port		Speaker	
Headphones		S-video	
Keyboard		Telephone line in	
Microphone		USB	

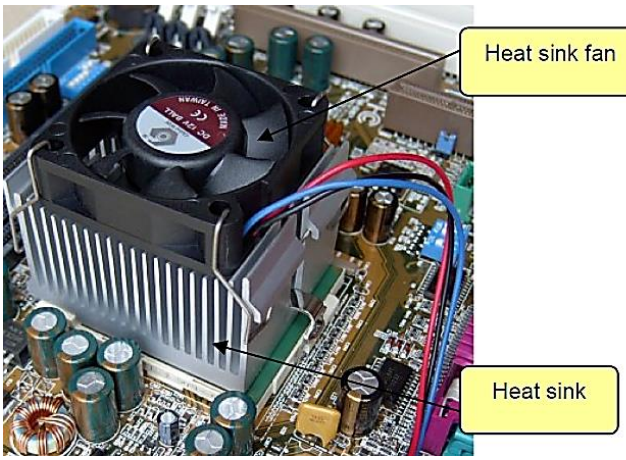
USB (Universal Serial Bus) ports are used in high-speed data transfer device interfaces. **Bluetooth ports** use radio waves to transmit data between two devices, without using cables.
Ethernet / Network ports are used for connecting computers to a network.
HDMI (High-Definition Multimedia Interface) is a proprietary audio/video interface for transmitting uncompressed video data and digital audio data.

CONNECTORS

A connector joins a cable to a port. *A* connector *at one* end of a cable attaches to a port on the system unit, and a connector at the other end of the cable attaches to a port on the peripheral. Most connectors are available in one of two genders: male and female.
Male connectors have one or more exposed pins.
Female connectors have matching holes to accept the pins on a male connector.

POWER SUPPLY AND COOLING TECHNOLOGY

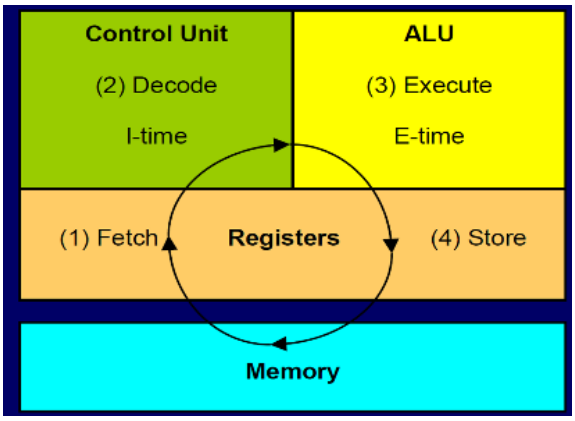
The power supply is the component of the system unit that converts the wall outlet AC power of 110 to 240 volts into DC power of 0.5 to 12 volts.
Built into the power supply is a fan that keeps the power supply cool. Processor chips generate heat, which could cause the chip to burn up.
A **heat sink** is a small ceramic or metal component with fins on its surface that absorbs and disperses heat produced by electrical components such as a processor.



A. THE CPU

The **Central Processing Unit (CPU)** is a chip that interprets, carries out the basic instructions and manages most of a computer's operations. It is at referred to as the 'brain' of the computer.

It has two basic sections: the **Control Unit** (CU) and the **Arithmetic/Logic Unit** (ALU), which work together to perform the processing operations. Other CPU components are the Registers and the System Clock.



THE CONTROL UNIT (CU)

The control unit is the component of the processor that directs and coordinates most of the operations in the computer. It interprets each instruction issued by program and then initiates the appropriate action to carry out the instruction. For every instruction, the control unit repeats a set of four basic steps called the machine cycle steps:

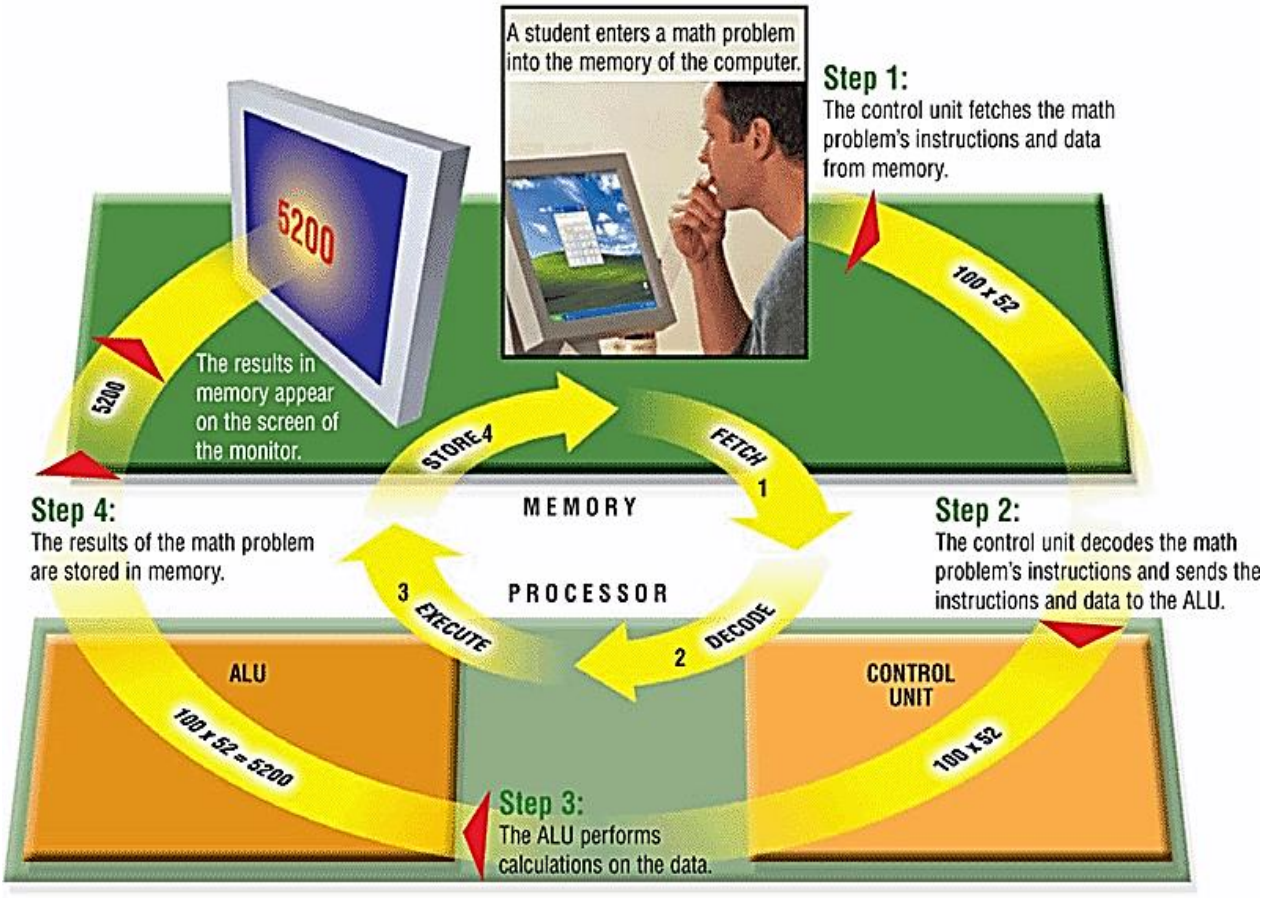
THE MACHINE CYCLE STEPS

Step 1: Fetching the instruction. The instruction to be executed is obtained from memory.

Step 2: Decoding the instruction. The instruction is translated into commands the computer understand and sent to the ALU.

Step 3: Executing the instruction. The commands are carried out.

Step 4: Storing results. The results are stored in registers or memory.



ARITHMETIC/LOGIC UNIT (ALU),

The ALU performs the arithmetic, comparison, and logical operations in a computer. It performs the execution step of a machine cycle. *Arithmetic operations include addition,* subtraction, multiplication, and division. *Logical operations work* with conditions and logical operators such as AND, OR, and NOT. For example, if you wanted to search a student database for Candidates of Computer students, you would search for any students classified as 'Computer students AND listed under Candidates.

REGISTERS

Registers are high-speed working storage areas *that temporarily hold instructions and data.* Registers work under the direction of the control unit to accept, hold, and transfer instruction or data and comparisons at high speed.
Registers are not part of Memory or Secondary Storage: Registers hold data immediately related to the operation being executed. Memory is used to store data that will be used in the near future. Secondary storage holds data that may be needed later (in future)

TYPES OF REGISTERS

Instruction register, which contains the instruction being executed;
Address register, which keeps track of where a given instruction or piece of data is stored in memory;
Storage register, which temporarily holds data taken from or about to be sent to memory;
The Accumulator, which collects the result of computations;
General-purpose register, which is used for several functions, as assigned by the CU

THE SYSTEM CLOCK

The *system clock is a small chip that is used* by the CPU to synchronize the timing of all computer operations. The system clock generates electronic pulse or ticks at a fixed rate, which set the operating pace of components in the system unit. Each tick is called a *clock cycle, which affects* machine cycle time.
The faster the clock, the more instructions the CPU can execute per second.

CLOCK SPEED

This refers to the speed at which a processor executes instructions. Clock speed is measured in hertz. A hertz is one cycle or tick per second. A Megahertz (MHz) equates to one million ticks of the system clock per second. Processor's speed is sometimes measured according to the number of MIPS (millions of instructions per second) it can process.

MEMORY (INTERNAL/PRIMARY STORAGE)

While performing a processing operation, a processor needs a place to temporarily store instructions to be executed and the data to be used with those instructions. The CPU cannot process data on an input device or disk directly; the data must first be available in memory. A computer's memory in the system unit is located physically close to the CPU to decrease access time. It provides the CPU with a working storage area for program instructions, data and information. Memory is also known as primary storage or internal storage. Memory usually consists of one or more chips on the motherboard.

TYPES OF MEMORY:

The system unit contains two types of memory: volatile and nonvolatile. The contents of *volatile memory are lost when* the computer power is turned off. The *contents* of nonvolatile memory are not lost when power is turned off. RAM is the most common type of volatile memory. Examples of nonvolatile memory include ROM, flash memory, and CMOS. Below, we discuss these types of memory.

RANDOM ACCESS MEMORY (RAM)

Random Access Memory (RAM) is the memory chips that are mounted directly on the motherboard or mounted on peripheral cards that plug into the motherboard. The RAM chips consist of millions of switches that are sensitive to changes in electric current. When the computer is powered on, certain operating system files are loaded from a storage device such as a hard disk into RAM. These files remain in RAM as long as the computer is running. As additional programs and data are requested, they are read from storage into RAM. The processor acts upon the data while it is in RAM. During the running time, the contents of RAM may change as the program is executed.

The amount of RAM a computer requires often depends on the types of applications you plan to use on the computer. A computer only can manipulate data that is in memory. A computer needs a certain amount of memory to store programs, data and information. The more RAM a computer has, the faster the computer will respond. A software package usually indicates the minimum amount of RAM it requires. RAM in computers purchased today ranges from 128MB, 512MB, and 1GB to 64GB.

BASIC TYPES OF RAM

* **Dynamic RAM (DRAM**) must be refreshed (or recharged) constantly by the CPU static RAM, and
* **Static RAM (SRAM)** is faster and more reliable than any form of DRAM. The term static refers to the fact that it does not have to be re-energized as often as DRAM.
* **Magneto resistive RAM (MRAM**), stores data using magnetic charges instead of electrical charges. MRAM has greater storage capacity, consumes less power, and has faster access times.
* **Virtual RAM (VRAM):** Modern operating systems can use spare storage space on the hard disk as if it is working memory and this is referred to as Virtual memory or Virtual RAM

READ-ONLY MEMORY (ROM)

Read-only memory (ROM) refers to memory chips storing permanent data and instructions. That is, the items stored in ROM chips cannot be modified—then, the name read-only. ROM is usually nonvolatile. In ROM, the combination of circuit states is fixed, and therefore its contents are not lost if the power is removed. The data, instructions, or information stored on ROM chips often are recorded when the chip is manufactured. ROM chips that contain permanently written data, instructions, or information are called firmware. Firmware can be read and used, but cannot be changed by user.

BASIC TYPES OF ROM

Programmable read-only memory (PROM) is a blank ROM chip on which you can permanently place data and programs. Once the data and instructions are programmed into PROM chip, the chip functions like a regular ROM and cannot be erased or changed. A variation of the PROM chip, called electrically erasable

programmable read-only memory (EEPROM) chip allows a programmer to erase the microcode with an electric signal.

DIFFERENCES BETWEEN RAM AND ROM

RAM	ROM
1. Volatile, temporally	1.Non Volatile, permanent
2. Contents lost when power goes off	2. Contents remain when power goes off
3. Read and Write	3. Read Only
4. Can be increased	4. Can't be Increased
5. Not installed at Factory	5. Installed at Factory

MEMORY CACHE

A cache is a relatively small block of very fast memory designed for the specific purpose of speeding up the internal transfer of data and software instructions. Cache uses internal storage technologies that are much faster than conventional RAM. Cache speeds up processing time because it stores frequently used instructions and data. The processor first checks cache, then RAM for needed data and instructions.

FLASH MEMORY

Flash memory is a chip also that keeps its memory when the power is shut off. Flash memory can be erased electronically and reprogrammed. Most computers use flash memory to hold their startup instructions because it allows the computer easily to update its contents.

CMOS

Complementary Metal-Oxide Semiconductor (CMOS) technology provides high speeds and consumes little power. CMOS technology uses battery power to retain information even when the power to the computer is off. Battery-backed CMOS memory chips, for example, can keep the calendar, date, and time current even when the computer is off.

UNITS OF MEASURING COMPUTER MEMORY

The smallest unit of measuring Computer Memory is a BInary digiT (Bit). Binary digits are the numbers 1 and 0 which can be represented in a computer by switching voltage on and off. Eight little bits make one BYTE. The storage capacity of computers (RAM and ROM) and that of auxiliary storage units like disks are generally given in bytes. One BYTE stores approximately one character.

MORE UNITS OF COMPUTER MEMORY:

Kilobyte (1K or 1 Kb) is 2^{10} = 1024 bytes. (Approximately 1 thousand bytes)
Megabyte (Mb) is 2^{10} = 1024 Kilobytes or 2^{20} bytes, (Approximately 1 million bytes)
Gigabyte (GB) is 2^{10} = 1024 Megabytes or 2^{30} bytes, (Approximately 1 billion bytes)
Terabyte (TB) is 2^{10} = 1024 Gigabytes or 2^{40} bytes, (Approximately 1 trillion bytes)
Other higher prefixes are Peta(2^{50}), Exa(2^{60}), Zetta(2^{70}), Yotta(2^{80}), approximately equal to 10^{15}, 10^{18}, 10^{21}, and 10^{24} bytes respectively.

NB: In computing today, the approximation 1024 to 1000 has brought about confusion and many manufacturers quote a disk with 1,000,000,000 bytes as 1 GB (1,000,000,000) instead of 1,073,741,824 bytes (2^{30}).

EXAMPLES

1. How many bits are required to store the following words?
   a) COMPUTING
   b) GOOD_SCHOOL

c) 36°C
d) U.N.E.B

2. Does a text document with 1,000,000 characters fit onto a standard floppy disk?
3. Arrange the elements below in terms of their relative size in ascending order:
   Gigabyte>Kilobyte>Megabyte>Bit>Byte
4. Convert:
   (i) 200 kb to bits
   (ii) 5,120,000 Bytes to Megabytes

Solutions:

1. (a) C,O,M,P,U,T,I,N,G = 9 Characters
But 1 Character = 8 bits (1 byte)
↔9 Characters =9x8
= 72 bits

(b) GOOD_SCHOOL = 11 Characters
But 1 Character = 8 bits (1 byte)
↔9 Characters =11x8
= 88 bits

2. A standard floppy disk has a capacity of 1.44MB.
1.44 MB = 1X1024X1024 bytes
= 1509949.44 bytes
Therefore, the floppy can accommodate 1,509,949 characters
i.e. a text document of 1,000,000 can fit well.

3. Correct ascending order (Small to Big): Bit, Byte, Kilobyte, Megabyte, Gigabyte.

4. (i) 200 Kb = 200x1024x8 = 1638400 bits.
(ii) 5, 120,000 bytes to Megabytes.
1MB = 1x1024xX1024 = 1048576 bytes.

↔ 1byte $= \frac{1}{1048576}$ MB

5,120,000 bytes $= \frac{1}{1048576}$ x 5,120,000 MB
= 4.8828125 MB

ACTIVITY

1. Convert the following:
(i) 1000000 KB to GB (ii) 16777216 bits to MB (iii) 1.5 TB to MB
2. Arrange the following in descending order:
Word, Page, Character, Paragraph, Sentence.

COMPUTER DATA REPRESENTATION & NUMBERING SYSTEMS

Humans understand decimal (base ten) just because they have ten counting fingers.



Digital electronics (computers) understand binary because binary consists of only two digits which correspond to the two power states; 0 representing electrical charge OFF and 1 representing electrical charge ON. Octal (base 8) and Hexadecimal (base 16) number systems are used to represent complex binary data in a more compact form.

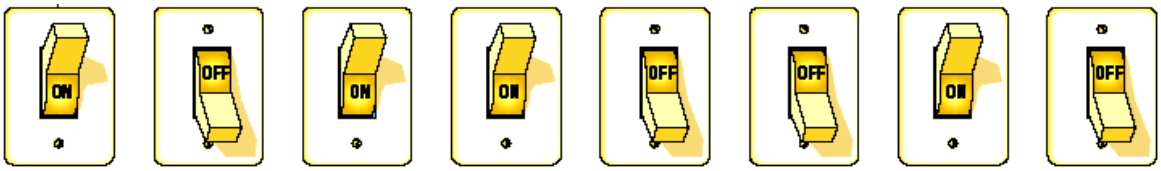
INARY NUMBERING SYSTEM

Binary is a numbering system that is a series of 1s and 0s only. The idea of binary was created in the 1600s. Binary has been used in nearly everything electronic; from calculators to supercomputers. Machine code language is in binary digits.

As an example the following bit pattern represents the word 'HELLO'. Computer does all that at very high speed during typing and you only see the resulting 'HELLO' on screen.

BINARY CODING SCHEMES

A binary coding scheme is a method used for representing all of the digits, letters, special characters, and control characters available to a digital computer using a combination of bits 0 and 1.



The off/on 0s and 1s are arranged in such a way that they can be made to represent each character uniquely. In a binary number, a digit 0 or 1 is called a bit. For example, 1001 is a 4-bit binary number, and, 11000110 is an 8-bit binary number.

There are three commonly used binary coding schemes: ASCII, EBCDIC and Unicode

ASCII

ASCII is an abbreviation for American Standard Code for Information Interchange. It is a character-encoding scheme based on the ordering of the English alphabet. ASCII-7 includes coding for 2^7 = 128 characters. ASCII-8 includes coding for 2^8=256 characters .The name ASCII-8 is often used for binary codes that use all values in a full byte (8 binary digits).

EBCDIC

The Extended Binary Coded Decimal Interchange Code (EBCDIC) uses 8 bits to represent a symbol in the data. EBCDIC was devised in the 1960s by IBM. EBCDIC allows 2^8 = 256 combinations of bits.256 unique symbols are represented using EBCDIC code. EBCDIC codes are used mainly, mainly on IBM mainframe and midrange computer systems.

UNICODE

Unicode is a universal character encoding standard for the representation of text which also includes symbols in multi-lingual environments. Unicode uses 32 bits to represent a symbol in the data. Unicode allows 2^{32} = 4164895296 (~ 4 billion) combinations. Unicode codes can uniquely represent any character or symbol present in any language like Chinese, Japanese etc.

THE OCTAL NUMBERING SYSTEM

The octal numeral system is a base 8 numeral system. It uses the numerals 0 through 7. At one time, the octal system was used mainly for work with computers. It provided an easier way to work with binary numbers. As computers changed from using 24-bit systems to 32- and 64-bit systems, hexadecimal replaced octal for most uses. The octal numeral system uses a three-bit binary coding. Each digit in an octal numeral is the same as three digits in a binary numeral. The grouping of the binary digits is done from right to left.

HEXADECIMAL NUMERAL SYSTEM

The hexadecimal numeral system, also known as just hex, is a numeral system made up of 16 symbols (base 16).

It uses the common symbols in the decimal numeral system (0 through 9) and includes six extra symbols. These symbols are characters taken from the English alphabet: A, B, C, D, E and F.
The hexadecimal system replaced the octal numeral system for much of the work done on computers.

ADVANTAGES OF USING HEX

* Hexadecimal numbers are very compact.
* As computers become more advanced, they tend to use larger groups of bits but they use multiples of 8 (16, 24, 32, 64, etc). Hexadecimal makes it easier to write these large binary numbers.
* The hexadecimal or base 16 number system is important to programmers because it's a shorthand way of writing out and inputting binary. It's simpler and easier because you can work with fewer symbols, or "numbers".
* It is easy to convert from hex to binary and binary to hex.

DECIMAL, BINARY, OCTAL AND HEXADECIMAL COUNTING TABLE/ CHART

DECIMAL	HEXA DECIMAL	4-BIT BINARY	OCTAL	3-BIT BINARY
0	0	0000	0	000
1	1	0001	1	001
2	2	0010	2	010
3	3	0011	3	011
4	4	0100	4	100
5	5	0101	5	101
6	6	0110	6	110
7	7	0111	7	111
8	8	1000		
9	9	1001		
10	A	1010		
11	B	1011		
12	C	1100		
13	D	1101		
14	E	1110		
15	F	1111		

CALCULATIONS ON CONVERSIONS

EXAMPLES

CONVERSION OF BINARY TO DECIMAL (BASE 2 TO BASE 10)

Example: Convert $(110011)_2$ to decimal

$= (1 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$

$= 32 + 16 + 0 + 0 + 2 + 1$

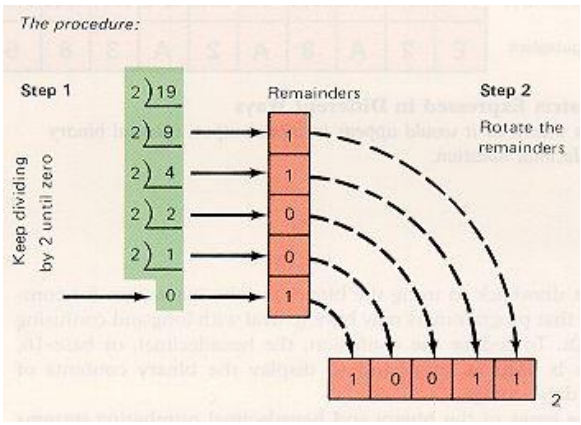
$= 51_{\text{decimal}}$

CONVERSION OF DECIMAL TO BINARY (BASE 10 TO BASE 2)

A decimal number can be converted easily into an equivalent number of any base by the use of the *division/remainder* technique.

Example 1: Convert 19 decimal to Binary

Step 1. Divide the number (19, in this example) repeatedly by 2, and record the remainder of each division. In the first division, 2 goes into 19 nine times with a remainder of 1. The remainder is always one of the binary digits--0 or 1. In the last division you divide 1 by the base (2) and the remainder is 1.



Step 2. Rotate the remainders as shown in the figure on the right; the result (10011) is the binary equivalent of a decimal 19.

Example 2: **Convert 51 decimal to Binary**

51 ÷ 2 = 25 remainder is 1
25 ÷ 2 = 12 remainder is 1
12 ÷ 2 = 6 remainder is 0
6 ÷ 2 = 3 remainder is 0
3 ÷ 2 = 1 remainder is 1
1 ÷ 2 = 0 remainder is 1

Answer = 1 1 0 0 1 1

Note: The answer is read from bottom to top as 110011 binary.

CONVERSION OF OCTAL TO DECIMAL (BASE 8 TO BASE 10)

Example: **Convert $(632)_8$ to decimal**

$= (6 \times 8^2) + (3 \times 8^1) + (2 \times 8^0)$
$= (6 \times 64) + (3 \times 8) + (2 \times 1)$
$= 384 + 24 + 2$
$= 410$ decimal.

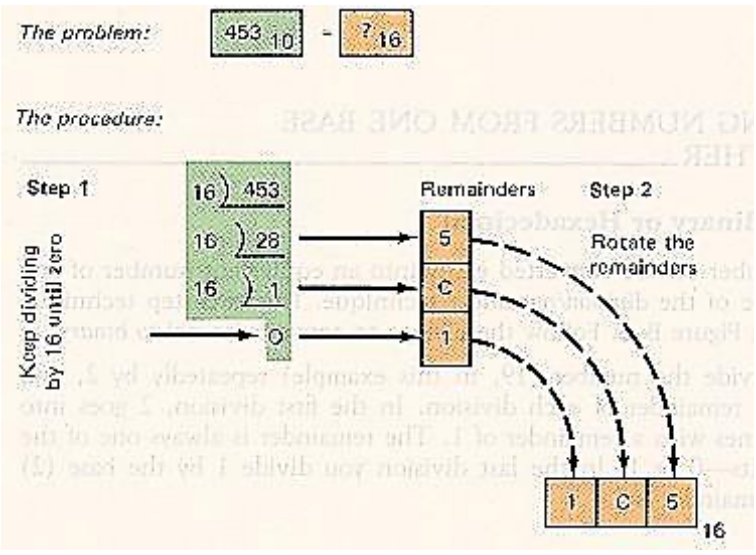
Example: Convert $(77)_{10}$ to hex

77 ÷ 16 = 4 remainder is D
4 ÷ 16 = 0 remainder is 4

Note: the answer is read from bottom to top. Therefore, the answer is $4D_{hex}$

CONVERSION OF DECIMAL TO HEX (BASE 10 TO BASE 16)

The Figure illustrates how the same division/remainder technique is used to convert a decimal 453 into its hexadecimal equivalent (1C5). In a *decimal-to-hex* conversion, the remainder is always one of the 16 hex digits.



CONVERSION OF OCTAL TO BINARY

One Octal Digit is equal to three bits because $8 = 2^3$. So, we convert each octal digit into a **string** of three bits.

Example: Convert 345_8 to binary:

Soln:

Octal Digit	3	4	5
Equal Bits	011	100	101
Therefore 345_{oct} =	011100101binary		

CONVERSION OF HEX TO BINARY

One Hex Digit is equal to four bits because $16 = 2^4$. So, we convert each hex digit into a **string** of four bits.

Example:

Convert 9ADhex to binary: (Remember A = 10dec = 1010bin, D = 14dec = 1101bin

Hex Digit	9	A	D
Equal Bits	1001	1010	1101
Therefore 9ADhex =	100110101101binary		

CONVERSION OF BINARY TO OCTAL

Here the reverse method is used: Conversion of binary numbers to octal and hex simply requires grouping bits in the binary numbers into groups of three bits for conversion to octal and into groups of four bits for conversion to hex.

Example:

Convert 11100111binary to octal:

Soln

Binary Digits	11100111		
Bits groups	011	100	111
Octal Equivalents	3	4	7
Therefore 11100111 binary = 347octal			

CONVERSION OF BINARY TO HEX

Also here the reverse method is used: Conversion of binary numbers to hex simply requires grouping bits in the binary numbers into groups of four bits for conversion

Example:

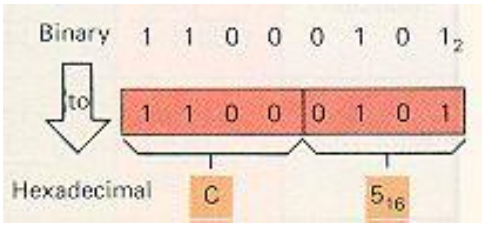
Convert 11100111 binary to hexadecimal:

Soln

Binary Digits	101110100001111			
Bits groups	0101	1101	0000	1111
Hex Equivalents	5	D	0	F
Therefore 11100111 binary 5D0Fhex				

Method 2: Convert 11000101 binary to hex

Soln: Place the binary digits in groups of four, then convert the binary number directly to hexadecimal.



i.e. 11000101 = [1100] [0101]

= C 5

= C5 hex.

ACTIVITY

1. Convert to Binary:
(i) 262 oct (ii) 78 dec (iii) 10E hex
2. Convert to Octal
(i) 11011bin (ii) 899 dec (iii) D7hex
3. Convert to Decimal
(i) 111001bin (ii) 5445oct (iii) C5he x
4. Convert to Hexadecimal
(i) 10011111011bin
(ii) 788oct
(iii) 563 decimal.
5. Convert the following IP address to binary and hexadecimal, keeping a dot between each byte. 192.168.0.1

6. Convert the following (RGB) color code from hex to decimal, keeping a dot between each color: #A4.FF.66.



NB. You can use your scientific calculator to prove the answers. It can do all these conversions!

UNIT THREE: STORAGE HARDWARE

UNIT INTRODUCTION

We have seen that primary memory such as RAM provides a small amount of temporary storage area for the data and instructions required by the CPU for processing.
Computer systems also need to store larger amounts of data, and information more permanently than allowed with primary memory.
When a user issues a command to start application software, such as a word processing program or a Web browser, the operating system locates the program in secondary storage, such as on a hard disk, CD, or DVD, and loads it into memory.

STORAGE MEDIA & DEVICES

A **storage medium** is the physical material on which a computer keeps data. There is a variety of storage media available.
Capacity is the number of bytes (characters) a storage medium can hold.
A **Storage Device** reads and writes data to and from a storage medium.
Reading is the process in which a storage device transfers data, from a storage medium into memory.
Writing is the process in which a storage device transfers these data from memory to a storage medium.
Access time, *is a measure of the amount of time it takes a storage* device to locate an item on a storage medium.
Transfer rate is the speed with which data, instructions, and information move to and from a device. Transfer rates for storage are stated in KBps (kilobytes per second)most storage media are either Magnetic media, or Optical media.

MAGNETIC MEDIA

Magnetic storage media represent data as magnetic spots on the tape or disk, with a magnetized spot representing a 1 bit and the absence of such a spot representing a 0 bit. Common examples of magnetic media include:
1. Magnetic tape

2. Floppy disk,
3. Zip and Jaz disks
4. Hard disks

MAGNETIC TAPE



Magnetic tape is a magnetically coated ribbon of plastic capable of storing large amounts of data at a low cost.

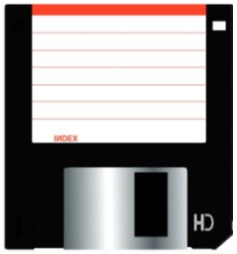
Tape storage requires sequential access, i.e. data must be accessed in the order in which it is stored. If the computer is to read data from the middle of a tape, all the tape before the desired piece of data must be passed over consecutively.

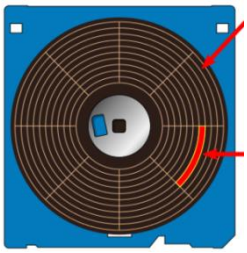
Today, magnetic tape storage is no longer used for routine processing.

DEMERITS OF MAGNETIC TAPES

- Random data access is not possible.
- Magnetic Tape Data storage has a limited shelf life of about 2 years only.

FLOPPY DISK (DISKETTE)





A *floppy disk, or diskette, is a portable, inexpensive* storage medium that consists of a thin circular, flexible plastic disk with a magnetic costing enclosed in a square-shaped plastic shell.



A standard floppy disk is 3.5-inches wide and has storage capacities up to 1.44 MB. A floppy disk drive is a device that can read from and write to a floppy disk.

Before you can write on a new disk, it must be formatted.

Formatting is the process of preparing a disk for data entry by organizing the disk into storage locations called tracks and sectors

CARE FOR DISKETTES



A floppy disk should not be exposed to heat, cold, magnetic fields and dust. Never leave diskettes in the disk drive. Diskettes should be rolled up and stored in pencil holders. Diskettes should not be inserted or removed from the drive while the red light is flashing. Avoid touching the inner magnetic strip of the diskette.

ADVANTAGES OF FLOPPY DISKS

1. Floppy diskettes are portable
2. Floppy diskettes are cheap
3. Random Data Access on a diskette is possible
4. A floppy diskette can be write- protected from being changed.

DISADVANTAGES OF FLOPPY DISKS

1. Floppy diskettes are not reliable – they need to handled with a lot of care, else you risk loosing data.
2. Floppy diskettes are not durable.
3. Data Access time is relatively slow.
4. They have limited Storage capacity (only 1.44MB)

ZIP DRIVE

The Zip drive is a medium-capacity removable disk storage system with capacities of 100 MB to 750 MB that was introduced by Iomega in late 1994.
However it was never popular enough. Zip drives fell out of favor for mass portable storage during the early 2000s due to emergence of much better USB flash drives CDs, and DVDs.

THE JAZ DRIVE



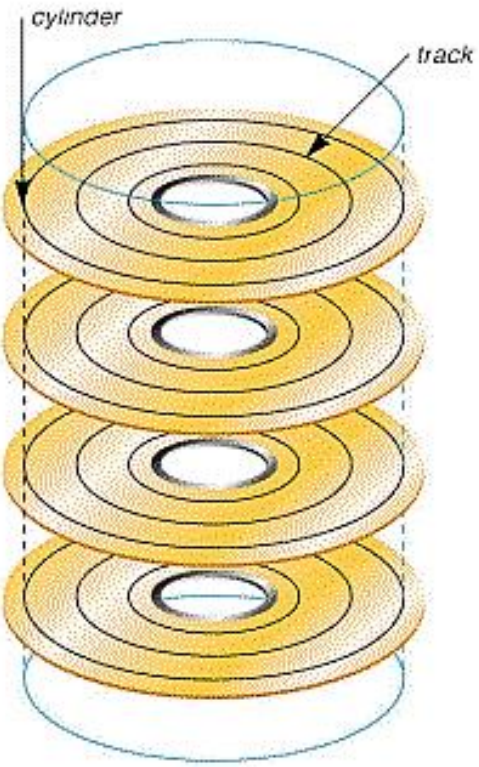
Similar the Zip drive, The Jaz drive was a removable disk storage system, introduced by the Iomega Company in 1995. The Jaz disks were originally released with a 1 GB capacity. The rising popularity and decreasing price of CDs and DVDs greatly hurt the success of the Jaz Drive and the Jaz line was ultimately discontinued in 2002.

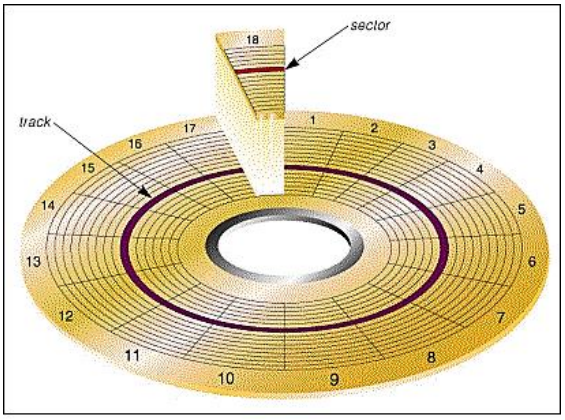
HARD DISKS



A *hard disk, also called hard drive, usually consists of several* inflexible, circular metal platters coated with magnetic oxide that can be magnetized to represent data. The entire device is enclosed in an air-tight, sealed case to protect it from contamination. Hard disks come in a variety of sizes. In most personal computers, the hard disk is housed inside the system unit.

Current personal computer hard disks have storage capacities from 160 GB to 1 TB and more.





A **track** is *a narrow recording band that* forms a full circle on the surface of the disk. The tracks are further divided into sectors.
A **cluster,** also called allocation unit, consists of two to eight sectors of space used to store data.
Sometimes, a sector has a fault and cannot store data. When you format a disk, the operating system marks these bad sectors as unusable. A **cylinder** is the vertical section of track through all platters on a hard disk.

A read/write head is the mechanism that reads items and writes items in the drive as it barely touches the disk's recording surface.
When a read/write head does accidentally touch the platter surface, it is called a ***head crash*** *and all data is* destroyed. Thus, it is crucial that you back up your hard disk regularly.
A ***backup*** *is a duplicate of a file, program, or* disk placed on a separate storage medium that you can use in case the original is lost, damaged, or destroyed.

HARD DISK INTERFACES

The hard disk interface defines the physical means by which the hard disk connects to the rest of the computer. There are many disk interfaces:

EXTERNAL HARD DISK INTERFACES INCLUDE:

1. USB (Universal Serial Bus),



2. FireWire

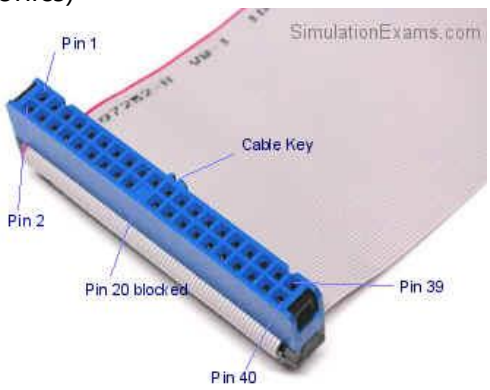


INTERNAL HARD DISK INTERFACES INCLUDE:

1. SATA, (Serial Advanced Technology Attachment)



2. EIDE, (Enhanced Integrated Drive Electronics)



3. SCSI, (Small Computer System Interface)



4. SAS (Serial-attached SCSI)



SPEED AND ACCESS TIME

Depending on the type of hard disk, transfer rates range from 15 MBps to 320 MBps. Access time for today's hard disks ranges from approximately 3 to 12 milliseconds. Hard disks improve their access time by using disk caching.

***Disk cache**, sometimes called a* buffer*, consists of a memory* chips on a hard disk that stores frequently accessed items such as data, instructions, and information.

It is similar to Memory Cache

TYPES OF HARD DISKS

- An **internal hard disk** is fixed in the system unit and usually stores the operating system required for the computer to work.
- An **external hard disk** is *a separate free-standing hard* disk that connects with a cable to a USB port.
- A **removable hard disk** *is* a hard disk that you insert and remove from either a dock or a drive.
- An **Internet hard drive**, also called online storage, is a service on the Web that provides storage to computer users, usually for a minimal monthly fee.

HARD DISK DURABILITY

Most manufacturers guarantee their hard disks to last somewhere between three and five years. Many last much longer with proper care and handling.
To prevent the loss of items store on a hard disk, you regularly should perform preventive maintenance such as defragmenting or scanning the disk for errors.

OPTICAL MEDIA

Optical storage refers to recording of data by making marks in a pattern that can be read back with the aid of light, usually a beam of laser light. The reflected light is converted into a series of bits that the computer can process. An optical disc is a flat, round, portable storage medium made of metal, plastic, and lacquer that is written and read by a laser.
Optical discs used in personal computers are 4.75 inches in diameter.
Smaller computers and devices use mini discs that have a diameter of 3 inches or less.

CARE FOR OPTICAL DISKS

The following should be done for the safety of data on Optical disks:

1. Do not expose the disc to excessive heat or sunlight
2. Do not eat, smoke or drink near a disc.
3. Do not stack disks.
4. Do not touch the underside of the disk.
5. Always store the disc in a jewel box when not in use
6. Always hold a disc by its edges.
7. Do not drop the disk to the ground
8. Don't bend the disk.



CATEGORIES OF OPTICAL DISKS

Two general categories are CDs and DVDs, with DVDs having a much greater storage capacity than CDs. Examples of Optical Disks include:

- **CD-ROM (compact disc read-only memory)**
  The contents of standard CD-ROMs are written by the manufacturer and only can be read and used. A typical CD-ROM holds from 650 MB to 1GB of data,
- **CD-R (compact disc-recordable)**
  CD-R (compact disc-recordable) is a technology that allows you to write on a compact disc using your own computer's CD-R drive.
  Once you have recorded the CD-R, you can read from it as many times as you desire.
  A CD-R is a multisession optical disc which allows you to write on part of the disc at one time and another part at a later time.
  However, you cannot erase the disc's contents.
- **CD-RW (compact disc-rewritable)**
  A CD-RW (compact disc-rewritable) is an erasable multisession disc that you can write on multiple times.

Reliability of the disc tends to drop, however, with each successive rewrite.
To write on a CD-RW, you must have a CD-RW drive and CD-RW software.
A CD-RW drive has a lower read and write speed as compared to CD-Rs

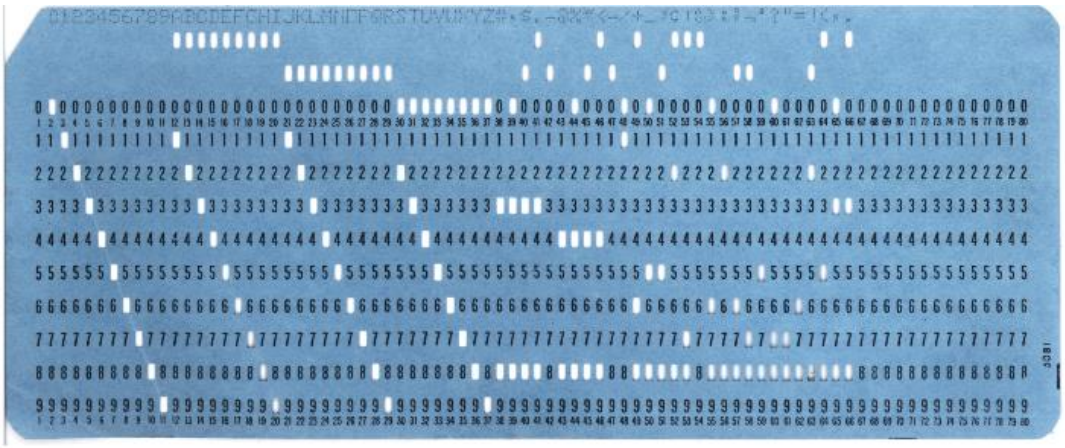
- **Magneto-optical (MO) disk**
  This is a hybrid disk that combines the best features of magnetic and optical disk technologies.
  It has the erase and rewrite capabilities of magnetic disks, but it also has the very high-volume density capabilities of optical disks.
  MO disks are not popular because they are too expensive, and not as reliable as magnetic media.
- **DVDs**
  DVD-ROM (digital video disc-ROM); A DVD-ROM is an extremely high capacity compact disc capable of storing from 4.7 GB to 17GB.
  In order to read a DVD-ROM, you must have a DVD-ROM drive, which can also read CDROMs.
  DVDs are also available in a variety of recordable and rewritable versions and formats such as DVD-R and DVD+R DVD+RW, DVD+RE, and DVD+RAM.

HIGH CAPACITY DVD FORMATS

- A Blu-ray Discs-ROM (BD-ROM) has storage capacities of up to 100 GB.
- The HD (high-density) DVD-ROM has storage capacities up to 60 GB.
- A mini-DVD that has grown in popularity is the *UMD (Universal Media Disc), which* can store up to 1.8 GB of games, movies, or music.

OTHER TYPES OF STORAGE MEDIA

1. **Punched Cards**
   A punched card, punch card, IBM card, or Hollerith card is a piece of stiff paper that contains digital information represented by the presence or absence of holes in predefined positions.



   They were used through the 20th century in unit record machines for input, processing, and data storage.
   Early digital computers used punched cards, often prepared using keypunch machines, as the primary medium for input and storage of both computer programs and data.
2. **USB flash drive**



A USB flash drive is a flash memory storage device that plugs in a USB port on a computer.
USB flash drives are convenient for mobile users because they are small and lightweight enough to be transported in a pocket.
Current USB flash drives have data storage capacities ranging from 256 MB to 64 GB.
USB flash drives have become the mobile user's primary portable storage device, making the floppy disk nearly outdated.

3. **Flash memory cards**



Flash memory cards are a type of solid-state media, which means they consist entirely of electronic components and contain no moving parts. Common types of flash memory cards include Memory Stick, CompactFlash (CF), SmartMedia, miscroSD, miniSD, xD, Picture Card, etc.
They are commonly used in electronic devices such as digital cameras and mobile phones. They are tiny, re-recordable, and able to retain data without power.
Depending on the device, manufacturers claim these storage media can last from 10 to 100 years.

4. **Photographic film**



Photographic film is a sheet of plastic such as polyester coated with a light sensitive emulsion that is used to record and store photographs.
Normal film is shipped in small canisters (boxes) that protect it from the light.
When exposed to light, it forms an invisible image
.
Chemical processes can then be applied to the film to create a visible image, in a process called film developing.
A normal photographic film can hold up to 40 pictures.

5. **Microfilm and Microfiche**

These are media used to store microscopic images of documents on roll or sheet film.
The images are recorded onto the film using a device called a computer output microfilm recorder.
The stored images are so small they can be read only with a microfilm or microfiche reader.
Microfilm and microfiche have the longest life of any storage medium.
Libraries use these media to store back issues of newspapers, magazines, and genealogy records.

UNIT FOUR: OUTPUT DEVICES

UNIT INTRODUCTION

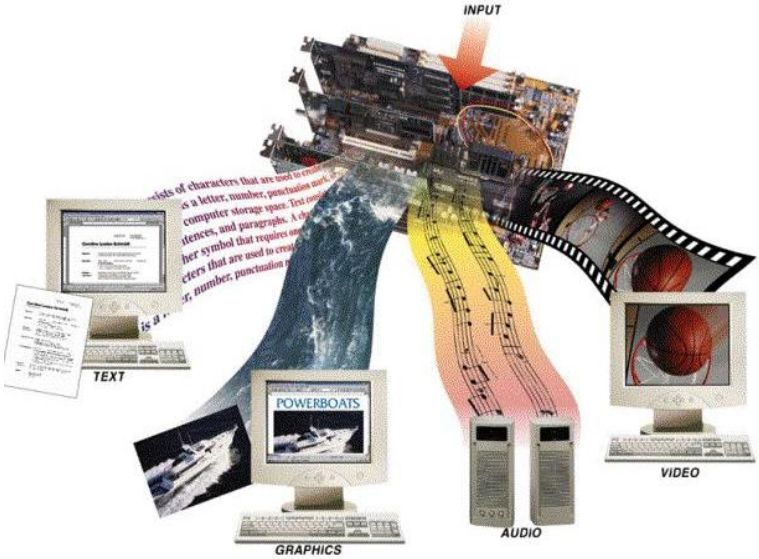
Output is data that has been processed into a useful form called information.
Computers generate several types of output, depending on the hardware and software being used and the requirements of the user.

An output device is any type of hardware component capable of conveying information to one or more people. Commonly used output devices include display devices, printers, Audio Output Devices and others.

CATEGORIES OF COMPUTER OUTPUT

While working with a computer, a user encounters four basic categories of output:

* Text, (characters that are used to create words, sentences, and paragraphs)
* Graphics (non-text information such as drawings and charts),
* Audio(music, speech, or any other sound)
* Video (full-motion images played back at various speeds)



A. DISPLAY DEVICES

A display device is an output device that visually conveys text, graphics, and video information.

Information shown on a display device often is called **soft copy**, because the information exists electronically and is displayed for a temporary period of time. Commonly used display devices include CRT Monitors, LCD Monitors, Plasma monitors, Projectors, Headgears and LED displays.



CRT MONITORS

A CRT (cathode ray tube) monitor is a desktop screen that contains a large sealed glass cathode-ray tube. Inside the CRT, an electron beam moves back and forth across the back of the screen. This causes dots on the front of the screen to glow; producing an image on the screen. Each dot consists of a red, a green, and a blue phosphor, which combine to make up a pixel.

A ***pixel*** is a single point in an electronic image. It is advisable to always sit 1 meter way from CRT monitors because they produce electromagnetic radiation, posing a health risk.

FLAT-PANEL DISPLAYS

A flat-panel display is a lightweight display device with a shallow depth and flat screen that typically uses LCD (liquid crystal display) or gas plasma technology.



Examples of flat -panel displays include LCD monitors, and plasma monitors. Many are widescreen, i.e. much wider than they are tall. Screens are measured diagonally from one corner to the other. Common sizes are 17", 19", 20", 22", 24" and 27", 45" and 65 inch screens.

DATA PROJECTORS

A data projector takes the image that displays on a computer screen and projects it onto a large screen or wall so that an audience of people can see the image clearly.



For example, many classrooms use data projectors so that all students easily can see an instructor's presentation on the screen.

Presence of excess light affects data projectors and so they perform well in dark rooms.

HEAD MOUNTED DISPLAY (HMD) / HEADGEAR

A headgear is made up of two tiny display and sound systems that channel images and sound from the source to the eyes and ears, thus presenting a stereo three dimensional sound effect in the virtual world.



The wearer may also put on a body suit that senses the body movement and relays the data into the virtual reality system which in turn adjusts the position of the user in the system.

LED DISPLAYS

A LED display is a flat panel display, which uses light-emitting diodes as a video display.



A LED panel may be a small display, or a component of a larger display. They are typically used outdoors in store signs and billboards.

MORE TERMS ASSOCIATED WITH DISPLAY DEVICES



1. **Resolution** is the number of horizontal and vertical pixels in a display device. A higher resolution uses a greater number of pixels and thus provides a smoother, sharper, and clearer image. Resolution is measured in dpi (dots per inch)
2. **Dot pitch** or **pixel pitch**, is the distance in millimeters between pixels on a display device. Text created with a smaller dot pitch is easier to read.

B. PRINTERS

A printer is a device that produces a hard copy output such as text and graphics on a physical material like paper.
Printed information (hard copy) exists physically and in a more permanent form than a soft copy on a display device. Printers with different speeds, features, quality, and capabilities are available in a range of prices. Printers can be grouped into two categories: impact and nonimpact printers.

IMPACT PRINTERS

An impact printer forms characters and graphics on a piece of paper by a striking mechanism against an ink ribbon that physically contacts the paper.
Impact printers are noisy because of this striking activity. Large Businesses use impact printers because these printers can withstand dusty environments, vibrations, and extreme temperatures.
Commonly used types of impact printers include Daisy wheel, dot-matrix, Braille and line printers.

DAISYWHEEL PRINTER

This is a kind of impact printer where characters are arranged on the ends of the spokes of a wheel.





The wheel (usually made of plastic) is rotated to select the character to print and then an electrically operated hammer bends the selected spoke forward slightly, squeezing in an ink ribbon between the character and the paper, as in a typewriter.
One advantage of this arrangement over that of a typewriter is that different wheels may be inserted to produce different typefaces (font styles and sizes)
Low speed and noise are its disadvantages. The speeds are between 20 and 90 characters per second (cps).

DOT-MATRIX PRINTER

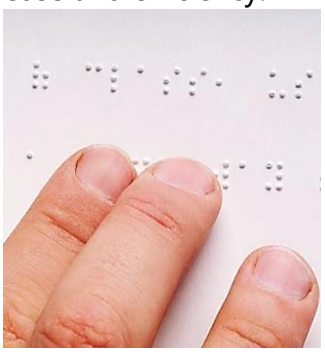


A dot-matrix printer produces printed images when tiny wire pints on a print head mechanism strike an inked ribbon like in a type writer.
When the ribbon presses against the paper, it creates dots that form characters and graphics.
Most dot-matrix printers use continuous-form paper, in which thousands of sheets of paper are connected together end to end. The papers have holes along the sides to help feed the paper through the printer.
Dot matrix printers provide cheap but low quality printing.

BRAILLE PRINTERS



A Braille printer, commonly known as a Braille embosser, is an impact printer that renders text as tangible dot cells which are felt and read by the blind.
Using Braille translation software, a document can be embossed with relative ease and efficiency.
They need special Braille paper which is thicker and more expensive than normal paper.



Once a copy produced, printing further copies is often quicker by means of a device called a "thermoform", which produces copies on soft plastic.

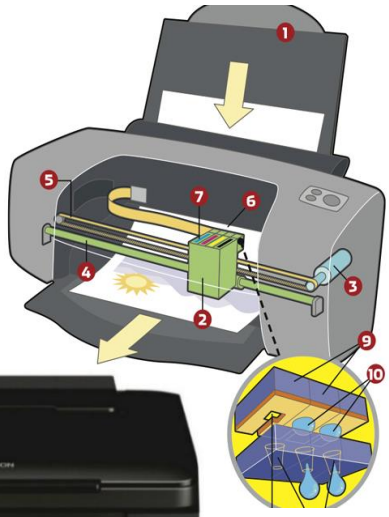
LINE PRINTERS

A line printer is a high-speed impact printer that prints an entire line at a time.
The speed of a line printer is measured by the number of lines per minute (LPM) it can print. Some line printers print as many as 3,000 LPM.
Mainframes, servers, or networked applications, such as manufacturing, distribution, or shipping, often use line printers.



NON-IMPACT PRINTERS

A nonimpact printer forms characters and graphics on a piece of paper without actually striking the paper.
Some spray ink, while others use heat or pressure to create images.
Commonly used nonimpact printers are ink-jet printers, laser printers, thermal printers, plotters, and mobile printers.



INK-JET PRINTER

An ink-jet printer forms characters and graphics by spraying tiny drops of liquid ink onto a piece of paper.
Ink-jet printers produce text and graphics in both black-and-white and color on a variety of paper types & sizes. The print head mechanism in an ink-jet printer contains ink-filled print cartridges.
Each cartridge has very many small ink holes, or nozzles. The ink propels through a combination of the holes to form a character or image on the paper.



A **bubble** jet printer is a type of inkjet printers in which bubbles (droplets) of ink are formed by rapid vaporization of the ink in the chamber, and then propelled onto the paper.

LASER PRINTER



A ***laser printer*** is a high-speed, high quality nonimpact printer.
Operating in a manner similar to a copy machine, a laser printer creates images using a laser beam and powdered ink, called ***toner***, which is packaged in a cartridge.
When printing a document, laser printers process and store the entire page before they actually print it. For this reason, laser printers sometimes are called *page printers*. Storing a page before printing requires the laser printer to have a certain amount of inbuilt memory.

THERMAL PRINTER

A thermal printer generates images by pushing heated pins against a coated heat-sensitive paper. The coating turns black in the areas where it is heated, producing an image.
Basic thermal printers are cheap, but the print quality is low and the images tend to fade over time.
Thermal printing technology is, however, ideal for use in small devices e.g. ATM receipt printers.



PLOTTERS

Plotters are printers used to produce large, high-quality, vector graphic drawings such as blueprints, maps, posters, and signs. These printers are usually very costly, and are used in specialized fields such as engineering, and graphic art. They use ink-jet printer technology, on a much larger scale, to print professional quality displays.



MOBILE PRINTERS

A mobile printer is a small, lightweight, battery powered printer that allows a mobile user to print from a notebook computer, Tablet PC, PDA, smart phone or other personal mobile device while traveling. They fit easily in a briefcase alongside a notebook computer. Mobile printers mainly use ink-jet, thermal, wax-transfer, or dye-sublimation technology.



TERMS ASSOCIATED WITH PRINTERS

1. **Toner** is a powder used in laser printers and photocopiers to form the printed text and images on the paper.
2. **DPI. (Dots per inch)** is a measure of the number of individual dots printed in a line within the span of 1 inch (2.54 cm). The DPI value correlates with image resolution.
3. **Hard copy** is a permanent reproduction, on the form of a physical object, of any media suitable for direct use such as paper.
4. **Page orientation** is the way in which a rectangular page is focused on for normal viewing. The two most common types of orientation are *portrait* and *landscape*. A page in portrait orientation is taller than it is wide, with information printed across the shorter width of the paper. A page in landscape orientation is wider than it is tall, with information printed across the widest part of the paper.

C. AUDIO OUTPUT DEVICES

Audio output devices are the components of the computer system that produce music, speech, or other sounds, such as beeps.
Common Audio Output Devices include:

* Computer Speakers
* PC Internal Speakers
* Headphones and
* Earphones

A. COMPUTER SPEAKERS

Computer Speakers typically have tone and volume controls, allowing users to adjust settings.
To boost the low bass sounds, surround sound speaker systems also include a woofer, with one or two center speakers and two or more satellite speakers that are positioned so that sound emits from all directions. Some Computer Speakers use Wireless technology.



B. PC INTERNAL SPEAKERS

Most personal computers have a small internal speakers that basically output beeps and low-quality sound.



C. HEADPHONES AND EARPHONES

In a crowded computer laboratory environment, speakers might not be applicable.
Instead, users can plug head-phones or earphones in a port on the sound card, in a speaker, or on the front of the system unit.
With the headphone or earphone, only the individual wearing the headset hears the sound from the computer.



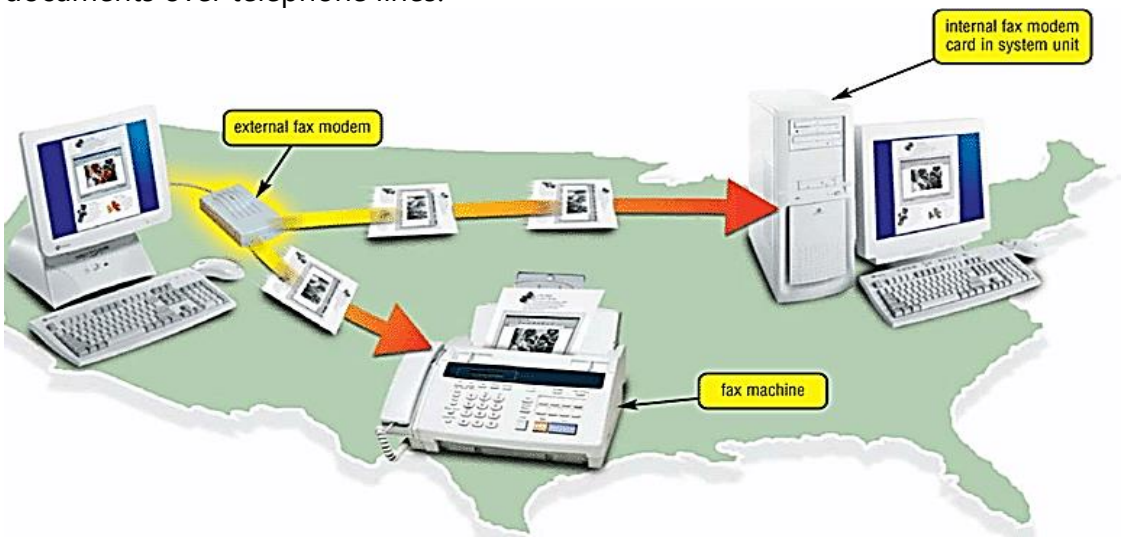
D. OTHER OUTPUT DEVICES

There are very many kinds of emerging output devices. Some are both input and output devices. Examples include:

* Fax (or facsimile) machine, Interactive whiteboard, Machine Tools, Multifunction peripherals, e.t.c

FAX (OR FACSIMILE) MACHINE

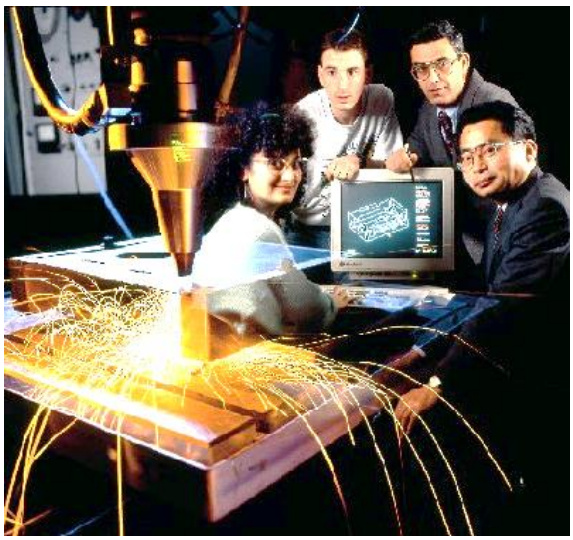
A fax machine is a device that transmits and receives typed or hand written documents over telephone lines.



A standalone fax machine scans the original document, converts the image into digitized data, and transmits the digitized image. A fax machine at the receiving end reads the incoming data, converts the digitized data into an image, and prints or stores a copy of the original image. Fax capability also can be added to a computer using an external fax modem.

MACHINE TOOLS

A machine tool is a machine for shaping metal or other rigid materials, usually by cutting, boring, grinding, or shearing. Through Computer-aided manufacturing (CAM) computers are used to control the output of machine tools and related machinery in the manufacturing of work pieces.



INTERACTIVE WHITEBOARD (IWB)



An interactive whiteboard is a touch-sensitive device, resembling a dry-erase board that displays the image on a connected computer screen.
The presenter can use bare hands, a special tablet, or remote control to interact with the device.
Notes written on the interactive whiteboard can be saved directly on the computer. Interactive whiteboards are used frequently in classrooms as a teaching tool.

MULTIFUNCTION PERIPHERAL (MFP)



A multifunction peripheral (MFP) is a device that performs a variety of functions that would otherwise be carried out by separate peripheral devices.
As a rule, a multifunction peripheral includes at least two of the following:

* A printer, A scanner, A photocopier, and A fax machine

MERITS AND DEMERITS OF MFPS

- Advantages of a multifunction device are that it takes up less office space.
- It is significantly less expensive than if you purchased each device separately.
- The major disadvantage of the machine is that if it breaks down you lose all functions.

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC TWO

1. Each dot of phosphor material on a CRT screen consists of a ……. phosphor
   A. blue, a red and a yellow
   B. green, a yellow and a blue
   C. red, a green and a blue
   D. yellow, a green and red
2. …….. is a type of output that consists of images such as drawings and charts.
   A. Graphics.
   B. Audio.
   C. Text.
   D. Video.
3. One of the main advantages of a hardcopy over a soft copy is that
   A. A softcopy is not attacked by computer viruses like a hardcopy
   B. A hard copy can be photocopied unlike a soft copy
   C. A hard copy exists physically and in a more permanent form than a softcopy
   D. A hardcopy is hard while a softcopy is soft.
4. The track point is commonly located between which keys on a keyboard?
   A. G, H and B keys
   B. Q, W and A keys
   C. T, Y and G keys
   D. D, F and C keys.
5. Some Students want to draw a sketch map of Uganda on a computer. Which of the following devices would you recommend to them?
   A. Touch Pad
   B. Mouse
   C. Joystick
   D. Stylus pen and Digitizing tablet

6. Which of the following is the parallel port, which allows several bits to be transmitted simultaneously; and commonly provides the interface for such devices as high-speed printers?

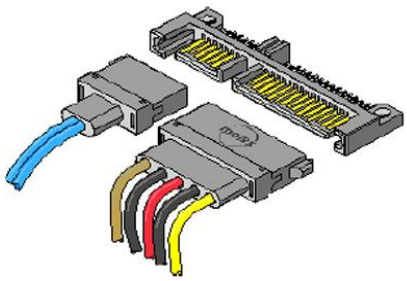
A 

B 

C 

D 

7. A……. also called an allocation unit, consists of two to eight sectors of space used to store data on a hard disk.
   A. Disk Drive.
   B. Cluster.
   C. Cylinder.
   D. Platter.
8. What is the binary equivalent of 3AF hexadecimal?
   A. 1110101111
   B. 1111010 111
   C. 943
   D. 31015
9. Which of the following can do both data input and output?
   A. Projector
   B. Scanner
   C. DVD Recorder
   D. Microphone
10. The binary coding scheme that can uniquely represent any character or symbol present in any language including up to 2^{32} = (~ 4 billion) characters available to a digital computer using a combination of bits 0 and 1 is:
   A. 7-bit American Standard Code for Information interchange (ASCII -7)
   B. 8-bit American Standard Code for Information interchange (ASCII -8)
   C. Extended Binary Coded Decimal Interchange Code (EBCDIC).
   D. Universal Code (UniCode).
11. Which hard disk interface is illustrated in the figure below?
   A. SATA, (Serial Advanced Technology Attachment)
   B. EIDE, (Enhanced Integrated Drive Electronics)
   C. SCSI, (Small Computer System Interface) and
   D. SAS (Serial-attached SCSI)



12. Serial ports transmit data
   A. one bit at a time.
   B. one byte at a time.
   C. in one direction only.
   D. when a clock pulse is applied to them.
13. The fastest type of data access is
   A. RAM.
   B. Registers
   C. Flash Disk
   D. CD
14. The main player in the microprocessor industry is
   A. Intel.
   B. IBM.
   C. DELL.
   D. AMD.
15. Which of these numbers represents the greatest amount of data?
   A. 500 Gb
   B. 0.2 Tb
   C. 640 Kb
   D. 3200 bytes
16. Which of the following types of printers does not use a print-head mechanism when printing characters?
   A. Line printers
   B. Dot Matrix printers
   C. Daisywheel printers
   D. Laser printers
17. Optical Disks used in computers are usually made of
   A. Zinc.
   B. Silicon.
   C. Chromium.
   D. Lacquer.
18. The system clock
   A. is a storage device.
   B. shows the time and date.
   C. determines data process speeds.
   D. turns off the computer after a long time.
19. Mwesigwa wants to start using his computer for watching local TV. What can he do to add this functionality to his PC?
   A. He should pay for DSTV services.
   B. He should connect the video out cable from a TV to his system unit.

C. He should buy and install a TV capture adapter card.
D. He should visit the internet website: *www.watchlocaltvfree.com* .

20. How many characters can be stored on a standard floppy disk?
A. 1.44
B. 11.52
C. 1440000
D. 1509949

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 2

1. What is computer hardware?
2. With use of examples describe the difference between impact printers and non-impact printers.
3. Describe the difference between RAM and ROM and how they differ from secondary storage.
4. Why is a computer's main memory system referred to as random access memory?
5. Compact disc-Rom devices are now used to store games. State three advantages and disadvantages of supplying games on the above mentioned device.
6. Give five differences between hard and floppy disks
7. State the difference between a data bus and an address bus.
8. Other than the CPU, mention two other devices that greatly affect the performance speed of a computer.
9. Assuming that one of your friends has bought a computer set with the specifications below. As a student of computer studies help him/her to understand these specifications as you answer the questions that follow;
   Specifications:
   Intel(R) Core (TM) i5 M520 @ 2.40 GHz (4 CPUs), 1 GB of DDR2 SDRAM, 250GB HDD, 7200 rpm, SuperMulti DVD+/-RW (+R DL) / DVD-RAM, 10/100/1000 Base-T network interface and 56K modem, Intel ® HD Graphics. 1280 X 800 (32 bit) LCD Display.
   Lenovo model 25184HU, Windows 7 Ultimate 64-bit (6.1, Build 7800)
   Norton Internet Security (3 years subscription), Microsoft Works (OEM), NTI CD-Maker Gold (OEM), Acer Empowering Technology, Adobe Acrobat Reader 7, Microsoft Office 2007 Home and Student Edition (Trial), & Acer ArcadeLive.
   a) State this computers processing speed
   b) Describe what the DVD+/-RW will enable him do
   c) Provide evidence for this computer connectivity ability.
   d) What do DDR and HD stand for in full?
10. How is your friend likely to benefit from LCD and HD display of his computer display?

S2 - TOPIC 3: COMPUTER SOFTWARE

This topic shall be broken down into units as below:

- Unit One: Introduction to Software
- Unit Two System Software
- Unit Three Application Software

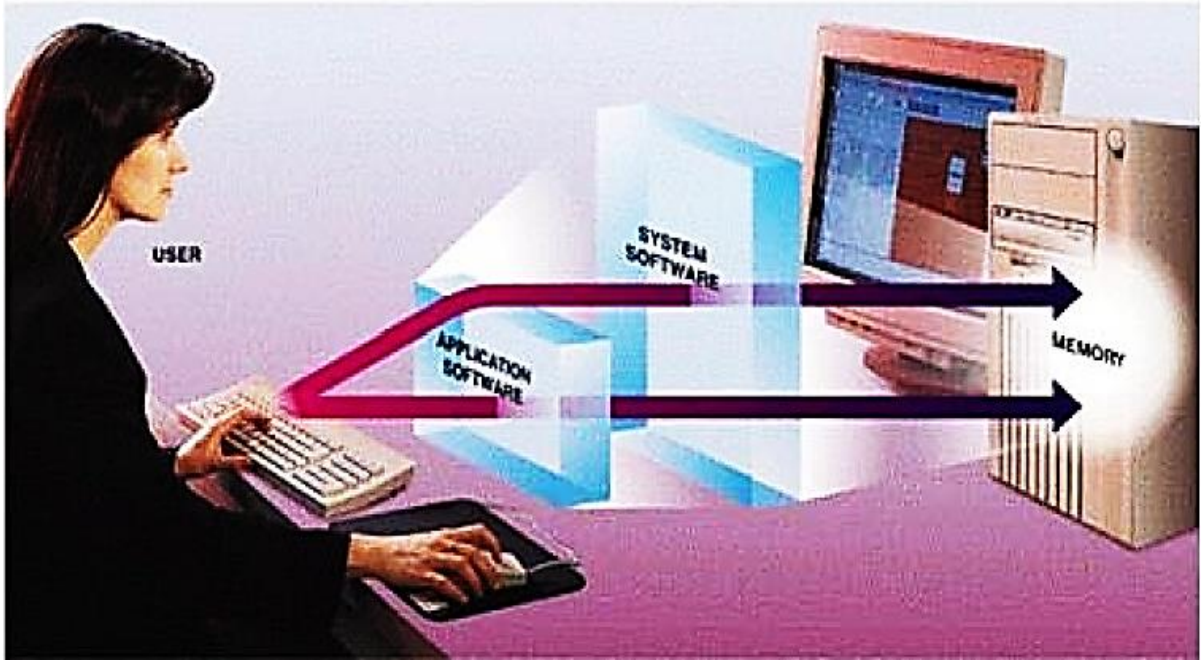
UNIT ONE: INTRODUCTION TO SOFTWARE

By the end of this unit you should be able to:

* Define and describe the types/classifications of software: (definitions with examples) Application & System Software
* Describe the characteristics of computer software

UNIT INTRODUCTION

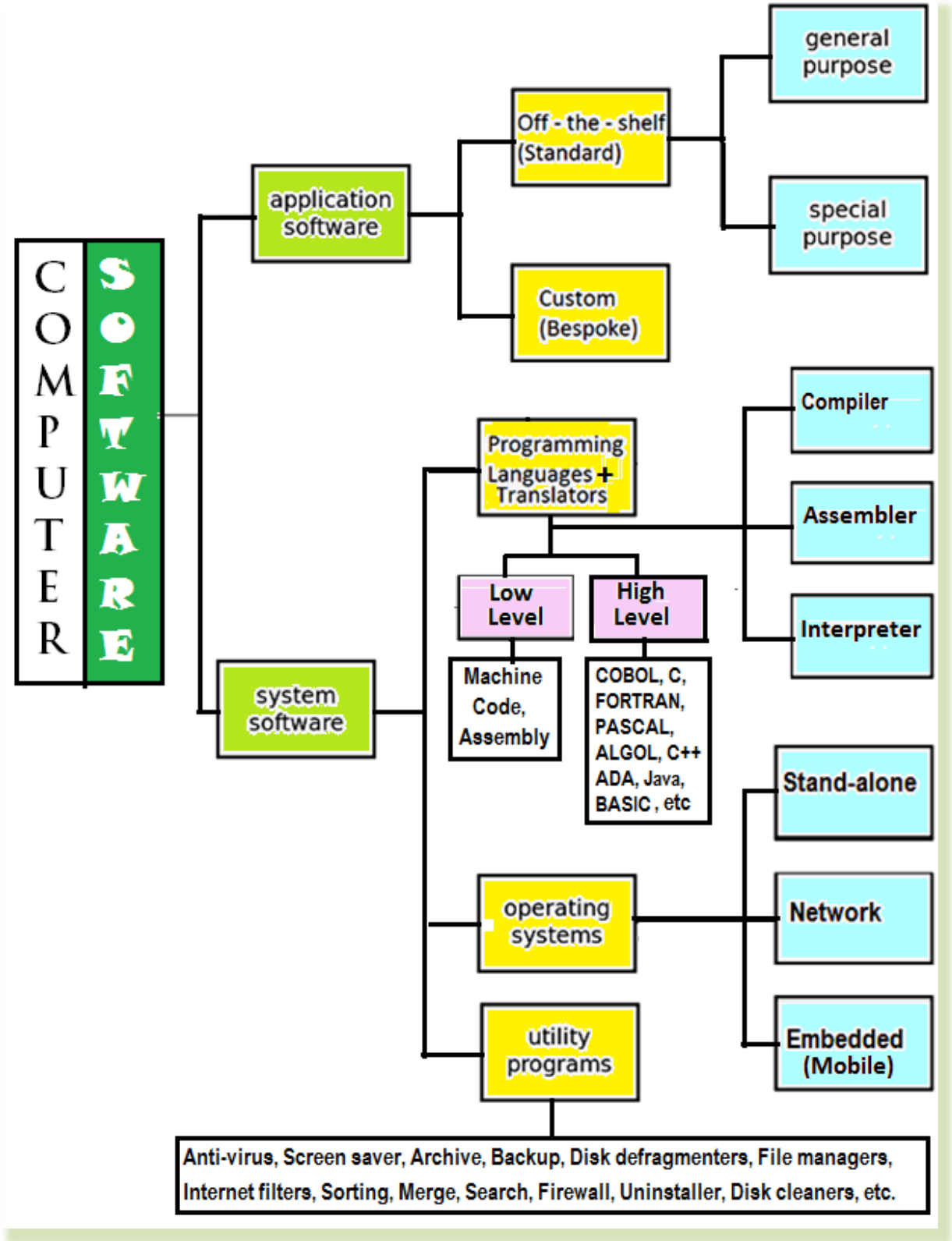
The usefulness of computer hardware depends a lot on available software and the ability of users to evaluate, monitor, and control the utilization of the software.
In Topic one Unit 8 (The Computer System), we met the term 'computer software'. We saw that:
Computer software refers to the electronic instructions and procedures that control the operation of a computer.



There are two major types of software: **system software** and **application software**. Each performs a different function.
System software e.g. the Operating system manages and coordinates all the other computer programs, devices, resources and activities.
While Application software like, Word-processors, Paint, Calculator and, Games solves the specific or exact needs of the user.

TYPES AND CLASSIFICATIONS OF COMPUTER SOFTWARE

Computer software can be generally broken down as shown in the chart below:



COMPUTER SOFTWARE TERMINOLOGIES

Software needs to be accessed before it can be used.

There are many terms used for the process of accessing software including running, executing, starting up, and opening.

A program can also be referred to as an application and the two words are used interchangeably.

FACTORS TO CONSIDER BEFORE OBTAINING A SOFTWARE PROGRAM

* **Correctness** — the software should do what it is supposed to do, according to the design specifications.
* **Robustness** — the software should be stable, and it should respond well to unexpected conditions e.g. wrong input.
* **User-friendliness** — the software should be easy to use by users from the intended audience.
* **Adaptability** — the software should be easy to customize/modify to adjust to the needs of the user.
* **Reusability** — the parts of the software code should be easily reused to build other programs.
* **Interoperability** — the software should be able to interface with other software systems.
* **Efficiency** — the software should make good use of its resources i.e. (memory, disk, CPU, network)
* **Portability** — the software should be easy transfer from one system to another.
* **Security** — the software should be able to protect the information it is responsible for.

CHARACTERISTICS OF GOOD COMPUTER SOFTWARE

* ...provides the required functionality.
* ...is usable by real (i.e. simple) users.
* ...is predictable, reliable and dependable.
* ...functions efficiently.
* ...has a "life-time" (measured in years).
* ...provides an appropriate user interface.
* ...is accompanied by complete documentation.
* ...can be easily customized/configured.
* ...can be "easily" maintained and updated.

UNIT TWO: SYSTEM SOFTWARE

UNIT INTRODUCTION

System software is a set of programs that control or maintain all the operations of the computer and its devices, such as the CPU, communication links, and peripheral devices.

System software serves as the interface between the user, the application software, and the computer's hardware.

System Software Includes:

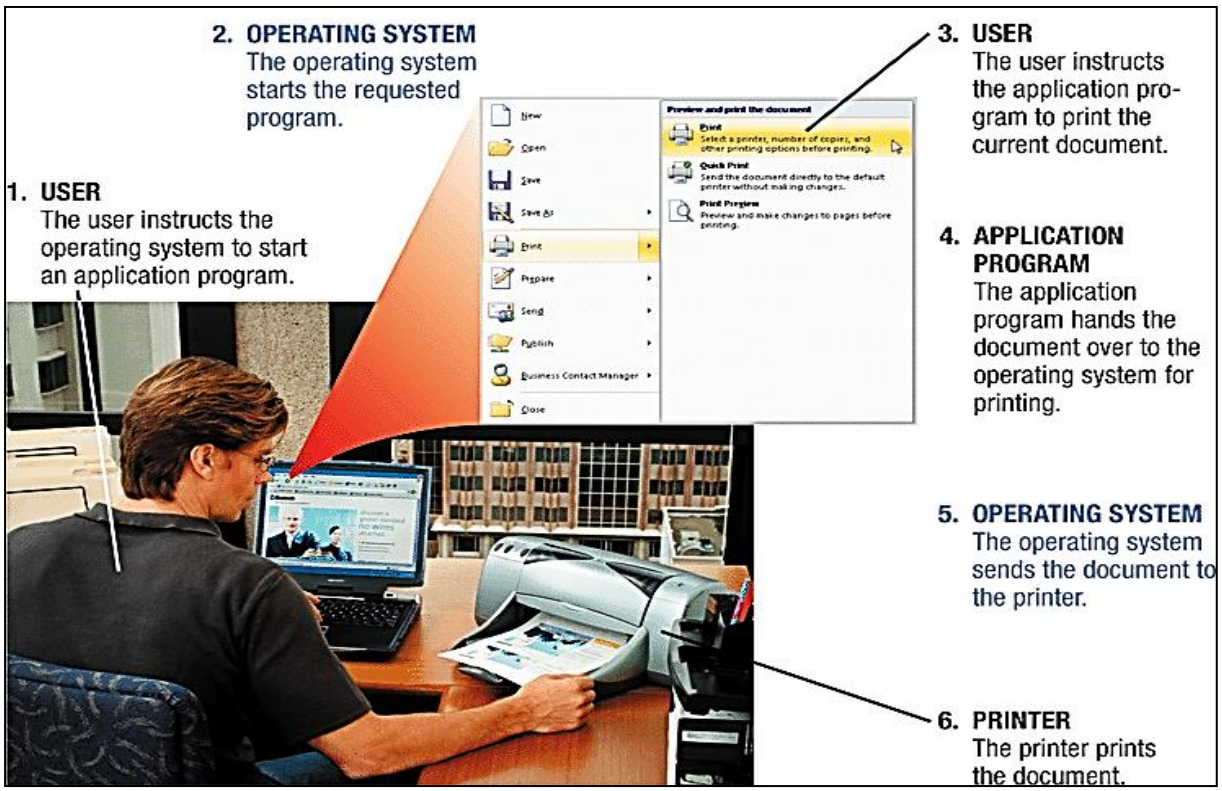
* An Operating system and Device Drivers
* Utility Programs and
* Programming Languages (Translators and Library Programs)

OPERATING SYSTEMS

An operating system is a generalized program that manages and coordinates all the activities taking place within a computer system.

The operating system functions as a middleman between the user and the computer, as well as between application software programs and the hardware devices.

HOW THE OPERATING SYSTEM ACTS AS A MIDDLEMAN BETWEEN THE USER, THE INPUT, PROCESSOR AND THE OUTPUT DEVICES



Device Drivers

To communicate with the hardware devices, the operating system relies on device drivers.

A device driver is a program that accepts instructions and then converts them into commands that the device understands.

Each device on a computer, such as the keyboard, mouse, monitor, printer, card reader/writer, and scanner, has its own device driver.

WHERE DOES THE OS RESIDE?

In most cases, the operating system is installed and resides on the computer's hard disk.

During the boot process, usually the operating system will look first in drive C: (the designation for the hard disk drive) for the OS system files.

On handheld computers and many mobile devices such as smart phones, however, the operating system may reside on a ROM chip.

THE KERNEL OF THE OS

This refers to the core of an operating system, responsible for managing memory, files, and devices; maintaining the computer's clock; starting applications; and assigning the computer's resources.

Each time you turn on the computer, the kernel and other frequently used instructions in the operating system are copied from the hard disk to the computer's RAM

THE TERM 'SOFTWARE PLATFORM'

The operating system that a computer uses sometimes is called its software platform. When you purchase application software, the package identifies the software platform on which it runs.

A cross-platform application is one that runs on multiple operating systems. Often, these cross-platform applications contain multiple versions, each corresponding to a different operating system.

FUNCTIONS OF AN OPERATING SYSTEM

Most operating systems provide similar functions that are outlined as follows :

* Starting a computer, (Booting the computer)
* Providing a user interface,
* Managing programs,
* Configuring devices, (Device drivers are often needed). Plug and Play devices are recognized automatically.
* Monitoring performance
* Providing file management.
* Administering security.
* Managing resources.
* Coordinating tasks, and Spooling.
* Managing memory,
* Establishing an Internet connection

A) STARTING THE COMPUTER, (BOOTING) AND TURNING IT OFF

The process of starting or restarting a computer is called **booting**.
The process of turning on a computer after it had been powered off completely is known as **cold booting. Warm booting** is the process of restarting a computer that already is powered on. When you install new software, often an on-screen prompt instructs you to **restart** the computer. In this case, a warm boot is appropriate. On startup, the OS may verify that the person attempting to use the computer is a legitimate user through use of a password. After the user logs on, the desktop and icons are displayed on the screen.
Finally, the operating system also executes programs in the Startup folder, which contains a list of programs that open automatically when you boot the computer.

TURNING OFF

When you instruct the computer to Turn Off, (See figure), the operating system properly closes any open processes and programs, saves your settings, and shuts down the computer.

B) PROVIDING A USER INTERFACE

Computer users interact with software through its user interface.
A user interface is the part of the software with which you interact; it controls how data and instructions are entered and information is presented on the screen.
It is through the user interface of an operating system that you communicate with the computer.

TYPES OF USER INTERFACES

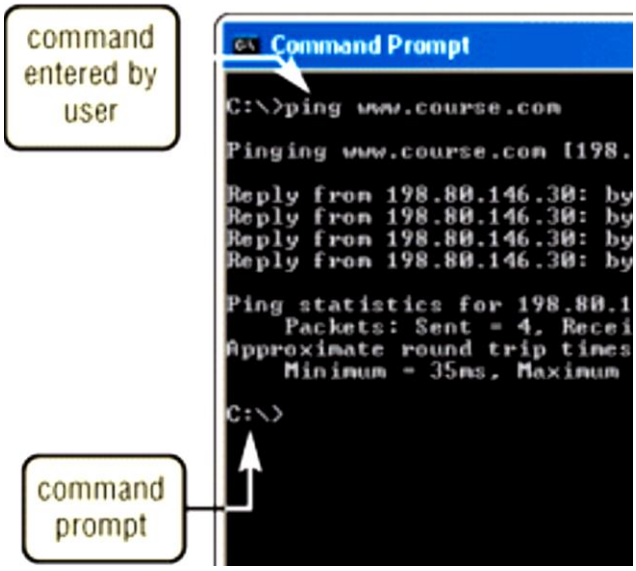
Three types of user interfaces are:

* Command-Line Interface (CLI),
* Menu-Driven Interface (MDI), and
* Graphical User Interface (GUI).

Most operating systems use a combination of these types of user interfaces to define how you interact with your computer.

COMMAND-LINE INTERFACE

With a *command-line interface*, you type keywords such as COPY, RENAME or DEL, using the keyboard to enter instructions. A **keyword** is a special word, phrase, or code that a program understands as an instruction.



When working with a command-line interface, the set of commands you use to interact with the computer is called the command language.

Command-line interfaces often are difficult to use because they require exact spelling, grammar, and punctuation.
Minor errors, such as a missing period, generate error messages.
Command-line interfaces, however, give a user more control to manage detailed settings, and execute programs faster.

SHOWN BELOW ARE SOME TYPICAL CLI COMMANDS.

COMMAND	DESCRIPTION	EXAMPLE	EXPLANATION
COPY	Copies individual files	COPY TODO.DOCX F:	Copies the file TODO.DOCX located in the current directory on the current storage medium to the F drive.
DIR	Displays the names of files on a storage medium	DIR F:	Displays the names of the files stored on the storage medium located in the F drive.
DEL	Deletes individual files	DEL F: HOMEWORK.DOCX	Deletes the file HOMEWORK.DOCX from the storage medium located in the F drive.
REN	Renames individual files	REN SAM.JPG BILL.JPG	Changes the name of the file SAM.JPG located in the current directory on the current storage medium to BILL.JPG.
CD	Changes to a new directory	CD HOMEWORK	Changes the current directory to HOMEWORK, located one level down from the current location on the current storage medium.
FORMAT	Prepares a storage medium for use, erasing what was there before	FORMAT F:	Formats the storage medium located in the F drive.

NB: For full list of commands, type the keyword '**help**' at the command prompt.

MENU-DRIVEN INTERFACE

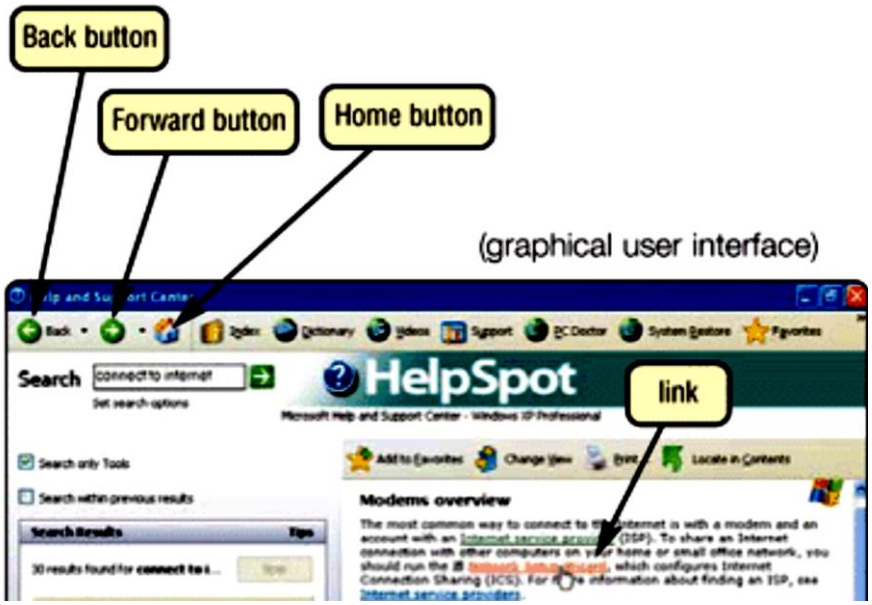
A *menu-driven interface* provides menus as a means of entering commands.
Menu-driven interfaces are easier to learn than CLI because users do not have to cram keywords for commands. The characteristic of being easy to learn and use is described as being User friendly.



GRAPHICAL USER INTERFACE (GUI)

Most of today's software programs have a graphical user interface (GUI).
A GUI is a user Interface in which visual images such as icons and buttons are used to issue commands.

Of all the interfaces a GUI typically is the most **User friendly**, because it does not require you to know any command language.



DISADVANTAGES OF A GUI AS COMPARED TO CLI

* GUI requires the computer to have more RAM as compared to Command Line.
* Command line instructions execute faster than GUI instructions.
* Processing GUI images 'wastes' CPU cycles.

EXAMPLES OF ELEMENTS/ OBJECTS OF A GUI

A GUI has very many features / elements in form of graphics that a user interacts with while using a computer. Some of these include:

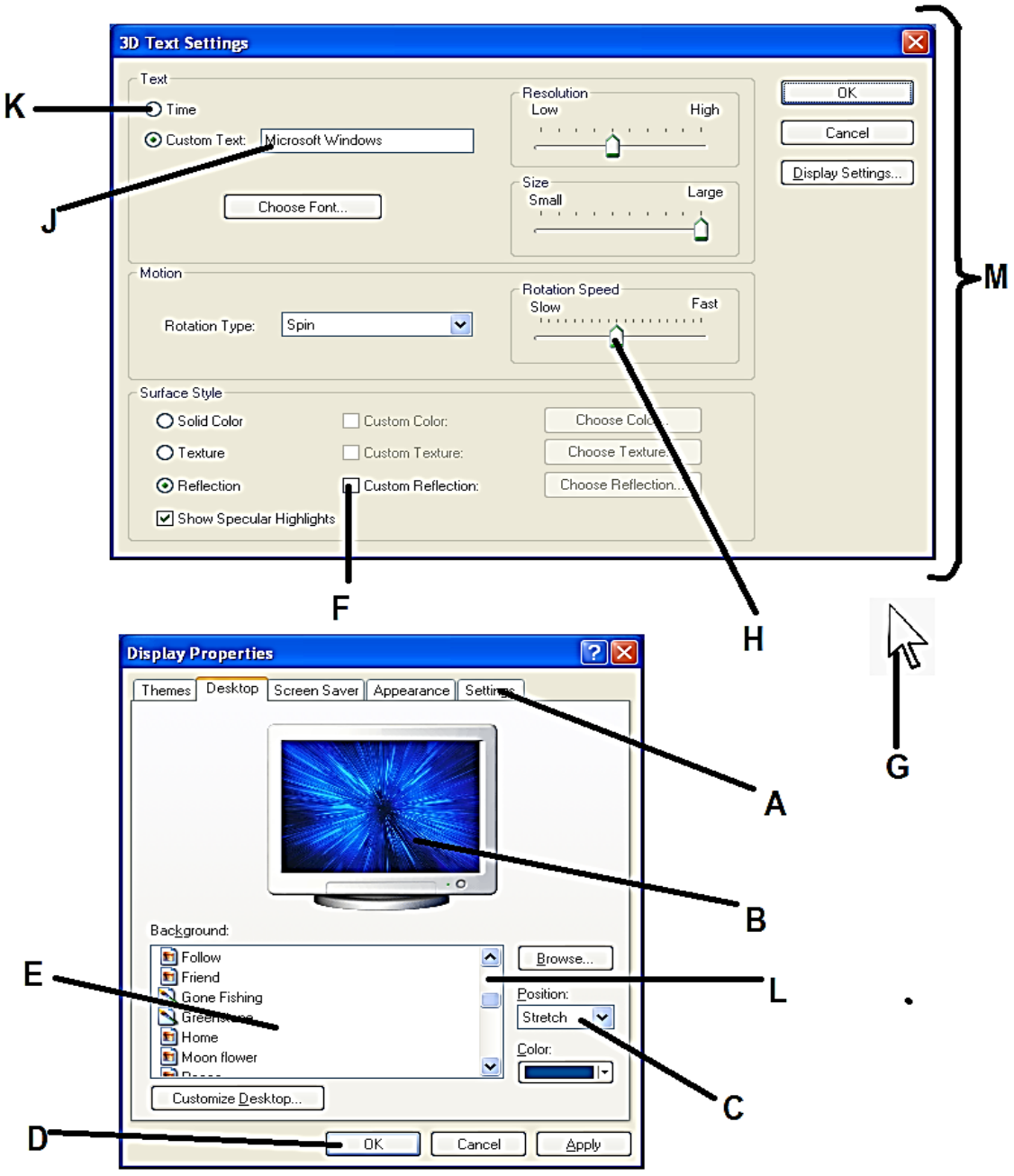
* Icons * Command Buttons * Drop Down Lists * Check boxes * List Boxes * Dialogue boxes * Windows * Cursor	* Scroll bars Radio Buttons * Preview areas * Slider buttons * Tabs * Menus * Text boxes * Toolbars, etc.

A GUI *menu* displays a set of available commands or options from which you choose one or more.

An *icon* is a small graphic that represents an item such as a program, an Instruction, or a file on a computer's hard disk.

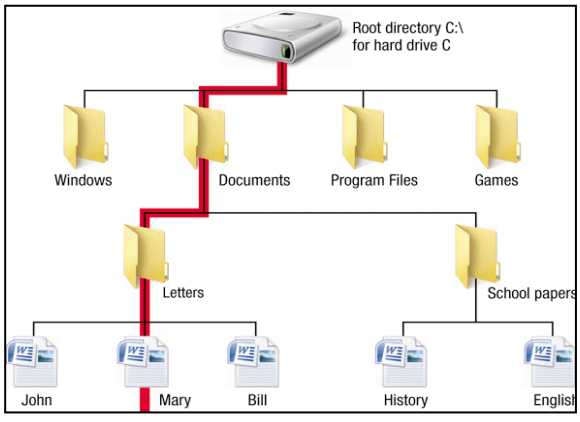
ACTIVITY:

Identify and name the GUI elements labeled in the screen shots below:



C) FILE MANAGEMENT

The operating systems help to organize files and folders on a computer's hard disk drive.



WHAT IS THE DIFFERENCE BETWEEN A FILE AND A FOLDER?

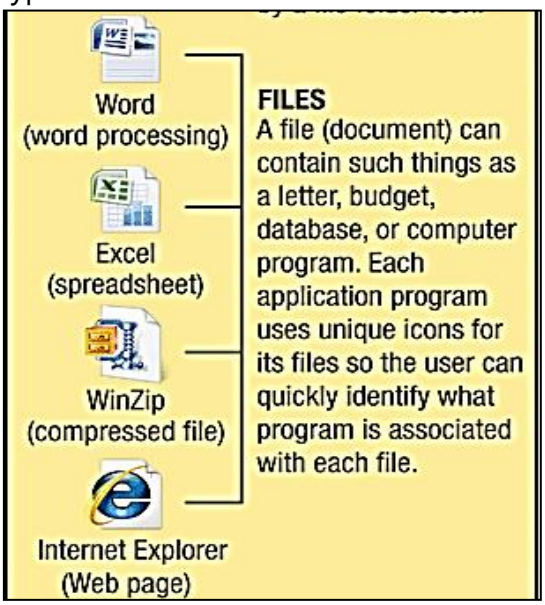
A file is a collection of bits that have been processed and stored in secondary memory.

A file may be a document that may contain characters such a letter, a database, a computer program, a song, a picture, etc.

A folder is a directory that usually contains related information. A folder can contain both files and other sub folders. Folders are represented by a folder icon.

FILES

The operating system also assigns a special graphic known as an icon to each file type.



FILE EXTENSION

Each file type is differentiated by its unique file extension. A file extension is a **suffix** to the name of a file applied to indicate the file format. It is separated from the base filename by a dot.

DOCUMENTS
.doc .docx .txt .rtf .htm .html .mht .mhtml .xml .xls .xlsx .mdb .accdb .ppt .pptx .pdf
PROGRAMS
.com .exe
GRAPHICS
.bmp .tif .tiff .jpg .jpe .jpeg .eps .gif .png .pcx .svg .dib
AUDIO
.wav .au .mp3 .snd .aiff .midi .aac .wma .ra
VIDEO
.mpg .mp2 .mp4 .mpe .mov .avi .rm .wmv .wm .asf
COMPRESSED FILES
.zip .sit .sitx .tar

Common File Extensions

D. MANAGING PROGRAMS

Operating systems can support just one user running one program or many of users running multiple programs.

These various capabilities of operating systems are described as

i. Single tasking,
ii. Single-user and multi-user,
iii. Multitasking, and
iv. Multiprocessing,

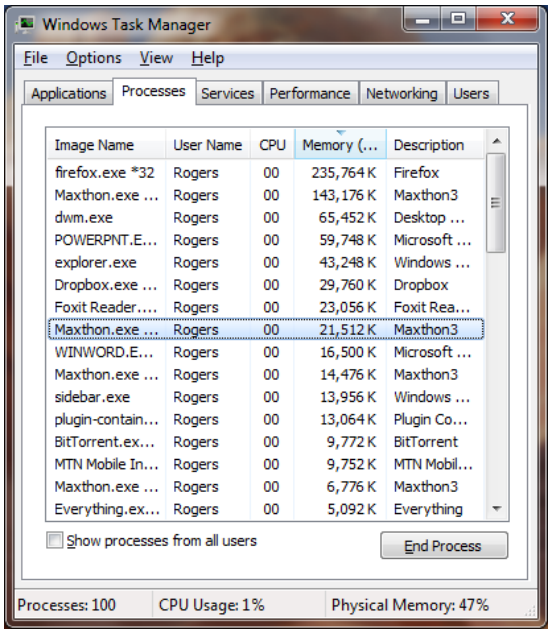
- A **single user-single tasking** operating system allows only one user to run one program at a time, while a **single user-multitasking** operating system allows one user to work on two or more programs that reside in memory at the same time.
- A multi-user operating system enables two or more users to run programs simultaneously. For example, mainframes, allow hundreds of users to connect at the same time.
- A **multiprocessing** OS manages coordinated processing of data by more than one processor. Multiprocessing increases a computer's speed and helps in fault tolerant systems.

- When a computer is running multiple programs concurrently, one program is in the foreground and the others are in the background.
- To make a program active, click on its tab on the taskbar or its window.
- This causes the operating system to place it in the foreground.
- In addition to application programs, an operating system manages other processes.
- Some of these processes are memory resident.
- They include utilities and routines that provide support to other programs or hardware.



D) MANAGING MEMORY

- The purpose of memory management is to optimize the use of RAM. RAM holds data and instructions while the processor is using them.
- The operating system allocates data and instructions to an area of memory while they are being processed, and carefully monitors the contents of RAM.
- Finally, the operating system releases these items from RAM when the processor no longer requires them.
- If you have many programs running at a go, it is possible to run out of RAM. So, the OS may have to use **virtual memory**.
- With virtual memory, the operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM.

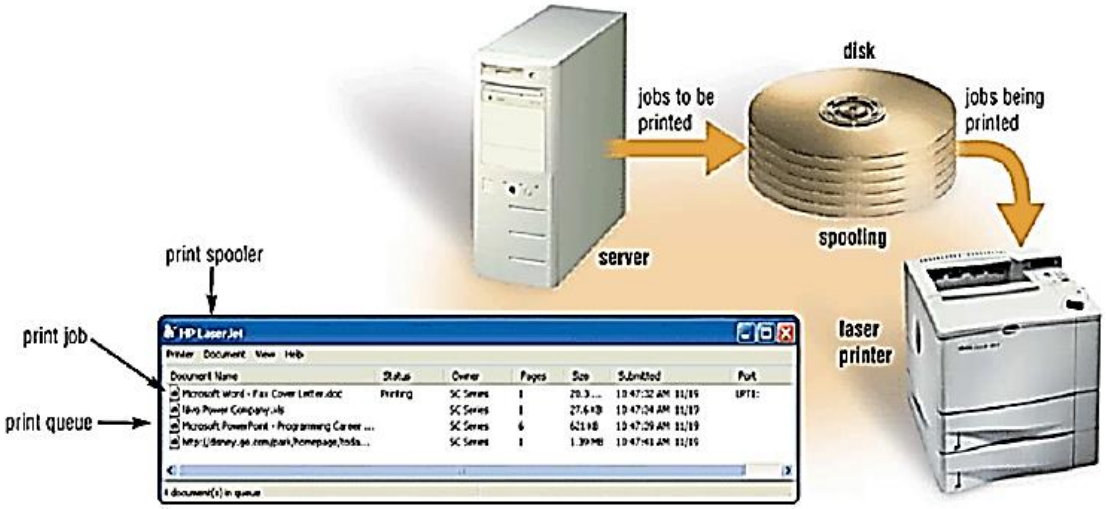


- As you interact with a program, part of it may be in physical RAM, while the rest of the program is on the hard disk as virtual memory.
- Users may notice the computer slowing down while it uses virtual memory, because virtual memory is slower than RAM. The area of the hard disk used for virtual memory is called a **swap file.**

E) COORDINATING TASKS

- The operating system determines the order in which tasks are processed.

- A **task**, or job, is a piece of work or operation that the processor manages.
- Tasks include receiving data from an input device, processing instructions, sending information to an output device, and transferring items from storage to memory and from memory to storage. Thousands of tasks can be going on in a computer simultaneously.
- Sometimes, a device may be busy processing one job when it receives a second job. This occurs because the processor operates at a much faster rate of speed than peripheral devices.
- For example, if the processor sends five print jobs to a printer, yet the printer can print only one document at a time.
- When this happens, the OS allocates / assigns memory to the jobs in the execution queue in an area called the **buffer**.
- A **BUFFER** is an area of memory or storage in which data and information is placed while waiting to be transferred to or from an input or output device.
- Operating systems typically use a technique called spooling to increase computer system efficiency.
- **SPOOLING** refers to the process of putting tasks that need to be done into a buffer until they can be executed.
- The operating system commonly uses a print spooler with print jobs. A print spooler, intercepts documents to be printed from the operating system and places them in the queue in the buffer. As soon as the print job is placed in the buffer, the CPU is available to process the next instruction.
- Spooling increases both processor and printer efficiency by placing print jobs in a buffer on disk before they are printed.



F) CONFIGURING DEVICES

- If you add a new device to your computer, such as a printer, its driver must be installed before the device will be operational.
- For devices with Plug and Play support, the OS recognizes the new device and loads the necessary drivers automatically. It also checks for conflicts with other devices.
- For devices that are not Plug and Play, Windows operating system provides a wizard to guide users through the installation steps.
- If you have an Internet connection, the Wizard will search an online repository of device drivers.
- If Windows still is unable to find a driver, you can download one from the manufacturer's Web site manually.

- Alternatively you can install the drivers from a CD-ROM provided with the purchased device.

G) ESTABLISHING AN INTERNET CONNECTION

Operating systems typically provide a means to establish Internet connections.
This is through a "Connect to a network" Wizard that guides users through the process of setting up a connection between a computer and an Internet service provider.
Some operating systems also include a Web browser and an e-mail program, enabling you to begin using the Web and communicate with others as soon as you set up the Internet connection.

H) MONITORING PERFORMANCE

The OS monitors the performance of the computer system.
It keeps track of each computer job, the various system resources and devices, the processor usage, the amount of unused physical RAM, and network usage.
Operating systems typically contain a performance monitor.
A **performance monitor** is a program that assesses and reports information about various computer resources and devices.
The information in performance reports helps users and administrators to identify a problem with the resources so they can try to resolve any problems.

I) ADMINISTERING SECURITY

- The OS helps users to administer computer access security by use of a user name or user ID and a password, before a user logs on to, a computer.
- After entering a user ID and password, the operating system compares the user's entry with a list of authorized user names and passwords.
- If the entry matches the user name and password kept on file, the operating system grants the user access.
- To protect sensitive data and information as it travels over the network, a network operating system may encrypt it to prevent unauthorized users from reading the data.
- **Encryption** is the process of encoding data and information into an unreadable form.
- When an authorized user attempts to read the data, it is decrypted, or converted back into a readable form.

TYPES OF OPERATING SYSTEMS

Early operating systems were **proprietary** and **device-dependent**.
A **device-dependent** program is one that runs only on a specific type or brand of computer. **Proprietary** software is privately owned and limited to a specific computer model.
The trend today is toward device-independent operating systems that will run on computers provided by a variety of manufacturers.
Three basic categories of operating systems exist today. They are **Standalone OS**, **Network OS**, and **Embedded OS**.

STAND-ALONE OPERATING SYSTEMS

A stand-alone operating system is a complete operating system that works on a PC.
Examples of popular stand-alone operating systems include: Mac OS X, UNIX, Linux, MS-DOS and Windows (XP, Windows Vista, Windows 7, Windows 8, etc.)

MAC OS

Macintosh operating system was released in 1984 with Apple's Macintosh computers. Mac OS X includes features such as a GUI, multitasking, large photo-quality icons, built-in networking support, email, online shopping, enhanced speech recognition, CD burning, and enhanced multimedia capabilities.

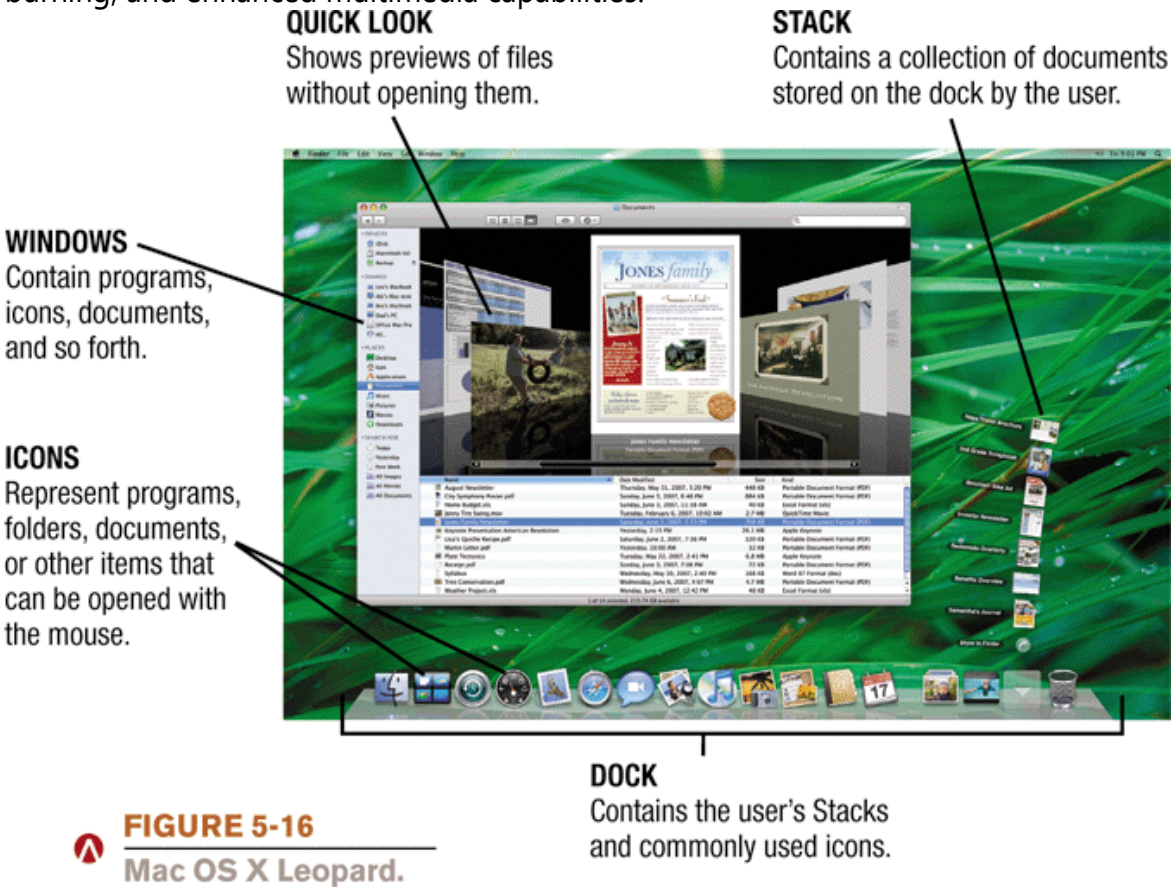


FIGURE 5-16
Mac OS X Leopard.

UNIX

UNIX is a multitasking operating system developed in the early 1970s by scientists at Bell Laboratories. Some versions of UNIX have a command-line interface, and others offer a graphical user interface.

Power users often work with UNIX because of its flexibility and power. Manufacturers such as Sun and IBM often sell personal computers and workstations with a UNIX operating system preinstalled.

LINUX

Linux is one of the fastest growing operating systems. Linux is a free, open source, UNIX-like operating system.

Open source software means its code is provided for use, modification, and redistribution. It has no restrictions from the copyright holder.

Some versions of Linux are command-line. Others are GUI.

Linux comes with very many utilities and applications such as open office.

A Live CD of Linux allows users to boot from it and preview the operating system without installing it.

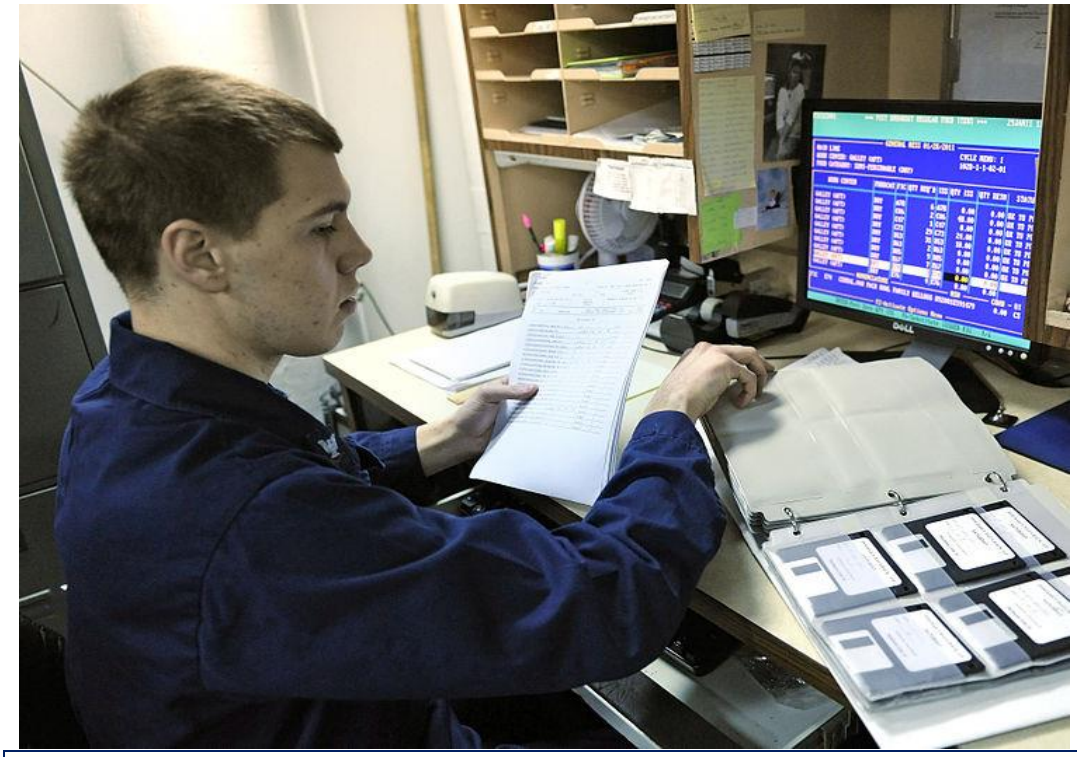
MS-DOS

In the early 1980s, Bill Gates' Microsoft Corporation introduced **DOS (Disk Operating System)** as its first operating system for IBM PCs.

DOS originally used a command-line interface.

Later versions of DOS included both command-line and menu-driven user interfaces.

Today, DOS is rarely used because it does not offer a graphical user interface and it cannot take full advantage of modern computer microprocessors.



A US Navy Specialist uses the existing DOS-based food service management system

MICROSOFT WINDOWS

Microsoft introduced an operating environment named Windows 1.0 on November 20, 1985.

It was Microsoft's first attempt to implement a multi-tasking graphical user interface-based operating environment on the PC platform.

Since then, many versions have been released, each with various new innovative features and functions.

Examples include Windows 2.0, Windows 95, Windows 98, Windows Me (Millennium Edition), Windows NT (New Technology) 3.1, Windows 2000, Windows XP (eXPerience), Windows Vista, Windows 7 , Windows 8, Windows 8.1 and Windows 10.



Start Screen, with live program tiles.

NETWORK OPERATING SYSTEMS

A network operating system (NOS) is an operating system that supports a network and typically resides on the server. It enables the server to manage data, users, groups, security, applications, shared file and printer access among other networking functions.

Some standalone OS can perform, these functions but network operating systems are designed specifically to support all sizes of networks.

Examples of network operating systems include Windows Server 2003, 2008, 2012, Solaris, and Novell NetWare, UNIX server, and Linux server.

EMBEDDED OPERATING SYSTEMS

An embedded operating system is an operating system that resides on ROM chips and typically used on handheld computers and small devices. Popular embedded operating systems today include Apple's iOS, Google's Android, Windows Embedded CE, Windows Mobile, Palm OS, Embedded Linux, Symbian OS, e.t.c.







WINDOWS MOBILE 6.0



SYMBIAN

Apple's iOS for iPhone and Google's Android

FACTORS TO CONSIDER WHEN CHOOSING AN OPERATING SYSTEM

When choosing an operating system for a computer the following factors may be considered:

* The **type of computer** in terms of size and make. Operating systems are available for all sizes of computers.
* The **hardware configuration** of the computer such as the memory capacity, processor speed and hard disk capacity should meet the required minimum requirements for the operating system to run well.
* The **application software** to be installed on the computer should be supported by the operating system. For example Microsoft Office 2010 cannot run on Windows 2000.
* The operating system should be **user friendly**. This depends on the skills of the intended users of the computers.
* The operating system should have **adequate information** and help guides for user reference.
* The **cost** of the operating system
* Reliability and security provided by the operating system.
* The number of processors and hardware devices it can support.
* The number of users it can support
* The availability of basic utilities and accessory programs within the operating system.

UTILITY SOFTWARE

Utility software refers to system software designed to analyze, optimize and maintain a computer in good working conditions. Utility software usually focuses on how the computer system operates. Although operating systems typically include some built-in utilities, many stand-alone utility programs are available.

Examples include Antivirus utility, Screen Saver utility, File compression utility, and many other utilities.

ANTIVIRUS UTILITY

A computer virus is damaging program that affects a computer negatively by altering the way the computer works without the user's knowledge or permission. Once a virus is in a computer, it can spread throughout and damage your files and OS.
Antivirus utilities are programs that scan for computer viruses, remove, disinfect and repair damaged files.

HOW DOES A VIRUS WORK?

A computer virus is a program or piece of code that operates by attaching itself to some other program or downloaded file. When this program starts, the virus code unintentionally runs, replicates itself and infects other programs or documents on the PC. A computer virus spreads mainly via e-mail attachments, downloadable files from the Internet or floppy disks. Virus infection can be prevented by installing (and maintaining) anti-virus software, among other strategies, some of which are outlined in this advice sheet.
A computer virus can seriously damage or completely destroy files or software on a computer. The result is that files may be lost permanently, programs may not function correctly, the overall performance of a computer may be slowed down or useful data may be lost in case the virus erases the whole hard disk. The process involved in repairing the damage can be time consuming and expensive.

TYPES OF COMPUTER VIRUSES

BOOT SECTOR INFECTORS

These viruses infect the boot sector on floppy disks and hard drives. The boot sector is a small program that initializes the operating system. By placing its virus code in the boot sector, a virus is guaranteed to be executed. It can load itself into the memory immediately and it is able to run whenever the computer is on, infecting the entire system. Boot sector infectors are spread through infected bootable disks (or other removal media) and can damage the entire computer system from the moment the computer is switched on.

MACRO VIRUSES

These viruses function by relying on the built-in (internal) programming languages used in popular applications, such as Microsoft Word and Excel, which allow users to create macros. Macros are very simple programs that automate tasks. Virus writers have created macros that, when opened unknowingly, replicate themselves and spread into other documents. These can subsequently be spread via e-mail attachments, flash disks or other removal media.

FILE INFECTORS

These viruses function by modifying specific program files, such as .EXE or .COM files (the file that starts Microsoft Word, for example, is winword.exe). When the program runs, the virus executes by loading itself into the memory and later infects and corrupts other files. These viruses are usually spread via infected flash disks or other removal media, over networks or the Internet.

EXAMPLES OF COMPUTER VIRUSES

- **Trojan Horse:-** A Trojan horse, or Trojan, is a non-self-replicating type of malware which appears to perform a desirable function but instead facilitates unauthorized access to the user’s computer system.
- **Worms:-** These generally spread through e-mails and networks. They do not infect files or damage them, but they replicate so fast that the entire network may collapse.

- **Memory Resident Virus:-** These viruses fix themselves in the computer memory and get activated whenever the OS runs and infects all the files that are then opened.
- **Rootkit Virus:-** Designed to hide the existence of certain processes or programs from normal methods of detection.
- **Logic Bombs/Time Bombs:-** These are viruses which are programmed to initiate at a specific date or when a specific event occurs.
- **Macro Viruses:-** A macro virus is a new type of computer virus that infects the macros within a document such as Word documents and Excel Spreadsheets.
- **Web Scripting Virus:-** Many web pages include complex codes in order to create an interesting and interactive content. This code is often exploited to bring about certain undesirable actions.
- **FAT virus:-** FAT virus attacks the FAT section and may damage crucial information. The file allocation table (FAT) is the part of a disk used to store all the information about the location of files, available space, unusable space, etc.
- **Polymorphic Virus:-** Polymorphic viruses encrypt or encode themselves in a different way (using different algorithms and encryption keys) every time they infect a system. This makes it very hard for antivirus software to find them.
- **Directory Virus:-** Directory viruses (also called Cluster Virus/File System Virus) infect the directory of your computer by changing the path that indicates the location of a file.

PREVENTING VIRUS INFECTION

- Install and regularly updated anti-virus software. This, in conjunction with good housekeeping, can greatly reduce the threat caused by computer viruses.
- In case of a school computer lab, all flash disks or other removal media, should remain within the confines of the computer room. It is not advisable to let students bring them home or return with them to school. However, if this occurs they should be scanned immediately using antivirus software. Floppies should also be write-protected in case only data access is required.
- Downloads should be saved to a designated hard drive where incoming files can be scanned automatically by anti-virus software.
- When the sender of an e-mail is not known to the recipient, avoid clicking on attachments containing an executable file.
- Creating back-ups of files won't directly prevent virus infection, but it may speed up the recovery process in the event of a virus erasing or damaging files.

WAYS OF OBTAINING ANTI-VIRUS SOFTWARE

- Commercial Programs: Anti-virus software can be purchased on the Internet or from reputable software retailers.
- Shareware or Freeware: There are a number of Web sites that offer effective anti-virus software solutions free of charge.
- Ensure that any anti-virus software obtained includes an update facility. It is important that computers are continuously protected against newer viruses as they emerge.

EXAMPLES OF POPULAR ANTI-VIRUS SOFTWARE PROGRAMS

- AVG Antivirus
- Avast Antivirus
- Norton Antivirus
- Avira Antivirus
- Microsoft Security Essentials
- F-Secure Antivirus

- Panda Cloud Antivirus
- Bit defender Antivirus
- Kaspersky Antivirus
- Norton Antivirus

HOW DOES ANTI-VIRUS SOFTWARE WORK?

- It scans the computer for viruses and deletes infected files.
- It monitors all incoming files and deletes any viruses contained in these files.
- It places suspect files in quarantine.
- Updates to the software are produced by the program developers in order to address new viruses as they emerge. The software can be set to automatically check for updates at regular intervals.

NB: We shall look at Computer viruses is more detail under Topic 12 (Computer Integrity and Security) in Senior Four

OTHER UTILITY SOFTWARE CATEGORIES

1. SCREEN SAVER UTILITY - A screen saver is a program that automatically fills the computer's screen with moving images or patterns when the computer is not in use. Screensavers were originally designed to prevent phosphor burn-in (ghosting) on CRT monitors. Currently, screensavers are used primarily for entertainment, advertising or security purposes.
2. FILE COMPRESSION UTILITY. A file compression utility shrinks the size of a file. A compressed file takes up less storage space than the original file. Compressed files, sometimes called zipped files, usually have a .zip extension. Attaching a compressed file to an e-mail message reduces the time needed for upload and download. When you download a compressed file, you must decompress it to restore it to its original form.
3. BACKUP utilities can make a copy of all information stored on a disk, and restore either the entire disk (e.g. in an event of disk failure) or selected files (e.g. in an event of accidental deletion).
4. DISK CHECKERS can scan the contents of a hard disk to find files or areas that are corrupted in some way, or were not correctly saved, and eliminate them for a more efficiently operating hard drive.
5. DISK CLEANERS can find files that are unnecessary to computer operation, or take up considerable amounts of space. Disk cleaner helps the user to decide what to delete when their hard disk is full.
6. DISK COMPRESSION utilities can compress the contents of a disk to small amounts of memory. They also decompress/ expand the compressed files.
7. DISK DEFRAGMENTERS can detect computer files whose contents are broken and spread across several locations on the hard disk, and move the fragments to one location to increase efficiency.
8. DISK PARTITIONS can divide an individual drive into multiple logical drives, each with its own file system which can be mounted by the operating system and treated as an individual drive.
9. ARCHIVE utilities output a stream or a single file when provided with a directory or a set of files. Archive suites, at times include compression and encryption capabilities.
10. CRYPTOGRAPHIC utilities encrypt and decrypt streams and files.
11. REGISTRY CLEANERS clean and optimize the Windows registry by removing old registry keys that are no longer in use.

12. FILE MANAGERS provide a convenient method of performing routine data management tasks, such as deleting, renaming, cataloging, moving, copying, merging, generating files and modifying data sets.
13. MEMORY TESTERS check for memory failures.
14. NETWORK utilities analyze the computer's network connectivity, configure network settings, check data transfer or log events.
15. A SPYWARE REMOVER is a utility that detects and deletes spyware and other similar programs.
    Spyware is a program placed on a computer without the user's knowledge that secretly collects information about user, often related to Web browsing habits.
16. INTERNET FILTERS are utilities that remove or block certain items from being displayed.
    Four widely used filters are anti-spam programs, Web filters, phishing filters, and pop-up blockers.
17. SYSTEM PROFILERS provide detailed information about the software installed and hardware attached to the computer.
18. SORTING UTILITY for organizing files in any chosen order.
19. MERGE UTILITY for Merging or combining different files in one.
20. HEX EDITORS directly modify the text or data of a file a program.
21. A SEARCH UTILITY is a program that attempts to locate a file on your computer based on criteria you specify.
22. A PERSONAL FIREWALL is a utility that detects and protects a personal computer from unauthorized intrusions.
23. An UNINSTALLER is a utility that removes a program, as well as any associated entries in the system files.
24. A DIAGNOSTIC UTILITY compiles technical information about your computer's hardware and certain system software programs and then prepares a report outlining any identified problems.
25. SYSTEM MONITORS for monitoring resources and performance in a computer system. ..etc.

ACTIVITY

1. Ubuntu is an example of an operating system. Write down five things that an operating system does.
2. Your group was the winner in a technology essay competition. The organizing company has therefore offered laptops to each of the members of your group, including your teacher. All your friends have chosen laptops with a GUI, but your teacher has chosen UNIX, which has a CLI!
(a) State the difference between GUI and CLI.
(b) Why do you think all your friends rushed for laptops with a GUI?
(c) Do you think your teacher was stupid to choose a laptop with a CLI? Give a reason for your answer.
(d) Your teacher has requested to give a speech to the entire class about computer viruses, how to prevent them and how to cure infected computers.
In about 50 words, write down the speech that you will deliver.

PROGRAMMING LANGUAGES

A programming language is a notation for writing computer software. They are coded instructions which are used when designing computer programs. Programming

languages can be used to create the procedures and specifications of a computation or algorithm.
A programming language is therefore a practical way for us (humans) to describe a set of consecutive actions to be executed by a computer.

ASSOCIATED TERMINOLOGIES

Computer programming is the process of designing, writing, testing, debugging and maintaining a program source code.
An algorithm is a step by step method to solving a problem, making a decision.
A program: a set of instructions that when executed, causes a computer to behave in a predetermined manner. Without programs, computers are useless.
Syntax: Grammatical arrangement of codes followed when writing a computer program.

TYPES/ LEVELS OF PROGRAMMING LANGUAGES

Programming languages can therefore be categorized under:

(I) LOW LEVEL LANGUAGES:

These are languages which the computer can easily understand and are strongly related to the processor. Low level languages are machine oriented and very difficult for programmers to understand. They are categorized into two:-
(a) Machine Code Languages
(b) Assembly Languages

MACHINE CODE LANGUAGE

These are first generation languages consisting of 0s and 1s. Machine language is written in binary codes i.e. digits of **0**s and **1**s. It is a language that consists of binary numbers that represent instructions normally locations and data which can be processed. Computers do not understand the language or words we commonly use.

ASSEMBLY LANGUAGES

An assembly language is a low-level programming language in which each statement corresponds to a single machine code instruction. These languages use a group of letters to represent a whole group of words instead of presenting a binary operation of zeros and ones (0s & 1s). They use more English words and therefore easily understood by the programmers. E.g. "ADD" for addition, "SUB" for subtraction.
However, each assemble language instruction is eventually translated into machine language by the compiler. Assembly language is converted into executable machine code by a utility program referred to as an assembler; the conversion process is referred to as assembly, or assembling the code.

(II) HIGH LEVEL LANGUAGES:

These are language which programmers can easily understand but not immediately understood by the computer.
In comparison to low-level programming languages, they use natural language elements, be easier to use, or may automate significant areas of computing systems, making the process of developing a program simpler and more understandable to people relative to a lower-level language.
They consist of phrases that are closer to human language or mathematical notations. They are later translated into low level languages for the computer to easily understand.
High level languages are also referred to as Third (3rd) Generation Languages.

EXAMPLES OF HIGH LEVEL LANGUAGES

i) **BASIC**: Beginners All Purpose Symbolic Instruction Code. This is used for training computer programmers. It is also a common language in Microcomputers and can almost do all the processing tasks.

ii) **COBOL:** Common Business Oriented Language. This is an international accepted high level language used for general commercial purposes. It is known for its capability to handle the input and output of very large volumes of data.

iii) **FORTRAN:** (Formula Translator). This is a procedure oriented language used for mathematical and engineering services. It is known for its simplicity /conciseness, efficiency and accuracy.

iv) **PASCAL:** Pascaline Arithmetic This language was named after Blaise Pascal a French mathematician who invented a mechanical calculator commonly known as a Pascaline. It is used for fast execution for mathematical problems.

v) **ALGOL:** (Algorithmic Language) This is suitable for scientific and engineering computations.

vi) **ADA:** This language was named after Lady AUGUSTA ADA LOVERACE. This language was used on the first commercial computer invented by Charles Babbage at the University of Cambridge in England. It is suitable for both scientific and commercial purposes.

vii) **C:** This is also a high level program oriented language used for software development. C is a concise versatile and portable general purpose language and compatible with many operating systems and application programs.

OTHER PROGRAMMING LANGUAGES INCLUDE:

* Python, C++, Visual BASIC, Java, Pascal, Perl, LISP, APL, PROLOG, LOGO etc.

LANGUAGE PROCESSORS, COMPILERS & INTERPRETERS

When computers execute programs written in languages such as BASIC, C, Java, etc., the computer must convert these humanly readable instructions into a form it can understand. System software contains the special language translation programs that translate these higher-level language programs into **machine language** that the computer can execute. The program in the high-level language before translation into machine language is called **source code.**

System software includes a compiler, interpreter, and assembler.

A COMPILER: A compiler is a program which translates **the entire** source program from high level language to low level language which can easily be understood the computer.

AN INTERPRETER: This is a program that translates the source code **line by line** while the program is running from high level language to low level language.

THE ASSEMBLER: This translates assembler instructions from assemble language to machine code language or the binary code. An assembler is similar to compiler, but it is used to translate only assembly language into machine code.

THE LINKERS: These combine compiled programs and determine where the program will be located in the memory.

LANGUAGE PROCESSORS: These have to translate high level languages to machine code languages which the processor can understand. They are used to work backwards to the processor.

NB: We shall look at programming in more detail in Topic 11.

UNIT THREE: APPLICATION SOFTWARE

UNIT INTRODUCTION

Application software consists of programs designed to perform specific tasks for end-users.

This unit presents an overview of the major types of application software that end-users depend on as they work with computers, and as they access computer networks.

Today, there are millions of commercial software products that cover a variety of tasks such as:

* Making personal and business activities more efficient,
* Assisting with graphics and multimedia projects
* Supporting household activities,
* Improving education,
* Facilitating communications, etc.

CLASSIFICATIONS OF APPLICATION SOFTWARE

The common Classifications of application software include:

* Off-the-shelf (standard) software,
* Custom (bespoke) software,
* Shareware, Freeware,
* Open-source, Public-domain software,
* Web-based software, copyrighted software,
* Special Purpose and General purpose.

OFF-SHELF SOFTWARE

This refers to packaged software that is designed to meet the needs of a wide variety of end users. Off the shelf software is mass-produced, commercially sold software, and copyrighted. Microsoft Office Word and Adobe Photoshop are examples of Off the shelf software.

CUSTOM (BESPOKE) SOFTWARE,

Custom software is tailor-made software, which is developed at a user's request to perform specific functions. Sometimes, when a company cannot find packaged software that meets its unique requirements, it pays computer programmers to write custom software that is specifically tailored to meet the needs of the company. Custom software usually costs more than packaged software.

COMPARISON OF THE CHARACTERISTICS OF STANDARD AND CUSTOM SOFTWARE

Standard Software Is...	Custom Software Is...
1. Easy to use, because it is known by many people.	1. Unique, and requires extensive training before use.
2. Cheaper because it is massively produced and packaged for commercial purposes.	2. Expensive because it requires hiring a programmer.
3. Easy to acquire because it is already made.	3. Difficult to acquire due to the time needed for programming it.
4. More reliable because it is tried and well tested by many users.	4. May contain programming errors since it is not tested adequately.

5. Containing online help to guide users in case of any problems in use.	5. Usually lacking online help services.
6. Cannot be modified or changed to meet unique user requirements.	6. Meets all user requirements and can be edited if need arises.

COPYRIGHTED SOFTWARE

Copyrighted software refers to computer programs with restrictions regarding use, modification, and redistribution. You have to pay for copyrighted software and must not copy it without permission from the manufacturer. Copying copyrighted software without paying for it is clearly unethical and illegal.

SHAREWARE

Shareware is copyrighted software that is distributed at no cost for a trial period. To use a shareware program beyond that period, you send payment to the program developer.

In some cases, a scaled-down version of the software is distributed free, and payment entitles the user to the fully functional product.

FREEWARE

Freeware is copyrighted software provided at no cost by an individual or a company that retains all rights to the software. Therefore, other programmers cannot include freeware in applications they intend to sell.

OPEN-SOURCE

Open source software is software provided for use, modification, and redistribution. This software has no restrictions from the copyright holder. Open source software usually can be downloaded from the Web at no cost.

PUBLIC-DOMAIN SOFTWARE

Public-domain software has been donated for public use and has no copyright restrictions. Anyone can copy or distribute public-domain software to others at no cost.

WEB-BASED SOFTWARE,

Web-based software refers to programs hosted by a Web site. Users access and interact with Web-based software from any computer or device that is connected to the Internet. Many Web sites allow free access to their programs; some charge a fee. Examples of Web-based software include e-mail, Website builders, online games, travel and mapping software, etc.



SPECIAL PURPOSE (SPECIALIZED) SOFTWARE

This refers to computer programs developed and dedicated to accomplish particular jobs only. Programs that run on special purpose computers like ATMs are special purpose software.

Other Examples of specialized software include:

* Business – Transaction and Sales Management software.
* Science and Engineering software etc..

GENERAL PURPOSE

This refers to a Wide a variety of application programs that perform many common tasks. Varieties of General purpose application programs include Word processing programs, Spreadsheet programs, web browsers, Graphics programs, etc.

USES OF POPULAR APPLICATION SOFTWARE VARIETIES AND THEIR EXAMPLES

1. WORD PROCESSORS

Used for producing textual documents like letters, notes, reports, memos, etc. Examples Include: WordPerfect, Lotus Word Pro, Word Star, OpenOffice.org Writer.

2. SPREAD SHEET SOFTWARE

Used for performing calculations, and the creating of graphs. Examples include: Microsoft Excel, Lotus 1-2-3, KSpread, OpenOffice.org Calc.

3. DATABASE MANAGEMENT SOFTWARE (DBMS)

Used to create and manage an organized collection of related and structured information (a database). Examples include: Lotus Approach, Microsoft Access, OpenOffice.org Base, Corel Paradox.

4. PRESENTATION SOFTWARE

These applications are used for making presentations and slide shows that can aid a speech presentation. Examples include: Screencast, Microsoft PowerPoint, OpenOffice.org Impress, Adobe Persuasion.

5. COMMUNICATIONS SOFTWARE

One of the main reasons people use computers is to communicate and share information with others. A variety of communications software options exist. Common communications software includes: Web browsers, e-mail software, chat rooms, newsgroups, Text messaging, FTP programs, blog software, Teleconferencing software.

6. COMPUTER AIDED DESIGN (CAD) SOFTWARE

This is the type of software that is used by engineers and architects to produce technical drawings such as designs of building structures and floor plans. Examples include: ArchiCAD, DosmusCAD, AutoCAD, etc.



7. DESKTOP PUBLISHING SOFTWARE

These are applications used for creating publications like cards, flyers, calendars, brochures, Newsletters, Certificates, etc. Examples include: Microsoft Publisher, Celframe Publisher, Adobe Page Maker, etc.

8. WEB BROWSING SOFTWARE

This is the type of software that is used for displaying Webpages from the internet or html documents on computers. Examples Include: Mozilla Firefox, Internet Explorer, Safari, Opera Netscape Navigator, etc.

9. WEB AUTHORING SOFTWARE

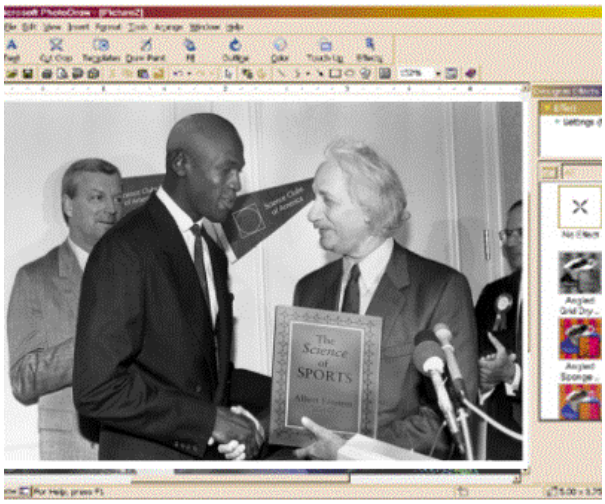
This is the type of software that is used by webmasters for building websites. Examples include: Microsoft FrontPage, Microsoft Expression Web, Antenna Web Design Studio, Adobe Dreamweaver, etc.

10. MEDIA PLAYERS

These are used for Audio and Video playback on computers. Examples include: Windows Media Player, Nero Showtime, Jet Audio, Power DVD, VLC Media Player, etc.

11. GRAPHICS SOFTWARE

- Used by graphic designers to create and design artistic graphics and to manipulate visual images on a computer such as logos, cartoons etc. Examples include Paint, Adobe Photo shop, Corel Draw, Adobe Illustrator etc.



The graphic on the right shows a digitally altered photograph shows sports star Michael Jordan (born 1963) meeting famous scientist Albert Einstein (who died in 1955).

12. ACCOUNTING SOFTWARE

This helps companies to record and report their financial transactions. With accounting soft-ware, you perform accounting activities related to the general ledger, accounts receivable, accounts payable, purchasing, invoicing, job costing, payroll functions, etc. Examples include Intuit QuickBooks, Microsoft Accounting, Sage Peachtree.

13. AUDIO AND VIDEO EDITING SOFTWARE

Audio editing software lets users produce studio quality soundtracks. With video editing software, you can modify video clips: you can reduce the length of a video clip, reorder a series of clips, or add special effects such as words that move horizontally across the screen, etc.



14. IMAGES VIEWING SOFTWARE

This refers to computer applications primarily used for previewing digital photographs on the computer screen. Many have basic features such as viewing thumbnails, slideshows, printing and simple editing such as cropping and resizing. Examples of Image viewers include: Microsoft Office Picture Manager, Windows Photo viewer, Picasa photo viewer, etc.

15. REFERENCE SOFTWARE

Reference software provides valuable and thorough information for all individuals. Popular reference software includes encyclopedias, dictionaries, health/medical guides, and travel directories. Examples include: Encyclopaedia Britannica 2011 Ultimate Reference DVD, Microsoft Student with Encarta Premium, etc.

16. NOTE TAKING SOFTWARE

Note taking software enables users to enter typed text, handwritten comments, drawings, or sketches anywhere on a page and then save the page as part of a notebook. The software can convert handwritten comments to typed text or store the notes in handwritten form. Examples include Microsoft Office OneNote.

17. TEXT EDITORS

Text editors are simple word processors that are generally used to type without any special formatting. Text editors are mainly used to create small notes, memos and programs. Examples of common text editors are: Notepad, Notepad++, Gedit etc.

18. GAMING SOFTWARE

These are programs developed as electronic game that involve human interaction with a user interface to generate visual feedback on a computer. Common computer games include: solitaire, chess titans, Racing, StarCraft, Need for Speed, etc.

19. EMAIL SOFTWARE / EMAIL CLIENT

Email software (Commonly known as email client) is a computer program used to access and manage a user's email account. Web applications that provide message management, composition, and reception functions are sometimes also commonly referred to as webmail.

Popular locally installed email clients include Microsoft Outlook, Pegasus Mail, Mozilla's Thunderbird, KMail, Evolution and Apple Mail. Popular web-based email clients (webmail) include: GMail, Yahoo! Mail, mail.com, Lycos mail, and Hotmail.

20. ENTERPRISE COMPUTING SOFTWARE

A large organization, commonly referred to as an enterprise, requires special computing solutions, because of its size.
Enterprise computing software is designed to help these enterprises manage and control their operations and resources, develop new products and services, manage relationships with customers and suppliers, and develop new business strategies.

SOFTWARE SUITES

A software suite is a collection of individual application soft-ware programs sold as a single package. When you install the suite, you install the entire collection of applications at once instead of installing each application individually.
Types of software suites include the following:

- **Internet suite.** An Internet suite is an Internet-related software suite. Internet suites usually include a web browser, e-mail client (often with a news client and address book), download manager, HTML editor, and an IRC client. Examples include Mozilla Application Suite and SeaMonkey internet suite
- **Graphics suite.** A graphics suite is a software suite for graphics work that are distributed together. Most graphics application suites include at least a bitmap graphics editor and a vector graphics editor. Examples include Adobe graphics suite and CorelDRAW Graphics Suite
- **Office suite.** An office suite is a collection of bundled productivity software (a software suite) intended to be used by knowledge workers. The components are generally distributed together, have a consistent user interface and usually can interact with each other, sometimes in ways that the operating system would not normally allow. The earliest office suite for personal computers was Starburst in the early 1980s, comprising the word processor WordStar, together with companion apps CalcStar (spreadsheet) and DataStar (database). Currently, Microsoft Office Software suite is the most popular suite used wordwide.

At a minimum, office suites typically include the following software applications: word processing, spreadsheet, database, and presentation graphics. The table below shows details of the popular Office Suites

SUITE NAME	Word Processor	Spreadsheet	Presentation Program	Database Management Software
Lotus Smart Suite	Lotus Word Pro	Lotus 1-2-3	Lotus Freelance Graphics	Lotus Approach
Microsoft Office	Microsoft Word	Microsoft Excel	Microsoft PowerPoint	Microsoft Access
KOffice	KWord	KSpread	KPresenter	Kexi
OpenOffice.org	OpenOffice.org Writer	OpenOffice.org Calc	OpenOffice.org Impress	OpenOffice.org Base
WordPerfect Office	WordPerfect	Quattro Pro	Corel Presentations	Corel Paradox
Celframe Office	Celframe Write	Celframe Spreadsheet	Celframe Power Presentation	Celframe Data Access

Ability Office	Ability Write	Ability Spreadsheet	Ability Presentation	Ability Database
Kingsoft Office	Kingsoft Writer	Kingsoft Spreadsheets	Kingsoft Presentation	(None)
Apple iWork	Apple Pages	Apple Numbers	Apple Keynote	(None)

Advantages of using software suites

- Costs significantly cheaper than buying each of the application package separately
- Easy to learn and use because applications within a suite usually use a similar interface and share common features such as clip art and toolbars.

Easy installation because all the various applications can be installed at once.

LEARNING AIDS AND SUPPORT TOOLS FOR APPLICATION SOFTWARE

To assist in the learning process, many programs provide off line Help, Web-based Help, wizards, and templates.

Off line Help is the electronic equivalent of a user manual. It usually is integrated in a program. In most programs, the F1 key or a button on the screen starts the Help feature.

Web-based Help provides updates and more comprehensive resources to respond to technical issues about software.

A **wizard** is computer program that guides a user through a procedure of completing a task. The wizard asks the user questions and then automatically performs actions based on the responses.

For example, spreadsheet software includes wizards for creating charts and building functions.

A **template** is a document that contains the layout and formatting necessary for a specific document type.

For example Word processors contain templates for, cover sheets, flyers, letters, resumes/CVs, etc.

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC THREE

1. The following devices contain a chip-based operating system except
   A. iPod
   B. Laptop
   C. Calculator
   D. Cell Phone
2. Which of the following applications would most likely use a DBMS?
   A. Supermarket bill
   B. Project report
   C. Movie Library records
   D. Graphics imaging
3. Which one of the following Operating Systems does not have a GUI?
   A. Windows 8
   B. DOS
   C. Mac OS X Leopard
   D. Linux
4. Copyright regulations don't apply to
   A. Freeware and Open source software
   B. Shareware and web based software
   C. Open source and Public domain software
   D. Public domain software and Off the shelf software
5. Susan has an Office Suite on her computer. It allows her to put spreadsheet tables into her word processor document. This Office Suite is an example of
   A. integrated software.
   B. proprietary software.
   C. a programming language.
   D. an operating system
6. A computer takes time to boot. During this time the computer is
   A. loading the operating system.
   B. loading all of the applications.
   C. letting the processor warm up properly.

D. making sure the voltage gets to the right level.

7. A software that enables users and applications to interact with the computer hardware is called:
   A. Operating system.
   B. Application software.
   C. Client software.
   D. Database Management System.
8. Time during which a job is processed by the computer is known as
   A. Delay times.
   B. Real time.
   C. Execution time.
   D. Down time.
9. The use of spooler programs and/or …. Hardware allows personal computer operators to do the processing work at the same time a printing operation is in progress
   A. Registered mails.
   B. Memory.
   C. CPU.
   D. Buffer.
10. A file is located at C:\My Documents\Business\Accounts.xls Which part of this path is a subfolder (subdirectory)?
   A. C:\
   B. Business
   C. My Documents
   D. .xls
11. What appears if a window contains more information than can be displayed in the window?
   A. Program icon.
   B. Scroll bars.
   C. Cascading menu.
   D. Check boxes.
12. Which of the following are the two general types of programs?
   A. Entertainment and Productivity.
   B. Microsoft and IBM.
   C. Word processing and Database.
   D. System Software and Application Software.
13. What kind of software can be used with image scanners to convert images of text into editable text for that can be processed by a text editor?
   A. Magnetic ink recognition.
   B. Optical mark recognition.
   C. Optical character recognition.
   D. Bar code recognition.
14. Unlike a software suite, the packages in an integrated software package……..
   A. Cannot be purchased individually.
   B. Each use a different interface.
   C. Do not share any common features.
   D. All of the above.
15. Linux can be obtained by ……
   A. Downloading it from the web free of charge.
   B. Buying a Linux book that includes a CD-ROM containing Linux
   C. Asking a retailer to pre-install Linux on a new computers hard disk
   D. All of the above

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 3

1(a) Explain the following terms:
(i) off the shelf software (ii) customized software (iii) utility program
2 (a) Explain what is meant by the term Operating System.
(b) Explain any five functions of an operating system.
(c) Describe as precisely as possible the use of each of the following features;
(i) List box (ii) Drop down list
(e) Describe one situation where it is more beneficial to use DTP (Desktop Publishing) Software instead of word processing software.

S2 TOPIC 4: WORD PROCESSING

UNIT ONE: INTRODUCTION TO WORD PROCESSING

DEFINING THE CONCEPT OF WORD PROCESSING

Word processing is the process of creating text documents containing objects like tables, and simple graphics using computer applications.

Word processors are the most commonly used computer applications in the world.

Word processors are mostly used for writing letters, reports, projects, books, essays, memos, resumes (CVs) etc. Manual type writers were phased out following the emergence of computer based word-processor applications.

Advantages of Using Electronic Word Processors as Compared to Manual Type Writers

i) Word processors can save softcopies for future use **while** with a type writer; a document has to be fully retyped if needed again.

ii) During typing with a word processor, it is possible to undo a mistake, **while** any error made with a type writer is immediately impacted on the printout.

iii) A type writer prints one character at a time **while** a word processor prints many pages at a time.

iv) There is a variety of quick text formatting features such as bold, italic, underline, colour, etc. in a word processor **whereas** there are limited formatting options with a typewriter.

v) A word processor provides grammar and spell check options **whereas** a typewriter cannot help in spell checking.

vi) It is easier to insert graphics and drawings in a word processor **yet** it is not easy to draw with a type writer.

vii) A word processor allows the user to type continuously without pressing the enter key at the end of each line (word wrap) **whereas** the user needs to advance the lever of a typewriter manually, at the end of every line.

viii) It is very simple to align text in a document to Left, Centre, Right or Justified **whereas** with a type writer, one has to manually align the text, which is very difficult.

ix) A word processor has edit features such as Copy and Paste in which repeatedly occurring text in a document can be copied to and pasted from the clipboard **whereas** a type writer has no clipboard.

x) A word processor can work on many pages at a go by inserting pages numbers, footers, headers, watermarks, etc. **whereas** a type writer works on one page at a time.

xi) A word processor can insert drawings word arts and pictures **whereas** with a type writer, drawings and pictures can only be drawn by a hand on the stencil.

xii) With A word processor, you can use mail merge feature to create a set of documents, such as a letter that is sent to many customers, by only creating one main document and inserting different fields for the customers' details **whereas** with a type writer, you have to type the each document separately.

xiii) A type writer requires a lot of strength to strike a key so as to have a strong impact on the stencil in order to get a reasonably visible printout **whereas** a computer keyboard has easy-to-press buttons which don't require too much strength during typing.

xiv) A type writer makes a lot of noise during its operation as **compared** to a word processor which is relatively quiet.

xv) A word processor has a lot of symbols such as Greek, Arabic, Latin, and Hebrew alphabet character sets **whereas** a type writer can only add the English alphabet and commonly used symbols that are currently calibrated on the typewriter.

xvi) A Word processor can add preformatted elements (templates) by selecting from a gallery of professional templates e.g. cover pages, resumes, etc. **whereas** with a type writer it is up to the typist to know the layout and professional look of document types.

NB: more points can still be generated basing on the features and operation of a word processor in comparison to a type writer

Disadvantages of Using Electronic Word Processors

i) Word processors cannot be used without Electricity.

ii) Word processors Use is Expensive due to the cost of computers.

iii) They have led to Unemployment of typists because one person using a word processor can do work which would be done by many using type writers.

iv) Many people are Computer illiterate, and cannot use the program.

v) Computers have Viruses, which lead to loss of data in soft copies.

vi) Using word processors on light emitting computer monitors for long leads to eye disorders, which isn't the case with type writers

vii) Word processors require purchase of hard ware like printers in order to obtain hard copies yet with typewriters, whatever is typed is permanent and instantly available as a hard copy: there is no delay for printing or risk of unintended file deletion. NB: It is this tangible writing experience free from computer meltdowns or deletions that is saving the typewriter from extinction.

EXAMPLES OF WORD PROCESSORS.

Examples of word processors include: Microsoft Word, Corel WordPerfect, Apple Pages, OpenOffice.org Writer, Google Docs etc.



NB: Text editors are not fully word processing applications because they are generally used to type without any special formatting. Text editors are mainly used to create small notes, memos and programs. Examples of common text editors are: Notepad, Notepad++, Gedit etc.

OPENING A WORD PROCESSOR.

To start Microsoft Word on your computer:

Click "Start" >> "Programs" >> "Microsoft Office" >>"Microsoft Office Word."

Or Type the program name WINWORD in the run dialog box and click Ok. If there is an icon of Microsoft Word available on your desktop (shaped like a square with a "W" in the middle), you can open up the program by double-clicking the icon.



IDENTIFYING BASIC FEATURES OF A WORD PROCESSOR.

The features are the functionalities the program can do. Below are some of the features of word processors.

1. **Word Wrap:** this feature automatically sends a word that does not fit within the margin settings onto the next line, without the user pressing Enter key.
2. **Find:** allows the user to locate all occurrences of a particular character, word or phrase.
3. **Replace:** allows the user to substitute existing characters, words or phrases with the new ones.
4. **Spell checker:** allows the user to check spellings of the whole document at one time or to check and even correct the spelling of individual words as they are typed (Autocorrect)
5. **Grammar checker:** this reports grammatical errors, usually by a wavy green line, and suggests ways to correct them.
6. **Thesaurus:** suggests alternative words with the same meaning (synonyms) for use in the document.
7. **Mail Merge:** This is feature used to create similar letters to be sent to several people. The names and addresses of each person can be merged with one single main document.
8. **Automatic page numbering:** numbers the pages automatically in a document
9. **Tables:** allow users to organize information into rows and columns.
10. **Multi-columns:** arranges text into two or more columns that look similar to newspaper or magazine
11. **Drop cap –** Formats the first letter in paragraph to be dropped across two or more lines.
12. **Clip art:** refers to pre-made images about various subjects used to illustrate concepts in documents.
13. **Template:** document with a specific format and layout based on to initiate new similar documents.
14. **Printing:** allows a user to obtain a hard copy of a document from the printer.
15. **Word Count:** Establishes the number of words, characters, paragraphs, etc. in a document.
16. **Headers and Footers:** Used to insert text in the top and bottom margin through the document.
17. **Footnotes** and **Endnotes** are used as references that provide additional information about a word or phrase within a document.
18. **Insert** and **Delete** allows a user to add and remove portions of text while editing document.

BASIC WORD PROCESSING TERMINOLOGY

Typeface - A typeface is the shape of the characters. Some common typefaces are Times New Roman, Arial, and Tahoma.

Font: – a style of a typeface

Line Spacing refers to the amount of vertical white space between two lines of text, from baseline to baseline. Line spacing is measured in points.

Text Alignment refers to the way lines of text are arranged relative to the edges of a block of text. There are four types of alignment: left, centre, right, and justify.
Justification is the process of aligning text in a document to both the left and right margins at the same time. Justified text may have extra spaces between letters within words, so that paragraphs appear as a block with an even right-margin ending.
Indent: An indent is the amount of white space set in between the margin and the beginning of text. Examples of indents include the first line indent, hanging indent and right indent.
Formatting Text Formatting text is the process of changing the appearance of text in a document. Formatting text involves using commands like bold, italics, underlining, changing font colour, etc.
Editing text: This refers to the process of making changes to the content of an existing document. Editing text involves commands like cut and paste, overtype, undo, insert, and delete.
Copy – To place selected text on the clipboard, without removing it from its current location.
Cut – To remove selected text from its current position and place it on the clipboard.
Copy and paste duplicated text, while Cut and paste moves text to a new location.
The clipboard The Clipboard is an area of memory in which you can store copied or cut text, graphics or any other items temporarily before being pasted into other locations**.**
The **paste special** feature helps to avoid pasting text with all its formatting. The paste special feature provides more control over what to paste.
Header - The header refers to text that appears in the top margin of all pages in a document.
Footer - The footer refers to text that appears in the bottom margin of all pages in a document.
Ruler - You can use the ruler to set the indent, margin and tab markers. Avoid using the space bar to align text!
Tabs Stops – tab stops are places where text can be made to line up. You can set a tab stop by clicking on the ruler bar at the desired position.
Hard Copy – A copy of a document printed out on physical paper.
Soft Copy – A copy of a document that is stored on a disk or other computer storage device.
Overtype Mode – Also called overwrite mode, causes any characters you type to replace ("overtype") the characters at the cursor. You can switch between overtype mode and insert mode by pressing the insert key.
Paragraph – The text between one paragraph break and the next. A paragraph break is inserted by pressing Enter key.
Save – To write the document's current state from RAM to a storage device.
Proofreading is the process of reviewing a document to ensure the accuracy of its content. Proof reading tools include spelling and grammar check (F7), thesaurus, etc.

UNIT TWO: WORD PROCESSING WITH MICROSOFT WORD

INTRODUCTION

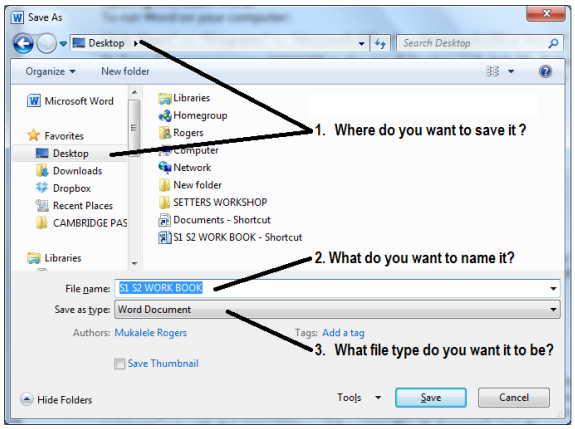
Microsoft Word is a word processor designed by Microsoft Corporation. It was first released in 1983 under the name Multi-Tool Word. It is a component of the Microsoft Office software system; it is also sold as a standalone product and included in Microsoft Works Suite. So far, there are 15` versions of Microsoft Word. The most popular versions are Word 2000, 2003, 2007, 2010 and 2013.

OPENING MICROSOFT WORD:

To run Word on your computer:
Click "Start" >> "Programs" >> "Microsoft Office" >>"Microsoft Office Word."
Or Type the program name WINWORD in the run dialog box and click Ok. If there is an icon of Microsoft Word available on your desktop (shaped like a square with a "W" in the middle), you can open up the program by double-clicking it, as well.



SAVING A DOCUMENT



When you create a brand new document and click on File Menu>>Save or the **Save** button on your Standard Toolbar or Ctrl+S, you will be presented with the **Save As** dialog box because Word wants to know three things:

1. Where do you want to save it?
2. What do you want to name it?
3. What file type do you want it to be?

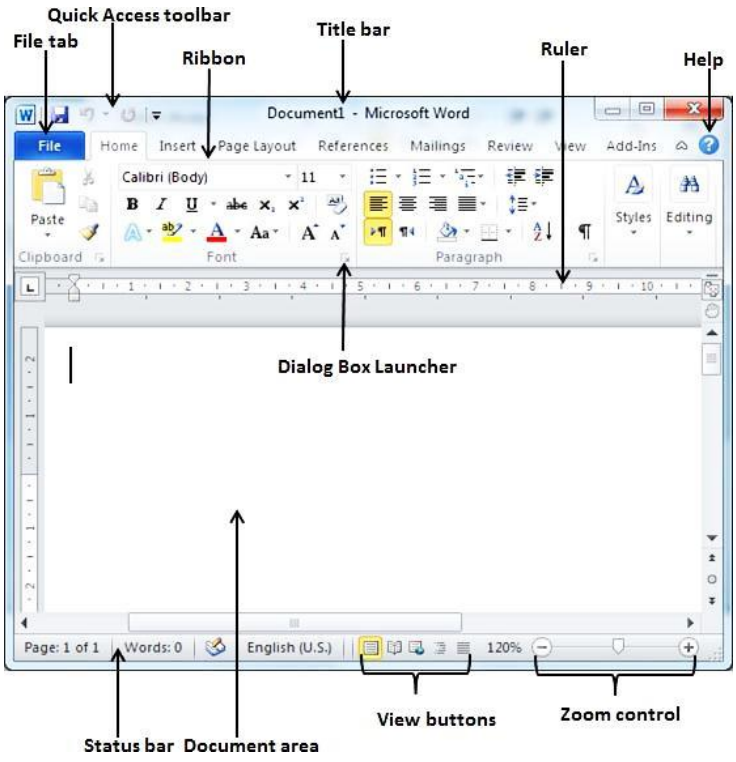
Once you have saved your new document, clicking on that *same* button no longer gives you these choices. Why? Because Word assumes you do not want to make those three choices again. Word assumes you simply want to update the originally saved copy by overwriting it with this new version of the same file. If, however, you **do** want to either put a copy of this same file in a new location, create a new copy with a new name, or change the file type, you must go to the **File** menu and choose **Save As** (or press F12).

Remember that Windows will not allow you to have two files with the exact same name in the same folder, so when you save a file to a location where that file already exists, Windows will replace the existing file with your new one. So, if you do not want to overwrite the existing file, but rather want to create a copy with a different name, put this file in a different location, or change the file type, you must use the **Save As** option.

When you choose **File/Save As,** you can use the dropdown box at the top of the **Save As** dialog box, labeled **Save in**, to select the *location* where you want to save your new copy. You can also change the *name* of your new copy by using the **File name** input box and then either save it in a new location or in the same location as the original (because this new copy now has a different name). Furthermore, you can change the *file type* by selecting a new type from the dropdown box at the bottom of the **Save As** dialog that's labeled **Save as type.**

COMMON PARTS OF A MICROSOFT WORD WINDOW

Word consists of many components that help you use its features.
Some of these components include the menu bar, title bar, Standard toolbar, Formatting toolbar, Task pane, status bar, and a lot more.

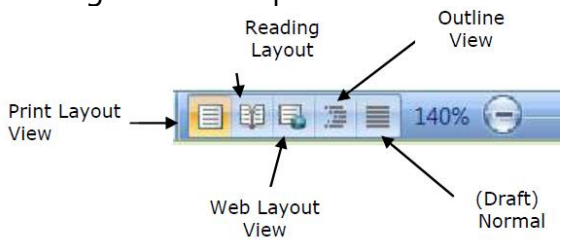


THE STATUS BAR

The status bar is a horizontal area at the bottom of the window which provides information about the current state of what you are viewing in the window and any other contextual information.

WAYS OF VIEWING A WORD DOCUMENT

Microsoft Word has different ways for you to get a good view of your work, depending on the task at hand. The views are in three categories: Layout, Viewing modes and previews.



(i) Print Layout
A view of a document as it will appear when you print it. Items such as headers, footnotes, columns, drawings, and text boxes appear in their actual positions. If you'd like to type and edit text in this view, you can save screen space by hiding white space at the top and bottom of the page.

(ii) Web Layout
A view of a document as it will appear in a Web browser. For example, the document appears as one long page (without page breaks) and text and tables wrap to fit in the window.)

(iii) Normal view
A view that shows text formatting but simplifies the layout of the page so that you can type and edit quickly.
NB: In normal view, page boundaries, headers and footers, backgrounds, drawing objects, and pictures that do not have the *'In line with text wrapping style'* do not appear.

(iv) Outline
A view that shows the headings of a document indented to represent their level in the document's structure.
In outline view, you can collapse a document to see only the main headings, or you can expand it to see all headings and even body text.

You can also use outline view to work with master documents and to move, copy, and reorganize text by dragging headings.
A **master document** is A "container" for a set of separate files (or subdocuments). You can use a master document to set up and manage a multipart document, such as a book with several chapters.
NB: In outline view, page boundaries, headers and footers, graphics, and backgrounds do not appear.

Reading Layout View

A view that is designed for reading documents on a computer screen. The document is resized to fit the screen and most toolbars are removed, but commands are available for navigating, commenting, and looking up words. Word also uses your computer's screen resolution settings to size the document for optimum readability, with minimum eye strain and with tools optimized for reading.
In reading layout view, you can use the Document Map or thumbnails to jump to different sections of the document and to keep track of your location in it.

A **Document Map** is vertical pane along the left edge of the document window that displays an outline of the document's headings.
Text may appear larger than expected, and the page breaks do not necessarily correspond to breaks between printed pages.

(ii) Thumbnail View

Thumbnails are small renderings of each page in your document, displayed in a separate. Thumbnails give you a visual impression of the content of each page. You can click a thumbnail image to jump directly to a page. Thumbnails are available in, normal view, print layout view, outline view, and reading layout view. They are not available in Web layout view or in conjunction with the

(iii) Document Map

The Document Map is a separate pane that displays a list of headings in the document. Use the Document Map to quickly navigate through the document and keep track of your location in it.
NB all the above views can be switched to from the View Menu.

TYPING (TEXT ENTRY) SKILLS

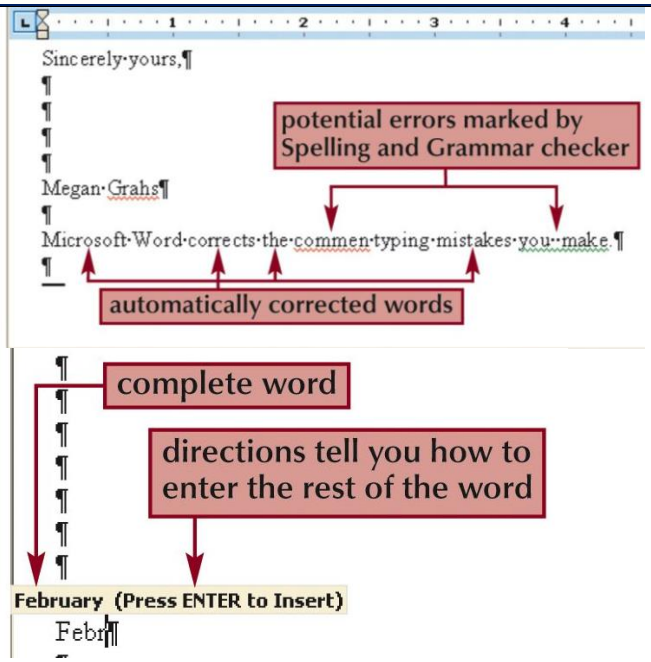
When typing, do not press the Enter key at the end of each line; the insertion point will automatically move to the next line when the current one is full. It will not divide a word between two lines. This is called word-wrap. **Only press** the Enter key when you want to begin a new paragraph.
If you want the insertion point to go to the next line within the same paragraph, use the Shift + Enter keyboard combination. This will force the insertion point to a new line. If you want the insertion point to go to the next page, then use Ctrl + Enter.
The auto correct feature checks for errors as you type, and automatically correct common typing errors.
If AutoCorrect does not recognize a word's spelling, it alerts you by displaying a wavy red line under the word, or a green line in case of a grammatical error.
To correct the error, right click in the error and choose the right alternative or use the Alt+F7 keyboard combination.

ACTIVITY 1

Launch Microsoft Word and create a new blank document. Type in the content as below.

For a school to teach and successfully implement the O-Level Computer Studies curriculum and for the students to attain and achieve the expected skills and competences in computing, the following basic or minimum requirements need to be instituted in the computer lab and/or in classroom.
1. Desktop Personal Computers or Laptops (for students' and teachers' use)
2. A closed and simple computer network with at least one (1) network hub.
3. Computer maintenance tools and/or kit
4. Fire Extinguisher
5. Safe Electrical installations (provide a socket for each computer set)
6. Uninterruptible Power Supply (UPS) Units

Tip: Do not press <Enter> key at the end of each line, the text will continue to the next line automatically.
Save the document as **Word Manual** in rich text file format, in a new folder '**Manuals'** On the Desktop. Tip: You need to create the folder within the save as dialog box while saving the file.
Save another copy of the file in My Document folder with file name **Training Exercise Second Copy**.
Save another copy of the document in My Documents folder as a word (.doc) document with file name **Training Exercise**.
Save another copy of the file to a flash disk or Local Disk D:\ with the file name **Training Exercise Backup Copy.**
Close the file without exiting the word processing application.
Open the file you saved in the Manuals folder on the desktop.
Exit Word.



As you type, Word will auto-scroll (shifting text up and finally disappearing from the top of the document window). The AutoComplete feature will automatically complete dates and words you use regularly. After you enter a few identifying letters, Word will display a small box, or ScreenTip, that suggests the full word you are typing. Press the Enter key to accept Word's suggestion, or continue typing to ignore the suggestion. To turn this feature off or add your own phrases to the AutoComplete list,

- Go to Insert menu>

- Select AutoText. This displays a dialogue box where you can customize AutoText, AutoFormat, SmartTags, and AutoCorrect options.
- When the click and type option is enabled under Tools>Options>Edit Tab, You can use the 'double click and type anywhere in the document' feature.

Keystrokes for moving the insertion point

Press	To move the insertion point
← or →	Left or right one character at a time
↑ or ↓	Up or down one line at a time
Ctrl+← or Ctrl+→	Left or right one word at a time
Ctrl+↑ or Ctrl+↓	Up or down one paragraph at a time
Home or End	To the beginning or to the end of the current line
Ctrl+Home or Ctrl+End	To the beginning or to the end of the document
Page Up or Page Down	To the previous screen or to the next screen
Alt+Ctrl+Page Up or Alt+Ctrl+Page Down	To the top or to the bottom of the document window

EDITING TEXT

To edit is to make changes to the content of your document.
The Editing group on the home ribbon has commands that help us to prepare and correct a typed document.
You can add or delete text, and copy or move text between locations. Before being copied or moved or changed, text has to be selected.

SELECTING TEXT (F8)

Selecting text is quick and easy using the mouse. However, it is also possible to use the keyboard.

Text Selection Techniques

Any amount of text	Click where you want to begin the selection, hold down the left mouse button, and then drag the pointer over the text that you want to select.
A word	Double-click anywhere in the word.
A line of text	Move the pointer to the left of the line until it changes to a right-pointing arrow, and then click.
A sentence	Hold down CTRL, and then click anywhere in the sentence.
A paragraph	Triple-click anywhere in the paragraph.
Multiple paragraphs	Move the pointer to the left of the first paragraph until it changes to a right-pointing arrow, and then press and hold down the left mouse button while you drag the pointer up or down.
A large block of text	Click at the start of the selection, scroll to the end of the selection, and then hold down SHIFT while you click where you want the selection to end.
An entire document	Move the pointer to the left of any text until it changes to a right-pointing arrow, and then triple-click.
Headers and footers	In Print Layout view (Print Layout view: A view of a document or other object as it will appear when you print it. For example, items such as headers, footnotes, columns, and text boxes appear in their actual positions.), double-click the dimmed header or footer text. Move the pointer to the left of the header or footer until it changes to a right-pointing arrow, and then click.
Footnotes and endnotes	Click the footnote or endnote text, move the pointer to the left of the text until it changes to a right-pointing arrow, and then click.
A vertical block of text	Hold down ALT while you drag the pointer over the text.
A text box or frame	Move the pointer over the border of the frame or text box until the pointer becomes a four-headed arrow, and then click.

To select text using the keyboard,

To select	Do this
One character to the right	Press SHIFT+RIGHT ARROW.
One character to the left	Press SHIFT+LEFT ARROW.
A word from its beginning to its end	Place the insertion point at the beginning of the word, and then press CTRL+SHIFT+RIGHT ARROW.
A word from its end to its beginning	Move the pointer to the end of the word, and then press CTRL+SHIFT+LEFT ARROW.
A line from its beginning to its end	Press HOME, and then press SHIFT+END.

One line down	Press END, and then press SHIFT+DOWN ARROW.
One line up	Press HOME, and then press SHIFT+UP ARROW.
A paragraph from its beginning to its end	Move the pointer to the beginning of the paragraph, and then press CTRL+SHIFT+DOWN ARROW.
A paragraph from its end to its beginning	Move the pointer to the end of the paragraph, and then press CTRL+SHIFT+UP ARROW.
A document from its end to its beginning	Move the pointer to the end of the document, and then press CTRL+SHIFT+HOME.
A document from its beginning to its end	Move the pointer to the beginning of the document, and then press CTRL+SHIFT+END.
From the beginning of a window to its end	Move the pointer to the beginning of the window, and then press ALT+CTRL+SHIFT+PAGE DOWN.
The entire document	Press CTRL+A.
A vertical block of text	Press CTRL+SHIFT+F8, and then use the arrow keys. Press ESC to turn off the selection mode.
The nearest character	Press F8 to turn on selection mode, and then press LEFT ARROW or RIGHT ARROW; press ESC to turn off the selection mode.
A word, a sentence, a paragraph, or a document	Press F8 to turn on selection mode, and then press F8 once to select a word, twice to select a sentence, three times to select a paragraph, or four times to select the document. Press ESC to turn off the selection mode.

CUT, COPY AND PASTE

To rearrange some of the contents of a document the use of cut and paste is invaluable. These terms originated in the traditional printing industry - Scissors were used to cut part of a page and it was physically pasted down into a new location.
The commands of cut (Ctrl +X), copy (Ctrl +C) and paste (Ctrl +V) can all be accessed from the Edit Menu or the Short cut Menu that pops after a right mouse click. Cut and paste is also known as **moving text**, while Copy and paste is also known as **duplicating text** within the document.

THE OFFICE CLIPBOARD

The Clipboard is an area of memory in which you can store text, graphics or any other items temporarily before being pasted into other locations. In Word 2003, the items currently collected on the clip board can be shown from the
Edit Menu > Office Clipboard or using Ctrl +C+C keyboard combination.

ACTIVITY

Use the mouse and keyboard shortcuts to carry out the following tasks:
(i) Duplicating selected text
(ii) Moving selected text
(v) Deleting text
(iv) Overtyping text
Adding and using items on the office clipboard
Copying from one document to another

PASTE AND PASTE SPECIAL

Word typically preserves all formatting when you copy information from a Web page or other documents.
This is good and helpful, but it can be undesirable - such as when you copy the text from a web that happens to be hyperlinked or having mismatching formats.
The paste special feature helps to avoid pasting text with all its formatting. The paste special feature provides more control over what to paste.

ACTIVITY

- Select an item you wish to copy to the Clipboard.
- From the Edit menu, click Copy.
- Note: Microsoft Office Word allows you to copy 24 items to the clipboard at once.
- Locate the insertion point at a different location within your current document (or indeed in a different document, or even a different Windows program).
- If the Clipboard toolbar is not displayed, then you can display it by clicking on View menu, point to Toolbars and click on Clipboard. Icons on this toolbar include Copy, Paste All and Clear Clipboard.
- To paste an item simply click on the appropriate icon on the Clipboard toolbar..

UNDO AND REDO

Whenever you make a mistake, there is a feature can be used to 'undo' the last action.
To Undo: Click the Undo button on the Quick Access Toolbar or press <Ctrl> + <Z>.
Press Ctrl+Y redo (to revert the undo action).

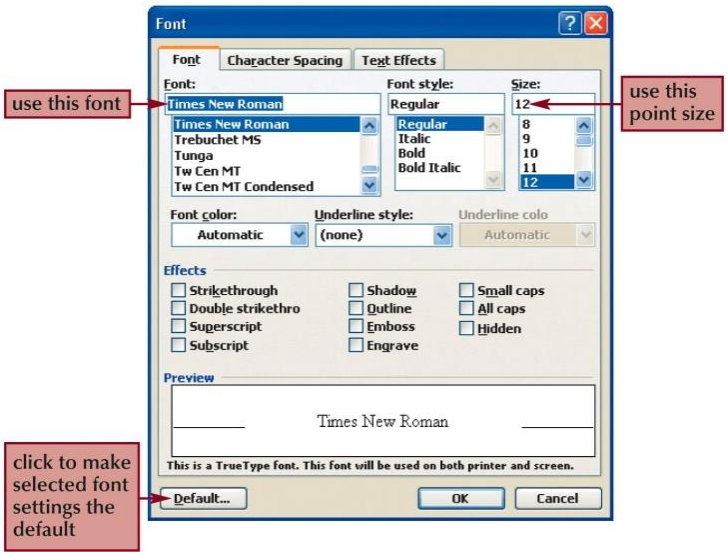
FORMATTING DOCUMENTS

Formatting refers to enhancing the appearance of a document. You can format text, paragraphs, pages or the entire document.

Formatting Text

Text formats can be applied to individual characters within a document. They include bold, italic and different font styles and sizes. Paragraph formats affect whole paragraphs and control the layout of text on a page such as alignment, indents and so on. 

The formatting toolbar has buttons for executing frequently used formatting commands such as changing Font style, size, bold, italic, underline, alignment, line spacing, bulleting and numbering, indentation, highlight and font color.

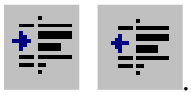


Font dialogue box has more commands for changing text effects

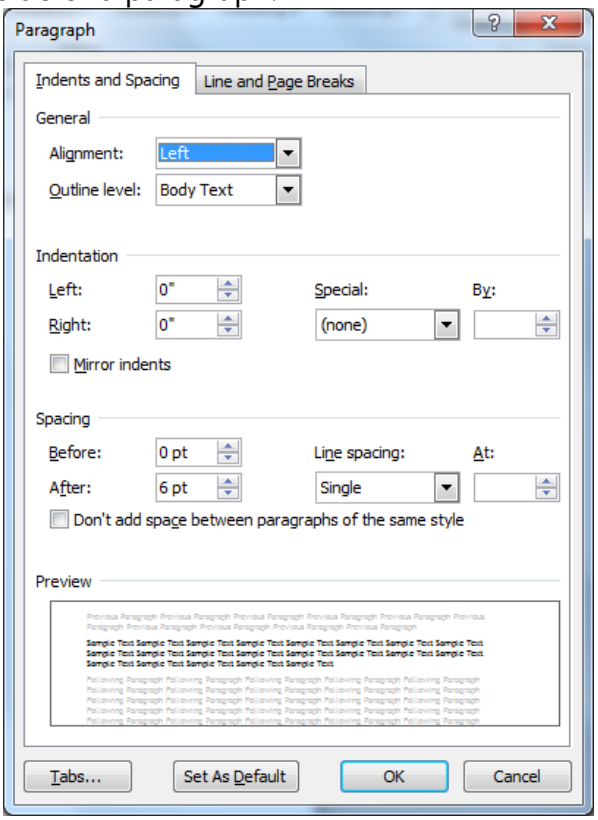
Formatting paragraphs

When you need to control how a paragraph lines up on a page, you apply paragraph formats. As with character formatting, some of the most commonly used options appear as buttons on the Formatting toolbar whilst others can only be accessed via the Paragraph dialog box. Paragraph formatting actions include Alignment (Left, center, right, Justified), Spacing, and Indents. **Indents** allow you to control the white space at the left and right hand side of a paragraph.

Mouse: Click the increase and decrease indent buttons to indent the selected paragraphs by ½ an inch from the left:



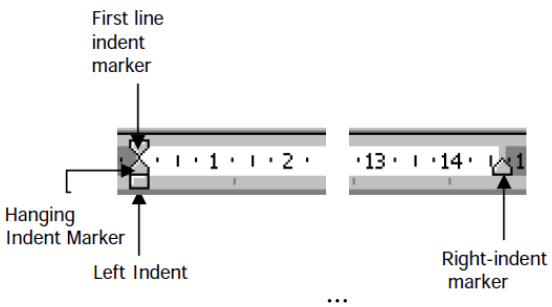
Keyboard: Press [CTRL][M] to increase the indent of the selection ½ inch from the left. Press [CTRL][SHIFT][M] to decrease the indent by ½ inch.



The Ruler

Use the ruler to set indents.

The buttons on the toolbar allow you to indent a set amount from the left only. If you need to indent a paragraph from the right, or you want the indent to be a very specific amount, it is easier to use the ruler.



First line indent

A first line indent is used where the first line of a paragraph needs to start further in than the other lines as in the example below:

> "It is company policy to ensure that all staff are fully trained in the use of the computer systems employed by the firm so that they may carry out their daily duties in the most efficient way."

Hanging Indent

A hanging indent is used where the first line of a paragraph needs to start further back than the other lines.

> "It is company policy to ensure that all staff are fully trained in the use of the computer systems employed by the firm so that they may carry out their daily duties in the most efficient way."

TABLES

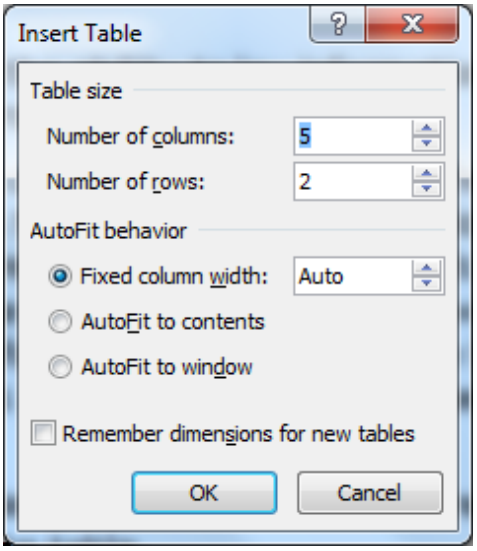
Tables give you the ability to lay information out in columns and rows.

When a table is created, Word will make the table as wide as the current page orientation allows. Therefore, if you know your table is going to be quite wide, you may want to switch to landscape before creating it. Your table is made up of rows and columns which intersect to form **cells**.

To create a table,

(i) Position the cursor where you want to insert the table.

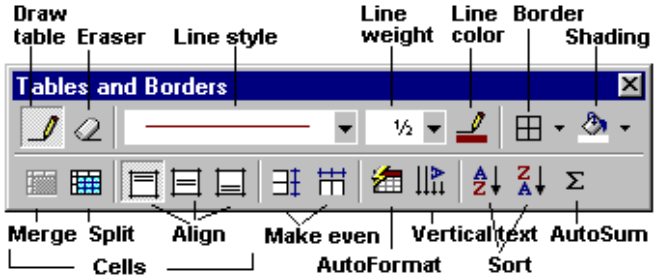
(ii) On the Table menu, point to Insert, and then click Table.



Enter the number of columns and rows of the required table and click Ok.

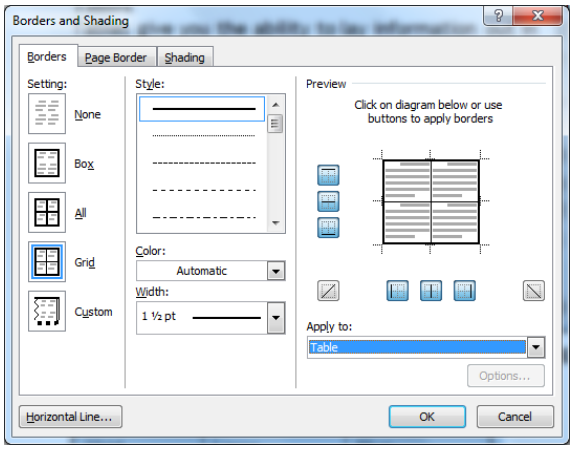
Garment	Size	Colour
Skirt	Small	Red
Shirt	Large	Blue

(iii) To enter text, just click in a cell and type. It is easy to create tables using Word. They can be simple, like the one below, or more complicated.



When you insert a table, Word automatically borders the outline and all the gridlines within – these will appear on a print out. You may want to change the border style and color or even remove some of the borders altogether. You can also shade in parts of your table to emphasise them. The tables and boarders toolbar has tools for editing table layout and design.

Also, all these options are available in the borders and shading dialog box.

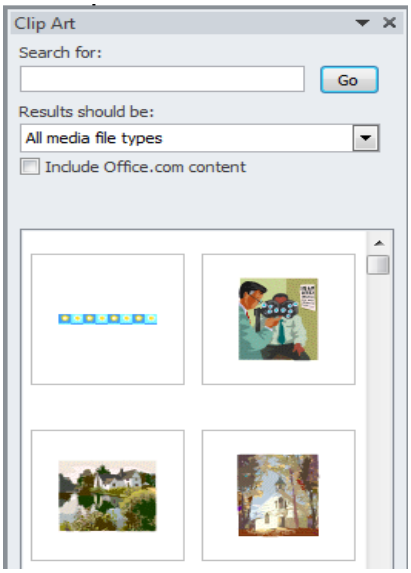


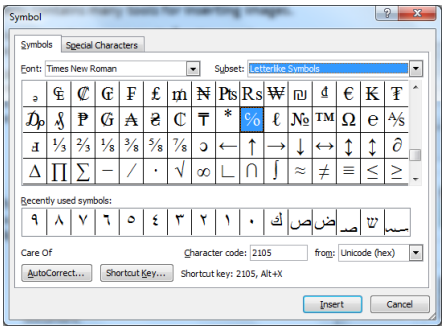
USING EXTERNAL DATA

To insert data from an external file:
i. Position the cursor at the point where you want to insert the file.
ii. Choose the INSERT ribbon TEXT group and the drop down arrow to the right of OBJECT select TEXT FROM FILE. The following dialog box will appear:
iii. Select the folder containing the file you want to insert and then click the file name to highlight it.
iv. Click the INSERT button to insert the file.

Inserting Symbols, Clip Art or Graphic Images into a document

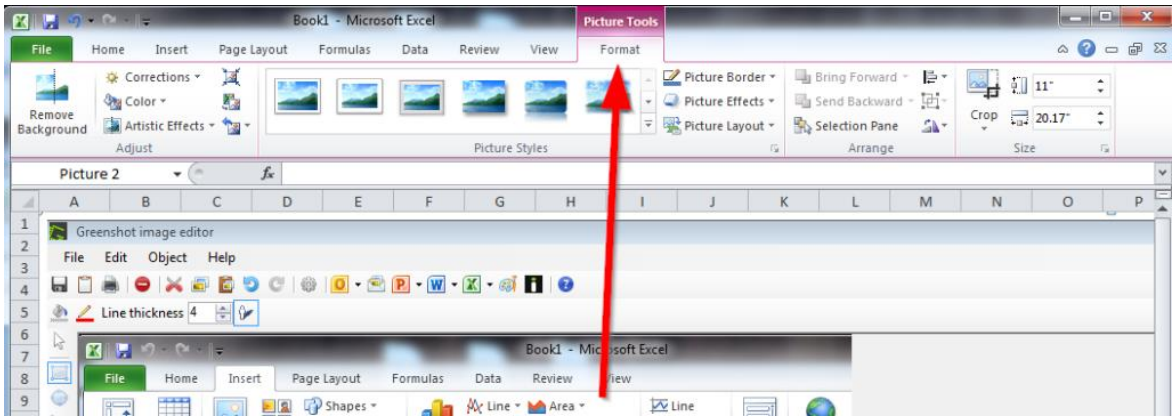
A document's appearance can be improved by adding clip art, symbols or graphic images. The insert menu contains many tools for inserting images.
The symbols not included on the keyboard such as letters of other alphabets, mathematical symbols or currency symbols can be inserted using the Insert Symbol command. The desired symbol is chosen from the Symbol Dialog box. You may wish to insert simple graphics, such as a picture from file or a piece of clip art, into a document. This can be done using the Insert Picture command.





MANIPULATING IMAGES

Microsoft Office offers very good image editing possibilities as well. To edit images in MS Office, simply click twice on every image to open the Picture formatting tab. You can adjust the color, borders, and size of every image, as well as add special effects, change contrasts, shapes, remove backgrounds, insert text and much more.



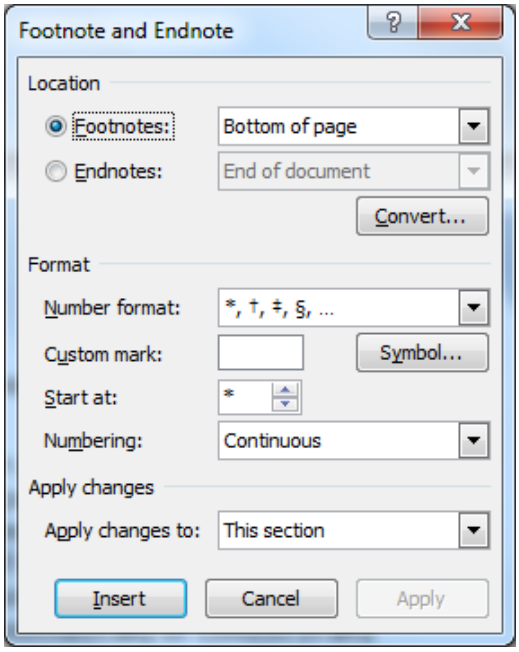
Cropping image/Change dimensions

Use the Crop option to remove unnecessary parts of the image. It is also possible to change the dimensions in order to make the image fit into the document better.

CREATING AND EDITING FOOTNOTES

Footnotes and Endnotes are reference texts that supply additional information about a given word or phrase in a document.

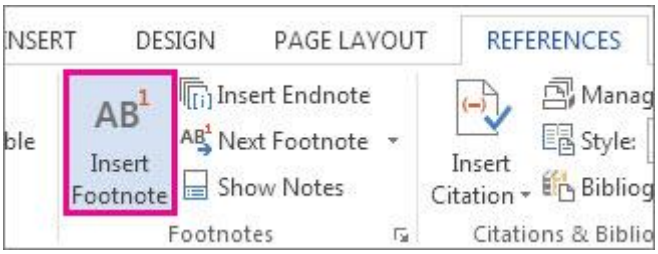
If you insert a footnote, the associated text can be placed either at the bottom of the page or beneath the last paragraph of text on the page. An endnote can be displayed either at the end of the section or at the end of the whole document. Both footnotes and endnotes are separated from the remainder of the text by a small horizontal line. Attention is drawn to the footnote text by a footnote reference mark[‡] in the main body of the text (these marks can be numbered automatically or consist of any characters you choose). See the bottom of this page for an example of a footnote.



Adding a footnote

Word inserts a reference mark in the text and adds the footnote at the bottom of the page.

1. Click where you want to add the footnote.
2. Click **References > Insert Footnote**.



Tip: You also can press Ctrl+Alt+F to insert a footnote.

[‡] An example of a footnote.

3. Type the *footnote text*.

Tip: To return to your place in your document, double-click the footnote mark.

NB Same procedure applies for adding an **endnote**, but Word inserts a reference mark in the text and adds the endnote at the end of the document.

Delete a footnote or an endnote

You don't delete the footnote with a separator line at the bottom of your page or an endnote at the end of your document. It's the *reference number* or mark in the body of the text you delete. And if you delete a reference number for a footnote or endnote itself, Word renumbers the existing notes.

1. Open your document.
2. On the **References** tab, in the **Footnotes** group, choose **Next Footnote** (default setting) or choose the drop-down arrow and choose **Next Endnote**.
3. Select the footnote or endnote and then press Delete.

ACTIVITY

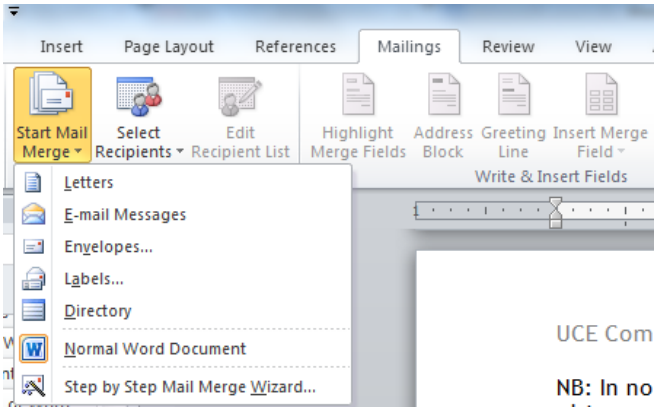
a)Using any word processing application program, insert the table below.

NAME	MARKS	
Moses	67	54
Hemedy	76	89
Marion	45	53
Teopista	83	57
Mercy	34	76
Samuel	54	77

b) Apply a thick outline border on the table.
c) Insert another row to represent the title as "BIOLOGY PAPER 1 AND 2 MARKS".
d) Merge the cells and center the title.
e) Insert a row between Mercy and Samuel for Jane.
f) Align all the records into the center.
g) Save your work as 'my table' on the desktop.
h) Print a copy of your work.

MAIL MERGE

You use mail merge when you want to create a set of documents, such as a form letter that is sent to many customers or a sheet of address labels. Each letter or label has the same kind of information, yet the content is unique. E.G. in letters to your customers, each letter can be personalized to address each



customer by name. The unique information in each letter or label comes from entries in a data source.

The mail merge process entails the following overall steps:

i. **SET UP THE MAIN DOCUMENT.** The main document contains the text and graphics that are the same for each version of the merged document. E.G., the return address or salutation in a form letter.

ii. **CONNECT THE DOCUMENT TO A DATA SOURCE**. A data source is a file that contains the information to be merged into a document. E.G., the names and addresses of the recipients of a letter.

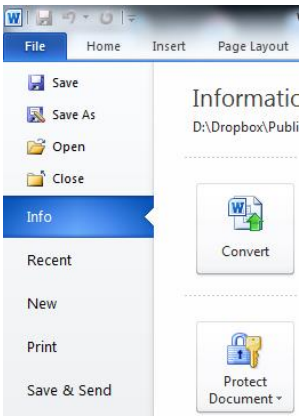
iii. **ADD PLACEHOLDERS**, called mail merge fields, to the document. When you perform the mail merge, the mail merge fields are filled with information from your data file.

iv. **REFINE THE LIST OF RECIPIENTS OR ITEMS.** Word generates a copy of the main document for each item, or record, in your data file. If your data file is a mailing list, these items are probably recipients of your mailing. If you want to generate copies for only certain items in your data file, you can choose which items (records) to include.

v. **PREVIEW AND COMPLETE THE MERGE**. You can preview each copy of the document before you print the whole set.

NB: The mail merge step by step wizard can take a user through the mail merge process.

MICROSOFT WORD 2010 - QUICK REFERENCE GUIDE



The **File tab**, located in the upper left-hand corner of the program window, replaces the Office button found in the 2007 version of Microsoft Word. The **File Tab** gives access to **backstage** view which contains basic file management commands, including New, Open, Save, Print, Close and Options.

To Create a New Document: Click the **File Tab**, select **New**, select a Blank document and click **Create**, or press **<Ctrl>** + **<N>**.

To Open a Document: Click the **File Tab** and select **Open**, or press **<Ctrl>** + **<O>**.

To Save a Document: Click the **Save button** on the Quick Access Toolbar, or press **<Ctrl>** **<S>**. Or Go to the **File Tab** and click **Save.**

To Save a Document with a Different Name: Click the **File Tab**, select **Save As**, and enter a new name for the document.

To Preview a Document: Click the **File Tab**, Click on Print the **Print Preview** Window will be on the right.

To Print a Document: Click the **File Tab** and select **Print**, and click Print or press **<Ctrl>** + **<P>**. > **To Undo:** Click the **Undo** button on the Quick Access Toolbar or press **<Ctrl>** + **<Z>**

To Close a Document: Click the **Close** button in the top right hand corner or press **<Ctrl>**+**<W>**. >

To Get Help: Press **<F1>** to open the Help window. Or click the question mark in the top right hand corner Type your question and press **<Enter>**.

To Exit Word: Click the **File Tab** and click **Exit**.

Formatting

To Cut or Copy Text: Select the text you want to cut or copy and click the **Cut** or **Copy** button in the Clipboard group on the Home tab.

To Paste Text: Place the insertion point where you want to paste and click the **Paste** button in the Clipboard group on the Home tab.

To Format Selected Text: Use the commands in the Font group on the Home tab, or click the **Dialog Box Launcher** in the Font group to open the Font dialog box.

To Copy Formatting with the Format Painter: Select the text with the formatting you want to copy and click the **Format Painter** button in the Clipboard group on the Home tab. Then, select the text you want to apply the copied formatting to.

To Change Paragraph Alignment: Select the paragraph(s) and click the appropriate alignment button

(**Align Left**, **Center**, **Align Right**, or **Justify**) in the Paragraph group on the Home tab.
To Indent a Paragraph: Click the **Increase Indent** button in the Paragraph group on the Home tab.
To Decrease an Indent: Click the **Decrease Indent** button in the Paragraph group on the Home tab.
To Add a Tab Stop: Click the **Tab alignment** box on the Ruler until you see the type of tab you want to insert. Then, click on the Ruler where you want to insert the tab stop.
To Adjust or Remove a Tab Stop: Click and drag the L tab stop to the desired position on the Ruler. Click and drag the tab stop off the Ruler to remove it.
To Change Paragraph Line Spacing: Click the **Line Spacing** button in the Paragraph group on the Home tab and select an option from the list.
To Create a Bulleted or Numbered List: Select the paragraphs you want to bullet or number and click the **Bullets** or **Numbering** button in the Paragraph group on the Home tab.
To Change a Document's Margins: Click the **Page Layout** tab on the Ribbon, click the **Margins** button in the Page Setup group, and select a setting.
To Change Page Orientation: Click the **Page Layout** tab on the Ribbon, click the **Orientation** button, and select an option from the list.
To Insert a Header or Footer: Click the **Insert** tab on the Ribbon and click the **Header** or **Footer** button in the Header & Footer group.
To Insert a Manual Page Break: Click the **Insert** tab on the Ribbon and click the **Page Break** button in the Page Setup group.
To Insert a Section Break: Click the **Page Layout** tab on the Ribbon, click the **Breaks** button in the Page Setup group, and select the type of break you want to insert.
To Correct a Spelling Error: Right-click the error and select a correction from the contextual menu. Or, press **<F7>** to run the Spell Checker.
To Find Text: Click the **Find** button in the Editing group on the Home tab. **To Replace Text:** Click the **Replace** button in the Editing group on the Home tab.
To Move Text with the Mouse: Select the text you want to move, drag the text to a new location, and release the mouse button.

Tables

To Insert a Table: Click the **Insert** tab on the Ribbon, click the **Table** button in the Tables group, and select **Insert Table** from the menu.
To Insert a Column or Row: Click the **Layout** tab under Table Tools and use the commands located in the Rows & Columns group.
To Delete a Column or Row: Select the column or row you want to delete, click the **Layout** tab under Table Tools, click the **Delete** button in the Rows & Columns group, and select an appropriate option from the menu.
To Adjust Column Width or Row Height: Select the column or row you want to adjust, click the **Layout** tab under Table Tools, and use the commands located in the Cell Size group.

Drawing and Graphics

To Insert a Clip Art Graphic: Click the **Insert** tab on the Ribbon and click the **Clip Art** button in the Illustrations group. Type the name of what you're looking for in the "Search for" box and click **Go**.
To Insert a Picture: Click the **Insert** tab on the Ribbon and click the **Picture** button in the Illustrations group. Find and select the picture you want to insert and click **Insert**.
To Adjust Text Wrapping: Double-click the object, click the **Text Wrapping** button in the Arrange group, and select an option from the list.
To Draw a Shape: Click the **Insert** tab on the Ribbon, click the **Shapes** button in the Shapes group, and select the shape you want to insert. Then, click where you want to draw the shape and drag until the shape reaches the desired size. Hold down the **<Shift>** key while you drag to draw a perfectly proportioned shape or straight line.
To Move an Object: Click the object and drag it to a new location. Release the mouse button when you're finished.
To Resize an Object: Click the object to select it, click and drag one of its sizing handles (o), and release the mouse button when the object reaches the desired size. Hold down the **<Shift>** key while dragging to maintain the object's proportions while resizing it.
To Delete an Object: Select the object and press the **<Delete>** key.

To Format an Object: Double-click the object and use the commands located on the Format tab.
To Insert a WordArt Object: Click the **Insert** tab on the Ribbon, click the **WordArt** button in the Text group, and select a design from the WordArt Gallery. Enter the text you. Click **OK**.

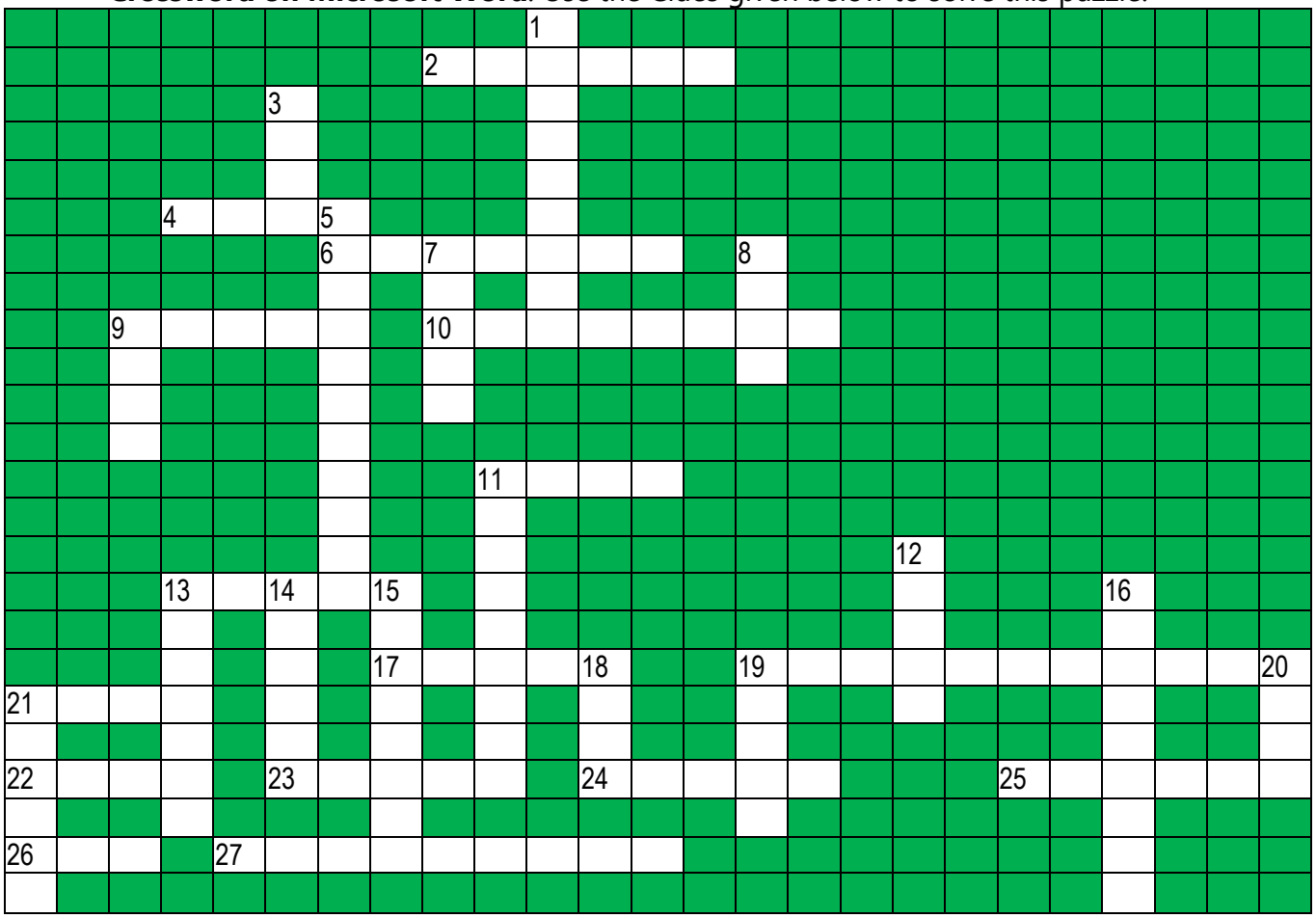
COMMONLY USED WORD PROCESSING KEYBOARD SHORTCUTS

Keystroke	Command	Keystroke	Command	Keystroke	Command
Alt-F4	Exit application	Ctrl-C	Copy	Ctrl-Shift-F5	Bookmarks
Alt-F8	Macros—edit	Ctrl-click	Graphic—original proportions	Ctrl-Shift-H	Hidden text
Alt-F9	Fields—display codes (toggle)	Ctrl-D	Font	Ctrl-Shift-K	Small Caps
Ctrl-] or [	Font grow/shrink 1 pt.	Ctrl-drag	Drawing—draw from center	Ctrl-Shift-L	List Bullet Style
Ctrl -	Soft hyphen -	Ctrl-E	Align—Center	Ctrl-Shift-M	Indent—decrease
Ctrl =	Subscript	Ctrl-Enter	Break—page	Ctrl-Shift-N	Normal Style
Ctrl-\	Move between master/subdocument	Ctrl-F	Find	Ctrl-Shift-P	Font Size
Ctrl-0 (zero)	Paragraph Space Above (add/delete 12 pt.)	Ctrl-F10	Maximize window	Ctrl-Shift-Q	Symbol Font
Ctrl-1	Line-spacing 1	Ctrl-F11	Fields—lock a field	Ctrl-Shift-S	Style box
Ctrl-2	Line-spacing 2	Ctrl-F3	Spike—cut to	Ctrl-Shift-spacebar	Hard space
Ctrl-3	Fields—lock a field	Ctrl-F4	Close	Ctrl-Shift-T	Hanging indent—decrease
Ctrl-4	Fields—unlock a field	Ctrl-F5	Document window—restore	Ctrl-Shift-Tab	Dialog box previous tabbed section
Ctrl-5	Line-spacing 1.5	Ctrl-F6	Next window	Ctrl-Shift-V	Paste formatting
Ctrl-6	Fields—unlink a field	Ctrl-F7	Document window—move	Ctrl-Shift-W	Underline—word
Ctrl-A	Select All	Ctrl-F8	Document window—size	Ctrl-Shift-Z	Remove Character formats
Ctrl-Alt- .	Ellipsis	Ctrl-F9	Fields—insert blank field	Ctrl-spacebar	Remove Character formats
Ctrl-Alt -	Remove menu item	Ctrl-G	Go To	Ctrl-T	Hanging Indent—increase
Ctrl-Alt =	Customize a menu	Ctrl-H	Replace	Ctrl-Tab	Dialog box next tabbed section
Ctrl-Alt-1	Heading Level 1	Ctrl-I	Italics	Ctrl-U	Underline
Ctrl-Alt-2	Heading Level 2	Ctrl-J	Justify—Full	Ctrl-Up/Down	Go To Next/Previous Paragr
Ctrl-Alt-3	Heading Level 3	Ctrl-K	Hyperlink	Ctrl-V	Paste
Ctrl-Alt-C	©	Ctrl-L	Align—Left	Ctrl-W	Close
Ctrl-Alt-E	Endnote	Ctrl-Left/Right	GoTo Next/Previous Word	Ctrl-X	Cut
Ctrl-Alt-F	Footnote	Ctrl-M	Indent—increase	Ctrl-Y	Repeat/Redo
Ctrl-Alt-F1	Ms. System Info	Ctrl-N	New document	Ctrl-Z	Undo
Ctrl-Alt-Hom	Browse a document	Ctrl-Num -	En Dash	F1	Help
Ctrl-Alt-I	Print Preview	Ctrl-O	Open a document	F10	Menu Bar
Ctrl-Alt-K	AutoFormat	Ctrl-P	Print	F11	Fields—next field
Ctrl-Alt-L	Insert List Num field	Ctrl-PgDn/PgUp	Browse next/previous item	F12	Save As
Ctrl-Alt-M	Insert Comment	Ctrl-Q	Remove Paragraph formats	F3	AutoText—insert entry
Ctrl-Alt-N	View—Normal	Ctrl-R	Align—Right	F6	Window pane—next
Ctrl-Alt-Num-	Em Dash	Ctrl-S	Save	F7	Spelling and Grammar check

Ctrl-Alt-Nu+	Customize a shortcut	Ctrl-Shift- >or <	Font next/previous size	F8	Selection extended
Ctrl-Alt-O	View—Outline	Ctrl-Shift -	Hard hyphen -	F9	Fields—update selected field
Ctrl-Alt-P	View—Page	Ctrl-Shift =	Superscript	Shift-drag	Drawing—constrain shape to symmetrical
Ctrl-Alt-PgDn/PgUp	To bottom/top of screen	Ctrl-Shift-8	Nonprinting characters on/off	Shift-drag	Graphic—crop
Ctrl-Alt-R	®	Ctrl-Shift-A	Case—All Caps	Shift-Enter	Newline within paragraph
Ctrl-Alt-S	Split a window	Ctrl-Shift-C	Copy formatting	Shift-F10	Shortcut Menu
Ctrl-Alt-T	™	Ctrl-Shift-D	Underline—double	Shift-F3	Case change (capitalization)
Ctrl-Alt-U	Table—remove border	Ctrl-Shift-E	Revision Marks on/off	Shift-F5	Go Back (3 maximum)
Ctrl-Alt-V	AutoText—insert entry	Ctrl-Shift-Enter	Break—column	Shift-F7	Thesaurus
Ctrl-Alt-Y	Repeat Find	Ctrl-Shift-F	Font Face		
Ctrl-Alt-Z	Go Back (3 maximum)	Ctrl-Shift-F11	Fields—unlock a field		
Ctrl-B	Bold	Ctrl-Shift-F3	Spike—paste		

ACTIVITY

Crossword on Microsoft Word. Use the Clues given below to solve this puzzle.



CLUES ACROSS

2. Area at the top of the page which can display information on every page. (6).

4. Ctrl+Z is equivalent to which command? (4).

6. Ctrl+H is equivalent to which command? (7).

9. Alt+F4 is equivalent to which command? (5).

10. What will pressing the F7 key check? (8).
11. Ctrl+S is equivalent to which command? (4).
13 Ctrl+P is equivalent to which command? (5).
17. The process of combining letters with addresses to produce mass mailing letters is referred to as mail: (5).
19. Formatting used to display a character above the line. (11).
21. Ctrl+O is equivalent to which command? (4).
22. Under which menu will you find page setup options? (4).
23. An alternative name for a graph. (5).
24. Under which menu will you find the word count option? (5).
25. Under which menu will you find paragraph format options? (6).
26. Ctrl+X is equivalent to which command? (3).
27. Ctrl+U is equivalent to which command? (9).

CLUES DOWN:

1. Pages can be formatted as portrait or: (9).
3. Ctrl+B is equivalent to which command? (4).
5. Portrait and Landscape are types of page: (11).
7. Ctrl+V is equivalent to which command? (5).
8. Ctrl+F is equivalent to which command? (4).
9. Ctrl+C is equivalent to which command? (4).
11. Formatting used to display a character below the line. (9).
12. To insert a manual page break, press the Ctrl key and which other key? (5).
13. The tool used to copy formatting from one item of text to another is called the Format: (7).
14. Ctrl+I is equivalent to which command? (6).
15. A special type of Word document, which can be recycled and used to create new documents. (8).
16. When typing, pressing ENTER key inserts a ……. break (9)
18. Under which drop down menu will you find the Cut, Copy and Paste commands? (4).
19. A set combination of formats that has a name and can be applied to text with a single click. (5).
20. What does 'T' stand for in RTF? (4).
21. Microsoft Word is often used within a suite of programs, called Microsoft: (6).

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC FOUR

1. Which of the following is not valid version of MS Office suite?
A) Office 2003
B) Office 2005
C) Office 2007
D) Office 2013

2. You cannot close Word application by
A) Choosing File menu then Exit
B) Press Alt+F4
C) Click X button on title bar
D) From File menu choose Close

3. What happens when you click on Insert >> Picture >> Clip Art
A) It inserts a clipart picture into document
B) It lets you choose clipart to insert into document
C) It opens Clip Art task pane
D) None of above

4. AutoCorrect was originally designed to replace _____ words as you type.
A) Short, repetitive
B) Grammatically incorrect
C) Misspelled
D) None of the above

5. The key F12 opens a
A) Save As dialog box
B) Open dialog box
C) Save dialog box
D) Function dialog box

6. Which of the following is not a word processor?
A) Apple Pages
B) Word perfect
C) Word wrap
D) Word pad

7. Which of the following is not available on the Ruler of MS Word screen?
A) Hanging Indent marker
B) Left Indent marker
C) Right Indent marker
D) Center Indent marker

8. Which file starts MS Word?
A) Winword.exe
B) Word.exe
C) Msword.exe
D) Word2007.exe

9. The word processing tool that offers similar words or alternatives is called a?
A) word checker
B) thesaurus
C) word scanner
D) spell checker

10. How can you apply exactly the same formatting you did to another text?
A) Copy the text and paste in new location. Then overwrite the pasted text with the new text.
B) Copy the text and click on Paste Special tool on new place
C) Select the text then click on Format Painter and select the new text
D) All of above

11. Which tool of a word processor lets you set certain page formatting options?
A) Page Dialog box
B) Document
C) Section
D) Page Setup

12. Which of the following is not a type of a text font format?
A) Embolden text
B) Align text to Left, Right or Center
C) Underline text
D) Strikethrough

13. What is a gutter margin?
A) Margin that is added to the left margin when printing
B) Margin that is added to right margin when printing

C) Margin that is added to the binding side of page when printing
D) Margin that is added to the outside of the page when printing

14. Portrait and Landscape are
A) Page Orientations
B) Paper Sizes
C) Page Layouts
D) Paper types

15. A character that is raised and smaller above the rest of the text is known as
A) Outlined
B) Raised
C) Superscript
D) Subscript

16. The text which appears just on top of the bottom margin of a page is called a …
A) header
B) footnote
C) margin text
D) footer

17. Formatting in word processing refers to
A) preparing a new floppy diskette for use.
B) cleaning diskettes for storage.
C) enhancing the appearance of text in a document.
D) erasing all data on a diskette.

18. In Word Mail Merge, the mailing list is known as the…
A) Data sheet
B) Source
C) Data source
D) Merged document

19. How can you increase the font size of selected text by one point every time?
A) By pressing Ctrl +]
B) By pressing Ctrl + [
C) By pressing Ctrl + }
D) By pressing Ctrl + {

20. Which operation you will perform if you need to duplicate a block of text to a new location?
A) Highlight, Select and Paste in new location.
B) Select, Cut and Paste in new location
C) Highlight, Copy and Paste in new location
D) Select, Copy and Paste in new location

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 4

1. (a)Use a Word processor of your choice to type the table below.

№	Item	Quantity	Price	Amount
1	Matooke	10 Bunches	10000	100000
2	Rice	20 kg	1500	30000
3	Meat	15 kg	4000	60000
4	Irish	10 kg	2500	25000
5	Cooking Oil	8 liters	1000	8000
6	Spices	N/A	9000	9000
7	Soda	4 crates	12000	48000
8	Mineral Water	5 boxes	10000	50000
9	Transportation	N/A	40000	40000
10	Miscellaneous	N/A	45000	45000
TOTAL AMOUNT REQUIRED				**XXXX**

NB:
(i) The font style is Verdana, size 15.
(ii) All column headings are and the words in the bottom row are **bold**.
(iii) The price column content is centered while the amount column content is aligned right.
(iv) The word "TOTAL AMOUNT REQUIRED" is merged across 4 cells.

FURTHER REQUIRED:

(b) Delete XXXX and use the auto sum tool on the table and borders toolbar to obtain the TOTAL AMOUNT REQUIRED.
(c)Add the title "Proposed Budget for Lunch during Wild Life Club Handover Party" at the beginning of the document.
(d) Format the heading added in (c) above as follows:
(i) Alignment: Centered
(ii) Font: Monotype corsiva
(iii) Font Color: Blue
(iv) Font Size: 20
Other font effects: Underline and Bold.
(e) Add a footer with the words: Drafted by [Your Name]
(f) Save as "Wild Life Club Budget" in a folder "Wild Life Club" on the desktop.

(g) Print your work

2. a) Type the document below in any word processor.

Computers in business

Different types of businesses commonly use computers to assist with day-to-day operating activities as:

- *Sales Order Entry*: procedures for handling customer orders, including receipt of the order and verification of availability of ordered stock.
- *Inventory Management and Control*: procedures of tracking, counting, and reordering stock items.
- *Personnel Management*: procedures for maintaining employee information (such as hire date, salary, performance rating, and date of last review) for both development and reporting purposes.
- *Payroll*: procedures for producing paychecks and reports on employee compensation.
- *Accounting*: procedures for maintaining the company's financial records.
- *Security*: procedures for controlling who has access to what data and information at what times and where, and who may enter data to a computer-based information system.
- *Investment and General Financial Management*: procedures a company institutes, follows, and reviews to guarantee profit and growth.

Computers are also being used in business to collect and analyze data, to produce concise information for management in a clear format suitable for making decisions, and to help managers avoid being overloaded with unnecessary information.

To keep up to date with detailed information about how computers are being used in the various sections of the business and banking world, consult well-known business publications such as *BusinessWeek*, *Fortune*, and *The Wall Street Journal*, as well as computer publications such as *PC World* and *Macworld*.

Source: Hutchinson, Sarah E. and Sawyer, Stacey C. (1992). Computers The User Perspective, 3rd edition, pg. 31, ISBN– 0-256-10435-2

Required:

(i) Change the heading to upper case, bold and underline it.
(ii) Change the font of the whole document to Tahoma, point size 11 except the heading which should be point size 15.
(iii) Add your name as header.
(iv) Save your file as Computers in Business.
(v) Print out a hard copy.

3. You are the secretary to the school's "Funds for Food" program and you are required to send out acknowledgement letters to people who have so far made contributions towards the program. The letter contents are the same for all the persons except the addresses, names and nature of contributions.

Below is the letter to be sent and a table of people who have made contributions.

Mukisa Senior Secondary School,
P.O. Box 21146,
IGANGA.
12TH June, 2007

[ADDRESS]

Dear ***[NAME],***

Thank you for your contribution of ***[NATURE OF CONTRIBUTION****] towards the "Funds for Food" program. This project is in its inaugural year but it has been a*

resounding success. The learners and staff agree that it should become an annual event. The principal would like to thank you and hopes for more support in future.

Thank you very much.

.....
NAMUKASA FLORENCE
PRINCIPAL

The following are the recipients:

NAME	ADDRESS	NATURE OF CONTRIBUTION
Lugayizi John	P.O. Box 14, KAMULI.	$430
Musiime Molly	P.O. Box 92, MBARARA.	500,000 /=
Nsibambi Eriya	P.O.Box 160, BULOBA.	20 kg of maize
Nakasolya Juliet	P.O. Box 1413, KAMPALA.	40 bags of rice

(i) Use an appropriate method in any word processing program to make a letter to be sent to each person in the table.
(ii) The address and names should be bolded and the contributions in italics.
(iii) Save your work as your index number
(iv) Print each of the four letters.

4. Type the following information as it is: (use font size 14)

Education in Uganda

The system of education in Uganda has a structure of 7 years of primary education*, 6 years of* secondary education *(divided into 4 years of lower secondary and 2 years of upper secondary school), and 3 to 5 years of* post-secondary education*. The present system has existed since the early 1960s.*

History

Mission schools were established in Uganda in the 1890s, and in 1924 the government established the first secondary school for Africans. By 1950, however, the government operated only three of the fifty-three secondary schools for Africans. Three others were privately funded, and forty-seven were operated by religious organizations. Education was eagerly sought by rural farmers as well as urban elites, and after independence many villages, especially in the south, built schools, hired teachers, and appealed for and received government assistance to operate their own village schools

Adopted from: Wikipedia, the free encyclopedia.

Further required:

a) Drop – cap the first letters of each of the paragraphs in the passage to 3 lines
b) Bolden and under line all dates
c) Make the headings font type **"comic Sans MS"** and font size 18
d) Copy the whole text to a new page and do the following changes:
   i. Remove all the Drop – caps
   ii. Create a footnote and in it state any two tertiary institutes you know
   iii. Insert a text box on the upper right hand corner of the page and in it insert the word count statistics including the footnotes and end notes.
   iv. Create a hyperlink to the first page.

NB: For more (over 200) computer practical questions and lab activities, get a copy of our book entitled "LAB ACTIVITIES FOR COMPUTER PRACTICAL APPLICATIONS"

S2 TOPIC 5: COMPUTER PRESENTATIONS

UNIT ONE: INTRODUCTION TO PRESENTATION SOFTWARE

UNIT INTRODUCTION

Computer presentations can be viewed as a slide show which usually displays on a large monitor or on a projection screen. Presentation software is used to create presentations which can communicate ideas and other information to a group of audience. Some presentation software can convert an existing slideshow into a format that can be accessed on the web.

Popular presentation software include Microsoft PowerPoint, Lotus Freelance Graphics, KPresenter, OpenOffice.org Impress, Corel Presentations, Celframe Power Presentation, Ability Presentation, Kingsoft Presentation, Apple Keynote, etc.

FEATURES OF PRESENTATION SOFTWARE

Presentation Software typically includes three major features: an editor that allows text to be inserted and formatted, a method for inserting and manipulating graphic images and a slide-show system to display the content.

Below are some of the specific features of PowerPoint.

Animation: This feature allows you to apply visual effects to individual items on the slide such as graphics, titles or bullet points.

Slide Show: helps to display and project all the digital slides created, shown one after the other, or as set in a custom show.

Notes Area: Allows the speaker to keep notes for personal reference during the presentation.

Summary slide: This feature creates one new slide with a list of all the titles of the slides in the presentation

Transition: Allows you to add visual movements as one slide changes to another.

Slide Master: Allows you to preset layouts, colors and fonts for all slides in the presentation at once

Insert text: Allows you to insert text in the presentation.

Delete text: Allows you to erase characters, words, charts, or slides as easily

Cut and Paste: Allows you to remove (cut) a section of text from one place in a presentation and insert (paste) it somewhere else.

Copy: Allows you to duplicate a section of text.

Page layout: Allows you to define various page sizes and margins.

Search and Replace: Allows you to search for a particular word or phrase. And replace it with another everywhere in the presentation

Graphics: The presentation application permits the addition of various types of graphics, such as bar charts, line charts, clip art, and photographs.

Headers, Footers, & Slide Numbering: Allows you to specify customized headers and footers that the presentation file will put at the top and bottom of every presentation. The presentation automatically keeps track of page numbers so that the correct number appears on each page.

Spell Checker: A utility that allows you to check the spelling of words in a presentation file.

Print: Allows you to send a presentation file to a printer to get a hardcopy or many hardcopies as you would like.

Thesaurus: A built-in thesaurus that allows you to search for synonyms (words with similar meaning) and antonyms ('opposites') without leaving the word processor.
Tables: Allows you to add tables and include content in rows and columns

- Several "**Auto"** features make it easier for you to perform your work.
  - AutoCorrect corrects your typing errors and capitalization mistakes
  - Auto clipart provides clipart suggestions that relate to your presentation topic
  - AutoContent Wizard has been enhanced to change your message depending on the size of your audience and time allotted for your presentation
- **Style Checker** allows the user to scan your presentation for design problems such as spelling errors, incorrect and inconsistent use of font sizes and other style attributes.
- **The Pack and Go** Wizard leads you step-by-step through preparing your presentation delivery on another computer. Your presentation is automatically compressed onto one or more diskettes or other storage devices.
- **Ability to present on screen presentation in color.**
- **Presentation conferencing** allows you to deliver a presentation or run a meeting from your computer onto a network of computers.

COMMON COMPUTER PRESENTATIONS TERMINOLOGIES

There are many terminologies associated with computer presentations. We shall be using most of the terms during our course of learning.
Some of the terminologies include are defined below:

- **Add-in:** An add-in is a small add-on program to enhance an existing program.
- **Ambient Light:** Ambient light is the available light in a room, whether by natural or mechanical sources.
- **Animated GIF**: An animated GIF is a graphic file type that is composed of many different images on top of each other. Together these images are compressed and work together, creating movement, and give the appearance of a mini movie.
- **Animation**: In Microsoft PowerPoint, animations are visual effects applied to individual items on the slide such as graphics, titles or bullet points.
- **Animation Scheme**: Animation schemes in PowerPoint allow you to apply formatting to bulleted items and titles from a variety of animation groupings, such as Subtle, Moderate and Exciting, rather than making the settings individually.
- **Batch File**: Batch files are short user generated programs created to accomplish repetitive tasks easily.
- **Bullet**: Bullets are small dots, squares, dashes or graphics that begin a short descriptive phrase
- **Clip**: video or movie is a small section of a larger video presentation. A series of video frames are run in succession to produce a short, animated video. This compilation of video frames results in a video clip.
- **Contextual Tabs and Menus**: Contextual tabs and menus appear when an object is selected. These contextual tabs contain information or options pertinent to that object only.
- **Custom show:** A custom show in PowerPoint is a group of slides selected from a larger presentation to present as a smaller presentation, without having to recreate a new presentation from scratch.

* **Default Design Template**: The default design template is the plain, white slide template in a new Microsoft PowerPoint presentation.
* **Design Template**: Design templates in Microsoft PowerPoint create a presentation that has a cohesive look. All slides are part of a coordinated package.
* **Design Theme**: Design themes make it easy to coordinate your PowerPoint presentation with colors, graphics and fonts that all work together to create a mood for your presentation.
* **Hotspot**: An invisible action button or area on an image map that is used as a hyperlink to another action or location.
* **Hyperlink**: Hyper linking allows the viewer to quickly access another location -- be it another Web site, a slide in a presentation, or link to another file
* **Layout:** The slide layout in PowerPoint is the arrangement of all the items that make up your slide, such as title, graphics or text boxes.
* **Lumens:** A projector emits light that produces the image on the screen. The amount of light produced is measured in lumens
* **Macro:** A macro is a series of commands to automate a repetitive task, are recorded and assigned to a keystroke combination.
* **Master Slide:** The Master Slide is the design template used for the slides within your presentation. There are four different master slides -- title master, notes master, handout master and the most common, the slide master
* **Normal View:** Normal View in Microsoft PowerPoint is the main working window in the presentation. The slide is shown full size on the screen.
* **Optimize Photos:** Optimizing is a term used to indicate a change to a photo or a graphic such as clip art, to reduce it in both visual size and file size, for use in other programs.
* **Outline View**: Outline View shows all the text of all slides, in a list on the left of the PowerPoint screen. No graphics are shown in Outline view
* **PowerPoint Viewer**: The PowerPoint Viewer is a small plug-in program from Microsoft that allows a PowerPoint presentation to be played on any computer.
* **ppt**: ppt is the file extension used for PowerPoint files.
* **Radio Button:** A radio button is a small circle beside an option that you may choose.
* **Resolution:** Resolution is the image created as a result of the number of pixels or dots used. This can be on a computer monitor or a setting on a digital camera
* **Selection Handles:** Selection handles surround the border of a graphic object and indicate to the user and the program that the object is currently selected and ready for something further to happen.
* **Slide:** A slide is a single page of a digital presentation created in presentation software programs such as PowerPoint and Open Office Impress.
* **Slide Layout:** The slide layout in PowerPoint is the arrangement of all the items that make up your slide, such as title, graphics or text boxes.
* **Slide Master:** The slide master in PowerPoint is a template that contains preset layouts, colors and fonts for PowerPoint presentations.
* **Slide Show:** A slide show is the presentation of all the digital slides created in programs such as PowerPoint and Open Office Impress, shown one after the other, just as on a slide projector of old.
* **Slide Sorter View:** A window in Microsoft PowerPoint that displays thumbnail versions of all your slides, arranged in horizontal rows.

* **Speaker Notes:** Speaker notes are notes added to the PowerPoint presentation slides for a reference for the presenter of the presentation.
* **Summary Slide:** The summary slide feature in Microsoft PowerPoint creates one new slide with a list of all the titles of the slides in the presentation
* **Task Pane:** Different areas of the Microsoft PowerPoint screen are known as panes. The Task pane is located on the right of the screen. It changes to display options associated with the current task.
* **Thumbnail:** A thumbnail is the term used to describe a minute version of a slide or picture.
* **Transition:** Slide transitions are the visual movements as one slide changes to another.
* **Watermark**: A watermark, in presentation software, is frequently used in a slightly different manner. A watermark is often a faded image or text used as a background of a slide. It is meant to enhance, but not be the focal point of the slide.

ADVANTAGES OF Electronic Presentations

The main purpose of an electronic presentation is to act as an aid during a speech presentation.

- It encourages and supports teaching learning process by displaying the content of the presentation. It helps the speaker avoid the common use of excessive text often found on the OHV (Over Head Projector).
- Presentation software is able to perform a variety of manipulations, such as editing text before printing it out, and the presenter can add new slides for adding new materials.
- Electronic presentations are usually fun to watch. They improve the audience's learning motivation, increasing materials for study, encouraging interaction between the speaker and the audience.
- Electronic Presentations can be saved in softcopy and reused in future.
- Presentation software usually provides a wide variety of presentation formats and layouts for the slides to organise content appropriately.
- Multimedia components such as clipart images, video clips and audio clips can be incorporated into the slides.
- The timing of the slides can be set so that the presentation automatically displays the next slides / items after a predetermined period of time.

Disadvantages

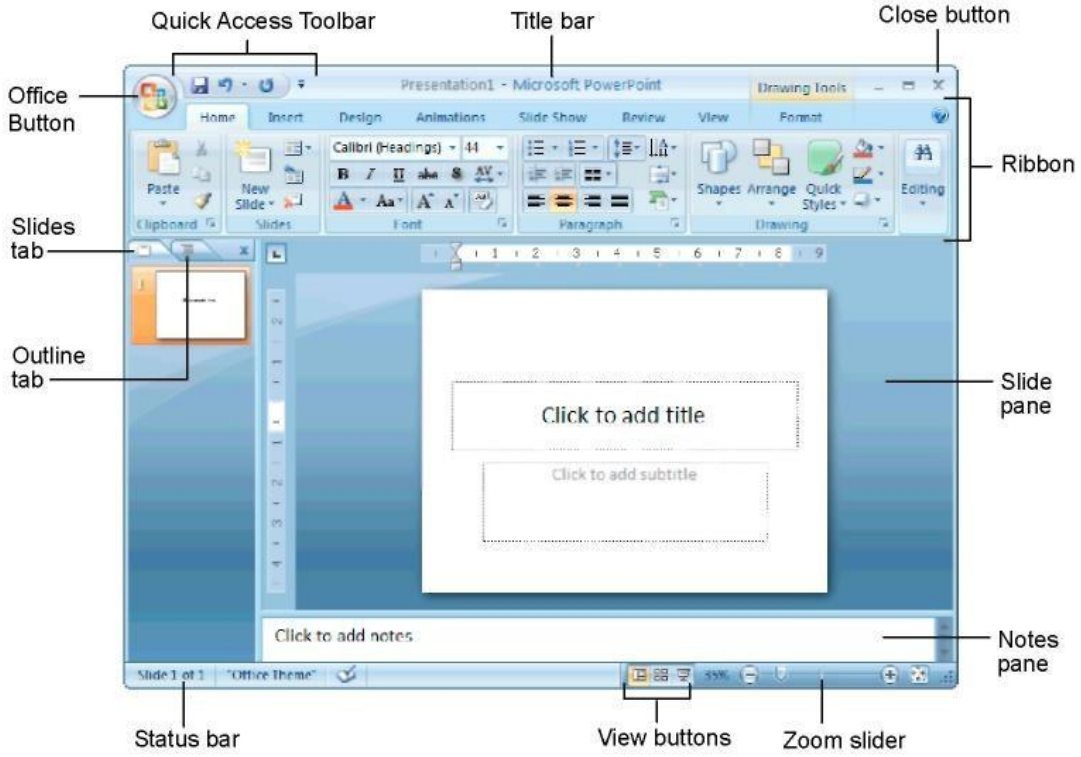
- Equipment failure: Relying on electronic presentations can be frustrating in case the computer system sometimes does not work as expected during delivery. The speaker has to be prepared with alternative strategy, such as keeping printed hand-outs to use in case of such a failure or power blackout.
- File Corruption: This damage caused by magnetic or physical damage so that the presentation will not run.
- Incompatible Media: Incompatible media means the incompatible the system available. The best solution is to be aware of the systems to use our own laptop.

- Distractions: Some members of the audience may be distracted by the animations and graphics in the presentation instead of focusing on the content.

UNIT TWO: PRESENTATIONS WITH MICROSOFT POWERPOINT

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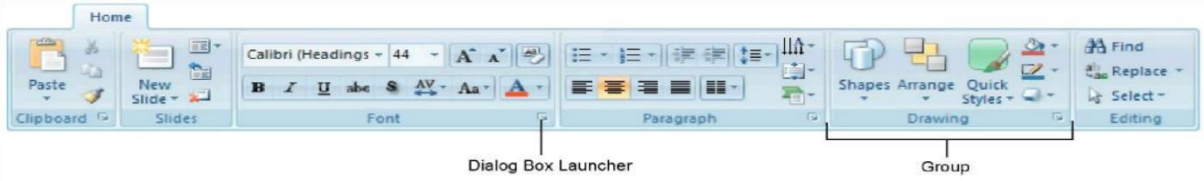
You can launch a presentation program like Microsoft PowerPoint to create slides. If installed on the computer, it can be found on the start menu > All Programs > Microsoft Office > Microsoft Office PowerPoint.



- To Create a New Presentation: Click the Office Button, select New, and click Create, or press <Ctrl> + <N>. To Open a Presentation: Click the Office Button and select Open, or press <Ctrl> + <O>.
- To Save a Presentation: Click the Save button on the Quick Access Toolbar, or press <Ctrl> + <S>.
- To Save a Presentation with a Different Name: Click the Office Button, select Save As, and enter a new name for the presentation.
- To Preview a Presentation: Click the Office Button, point to the Print list arrow, and select Print Preview.
- To Print a Presentation: Click the Office Button and select Print, or press <Ctrl> + <P>.
- To Undo: Click the Undo button on the Quick Access Toolbar or press <Ctrl> + <Z>.
- To Close a Presentation: Click the Office Button and select Close, or press <Ctrl> + <W>.
- To Get Help: Press <F1> to open the Help window. Type your question and press <Enter>.
- To Exit PowerPoint: Click the Office Button and click Exit PowerPoint.

- To Cut or Copy Text: Select the text you want to cut or copy and click the Cut or Copy button in the Clipboard group on the Home tab. To Paste Text: Place

the insertion point where you want to paste and click the Paste button in the Clipboard group on the Home tab.



- To Format Selected Text: Use the commands in the Font group on the Home tab, or click the Dialog Box Launcher in the Font group to open the Font dialog box.
- To Copy Formatting with the Format Painter: Select the text with the formatting you want to copy and click the Format Painter button in the Clipboard group on the Home tab. Then, select the text you want to apply the copied formatting to.
- To Change Paragraph Alignment: Select the paragraph(s) and click the appropriate alignment button (Align Left, Center, Align Right, or Justify) in the Paragraph group on the Home tab.
- To Create a Bulleted or Numbered List: Select the paragraphs you want to bullet or number and click the Bullets or Numbering button in the Paragraph group on the Home tab.
- To Apply a Document Theme (called design templates in previous versions of PowerPoint): Click the Design tab on the Ribbon, click the More button in the Themes group, and select a theme from the gallery.
- To Change the Slide Background: Click the Design tab on the Ribbon, click the Background Styles button in the Background group, and select a background.
- To Change Paragraph Line Spacing: Select the paragraph(s), click the Line Spacing button in the Paragraph group on the Home tab, and select an option from the list.
- To Insert a Header or Footer: Click the Insert tab on the Ribbon and click the Header & Footer button in the Text group. Select the option(s) that you want and click Apply or Apply to All.
- To Correct a Spelling Error: Right-click the error and select a correction from the contextual menu. Or, press <F7> to run the Spell Checker.

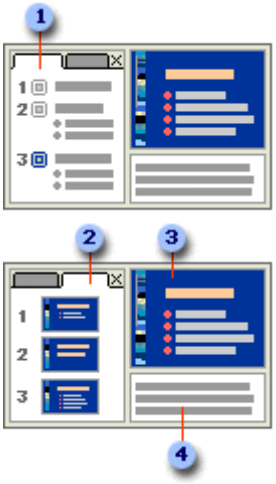
DEVELOPING A PRESENTATION

PRESENTATION VIEWS

PowerPoint has four main views: Normal view, Slide Sorter view, Notes Page view, and Slide Show view. What was known as the View menu in earlier versions of PowerPoint is now the View tab in Microsoft Office PowerPoint. The View tab is located on the Ribbon menu.

Normal view

Normal view is the main editing view, where you write and design your presentation. This view has four working areas:



1 Outline tab This is a great place to start writing your content — to capture your ideas, plan how you want to present them, and move slides and text around. The Outline tab shows your slide text in outline form.

2 Slides tab This is a great place to view the slides in your presentation as thumbnail-sized images while you edit. The thumbnails make it easy for you to navigate through your presentation and to see the effects of any design changes. You can also easily rearrange, add, or delete slides here.

3 Slide pane In the upper-right section of the PowerPoint window, the Slide pane displays a large view of the current slide. With the current slide shown in this view, you can add text and insert pictures (picture: A file (such as a metafile) that you can ungroup and manipulate as two or more objects, or a file that stays as a single object (such as bitmaps).), tables, SmartArt graphics, charts, drawing objects, text boxes, movies, sounds, hyperlinks, and animations.

4 Notes pane In the Notes pane below the Slide pane, you can type notes that apply to the current slide. Later, you can print your notes and refer to them when you give your presentation. You can also print notes to hand out to your audience or include the notes in a presentation that you send to the audience or post on a Web page.

You can switch between the Slides and Outline tabs. The Slides and Outline tabs change to display symbols if the pane becomes too narrow. To change the display of the Outline tab or Slides tab, see Show or hide Outline or Slides tab.

Slide Sorter view



Slide Sorter view is a view of your slides in thumbnail form.

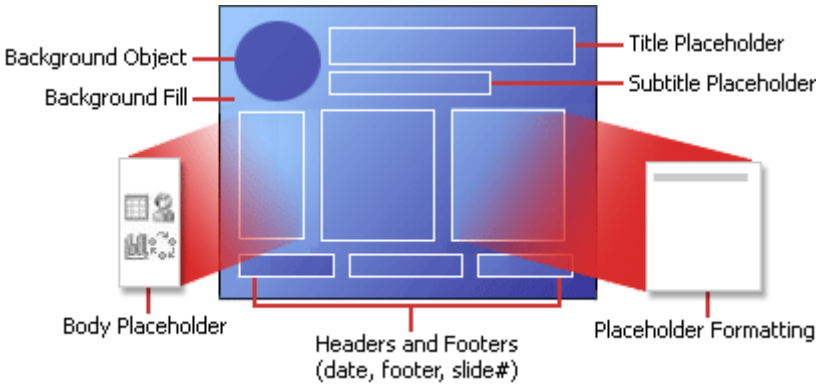
Notes Page view

You can type your notes in the Notes pane, which is located just below the Slide pane in Normal view. However, if you want to view and work with your notes in full page format, on the View tab, in the Presentation Views group, click Notes Page.

SLIDE DESIGN

A slide is designed by choosing an appropriate slide layout for it first, they adding necessary content and formation. You can use layouts to arrange objects and text on a slide. A layout defines positioning information for content that will later appear on a slide. Layouts contain placeholders, which in turn hold text, such as

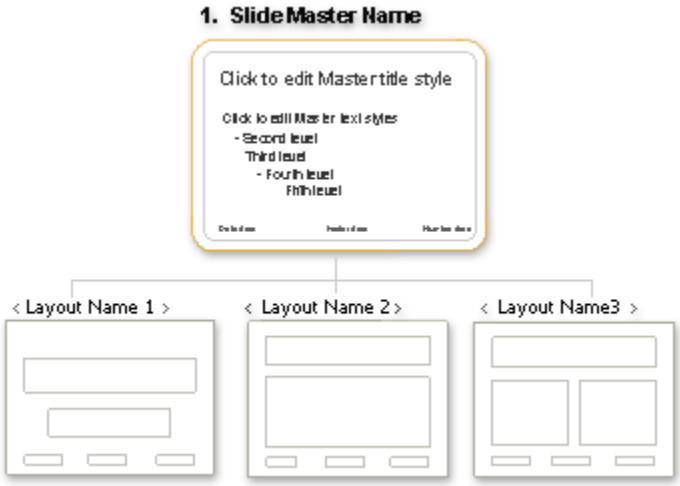
titles and bulleted lists, and slide content such as SmartArt graphics, tables, charts, pictures, shapes, and clip art. While you can add text and object placeholders to a layout or slide master, you cannot add placeholders directly to a slide.
Microsoft Office PowerPoint includes five built-in, standard layouts, or you can create custom layouts that meet your specific organizational needs. People creating presentations in your organization can then use either the built-in or your custom layouts to create their presentations.
The following diagram shows all of the layout elements that you can include on a Office PowerPoint slide.



A presentation can contain one or more slide masters. Each slide master contains one or more layouts, which make up a template. Each template can contain theme information, such as color, effects, fonts, slide background style, and default information describing how the theme and other formatting information are applied to the content in your slides.

SLIDE MASTER

A slide master is part of a template that stores information, including placements of text and objects on a slide, text and object placeholder sizes, text styles, backgrounds, color themes, effects, and animation.



When you save one or more slide masters as a single template file (.potx), it creates a template that you can use to create new presentations. Each slide master contains one or more standard or custom sets of layouts.
The following picture shows a single slide master that contains three layouts.

Edit a slide master

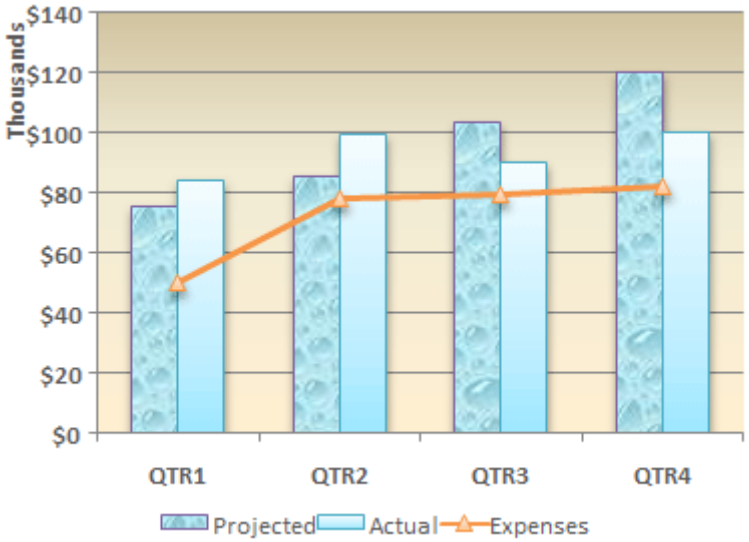
- On the View tab, in the Presentation Views group, click Slide Master.
- If you want to remove an unwanted, default placeholder , click the border of the placeholder, and then press DELETE.
- If you want to add a placeholder, do the following:
- Click a thumbnail slide layout below the slide master that you added.

- On the Slide Master tab, in the Master Layout group, click the arrow next to Insert Placeholder, and then click a placeholder.
- Click a location on the slide master, and then drag to draw the placeholder.
- Tip To resize a placeholder, drag one of its corner borders.
- You can also apply suitable formatting and add graphics and images to the slide master.

CHARTS

CREATING CHARTS

PowerPoint's Chart tool is located on the Standard toolbar. Click the Chart tool to create a graph in your presentation. PowerPoint activates a data worksheet with labels and numbers. Change these labels and numbers to reflect your data. If you do not want to graph a certain row or column, double-click it and PowerPoint will remove that data from the chart. When you are through entering data in the worksheet, close it.



Tip: It is efficient to choose a "Chart" layout for a new slide of chart. To do this:

- Click on the Insert menu and choose New Slide.
- In the layout dialogue box, choose the "Chart" layout. Click OK.
- In the PowerPoint working window, double click the chart place holder to activate the edit mode.
- Enter the data from the table below into the data sheet on the screen and watch the change of the chart.

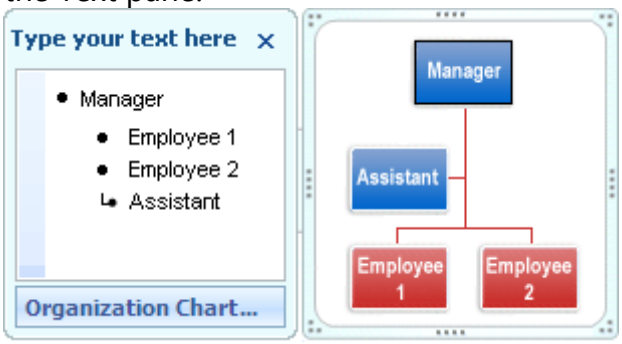
The chart border will change and the chart toolbar will appear at the top of the screen. The chart toolbar includes buttons for changing chart type., inserting gridlines and legends, and additional chart features. For example, if you want to change a column chart to a horizontal bar chart, choose that chart type from the Chart Type tool.

ORGANIZATION CHARTS

An organization chart graphically represents the management structure of an organization, such as department managers and all employees within a company. By using a SmartArt graphic in Microsoft Office Excel, Microsoft Office Outlook, Microsoft Office PowerPoint, or Microsoft Office Word, you can create an organization chart and include it in your worksheet, presentation, or document. To create an organization chart quickly and easily, you can type or paste text in your

organization chart and then have the text automatically positioned and arranged for you.

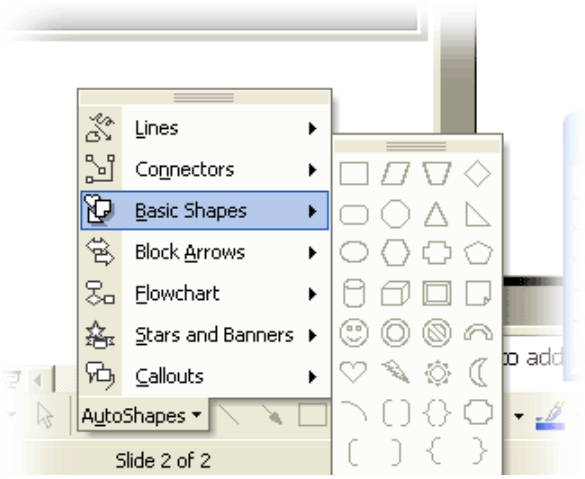
When you add an assistant shape to an organization chart layout, such as **Organization Chart**, a bullet with a line attached indicates the assistant shape in the Text pane.



Although you can use other hierarchy layouts to create an organization chart, the assistant shape and the hanging layouts are available only with organization chart layouts.

To quickly add a designer-quality look and polish to your SmartArt graphic, you can change the colors or apply a SmartArt Style to your organization chart. You can also add effects, such as glows, soft edges, or 3-D effects. In Office PowerPoint presentations, you can animate your organization chart.

GRAPHICAL OBJECTS



PowerPoint has a set of drawing tools used to place lines, shapes, figures, WordArt, and text on a slide.

PowerPoint's drawing tools are similar to drawing tools in other graphics programs. To use these tools, make sure you are in Slide View.

Use the Auto Shapes tool (shown below) to create regular shapes like stars, polygons, triangles, and other shapes.

If you draw something on a slide and want to delete it, click on the object and press the Delete key.

PowerPoint has a collection of clip art that you can use in your presentation. Select the slide you want the clip art on, and choose Picture/Clip Art from the Insert menu. Choose the category you want and select a clip art image. You can also use the Copy and Paste procedures described earlier to paste clip art into PowerPoint from other programs. For example, if you have created your own logo in Adobe Illustrator, you can copy the image and paste it into a PowerPoint presentation. PowerPoint also lets you insert Microsoft Excel charts, Microsoft Word tables, pictures in separate files and other objects.

- **To Insert a Clip Art Graphic:** Click the **Insert** tab on the Ribbon and click the **Clip Art** button in the Illustrations group. Type the name of what you're looking for in the "Search for" box and click **Go**.

- **To Insert a Picture:** Click the **Insert** tab on the Ribbon and click the **Picture** button in the Illustrations group. Find the picture you want to insert and click **Insert**.
- **To Draw a Shape:** Click the **Insert** tab on the Ribbon, click the **Shapes** button in the Shapes group, and select the shape you want to insert. Then, click where you want to draw the shape and drag until the shape reaches the desired size. Hold down the **<Shift>** key while you drag to draw a perfectly proportioned shape or straight line.
- **To Format an Object:** Double-click the object and use the commands located on the Format tab.
- **To Move an Object:** Click the object and drag it to a new location. Release the mouse button when you're finished.
- **To Resize an Object:** Click the object to select it, click and drag one of its sizing handles (0), and release the mouse button when the object reaches the desired size. Hold down the **<Shift>** key while dragging to maintain the object's proportions while resizing it.
- **To Delete an Object:** Select the object and press the **<Delete>** key.

PRESENTATION OUTPUT

USING TRANSITIONAL EFFECTS

Slide transitions effects that occur in Slide Show view when you move from one slide to the next. You can control the speed of each slide transition effect, and you can also add sound. Microsoft Office PowerPoint includes many different types of slide transitions, including (but not limited to) the following:



1 No transition 2 Blinds Horizontal 3 Blinds Vertical 4 Box In 5 Box Out 6 Checkerboard Across 7 Checkerboard Down 8 Comb Horizontal 9 Comb Vertical

- To see more transition effects, on the transitions menu, click the More button , as shown in the diagram above.
- To set the slide transition speed, in the Transition To This Slide group, click the arrow next to Transition Speed, and then select the speed that you want.
- To Add the same slide transition to all of the slides in your presentation, In the Transition To This Slide group, click Apply to All.

USING ANIMATION EFFECTS

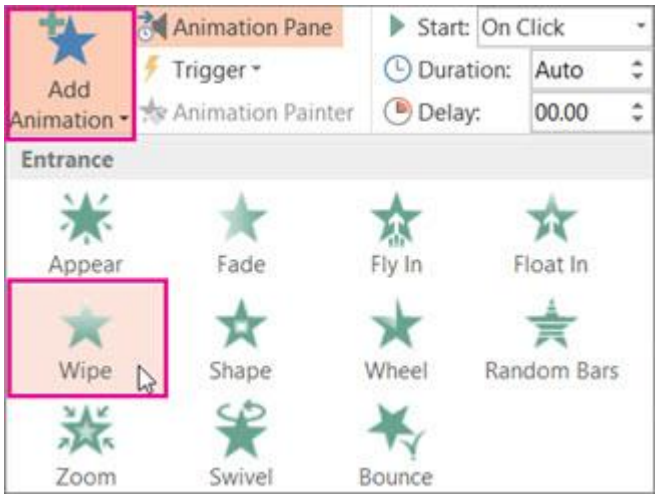
You can animate the text, pictures, shapes, tables, SmartArt graphics, and other objects in your PowerPoint presentation.

Effects can make an object appear, disappear, or move. They can make an object change size or color.

Apply an animation

Select the object or text on the slide that you want to animate.

On the **Animations** tab of the ribbon, click **Add Animation**, and pick an animation effect.



Remove an animation effect

When you animate an object, a small numeral appears just to the left of that object to indicate the presence of an animation effect and its place in the sequence of animations on the current slide.



Select the numeral of the animation that you want to remove.

Press the Delete key on your keyboard.

TIP: You can apply animations on placeholders on the master slide and they will be applied to all slides in the presentation at once to save time.
NB: Avoid applying multiple uncoordinated animations on the same object.

ADDING PRESENTER NOTES ON A SLIDE

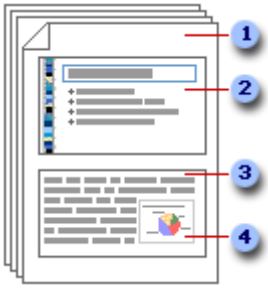
Use the notes pane (notes pane: The pane in normal view in which you type notes that you want to accompany a slide. You print these notes as notes pages or have them display when you save a presentation as a Web page.) in Normal view to write notes about your slides.



1 Notes pane in Normal view

You can type and format your notes as you work in Normal view, but to see how your notes pages will be printed and to see the full effect of any text formatting, such as font colors, switch to Notes Page view. You can also check and change the headers and footers of your notes in Notes Page view.

Each notes page shows an image of a slide, along with the notes that go with that slide. In Notes Page view, you can embellish your notes with charts, pictures (picture: A file (such as a metafile) that you can ungroup and manipulate as two or more objects, or a file that stays as a single object (such as bitmaps).), tables, or other illustrations.



1 Notes pages include your notes and each slide in the presentation.

2 Each slide is printed on its own notes page.

3 Your notes accompany the slide.

4 Data such as charts or pictures can be added to your notes pages.

- A picture or object that you add in Notes Page view will appear on your printed notes page, but not on your screen in Normal view. If you save your presentation as a Web page, the picture or object does not appear when you display your presentation in the Web browser, although your notes do.
- The changes, additions, and deletions that you make on a notes page apply only to that notes page and to the note text in Normal view.
- If you want to enlarge, reposition, or format the slide image area or notes area, go to Notes Page view and make the changes.
- You can't draw or place pictures in the notes pane in Normal view. Switch to Notes Page view and draw or add the picture there.

NAVIGATION USING ACTION BUTTONS AND HYPERLINKS

Hyperlinks

A hyperlink is a connection from one slide to another slide in the same presentation (such as a hyperlink to a custom show) or to a slide in another presentation, an e-mail address, a Web page, or a file.

You can create a hyperlink from text or from an object, such as a picture, graph, shape, or WordArt .

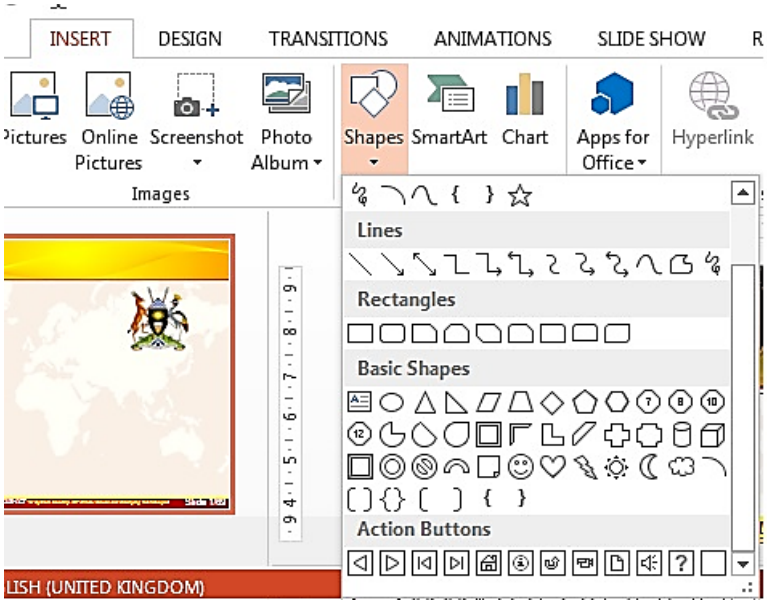
Create a hyperlink to a slide in the same presentation

In Normal view, select the text or the object that you want to use as a hyperlink.
On the Insert tab, in the Links group, click Hyperlink. Or press Ctrl+K.
Under Link to, click a place in this document, click the slide that you want to use as the hyperlink destination.

Action Buttons

An action button is a ready-made button that you can insert into your presentation and define hyperlinks for. Action buttons contain shapes, such as right and left arrows, and commonly understood symbols for going to next, previous, first, and last slides, and for playing movies or sounds. Action buttons are most commonly used for self-running presentations — for example, presentations that are shown repeatedly at a booth or kiosk (kiosk: A computer and monitor, typically located in an area frequented by many people, that can include touch screens, sound, or video. Kiosks can be set up to run PowerPoint presentations automatically, continuously, or both.).

Creating an Action button



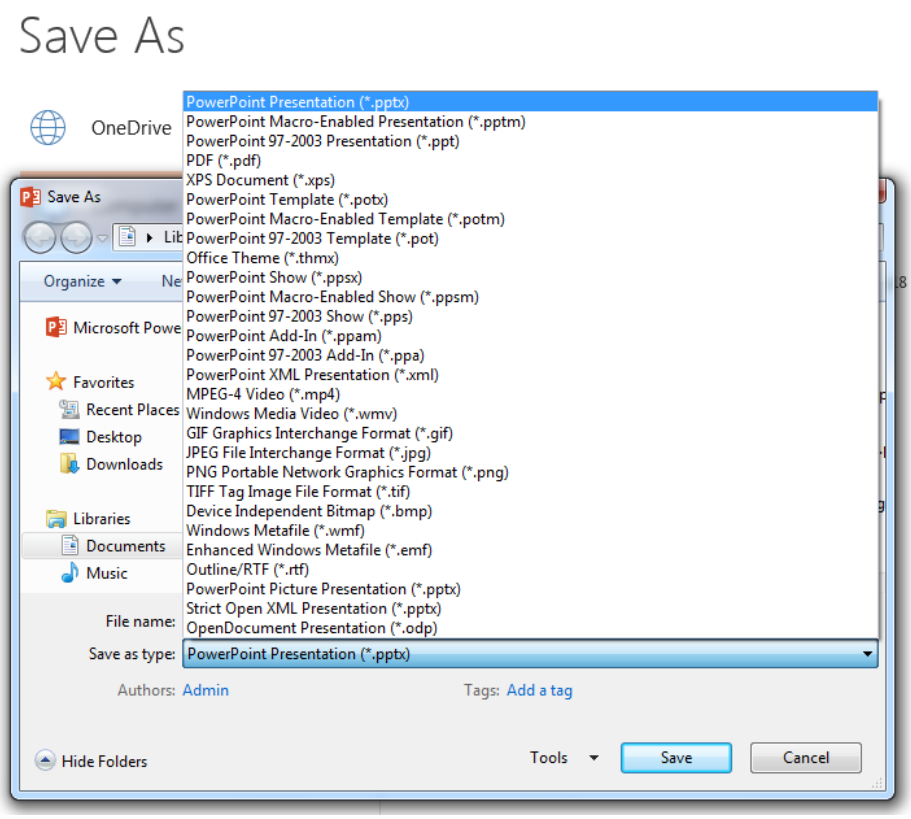
- On the Insert tab, in the Illustrations group, click the arrow under Shapes, and then click the More button .
- Scroll to the bottom, under Action Buttons, click the button that you want to add.
- Click a location on the slide, and then drag to draw the shape for the button.
- In the Action Settings dialog box, do one of the following:
- To choose the behavior of the action button when you click it, click the Mouse Click tab.
- To choose the behavior of the action button when you move the pointer over it, click the Mouse Over tab.
- To choose what will happen when you click or move the pointer over the action button, do one of the following:
- If you don't want anything to happen, click None.
- To create a hyperlink, click Hyperlink to, and then select the destination for the hyperlink.

CHECKING SPELLING

Maybe you are looking for a way to find and fix spelling mistakes in your document more quickly and easily? Or maybe you don't want to see the wavy red lines that your Microsoft Office program displays in your document? In most

cases, checking spelling in all the Microsoft Office programs is fairly easy. Press F7, and then use the dialog box or task pane that appears to go through the file or item that you are working on. The following are detailed instructions as well as explanations of the unique options that are available for each Microsoft Office program:

- Click inside the file. Optionally, to check only a specific piece of text, select the text that you want to check.
- Press F7 or On the Review tab, in the Proofing group, click Spelling
- If the program finds spelling mistakes, a dialog box or task pane is displayed, and the first misspelled word found by the spelling checker is selected. You decide how you want to resolve each error that the program finds.



SAVING A PRESENTATION IN APPROPRIATE OUTPUT FORMATS

With Microsoft Office PowerPoint you can save your presentation into any of the file types listed below.

Save As file type	Extension	Use to save
PowerPoint Presentation	.pptx	An Office PowerPoint 2007+ presentation, which is an XML-enabled file format, by default.
PowerPoint Macro-Enabled Presentation	.pptm	A presentation that contains Visual Basic for Applications (VBA) code.
PowerPoint 97-2003 Presentation	.ppt	A presentation that you can open in PowerPoint 97 to Office PowerPoint 2003.
PDF Document Format	.pdf	Publish as PDF or XPS: A PostScript-based electronic file format developed by Adobe Systems that preserves document formatting and enables file sharing.
XPS Document Format	.xps	Publish as PDF or XPS: A new Microsoft electronic paper format for exchanging documents in their final form.
PowerPoint Design Templates	.potx	A presentation as a template that you can use to format future presentations.
PowerPoint Macro-Enabled Design Template	.potm	A template that includes pre-approved macros that you can add to a template to be used in a presentation.

PowerPoint 97-2003 Design Template	.pot	A template that you can open in PowerPoint 97 to Office PowerPoint 2003.
Office Theme	.thmx	A style sheet that includes definitions of a color theme, font theme, and effect theme.
PowerPoint Show	.pps; .ppsx	A presentation that always opens in Slide Show view rather than in Normal view.
PowerPoint Macro-Enabled Show	.ppsm	A slide show that includes pre-approved macros that you can run from within a slide show.
PowerPoint 97-2003 Show	.ppt	A slide show that you can open in PowerPoint 97 to Office PowerPoint 2003.
Single File Web Page	.mht; .mhtml	A Web page as a single file with an .htm file and all supporting files, such as images, sound files, cascading style sheets, scripts, and more. Good for sending a presentation in e-mail
Web Page	.htm; .html	A Web page as a folder with an .htm file and all supporting files, such as images, sound files, cascading style sheets, scripts, and more. Good for posting on a site or editing with Microsoft Office FrontPage or another HTML editor.
GIF (Graphics Interchange Format)	.gif	A slide as a graphic for use on Web pages. The GIF file format is limited to supporting 256 colors, and therefore it is more effective for scanned images such as illustrations rather than color photographs. GIF can also be good for line drawings, black and white images, and small text that is only a few pixels high. GIF supports animation and transparent backgrounds.
JPEG (Joint Photographic Experts Group) FileFormat	.jpg	A slide as a graphic for use on Web pages. The JPEG file format supports 16 million colors and is best suited for photographs and complex graphics.
PNG (Portable Network Graphics) Format	.png	A slide as a graphic for use on Web pages. PNG was approved as a standard by the World Wide Web Consortium (W3C) to replace GIF. PNG does not support animation as GIF does, and some older browsers do not support this file format.
TIFF (Tag Image File Format)	.tif	A slide as a graphic for use on Web pages. TIFF is the best file format for storing bit-mapped images on personal computers. TIFF graphics can be any resolution, and they can be black and white, gray-scaled, or color.
Device Independent Bitmap	.bmp	A slide as a graphic for use on Web pages. A bitmap is a representation, consisting of rows and columns of dots, of a graphics image in computer memory. The value of each dot (whether it is filled in or not) is stored in one or more bits of data.
Outline/RTF	.rtf	A presentation outline as a text-only document tha provides smaller file sizes and the ability to share macro-free files with others who may not have the same version of PowerPoint or the operating system that you have. Any text in the notes pane is not saved with this file format.
PowerPoint slide	.sldx	An autonomous slide file.
MPEG 4 Video	.mp4	A video file (Converts an automatically running presentation into a video)

CHOOSING PRINTER OPTIONS AND PRINTING A PRESENTATION

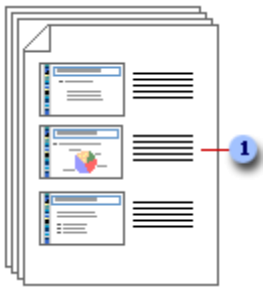
In Microsoft Office PowerPoint, you can create and print slides, handouts, and notes pages. Most presentations are designed to be presented in color, but slides and handouts are typically printed in black and white or shades of gray, also known as grayscale (grayscale: A series of shades from white to black used in displaying or printing text and graphics.). When you print in grayscale, color images are printed in variations of gray tones between black and white.
When you print your slides, PowerPoint sets the colors in your presentation to match the selected printer's capabilities. You can size the slides to fit different paper sizes, including letter and ledger, or you can specify a custom size.In Microsoft Office PowerPoint you can print other parts of a presentation, such as handouts, notes pages, or a presentation in Outline view.

Print the slides

- Click the Microsoft Office Button or File Tab, click the arrow next to Print, and then click Print Preview.
- In the Page Setup group, in the Print What list, select Slides.
- Click Options, point to Color/Grayscale, and then click one of the following:
- Color If you print to a color printer, this option prints in color.
- Color (On Black and White Printer) If you print to a black-and-white printer, this option prints in grayscale.
- Grayscale This option prints images that contain variations of gray tones between black and white. Background fills are printed as white, so that the text will be more legible. (Sometimes grayscale appears the same as Pure Black and White.)
- Pure Black and White This option prints the handout with no gray fills.
- Click Print.

Create and print handouts

You can print your presentation in the form of handouts — with one, two, three, four, six, or nine slides on a page — that your audience can use to follow along as you give your presentation or keep for future reference.



1 The three-slides-per-page handout includes lined space for note taking by the audience.

You can select a layout for your handouts in print preview (print preview: A view of a document as it will appear when you print it.).

SLIDE SHOW

Sub topic Objectives:

1. setting up a slide show to run manually or automatically.
2. running a slide show from current slide.

SETTING UP A SLIDE SHOW TO RUN MANUALLY OR AUTOMATICALLY

- Use the options in the Show slides section to specify which slides are available in a presentation or to create a custom show (A presentation within

a presentation in which you group slides in an existing presentation so that you can show that section of the presentation to a particular audience.).

- To show all slides in your presentation, click All.
- To show a specific group of slides from your presentation, enter the first slide number that you want to show in the From box, and enter the last slide number that you want to show in the To box.
- To start a custom slide presentation that derives from another PowerPoint presentation, click Custom show, and then click the presentation that you want to view as a custom show (custom show: A presentation within a presentation in which you group slides in an existing presentation so that you can show that section of the presentation to a particular audience.).

Show options

- Use the options in the Show options section to specify how you want sound files, narrations, or animations to run in your presentation.
- To play a sound file or animation continuously, select the Loop continuously until 'Esc' check box.
- To show a presentation without playing an embedded narration, select the Show without narration check box.
- To show a presentation without playing an embedded animation, select the Show without animation check box.
- When you deliver your presentation before a live audience, you can write on your slides. To specify an ink color, in the Pen color list, select an ink color.
- Note The Pen color list is available only if Presented by a speaker (full screen) (in the Show type section) is selected.

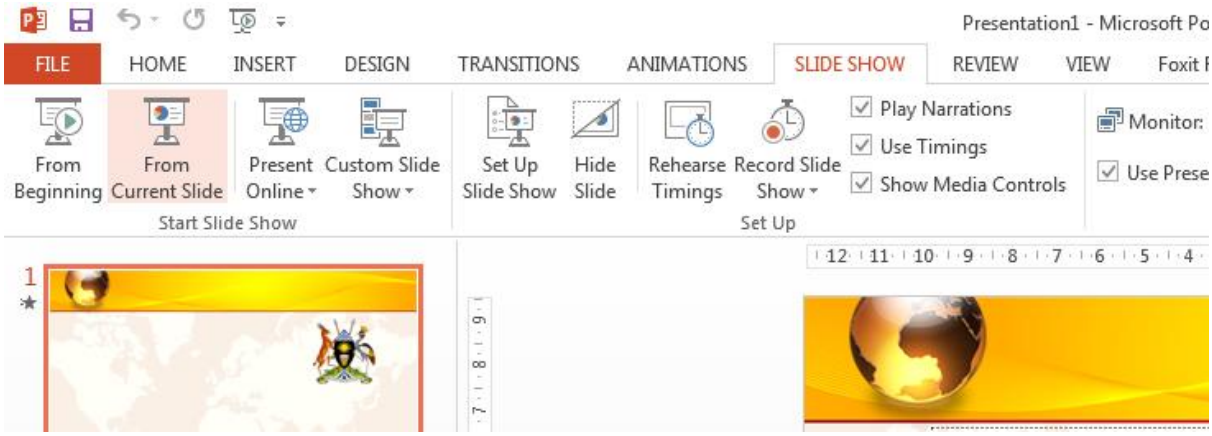
Advance slides

- Use the options in the Advance slides section to specify how to move from one slide to another.
- To advance to each slide manually during your presentation, click Manually.
- To use slide timings to advance to each slide automatically during your presentation, click Using timings, if present.
- Tip You can use slide timings to set a pace for your self-running presentation.

RUNNING A SLIDE SHOW FROM CURRENT SLIDE

When you press F5 to switch to a full-screen slide show, the first slide will show first regardless of which slide is the current one in normal view.

To run a slideshow from current slide, you press Shift + F5 or select the appropriate option from the Slide Show Menu.



PRINCIPLES OF A GOOD PRESENTATION DESIGN

1. Keep it Simple

Don't let your message and your ability to tell a story get derailed by slides that are unnecessarily complicated, busy, or jumbled. Your slides should have plenty of "white space". Do not feel compelled to fill empty areas on your slide with other unnecessary graphics or text boxes that do not contribute to better understanding. The less clutter you have on your slide, the more powerful your visual message will become.

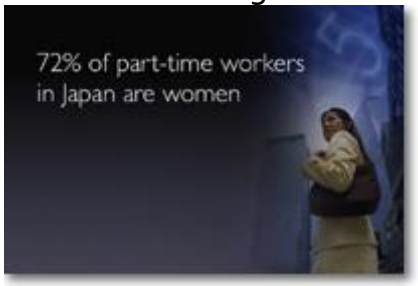


2. Limit text

Remember, the slides are meant to support the narration of the speaker, not make the speaker redundant. Try to avoid text-heavy slides like this one.



Aim for something like this simple slide below.



3. Limit animations

Use slide animations sensibly. Object builds (also called animations), such as bullet points, should not be animated on every slide. Some animation is a good thing, but stick to the most subtle and professional (similar to what you might see on the evening TV news broadcast). A simple "Wipe Left-to-Right" (from the "Animations" menu) is good for a bullet point, but a "Move" or "Fly" for example is too tedious and slow (and yet, is used in many presentations today). Listeners will get bored

very quickly if they are asked to endure slide after slide of animation. For transitions between slides, use no more than two-three different types of transition effects.

4. Use high-quality graphics

Use high-quality graphics including photographs. You can take your own high-quality photographs with your digital camera, purchase professional stock photography, or use the plethora of high-quality images available on line (be cautious of copyright issues, however). Never simply stretch a small, low-resolution photo to make it fit your layout – doing so will degrade the resolution even further.

5. Have a visual theme, but avoid using PowerPoint templates

You clearly need a consistent visual theme throughout your presentation, but most templates included in PowerPoint have been seen by your audience countless times (It may have been interesting in 1993, but today the use of those common themes often undermines the professionalism of the presenter). Your audience expects a unique presentation. You can make your own background templates which will be more tailored to your needs. You can then save the PowerPoint file as a Design Template (.pot) and the new template will appear among your standard Microsoft templates for your future use.

6. Choose clearly visible colors

Color evokes feelings. Color is emotional. The right color can help persuade and motivate. There should be a sharp, clear contract between background and foreground colors on a slide.

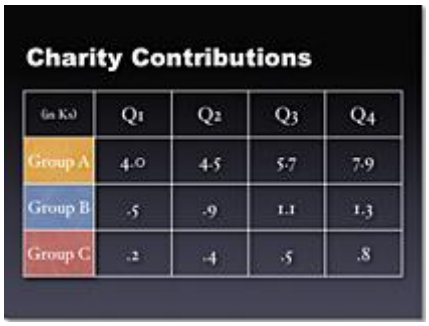
7. Choose easy to read fonts

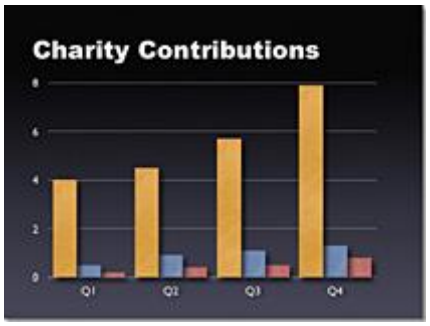
Fonts communicate subtle messages in and of themselves, which is why you should choose fonts deliberately. Use use no more than two complementary fonts (e.g., Arial and Arial Bold). Make sure you know the difference between a Serif font (e.g., Times New Roman) and a Sans-Serif font (Helvetica or Arial). Serif fonts were designed to be used in documents filled with lots of text. Serif fonts are said to be easier to read at small point sizes, but for on screen presentations the serifs tend to get lost due to the relatively low resolution of projectors. San-serif fonts are generally best for PowerPoint presentations, but regardless of what font you choose, make sure the text can be read from the back of the room.

8. Use appropriate charts

Always be asking yourself, "How much detail do I need?" Presenters are usually guilty of including too much data in their on-screen charts.

In general, tables are good for side-by-side comparisons of quantitative data. However, tables can lack impact on a visceral level. If you want to show how your contributions are significantly higher than two other parties, for example, it would be best to show that in the form of a bar chart (below, right). If you're trying to downplay the fact that your contributions are lower than others, however, a table will display that information in a less dramatic or emotional way.





Summary: A good presentation should have

- Font sizes that the audience can read from a distance.
- Suitable charts and graphs with understandable labels.
- High contrast between background color and text color.
- Proper spelling and grammar.
- Appropriate art and graphics to help convey your message.
- A consistent and simple design. This can be achieved using a slide master.
- Limited number of words on each screen. Use key phrases and include only essential information.
- Not have unnecessary CAPITALISATION.
- Not have distracting flashy transitions such as text fly-ins. These features may seem impressive at first, but are distracting and get old quickly.
- Not have too many animations and sounds that could negatively impact the credibility of the presentation.
- Have good quality images that reinforce and complement your message. Ensure that your image maintains its impact and resolution when projected on a larger screen.
- A limited number of slides. Presenters who constantly "flip" to the next slide are likely to lose their audience. A good rule of thumb is one slide per minute.

Delivery Tips:

- Know how to and practice moving forward AND backward within your presentation. Audiences often ask to see the previous screen again.
- Have a Plan B in the event of technical difficulties. Remember that transparencies and handouts will not show animation or other special effects.
- Practice with someone who has never seen your presentation. Ask them for honest feedback about colors, content, and any effects or graphical images you've included.
- Do not read from your slides. The content of your slides is for the audience, not for the presenter.
- Do not speak to your slides. Many presenters face the direction of their presentation rather than their audience.
- Do not apologize for anything in your presentation. If you believe something will be hard to read or understand, don't use it.



OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC FIVE

1. Slides can have
   A. title, text, graphs
   B. drawn objects, shapes
   C. clipart, drawn art, visual
   D. any of the above
2. Which key on the keyboard can be used to launch a Slide show?
   A. F1 B. F2
   C. F5 D. F10
3. Which option can be used to set custom timings for slides in a presentation?
   A. Slider Timings
   B. Slide Master
   C. Rehearsal
   D. Slide Show Setup
4. Which option can be used to create a new slide show with the current slides but presented in a different order?
   A. Rehearsal
   B. Custom Slide show
   C. Slide Show Setup
   D. Slide Show View
5. How can the slide show be repeated continuously?
   A. loop continuously until 'Esc'
   B. repeat continuously
   C. loop more
   D. by pressing Alt+F5
6. From where can we set the timing for each object?
   A. custom transition
   B. Slide transition
   C. custom animation
   D. slide sorter
7. The arrangement of elements such as Title and subtitle text, pictures, tables etc. on a slide is called :
   A. Layout B. Presentation
   C. Design D. Scheme
8. A File which contains ready-made styles and content that can be used for a presentation is called :
   A. Theme B. Template
   C. Wizard D. Pre formatting
9. Hyperlinked buttons that to connect to other slides or documents are.
   A. Connection buttons
   B. Hyperlink buttons
   C. Action buttons
   D. Next and Back buttons
10. To place something in the same position on every slide of presentation automatically, insert into
    A. Slide master
    B. Slide Header
    C. Handout master
    D. None of the above
11. To edit an already inserted embedded organization chart object,
    A. Double Click on it.
    B. CTRL + Click on it.
    C. SHIFT + Click on it.
    D. None of the above.
12. To draw a Square box in a slide, select the rectangle tool,
    A. Hold CTRL & Draw
    B. Hold ALT & Draw
    C. Hold SHIFT & Draw
    D. All of the above
13. What is the use of Notes in slides?
    A. They will be displayed at the time of Slide Presentation
    B. They consist of more information for the presenter but not for the audience.
    C. This is just for printing purpose only
    D. To be inserted in Slides later
14. Which of the following is correct regarding the Background of slides
    A. Background color of slides can be change
    B. Picture can be set as Slide Background
    C. Texture can be set as Slide Background
    D. All of the Above
15. Animation means adding
    A. Colour to slide content
    B. entertaining graphics to a slide
    C. video to slide content
    D. motion to slide content
16. Which of the following is not a presentation graphics software package?

A. Microsoft PresenterPoint
B. KPresenter
C. OpenOffice.org Impress,
D. Apple Keynote

17. The slide sorter facility in presentation software
A. sets the slide show running.
B. presents a number of slides for arranging.
C. formats and edits slides.
D. adds Color and blank slides.
18. Special effects used to introduce slides in a presentation are called
A) effects
B) custom animations
C) transitions
D) present animations
19. The primary purpose of Presentation software is to.....
A. Create awareness, documents, letters and reports
B. Design, create and edit slides for overheads
C. Create and edit video animations
D. Create new graphics, brochures and booklets
20. Which of the following is not a good presentation design quality?
A. Writing in short sentences in point form instead of full paragraphs.
B. Putting animations to show one point at a time during slide show.
C. Adding a wide variety of font styles, transitions and colors to in order to exploit most of the features of PowerPoint.
D. Using the same background consistently throughout presentation.

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 5

1. Explain the following terms as used in presentations software
   i. Transition Looping
   ii. Slide Master
   iii. Slide Layout
   iv. Master layout
2. Describe briefly the functions of the following views as used in presentation software:
   (i) Outline view
   (ii) Slide sorter view
   (iii) Notes pages view
   (iv) Slide show
3. What is Auto Content Wizard and Slide Show stand for as used in presentation software.
4. Give examples of presentation programs you know, briefly explain the importance of presentation programs.

PRACTICAL QNS

Q 1

You have been a head prefect for the year 2013/14, you are required to make a presentation to mark your reign that will be presented to the students audience during a handover ceremony.

Note: your slides should:

(i) Run automatically after 5 seconds
(ii) Contain minimum graphics about your achievements, major events among others.
(iii) appropriate design as made in the slide master
(iv) Your email address and contact as footer.
(v) The date should update automatically
(vi) Save your presentation as "My Speech" in your folder.

(a) SLIDE1: Appropriate title and your name.
(b) SLIDE2: a preamble statement summarizing your term
(c) SLIDE3: An outline of major or strategic objectives and principles that made you achieve a successful term
(d) SLIDE4: your achievements and challenges
(e) SLIDE5: A memorable recommendation for the incoming leadership

Q 2

Road accidents are very rampant in Uganda. Many people have lost their lives in road accidents. You are required, using a presentation software to educate Ugandans about road accidents.

(a) Create 4 slides as indicated in parts (i) to (iv).

Every slide should:

- Use minimal graphical effects to make the presentation entertaining.
- Be able to convey the appropriate message to the community.
- Run with a click of the mouse.
- Custom a unique background in a slide master.
- Have your name and slide number as footer.

(b) (i) Slide 1: should include the title, your name and your school name.
(ii) Slide 2: should include the actual causes of road accidents in Uganda.

(iii) Slide 3: Should include the contribution of the traffic police in the prevention of road accidents.

(iv) Slide 4: should include measures that can be put to avoid road accidents.

(v) Save your work as "Road Accidents"

Q 3

As a Medical officer in your home district, you have been assigned a project to sensitize people in your locality about Aids.

You are required to design four slides.

i) slide I: Introduction (include definition of AIDS).

ii) Slide II: Content (How Aids is spread).
iii) Slide III: What are some of the effects of Aids on families?
iv) Slide IV: How can we prevent the spreading Aids?
v) Save your presentations as "Aids".
vi) Set your slides to have suitable background.
vii) Include your name and index number on each slide as a footer.
viii) Set the slides to run automatically.
ix) Insert a graphic on each slide.
x) Print your work.

Q 4

The Health Prefect has appointed you as a health educator in your STRAIGHT TALK youth group and you are required to give a talk on the topic, "ABSTAINANCE – the

best way of preventing HIV/AIDS"
You are therefore required to:

a) Design 5 slides as follows:
   i. Title Slide: Should have the Topic, Your Name and (an automatic-update) Date of Talk.
   ii. Slide 2: Introduction to the topic and Definition of 'Abstinence'
   iii. Slide 3: Four principles that adolescents can use to stay abstinent.
   iv. Slide 4: Negative Consequences of Sexual Activity.
   v. Slide 5: Conclusion.
b) Include Slide Numbers on all slides excluding the title slide.
c) Save your presentation as Abstinence Talk.ppt
d) Use uniform text entry animations and slide transitions.
e) Put your name as a handouts header and index number handouts footer.
f) Print out one page only, having all the 5 slides.

Q 5

As a forest officer in your home district, you have been assigned a project to sensitize people in your locality about the importance of education.
You are required to design four slides.

i. Slide I: Introduction (include definition of forestry)
ii. Slide II: Content (types of forests)
iii. Slide III: Benefits and achievements of forests
iv. Slide IV: Short comings of forests and conclusion, Save your presentations as "forests"
v. Set your slides to have suitable background
vi. Include your name and index number on each slide as a footer
vii. Set the slides to run automatically
viii. Insert a graphic on each slide

NB: For more (over 200) computer practical questions and lab activities, get a copy of our book entitled "LAB ACTIVITIES FOR COMPUTER PRACTICAL APPLICATIONS"

S3 – TOPIC 6: SPREADSHEETS

UNIT ONE: INTRODUCTION TO SPREAD SHEETS

UNIT INTRODUCTION

Spreadsheet software refers to Application software packages that are used for calculations, including the creation of graphs.
Examples of spreadsheet software applications include: Microsoft Excel, Lotus 1-2-3, KSpread, Apple Numbers, OpenOffice.org Calc, Kingsoft Spreadsheets, Quattro Pro, Ability Spreadsheet, etc.

Advantages of Using Electronic Spreadsheets over Manual Spreadsheets

- It is Easy to make changes and corrections (**to edit**) data on the worksheet.
- Electronic spreadsheets can **quickly perform** mathematical, statistical, and financial calculations.
- The rest of the worksheet is **recalculated** whenever data in one place changes.
- Spreadsheets have in-built **functions** and macros which make work easy.
- Calculations are always **accurate**, provided that the data and formulae entered are correct.
- They offer different options of data presentation by using charting tools such as pie charts, bar graphs, etc.
- They are very useful for applications that require modeling and **what-if analysis**. When you revise the contents of one or more cells in a worksheet and observe the effect this change has on all the other cells, you are performing a what-if analysis.
- They easily filter, sort, and arrange data in alphabetical order for better organization.
- Workbooks can be saved in **soft copies** that can be easily modified and reused in future.
- Electronic spreadsheets are much larger than manual worksheets. They are not limited by paper size like in manual workbooks.

Disadvantages (Demerits) of Using Electronic Spreadsheets

- Electronic spreadsheets require special software and hardware which is **expensive**.
- Spreadsheets require enough time for **training** and practicing.
- There is a lot of **complexity** surrounding formulas, functions and their arguments.
- Computers can get system errors, and **virus infections**. These problems also can lead total loss of data.
- Electronic spreadsheets cannot be used in areas **without Electricity**.
- There is Difficulty in **finding Data Mistakes** since Electronic spreadsheets have many fields, making it look like a screen full of small boxes.
- **Difficult printing:** Obtaining hard copies becomes very hard especially when the worksheets are too wide as compared to the available page sizes.

FEATURES OF A SPREADSHEET APPLICATIONS

1. Saving. Saving enables a user to create a file for the workbook in a directory on the disk. The Save command can be accessed from the File menu. **NB:** The file extension of an Excel document is **.xls**

2. Columns and Rows. A spreadsheet is a grid consisting of columns and rows. Rows are labeled with numbers, and columns are labeled with letters, giving each cell a unique address consisting of a number and a letter.

3. Auto Complete feature. The AutoComplete can speed up data entry, especially if you have to enter a particular word or phrase repeatedly. When you start entering data into an empty cell, directly below an existing list, Excel will automatically offer you a match from the data above it.

4. Formulas. Formulas are used to express mathematical relationships between cells. For example, C1=A1+B1 would add and display the sum of cells A1 and B1 into cell C1. It could also be a simple mathematical formula, such as
(100 * 3) / 40. Formulas are not displayed on spreadsheets. What you see in the cell is the result of the formula. Don't forget about order of operations (BEDMAS); anything inside parenthesis happens first, followed by Exponent (^) Division (/) multiplication (*), followed by addition (+) and subtraction (-).

5. Functions. Functions are used as shortcuts when performing mathematical calculations. Functions are pre-programmed formulae that give power and flexibility to spreadsheet calculations. They prevent the user from having to continually enter long and cumbersome formula expressions. They constitute standard keywords and syntax. Some examples are SUM, AVERAGE, MAX, and MIN.

6. Cell References / Addresses. You can refer to a Cell by using the Column letter and Row number. For Example, D8 refers to a cell in Column D and Row 8. In this case, D8 is known as the Cell Reference and is also used as the default name for the cell.
A **Circular reference** occurs when a formula refers back to its own cell. For example inserting the formula =A2+A3 in cell A2 creates a circular reference.

7. Ranges. A range is a combination of two or more adjacent cells in a worksheet. You refer to a range by using the cell reference of the top – left and bottom- right cells. For example, B2:D8 defines the rectangular range bound at the top left by the cell B2 and at the bottom – right by the cell D8.

8. Custom names for cells and ranges. Identifying a particular cell (or range of cells) is made easier when it is given a unique name. **Advantages of names:**

- Names are easier to remember than default cell references since they can be specific to the task being worked upon
- Names make it easier to change the structure of the sheet.
- Named cells/ranges can be referred to from other sheets easily.
- It is easy to go to a named cell using F5.

9. Graphs and charts. A Graph or Chart is a graphical representation of Data in a spreadsheet. These graphics, which illustrate the meaning of the numbers in the spreadsheet in different ways, can be used to stimulate interest and help make a point.
There are several different types of graphs that can be made. Area graphs, bar and column graphs, line graphs, pie charts, scatter plot diagrams and 3-D graphs are some examples.

OTHER FEATURES OF SPREADSHEET SOFTWARE

- Multiple worksheets

- Inserting/deleting columns and rows
- Cell formats (Numbers, Strings, Currencies, Dates, Times)
- Cell merging (rows and columns)
- Cell locking
- Custom styles for columns, rows and column groups
- Delete text: Allows you to erase characters, words, charts, or worksheets as easily as you can cross them out on paper.
- Cut and Paste: Allows you to remove (cut) a section of text from one place in a spreadsheet and insert (paste) it somewhere else.
- Copy: Allows you to duplicate a section of text.
- Search and Replace: Allows you to direct the spreadsheet to search and replace a particular word or phrase.
- Headers, Footers, & Page Numbering: Allows you to specify customized headers and footers that the spreadsheet file will put at the top and bottom of every worksheet. The spreadsheet automatically keeps track of page numbers so that the correct number appears on each page.
- Spell Checker: A utility that allows you to check the spelling of words in a spreadsheet file.
- Print: Allows you to send a spreadsheet file to a printer to get a hardcopy or many hardcopies as you would like.
- Graphics: The spreadsheet application permits the addition of various types of graphics, such as bar charts, line charts, clip art, and photographs.
- Data Sort
- Macros – Allow a user to record or save a sequence of keystrokes or instructions that can be run later.
- Recalculation
- Zooming Worksheet view
- Alignment, Wrap Text, etc.

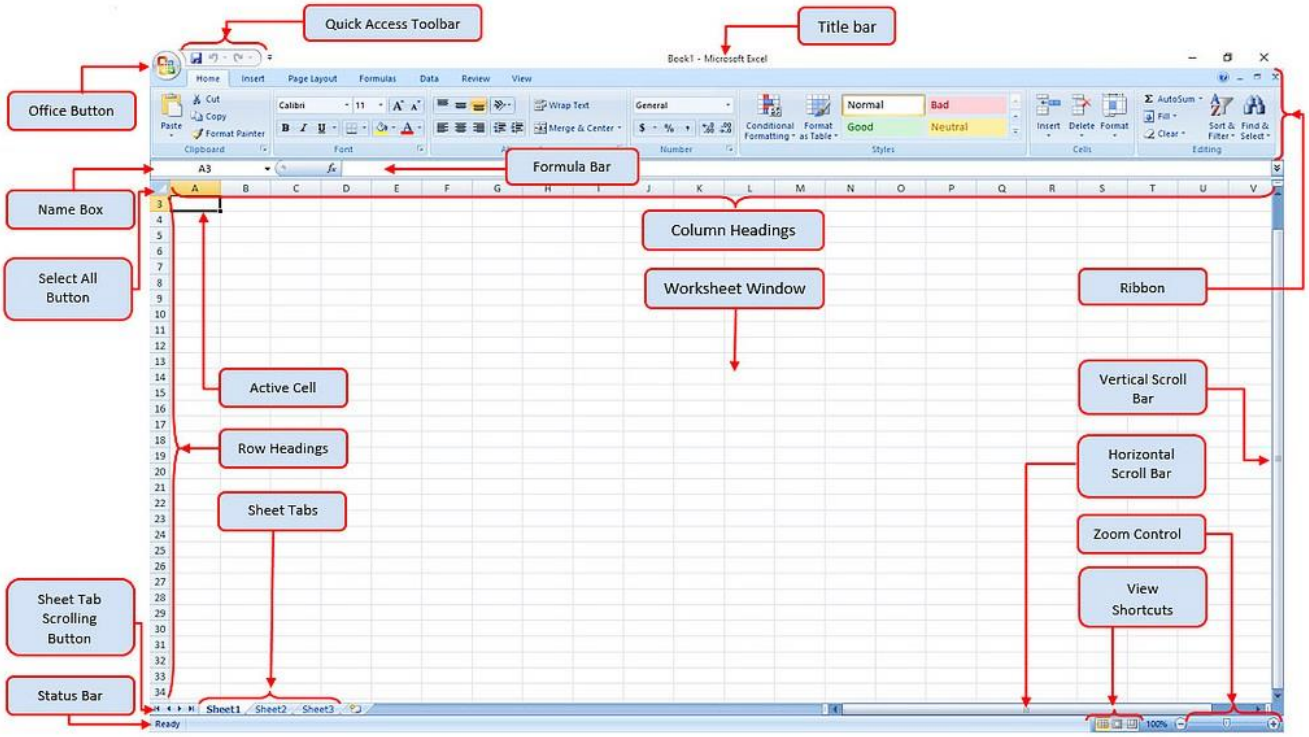
RELATIVE, ABSOLUTE AND MIXED CELL REFERENCES

- **RELATIVE REFERENCE:** a relative reference is a cell address that changes when it is copied to other cells in a spreadsheet. This is because it is based on the relative position of the cell.
- Example: If in the cell C3 we have the formula =A1+B2, and we copy the formula to cell E8, then it would automatically adjust to =C6+D7.
- **ABSOLUTE REFERENCE:** An absolute cell reference is a cell address that does not change when it is copied to other cells in the spreadsheet. Absolute references always refer to cells in a specific location. To make a cell address absolute, we insert the dollar symbol $ before the letter that identifies the column and before the number that identifies the row, example B1 becomes $B$1. If you copy the formula across rows or down columns, the absolute reference does not adjust.
  Example: If in the cell C3 we have the formula =$A$1+$B$2, and we copy the formula to cell E8, then it would remain the same =$A$1+$B$2.
  MIXED REFERENCE: is when you have either: an absolute column and a relative row e.g. $B1 or a relative column and an absolute row e.g. B$4.
  And if the cell address is copied to other cells, the relative argument changes and the absolute part does not change.

- Example: If in the cell C3 we have the formula =$A1+B$2, and we copy the formula to cell E8, then it would automatically adjust to =$A6+D$2
  Note: An easy way to add the dollar signs to a cell reference is to edit a cell reference and then press the F4 key on the keyboard.

UNIT TWO: SPREADSHEETS WITH MICROSOFT EXCEL

Working With the Microsoft Excel Window



Active cell / Selected cell - An active is the cell you are currently working on. The cell with a thick outline.
Cell Reference - The column letter and the row number of a cell
A formula must always start with "=" sign and what the calculations for each cell
Grid Lines - The horizontal and vertical lines on the spreadsheet
Sheet tabs - Tabs that identify the worksheets in a workbook
Spreadsheets - a grid that organizes data in rows and columns.
Value - A number that can be entered into a cell
Workbook - A group of many worksheets
Worksheet - One page of a spreadsheet that contains up to 65,536 rows and 256 columns
Name Box - The Name Box is located next to the formula bar above the worksheet area. The Name Box displays the cell reference of the active cell.
Toolbars are located at the top under the main Menu bar
Formula Bar is located under the toolbars
A single "grid", or page, is usually referred to as a worksheet. The current worksheet is the main area of the window
Task pane is the panel to the right of the worksheet.
Status bar is located at the bottom of the window
Columns - The vertical segments that you see on the spreadsheet are called columns.
Rows - The horizontal segments are referred to as rows.

Cells - Each box that is created from a row and column intersecting is referred to as a cell.
Scroll bars – A worksheet is too large. Scroll bars are used to roll or navigate to other parts of the worksheet that are not visible.

DATA TYPES THAT CAN BE ENTERED INTO A SPREADSHEET CELL

A cell may contain (i) labels or (ii) values.
A label is a text entry, such as TOTAL, that cannot be numerically manipulated by the spreadsheet.
A value can be a number, a date, the answer of a formula, currency, time, percentage, fraction, a logical value, error value e.t.c.
If the ####### symbols appear in the cell, it means that the column is not wide enough.

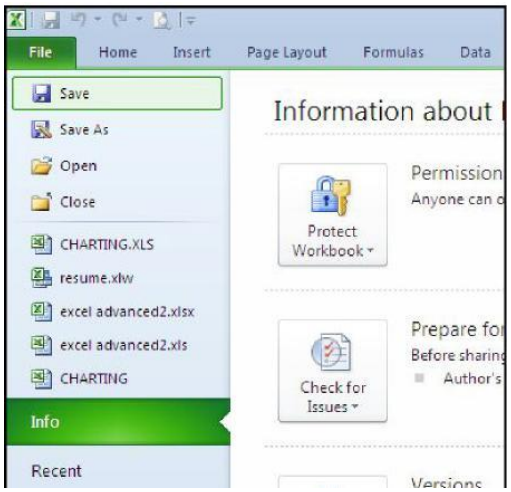
ERRORS IN SPREADSHEET CELLS

If you create a formula in Excel that contains an error or circular reference, Excel lets you know about it with error messages below.

Error	Meaning
#DIV/0!	Trying to divide by 0
#N/A!	A formula or a function inside a formula cannot find the referenced data
#NAME?	Text in the formula is not recognized
#NULL!	A space was used in formulas that reference multiple ranges; a comma separates range references
#NUM!	A formula has invalid numeric data for the type of operation
#REF!	A reference is invalid
#VALUE!	The wrong type of operand or function argument is used

EXCEL 2010 – THE FUNDAMENTALS

The **File Ribbon**, located in the upper left-hand corner of the program window, replaces the Office button found in the 2007 version of Microsoft Excel. The File ribbon gives access to backstage view which contains basic file management commands, including New, Open, Save, Print and Close. And Options..



To Create a New Blank Workbook: Click the **File ribbon**, select **New**, and click **Create**, or press **<Ctrl>** + **<N>**.
To Open a Workbook: Click the **File ribbon** and select **Open**, or press **<Ctrl>** +**<O>**.
To Save a Workbook: Click the **Save button** on the Quick Access Toolbar, or press **<Ctrl>** + **<S>**.
To Save a Workbook with a Different Name: Click the **File ribbon**, select **Save As**, and enter a new name for the presentation.

To Preview a Workbook: Click the **File ribbon**, select **Print**
To Print a Workbook: Click the **Office Button** and select **Print**, or press **<Ctrl>** + **<P>**.
To Quick Print: Click the **File ribbon**, select **Print,** Click **Print** button.
To Undo: Click the **Undo** button on the Quick Access Toolbar or press **<Ctrl>** +**<Z>**.
To Close a Workbook: Click the **Close** button or press **<Ctrl>** + **<W>**.
To Get Help: Press **<F1>** to open the Help window. Type your question and press **<Enter>**.
To Exit Excel: Click the **File ribbon** and click **Exit**.

EDITING

To Edit a Cell's Contents: Select the cell, click the Formula Bar, edit the cell contents, and press**<Enter>** when you're finished.
To Clear a Cells: Select the cell(s) and press the **<Delete>** key.
To Cut or Copy Data: Select cell(s) and click the **Cut** or **Copy** button in the Clipboard group on the Home tab.
To Paste Data: Select the destination cell(s) and click the **Paste** button in the Clipboard group on the Home tab.
To Copy Using Auto Fill: Point to the fill handle at the bottom-right corner of the selected cell(s), then drag to the destination cell(s).
To Move or Copy Cells Using Drag and Drop: Select the cell(s) you want to move or copy, position the pointer over any border of the selected cell(s), then drag to the destination cells. To copy, old down **<Ctrl>** key while dragging.
To Paste Special: Cut or copy the cell(s), select the destination cell(s), click the **Paste** button list arrow in the Clipboard group on the Home tab, and select **Paste Special**. Select an option and click **OK**.
To Insert a Column or Row: Right-click the selected row or column heading(s) to the right of the column or below the row you want to insert and select **Insert** from the contextual menu.
To Delete a Column or Row: Select the row or column heading(s) and either right-click them and select **Delete** from the contextual menu, or click the **Delete** button in the Cells group on the Home tab.
To Insert a Comment: Select the cell where you want to insert a comment and click the **Review** tab on the Ribbon. Click the **New Comment** button in the Comments group. Type a comment, then click outside the comment text box. Point to the cell to view the comment.

FORMATTING

To Format Text: Use the commands in the **Font** group on the **Home** tab, or click the **Dialog Box Launcher** in the **Font** group to open the Font dialog **box**
To Format Values: Use the **commands** in the Number group on the Home tab, or click the **Dialog Box Launcher** in the Number group to open the Format Cells dialog box.
To Copy Formatting with the Format Painter: Select the cell(s) with the formatting you want to copy and click the **Format**
Painter button in the Clipboard group on the Home tab. Then, select the cell(s) you want to apply the copied formatting to.
To Change Cell Alignment: Select the cell(s) and click the appropriate alignment button (**Align Left**, **Center**, **Align Right**) in the **Alignment** group on the **Home** tab.

FORMULAS AND FUNCTIONS

To Total a Cell Range: Click the cell where you want to insert the total and click the **AutoSum** button in the **Editing** group on the **Home** tab. Verify the selected cell range and press **return**.

To Enter **a Formula:** Select the cell where you want to insert the formula, press **<=>**, and enter the formula using values, cell references, operators, and functions. Press **<Enter>** when you're finished.

To Insert a Function: Select the cell where you want to enter the function and click the **Insert Function** button on the Formula Bar.

To Reference a Cell in a Formula: Type the cell reference (for example, **B5**) in the formula or click the cell you want to reference.

To Create **an Absolute Cell Reference:** Precede the cell references with a **$** sign or press **<F4>** after selecting a cell range to make it absolute.

To Use Several Operators or Cell Ranges: Enclose the part of a formula you want to calculate first in parentheses.

To Add Sparkline: select data including cell you wish Sparkline to appear. Go to **insert** tab **Sparkline's** group select type of Sparkline you wish to use, **line**, **Columns**, **Win/Loss.**

CHARTS

To Create a Chart: Select the cell range that contains the data you want to **chart** and click the **Insert** tab on the Ribbon. Click a chart type button in the **Charts** group and select the chart you want to use from the list.

To Adjust Column Width and Row Height: Drag the right border of the column header. **Double**-click the border to AutoFit the row according to its contents. Drag the bottom border of the row header. Double-click the border to AutoFit the row according to its contents.

To Add Cell Borders: Select the cell(s), click the **Border** button list arrow in the Font group on the Home tab, and select a border type.

To Add Cell Shading: Select the cell(s), click the **Fill Color** button list arrow in the Font group on the Home tab, and select a fill color.

To Apply a Document Theme: Click the **Page Layout** tab on the Ribbon, click the Themes button in the Themes group, and select a theme from the gallery.

To Insert a Header or Footer: Click the **Insert** tab on the Ribbon and click the **Header & Footer** button in the Text group. Enter header text.

WORKBOOK MANAGEMENT

To Add a New Worksheet: Click the **Insert Worksheet** tab next to the sheet tabs at the bottom of the program screen.

To Delete a Worksheet: Select the sheet want to delete, click the **Delete** button in the **Cells** group on the **Home** tab, and select **Delete Sheet**. Or, right-click the sheet tab and select **Delete** from the contextual menu.

To Rename a Worksheet: Double-click the sheet tab, enter a new name for the worksheet, and press **<Enter>**.

To Split a Window: Drag either the vertical or horizontal split bar (located near the scroll bars) onto the worksheet.

To Freeze Panes: Place the cell pointer where you want to freeze the window, click the **View** tab on the Ribbon, click the **Freeze Panes** button in the **Window** group, and select an option from the list. **To Select a Print Area:** Select the cell range you want to print, click the **Page Layout** tab on the Ribbon, click the **Print Area** button in the **Page Setup** group,

and select **Set Print Area**.

To Adjust Page Margins, Orientation**, Size, and Breaks:** Click the **Page Layout** tab on the Ribbon and use the commands in the **Page Layout** group, or click the **Dialog Box Launcher** in the **Page Setup** group to open the **Page Setup** dialog box.

To Protect or Share a Workbook: Click the **Review** tab on the Ribbon and use the commands in the **Changes** group.

EXCEL COMMON FUNCTIONS CHECKLIST

FUNCTION NAME	FUNCTION SYNTAX	FUNCTION DESCRIPTION
AVERAGE	=AVERAGE(C1:C4)	Find the average (mean) of a list of numbers.
CONCATENATE	=CONCATENATE(B1,B2)	Joins contents of cells together.
CONVERT	=CONVERT(68, "F", "C")	Converts 68 degrees Fahrenheit to Celsius (20)
COUNT	=COUNT(B4:B12)	Counts the number of cells which have a number in them
COUNTIF	=COUNTIF(B2:B6,12)	Counts the number of cells which have a 12 in them
DEC2BIN	=DEC2BIN("19")	Converts a decimal number 19 to binary
HEX2OCT	=HEX2OCT("3B4E")	Converts hexadecimal 3B4E to octal
IF	=IF(logical_test, [value_if_true], [value_if_false]) e.g. =IF(A2<=50,"PROMOTED","CHOPPED")	Records PROMOTED if the number in cell A2 is less than or equal to 50 Otherwise, the function displays CHOPPED
INT	=INT(B1)	Records the whole number part of a number e.g 3.15 becomes Integer 3
LARGE	=LARGE(B3:B13,2)	Gives the 2nd largest number
LOG	=LOG(8, 2)	Returns the Logarithm of 8 with base 2
LOWER	=LOWER(A2)	Converts text string to Lower case
MAX	=MAX(A2:A6)	Largest of the numbers in the range A2:A6
MEDIAN	=MEDIAN(A2:A6)	Median of all the numbers in the range A2:A6
MIN	=MIN(A2:A6)	Smallest of the numbers in the range A2:A6
MODE	=MODE(A2:A6)	Returns the commonest or most frequently occurring number in the range A2:A6
NOW	= NOW()	Returns the serial number of the current date and time
OCT2BIN	=OCT2BIN(67)	Converts an octal number 67 to binary
POWER	=POWER(2,4)	Returns 2 raised to the power of 4 i.e 2x2x2x2=16
PRODUCT	=PRODUCT(A2:A4)	Multiplies the numbers in cells A2 through A4.
PROPER	=PROPER(A2)	Proper case of first string (this is a TITLE =This Is A Title)
RANK	=RANK(NUMBER,REF,[ORDER]) e.g. =RANK(A3,A2:A6,1)	Gives the Rank (Position) of A3 out of the values in the range A2:A6, in ascending order
ROMAN	=ROMAN(B2)	Converts the value in cell B2 to roman numerals

ROUND	=ROUND(B3,2)	Rounds value in B3 to 2 decimal places
ROUND	=ROUND(2.15, 1)	Rounds 2.15 to one decimal place
SMALL	=SMALL(B3:B13,2)	Gives the 2nd smallest number
SQRT	=SQRT(16)	Square root of 16
SUM	=SUM(C1:C4)	Adds a list of numbers
TODAY	=TODAY()	Returns the current date.
UPPER	=UPPER(A2)	Converts text to Upper Case (CAPITAL LETTERS)
VLOOKUP	VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup]), e.g. =VLOOKUP(38, A2:C10, 3, FALSE).	You can use the VLOOKUP function to search the first column of a range (range: Two or more cells on a sheet. The cells in a range can be adjacent or nonadjacent.) of cells, and then return a value from any cell on the same row of the range.
HLOOKUP	HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup]). =VLOOKUP(38, A2:G4, 3, FALSE).	Searches for a value in the top row of a table or an array of values, and then returns a value in the same column from a row you specify in the table or array.

COMMON SPREADSHEET KEYBOARD SHORTCUTS

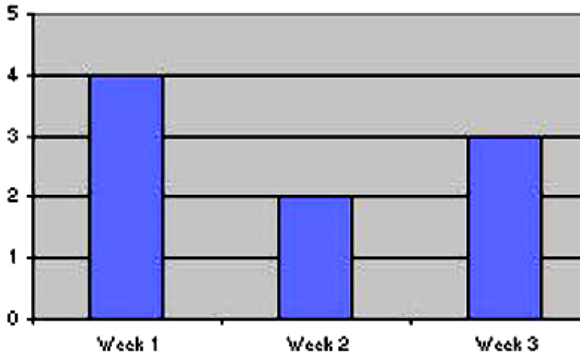
Home	To the first cell in the current row
Ctrl + Home	To the first cell in the current sheet
Ctrl + End	To the last cell containing data
Page Up	One screen up
Page Down	One screen down
Alt + PgUp	One screen to the left
Alt + PgDown	One screen to the right
F5 or Ctrl + G	Display Go to Dialogue Box
Ctrl + F4	Close Workbook
Alt + F4	Exit Application
Shift + F11	New Workbook
Ctrl + Semicolon (;)	Enter Current Date
Ctrl + Shift +Enter	Fill a range of cells with same data
TAB	Moves one cell to the right in a worksheet.
ESC	Cancels an entry in the cell or Formula Bar.
F1	Displays Help
F2	Edits the active cell and positions the insertion point at the end of the cell contents.

F5	Displays the **Go To** dialog box
F6	Switches between the worksheet, ribbon, task pane, and Zoom controls.
F7	Displays the **Spelling** dialog box to check spelling in the active worksheet or selected range.
F8	Turns extend selection mode on or off.
F9	Re Calculates all worksheets in all open workbooks.
F11	Creates a chart of the data in the current range in a separate Chart sheet.
F10	Turns key tips on or off. (Pressing ALT does the same thing.) CTRL+F10 maximizes or restores the selected workbook window.
F12	Displays the **Save As** dialog box.

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC SIX

Refer to this spreadsheet and chart to answer questions 1-3:

	A	B	C	D
1	Unit price:	$5.00		
2				
3	SALES	Units	Total	
4	Week 1	4	$20.00	
5	Week 2	2	$10.00	
6	Week 3	3	$15.00	
7				
8	Total	9	$45.00	



1. Which cell contains the entry "=SUM(B4:B6)"?
   A. B1
   B. C4
   C. B8
   D. C8
2. What is the data type in cell B4?
   A. Label
   B. Formula
   C. Function
   D. Value
3. The columns in the chart show which range of data?
   A. B4:B6
   B. C4:C6
   C. A4:C6
   D. B4:C6
4. Given the following statement: =IF(G10>50, "FAIL", "PASS"), what is the result if G10 was 50?
   A. PASS
   B. FAIL
   C. G10<50
   D. Empty
5. "Ascending" and "Descending" are used in which spreadsheet feature?
   A. Sorting
   B. Repeating
   C. Analyzing
   D. Calculating
6. The best spreadsheet function for finding the smallest value in a range is
   A. MIN
   B. MAX
   C. SMALLER
   D. MINIMUM
7. Which of the following is true about an absolute reference in a spreadsheet?
   A. It can only be used on individual cells but not on ranges.
   B. The spreadsheet does recalculation every time it is used.
   C. The reference cell changes when you copy within a worksheet.

D. The reference cell stays the same no matter where you copy it to within the worksheet

8. Which error message will excel show if text in a function syntax is not recognized?
   A. #DIV/0!
   B. #REF!
   C. #NUM!
   D. #NAME?

5R x 2C

	A	B
1	Kids Update	Age
2	Chrysolite	8
3	Setareki	6
4	William	3
5	Paulo	2

9. In the figure above, the statement (5R x 2C) shown in the name box of the Microsoft Excel worksheet means
   A. it is a formula for multiplying the value in cell 5R with that in cell 2C.
   B. there are 5 rows and 2 columns being highlighted in this worksheet.
   C. the cursor is located at the intersection of Row 5 and Column 2.
   D. That 5Rx2C is the active cell.
10. How many cells are in the range Y12:AC18 in a spreadsheet?
   A. 12
   B. 18.
   C. 35.
   D. 216.
11. What symbol is used before a number to make it a label?
   A. " (quote)
   B. = (equal)
   C. _ (underscore)
   D. ' (apostrophe)
12. The range A1:A5 has been renamed "Sales" in a spreadsheet. Which of the following formulas will Excel Not be able to calculate?
   A. =SUM(Sales)-A3
   B. =SUM(A1:A5)*.5
   C. =SUM(A1:A5)/(10-10)
   D. =SUM(A1:A5)-10
13. The chart wizard term, 'data series' refers to
   A. A chart legend
   B. A collection of chart data markers
   C. A set of values you plot in a chart
   D. A data label
14. A worksheet range is a
   A. a command used for data modeling
   B. a range of values such as from 23 to 234
   C. a group of cells
   D. A group of worksheets
15. Getting data from a cell located in a different sheet is called …
   A. Accessing
   B. Referencing
   C. Updating
   D. Functioning
16. Which shape does the cursor take up when it hovers over the fill handle?
   A. Thin black cross
   B. Fat white cross
   C. Four headed arrow
   D. Blinking vertical bar | cursor
17. The autofill feature
   A. Extends a sequential series of data
   B. Fills other cells with the current cell's content
   C. Copies the formula in the current cell to other cells.
   D. All of the above
18. A circular reference is
   A. Geometric modeling tool
   B. A cell that points to a drawing object
   C. A formula that either directly or indirectly depends on itself
   D. Always erroneous
19. Without using the mouse or the arrow keys, what is the fastest way of getting to cell A1 in a spreadsheet?
   A. Press ctrl +home
   B. Press home
   C. Press shift + home
   D. Press alt + home
20. Which of the following methods cannot be used to edit the contents of a cell?
   A. Press the alt key
   B. Clicking the formula bar
   C. Pressing the f2 key
   D. Double clicking the cell

PAST EXAMINATIONS REVISION QUESTIONS ON TOPIC 6

1. The following spreadsheet shows the profit or loss on sales at an ice-cream stall during a four week period.

	A	B	C	D	E	F
1	Ice-Cream Stall					
2		Cost Price ($)				
3	Ice-Cream	3				
4	Orange Juice	2				
5						
6		Ice-Cream Sales	Orange Juice Sales	Income ($)	Expenses ($)	Profit/Loss
7	Week 1	300	40	980	900	Profit
8	Week 2	250	10	770	900	Loss
9	Week 3	450	10	1370	900	Profit
10	Week 4	300	20	940	900	Profit

(a) State the format of the data in cell B6.

(b) Write down a formula that could be in cell D7 to calculate the Income for week1.

(c) Describe how the formula in D7 can be copied into the cells D8, D9 and D10.

(d) Cell F7 contains the function: =IF(D7 > E7, Profit, Loss) and is copied into cells F8, F9 and F10. Write down the function that will be in cell F10.

(e) State the cells that are needed to create a line graph to show the Income and Expenses for Week 1 to Week 4.

PRACTICAL QNS

1. The following data was obtained from a retailer about goods that were sold in the month of August, 2000.

Item	Quantity	Unit price
Cool cool bar	500	250
Ice cream	250	600
Toilet paper	1,000	500
News papers	500	1,500
Air time	689	5,000
Balloons	2,000	50
Pen (nice clear)	3,000	400
2B pencils	1,000	600
Printing paper	500	8,500
Plastic chairs	53	1,800

a) Enter the above data on a suitable spreadsheet program of your choice and save as "retail".

b) Format cells to hold currency and "Shs." as a prefix on unit price respectively.

c) Create two rows to hold; total and comment.

d) Determine the total amount of money obtained from each item during the month.

e) Generate a comment for sales that are: less than Shs. 1,000,000 as 'a poor sale' and that greater than Shs. 1,000,000 as 'a good sale'.

f) Insert a row after plastic chairs with a title "Grand totals" to determine the net sales for the business for the period.

g) Add another column named "percentage" and in it, determine the percentage sale of each item as fraction of Grand total for the month ending in august.

h) Using item names and percentage column respectively create a pie – chart to represent the above data as an object on sheet 2 of your spreadsheet.

2. The table below shows results of students of Nateete primary school obtained during end of June Examinations.

NAME	MATH	ENGLISH	S.S.T	SCIENCE
NAMUSIS JANE	40	85	79	66
KAWUMA MUSA	58	75	85	75
KABALI HADADI	79	65	83	90
NAMUGENYI MARIAM	65	90	74	72
KAKOOZA WAHAB	70	65	79	65
NAMULONDO HASIFAH	45	75	66	72

Using spreadsheets:

a. Type the information above.
b. Insert another column name it total and get the total marks of all students.
c. Insert another column name it average and find the average of all students
d. Create a chart which extracts Students' name and average.
e. Print the chart and your final table.
f. Save your worksheet as Nateete.

3. The following table shows income and expenses allocated to different items at SENTAMU's monthly plan. The expenses are food, communication, transport and school fees incurred every month. The table below shows the arrangement.

	SENTAMU's MONTHLY BUDGET						
	Income	**20% food**	**5% comm**	**8% transp**	**30% fees**	**Total-Exp**	**Bal.**
Jan	700,000						
Feb	1,800,000						
March	1,300,000						
April	2,000,000						
May	1,500,000						
June	800,0000						
July	3,000,000						
Aug	1,700,000						
Sept	1,900,000						
Oct	2,600,000						
Nov	2,700,000						
Dec	900,000						
Average Income							
Highest Income							
Lowest Income							

Required:

i. Calculate the food expenses that are spent every month
ii. Calculate the expenses incurred in communication.

iii. Which amount is spent in transport expenses every month.
iv. Calculate the amount SENTAMU will spend on school fees every month.
v. Use a function to calculate the Total Expenses incurred every month.
vi. Calculate the balance (bal) of money that shall remain after all expenses have been incurred for every month.
vii. Calculate the average income across the months.
viii. Calculate the highest income performed.
ix. Calculate the lowest income ever performed in all months.
x. Save your work as "sentamu".

4. Enter the table below into a spreadsheet application.

INCOME AND EXPENDITURE ESTIMATE FOR THE YEAR 2010/2011						
CODE	ITEM	JAN	FEB	MAR	OVERALL	TOTAL
INCOME						
INC 01	Sales	125,000				
INC 02	Services	50,000				
INC 03	Others	70,000				
TOTAL						
EXPENDITURE						
EXP 01	Salaries	50,000				
EXP 02	Wages	30,000				
EXP 03	Travel	10,000				
EXP 04	Purchases	60,000				
	TOTAL					
	PROFIT					

Using the information below, add suitable spreadsheet formulae to complete the table above.

- Sales are to increase by 10% every month; Income from Services & Others is to increase by 2% per month.
- Salaries and wages should increase by 50% only in Feb and remain constant in Mar.
- Travel should remain constant in Feb but decrease by 20% in Mar. Purchases should increase by 5% per month.
- Add a new column "Average Income" and calculate the average income in every month.
- Calculate the TOTAL Income and Expenditure for each month.

(c) Calculate: (i) the Overall Income and Overall expenditure.
(ii) The profit earned for each month, and the overall total profit earned by the company.
(d) Save your work as my accounts.

NB: For more (over 200) computer practical questions and lab activities, get a copy of our book entitled "LAB ACTIVITIES FOR COMPUTER PRACTICAL APPLICATIONS"

S3 - TOPIC 7: SYSTEM START-UP AND CONFIGURATION

UNIT 1: COMPUTER BOOTING

Unit Objectives

To be able to:

- Define booting
- Describe the types of booting
- Explain when booting can be done
- Describe Step-by-step the process of booting

Unit Introduction

- For the computer to run it needs an OS, because the OS is the software that manages all the activities and devices attached to the computer.
- However, when the computer is off, the OS is not running, and is simply stored on the hard disk inside the computer.
- Therefore when a user presses the power button when the computer is off, the OS cannot get itself out of the hard drive since is it off. So how does the computer start up without the OS?
- In this unit we shall look at the step by step details of the boot process.

DEFINITION OF BOOTING

- Booting is the process of loading the operating system (OS) from disk into working memory.
- Booting (also known as booting up) is the initial set of operations that a computer system performs when electrical power is switched on.
- The process begins when a computer that has been turned off is re-energized, and ends when the computer is ready to perform its normal operations.

TYPES OF BOOTING

- There are basically two types of booting:

1. Cold booting: This is the process of turning on a computer after it had been powered off completely.
2. Warm booting: This is the process of restarting a computer that already is powered on.

REASONS FOR WARM BOOTING

- When you install new software, often an on-screen prompt instructs you to restart the computer. In this case, a warm boot is appropriate.

DELIBERATE

Users may deliberately initiate a reboot. Rationale for such action may include:

- **Troubleshooting:** Rebooting may be used by users, support staff or system administrators as a technique to work around bugs in software,[10] for example memory leaks or processes that hog resources to the detriment of the overall system, or to terminate malware. While this approach does not address the root cause of the issue, resetting a system back to a good, known state may allow it to be used again for some period until the issue next occurs.
- **Switching operating systems:** On a multi-boot system without a hypervisor, a reboot is required to switch between installed operating systems.
- **Offensive:** As stated earlier, components lose power during a cold reboot; therefore, components such as RAM that require power lose the data they hold. However, in a cold boot attack, special configurations may allow for part of the system state, like a RAM disk, to be preserved through the reboot.

The means performing a deliberate reboot also varies and may include:

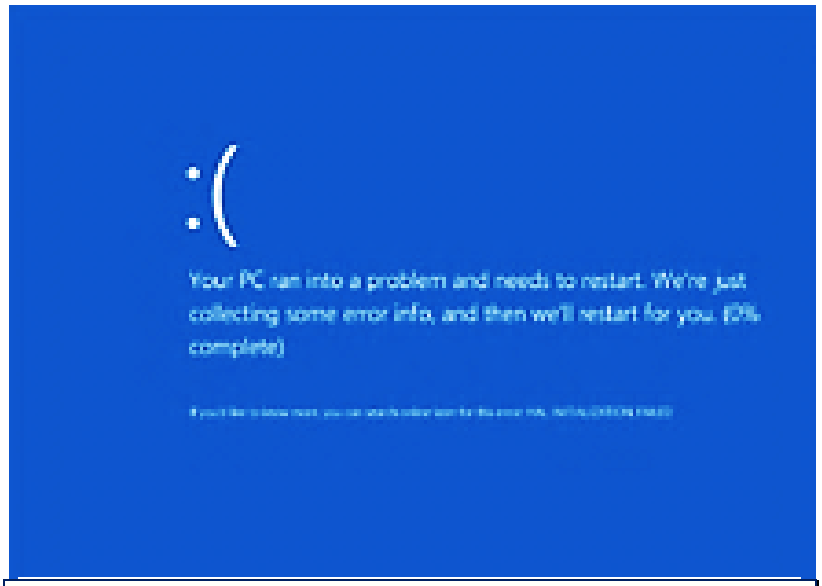
- **Manual, hardware-based:** A power switch or reset button can cause the system to reboot.Doing so, however, may cause the loss of all unsaved data.
- **Manual, software-based:** Computer software and operating system can trigger a reboot as well; more specifically, Microsoft Windows operating systems are outfitted with a restart command that closes open programs and eliminate data loss due to reboot.
- **Automated:** Software can be scheduled to run at a certain time and date; therefore, it is possible to schedule a reboot.[13]

POWER FAILURE

Unexpected loss of power for any reason (including power outage, power supply failure or depletion of battery on a mobile device) forces the system user to perform a cold boot once the power is restored. Some BIOSes have an option to automatically boot the system after a power failure.An uninterruptible power supply (UPS), backup battery or redundant power supply can prevent such circumstances.

RANDOM REBOOT

Random reboot is a non-technical term referring to an unintended (and often undesired) reboot following a system crash, whose root cause may not immediately be evident to the user. Such crashes may occur due to a multitude of software and hardware problems, such as triple faults. They are generally symptomatic of an error in ring 0 that is not trapped by an error handler in an operating system or a hardware-triggered non-maskable interrupt. Systems may be configured to reboot automatically after a power failure, or a fatal system error or kernel panic. The method by which this is done varies depending whether the reboot can be handled in software, or must be handled at the firmware or hardware level. Operating systems in the Windows NT family (from Windows NT 3.1 through Windows 7) have an option to modify the behavior of the error handler so that a computer immediately restarts rather than displaying a Blue Screen of Death (BSOD) error message.



A system crash in Windows 8 that requires the system to be rebooted.

On most windows systems, pressing the F8 key during the boot process opens the Windows Advanced Startup Options menu, which allows you to select how to boot Windows.

- **Safe Mode** – Starts Windows but only loads drivers for basic components, such as the keyboard and display.
- **Safe Mode with Networking Support** – Starts Windows identically to Safe Mode and also loads the drivers for network components.
- **Safe Mode with Command Prompt** – Starts Windows and loads the command prompt instead of the GUI interface.
- **Last Known Good Configuration** – Enables a user to load the configurations settings of Windows that was used the last time that Windows successfully started. It does this by accessing a copy of the registry that is created for this purpose.

STEP-BY-STEP PROCESS OF BOOTING

1. The power supply sends a signal to the components in the system unit.
2. The processor finds the ROM chip(s) that contain the BIOS (Basic input/output system).
3. The BIOS performs the POST (Power-On Self-Test) which checks components such as the mouse, keyboard and adapter cards. A series of messages may display.
4. The results of the POST are compared with data in a CMOS chip
5. The BIOS looks for system files on the Hard disk (C:)
6. The system files and the kernel of the Operating System load into RAM from the Hard Disk.
7. The OS loads configuration information and displays the welcome screen.
   - A series of messages that may be displayed during a POST
8. On startup, the OS may verify that the person attempting to use the computer is a legitimate user through use of a password.
9. After the user logs on, the desktop and icons are displayed on the screen.
10. Finally, the operating system also executes programs in the Startup folder, which contains a list of programs that open automatically when you boot the computer.

FURTHER DEFINITIONS

- A boot loader is a computer program that loads the main operating system or runtime environment for the computer after completion of self-tests. Examples of boot loaders include NTLDR, BOOTMGR, GNU GRUB, Syslinux, etc.
- A boot drive is the drive from which your personal computer boots (starts).
- In most cases, drive C (the hard disk) is the boot drive.

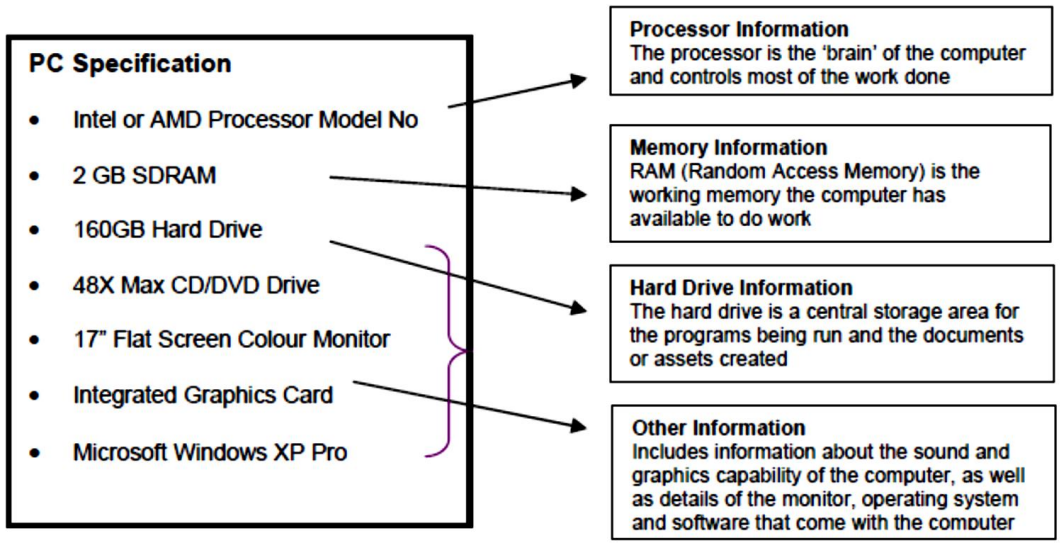
UNIT 2: SYSTEM CONFIGURATION

To be able to:

a) Determine and interpret specifications of a computer
b) Describe the parts of a computer
c) Connect and setup hardware components
d) Explain and perform disk formatting

WHAT IS A SPECIFICATION?

Understanding a Specification



The specification or 'spec' is a list of the key components that make up the computer. It is provided by retailers to help buyers decide which PC, and which combination of features, they need. When buying a PC, it is important to start by deciding what it is you want the PC to do.
This then informs what specification you actually need.
When reviewing a computer specification, the most important components to take account of are the **processor**, the amount of **RAM** and the size of the **hard drive** as these are central to the overall capability of the system. If it is planned to use specialised programs for students with special needs (e.g., scan/read software), it is advisable to purchase a suitable specification computer to meet the system requirements for these programs.

INTERPRET THE HARDWARE SPECIFICATIONS OF A COMPUTER SYSTEM

THE CPU OR PROCESSOR

The two main features of CPUs that you need to be aware of are its speed and type.
The **processor speeds** of most of today's PCs are measured in GHz (GigaHertz). 1 GHZ means that it can execute approximately 1 billion instructions per section.
The **CPU type** determines the type of application for which a particular type of processor is used. The two most popular companies that currently produce CPUs are Intel and AMD. Intel processors are little more expensive than AMD's due to the small difference in performance.

MAIN MEMORY

The **capacity** of a computer's memory determines the number of programs that it can hold at a time, which affects the performance of a computer system. More memory indicates that it can hold more programs at a time. Modern PCs memory capacity is measured in GB (Gigabytes).
There are two main **types of RAM** - SDRAM (Synchronous Dynamic RAM) and RDRAM (Rambus Dynamic RAM). RDRAM are faster and more expensive than SDRAM and are used mainly for high performance computers.
Wordsize determines the number of bits that can be stored and processed at a time by the CPU. Most modern PCs have a wordsize of either 32-bit of 64-bit.
RAM speed determines how fast the chip updates the data that it contains. In modern PCs it is measured in MHz (MegaHertz) and is usually above 400MHz.

HARD DRIVE

Storage capacity determines how much information can be stored for later use. More hard disk space means you can store more programs and data. In modern PCs it is measured in Gigabytes (GB) but are reaching up to Terabytes (TB).
Hard disk speed is normally expressed in revolutions per minute (rpm). The rpm is how fast the disk is spinning and varies from 5400 rpm - 15000 rpm.

OTHER SPECIFICATIONS

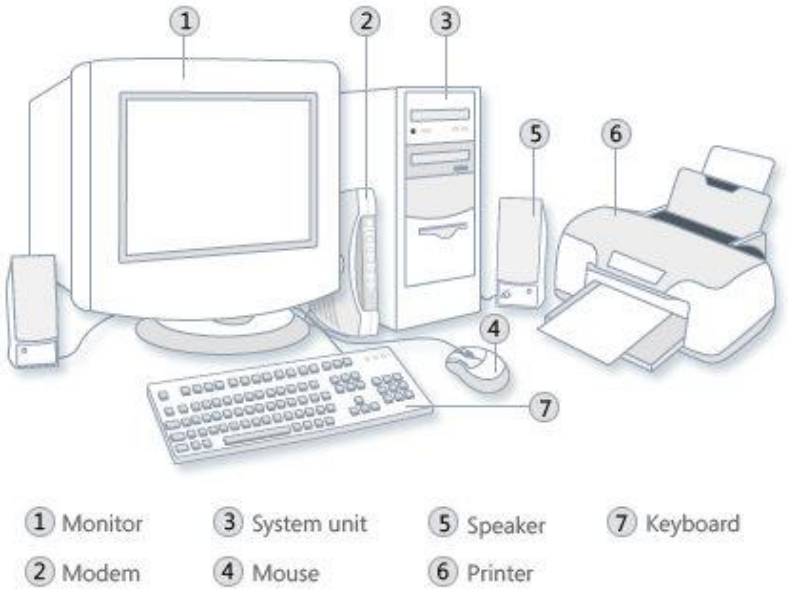
Ports
A computer system need to send and receive information from peripheral devices. A **port** is a piece of technology that is used to connect external devices to a computer.
Expansion Slots
Expansion slots are sockets found on the motherboard and are used to insert additional circuit boards (cards). They can be used for adding more memory, graphics facilities and other special devices. There are three types of expansion slots:
1) Peripheral Component Interconnect (PCI) - used to attach sound cards, network cards and video cards.
2) Accelerated Graphics Port (AGP) - mainly used for graphics cards

3)Industry Standard Architecture (ISA) - used for attaching modems and not commonly seen on most modern computers.

PARTS OF A COMPUTER

If you use a desktop computer, you might already know that there isn't any single part called the "computer." A computer is really a system of many parts working together. The physical parts, which you can see and touch, are collectively called hardware. (Software, on the other hand, refers to the instructions, or programs, that tell the hardware what to do.)

The following illustration shows the most common hardware in a desktop computer system. Your system might look a little different, but it probably has most of these parts. A laptop computer has similar parts but combines them into a single, notebook-sized package.



Desktop computer system

IT TECHNICIAN

Has specialized skills to install, maintain, and repair computer parts.

☐ Computers include desktop, laptop, and personal electronic devices.



Education and Certification

☐ **A successful IT technician has training and experience in the following:**

- Personal computers, printers, scanners, and laptop computers
- Safe lab procedures
- Troubleshooting
- Operating systems
- Networks
- Security
- Communication skills
- Industry standard certification:
- CompTIA A+

European Certification of Informatics

BASIC PERSONAL COMPUTER SYSTEM

- A computer system consists of hardware and software components.
- Hardware is the physical equipment such as the case, storage drives, keyboards, monitors, cables, speakers, and printers.
- Software is the operating system and programs.
- The operating system instructs the computer how to operate.
- Programs or applications perform different functions.



COMPUTER CASES AND POWER SUPPLIES

Computer case

☐ Provides protection and support for internal components

☐ Should be durable, easy to service, and have enough room for expansion

Power supply

☐ Converts AC power from the wall socket into DC

☐ Must provide enough power for the installed components and future additions



☐ Contain the framework to support and enclose internal components of the computer

☐ Typically made of plastic, steel, and aluminum

☐ Available in a variety of styles

☐ The size and layout of a case is called **a form factor**

☐ Designed to keep internal components cool

☐ Helps to prevent damage from static electricity

CASE SELECTION

Factor	Rationale
Model Type	Two main case models (one for desktop PCs and the other for tower PCs). The type of motherboard determines the type of case. Size and shape must match exactly.
Size	If a computer has many components, it will need more room for airflow to keep the system cool.
Available Space	Desktop cases allow space conservation in tight areas because the monitor can be placed on top of the unit. The case design may limit the number and size of the components that can be added.
Power Supply	Match the power rating and connection type of the power supply to the type of motherboard chosen.
Appearance	There are many case designs to choose from if it is necessary to have a case that is attractive.
Status Display	LED indicators that are mounted on the front of the case can tell you if the system is receiving power, when the hard drive is being used, and when the computer is on standby or sleeping.

Vents	All cases have a vent on the power supply. Some cases have more vents to dissipate an unusual amount of heat.

CONNECT AND SETUP HARDWARE COMPONENTS

If you are setting up a newly purchased computer that's still in the box, you will probably find a **how-to guide** in the packaging that includes **step-by-step details**. However, even if it didn't include instructions you can still set up the computer in just a **few easy steps**. In this lesson, we'll go through the different steps that are needed to set up a typical computer.

SETTING UP A LAPTOP COMPUTER



If you have a laptop, setup should be very easy: Just open it up and press the power button. If the battery isn't charged, you'll need to plug in the **AC adapter**. You can continue using the laptop while it charges.
If your laptop has any **peripherals**, such as **external speakers**, you may want to read the instructions below, since laptops and desktops generally use the same types of connections.

SETTING UP A DESKTOP COMPUTER

Step 1



Unpack the **monitor** and **computer case** from the box. Remove any plastic covering or protective tape. Place the monitor and computer case where you wish on the desk or work area.
Think about where you want your desk or work area to be located, as well as where you want your monitor, computer case, and other hardware. Be sure to place your computer case in an area that is **well-ventilated** and that has good air flow. This will help to prevent overheating.

Step 2



Locate the **monitor cable**. It will usually be either a VGA or DVI cable. VGA cables will often have **blue** connectors to make them easier to identify. (If you have an **all-in-one** computer that's built into the monitor, you can skip to **Step 4**).

Step 3



Connect one end of the cable to the **monitor port** on the back of the **computer case** and the other end to the **monitor**. Hand-tighten the plastic-covered screws on the monitor cable to secure it.
Many computer cables will only fit a specific way. If the cable doesn't fit, don't force it or you might damage the connectors. Make sure the plug aligns with the port, then connect it.

Step 4



Unpack the **keyboard** and determine whether it uses a **USB** (rectangular) connector or a **PS/2** (round) connector. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. If it uses a PS/2

connector, plug it into the **purple** keyboard port on the back of the computer.

Step 5

Unpack the **mouse** and determine whether it uses a **USB** (rectangular) connector or a **PS/2** (round) connector. If it uses a USB connector, plug it into any of the USB ports on the back of the computer. If it uses a PS/2 connector, plug it into the **green** mouse port on the back of the computer.



If your keyboard has a **USB port**, you can connect your mouse to the keyboard instead of connecting it directly to your computer.

If you have a **wireless** mouse or keyboard, you may need to connect a Bluetooth **dongle** (USB adapter) to your computer. However, many computers have built-in Bluetooth, so a dongle may not be necessary.

Step 6

If you have **external speakers** or **headphones**, you can connect them to your computer's **audio port** (either on the front or the back of the computer case). Many computers have color-coded ports. **Speakers** or **headphones** connect to the **green** port, and a **microphone** can connect to the **pink** port. The **blue** port is the **line in**, which can be used with other types of devices.



Some speakers, headphones, and microphones have **USB connectors** instead of the usual audio plug. These can be connected to any USB port. In addition, many computers have speakers or microphones built into the monitor.

Step 7

Locate the two **power supply cables** that came with your computer. Plug the first power supply cable into the back of the **computer case**, and then into a **surge protector**. Then, using the other cable, connect the **monitor** to the **surge protector**.



Step 8

Finally, plug the **surge protector** into a wall outlet. You may also need to turn the **surge protector** on if it has a power switch.



If you don't have a surge protector, you can plug the computer directly into the wall. However, this is **not recommended**, as electrical surges can damage your computer.

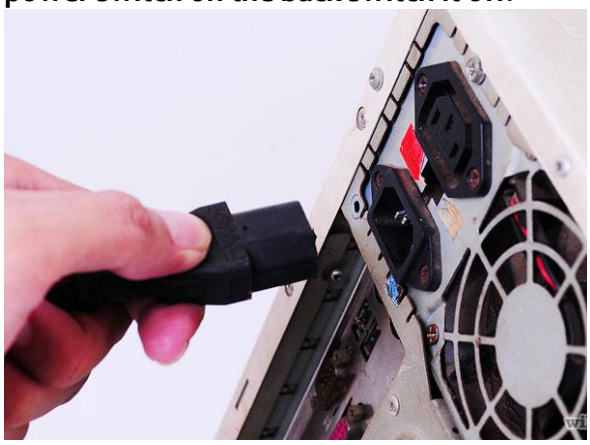
Challenge!

- If you have a desktop computer that is already set up at home, take a look at it.
  - Look at the **monitor cable**, and see where it connects to the computer case and monitor.
  - Locate the **power cords** for the monitor and computer case.

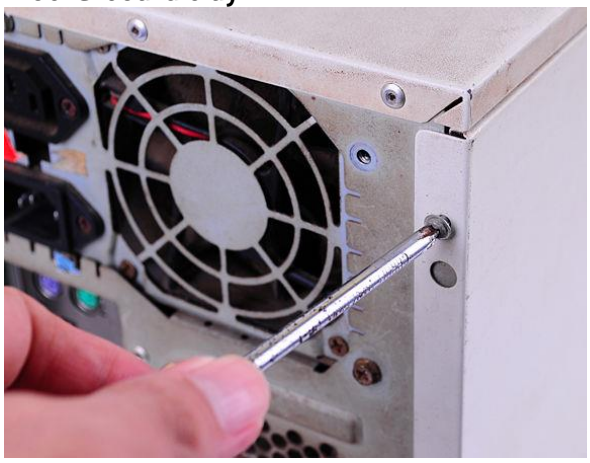
- Locate the **audio ports**.
- Does your computer have a **VGA monitor port,** or another kind?
- Do you have a **USB** or **PS/2** mouse?
- Do you have a **USB** or **PS/2** keyboard?
- Is your computer plugged into a **surge protector**?

HOW TO INSTALL COMPUTER HARDWARE

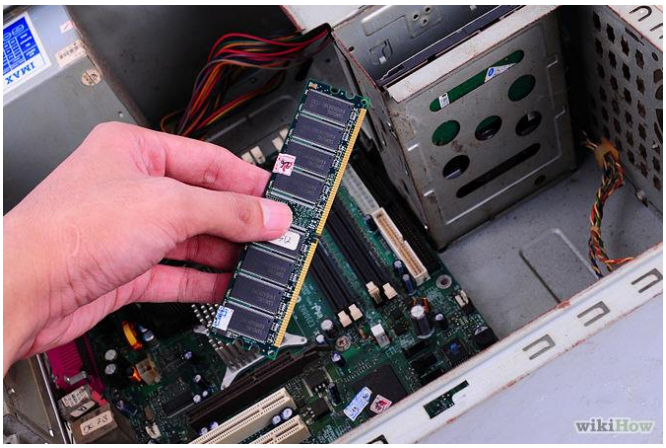
Turn Off the computer and unplug all wires connected to the tower and if there is a power switch on the back switch it off.



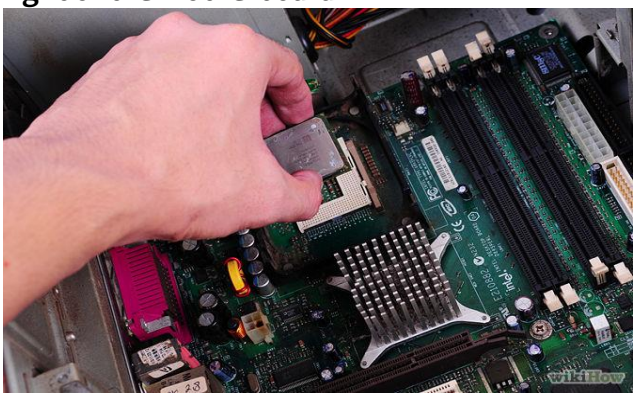
Take out the screws on the back of the tower, take out the panel, then wear an anti-static wrist strap to protect components by earthing your static electricity, and then take out the motherboard tray.



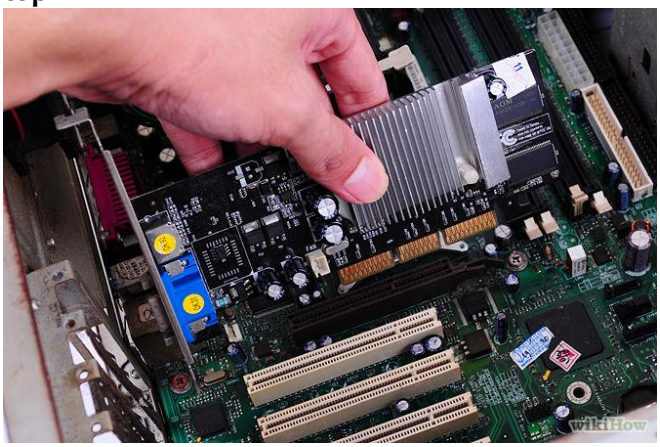
Take the motherboard and screw it on to the motherboard tray then slide it back into the case.



Firmly insert RAM(Random Access Memory) sticks into the long and narrow slots usually located at the top right of the motherboard.

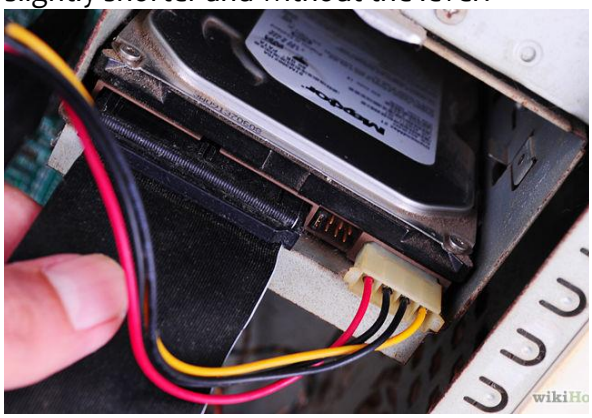


Carefully place the CPU into the socket that is square shaped on the motherboard then place the CPU fan on top.

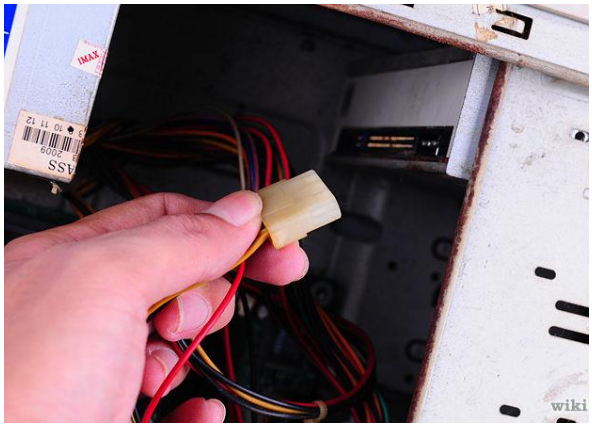


For video cards, look for a slot about the length of your middle finger and has very small lever. Take out the small case panel about the size of your finger on the back and firmly insert the card into the slot, make sure the back of the card comes outside.

- For sound/network cards look for a slot similar to the video card slot, but slightly shorter and without the lever.

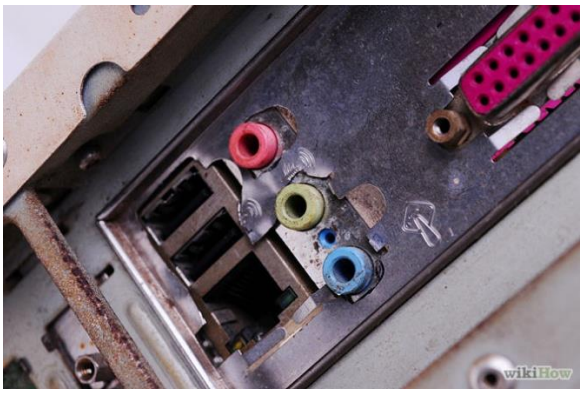


Slowly slide the hard drive into the hard drive bay usually located at the front of the tower then connected the cables from the back of the hard drive to the motherboard.



CD(compact Disk)/DVD(Digital Video Disc) ROM(Read Only Memory) drives are similar to hard drives, just slide it into the bay at the top (right or left depending on the panel that was open) and connect the wires.

For audio devices match the colors and USB is pretty much self-explanatory.



If you have a video card the back of it should be sticking outside which is where you connect the monitor cable to, unless there is no video card then you connect to the motherboard. Video cards now a days come with adapters for older monitors so make sure to connect the adapter to the back of the video card before plugging in the monitor.

COMPUTER ASSEMBLY

- Computer assembly is a large part of a technician's job.

Work in a logical, methodical manner when working with computer components

Improve computer assembly skills dramatically with practice

OPEN THE CASE

- Prepare the workspace before opening the computer case:

Adequate lighting

Good ventilation

Comfortable room temperature

Workbench accessible from all sides

Avoid cluttering workbench

An antistatic mat on the table

Small containers to hold screws and other small parts

- There are different methods for opening cases. To learn how, consult the user manual or manufacturer's website.

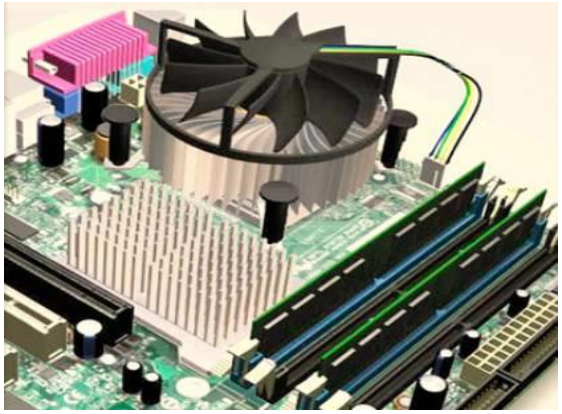
INSTALL THE POWER SUPPLY

Power supply installation steps include the following:

1. Insert the power supply into the case
2. Align the holes in the power supply with the holes in the case
3. Secure the power supply to the case using the proper screws

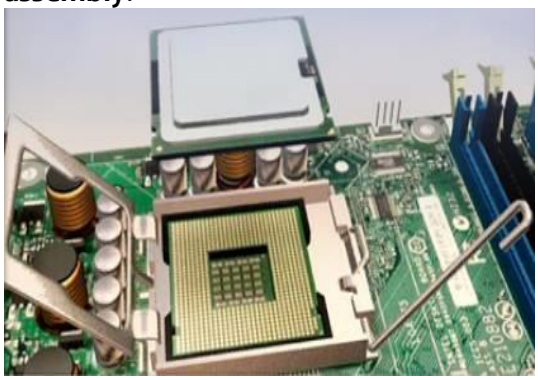
ATTACH COMPONENTS TO THE MOTHERBOARD

- As part of an upgrade or repair, a technician may need to attach components to the motherboard, and then install the motherboard.



CPU on Motherboard

- The CPU and **motherboard** are sensitive to electrostatic discharge so use a grounded antistatic mat and wear an antistatic wrist strap. **CAUTION:** When handling a CPU, do not touch the CPU contacts.
- The CPU is secured to the **socket** on the motherboard with a **locking assembly**.



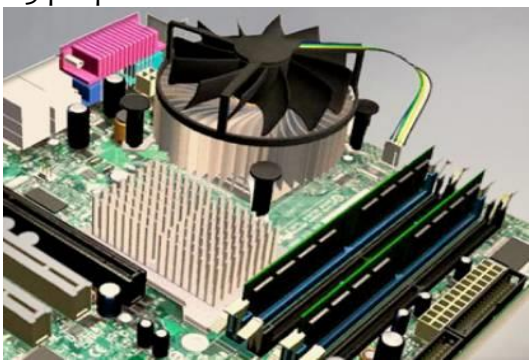
THERMAL COMPOUND

- **Thermal compound** helps to keep the CPU cool.
- To install a used CPU, clean it and the base of the heat sink with isopropyl alcohol to remove the old thermal compound.
- Follow manufacturer's recommendations about applying the thermal compound.



HEAT SINK/FAN ASSEMBLY

- The **Heat Sink/Fan Assembly** is a two-part cooling device.
- The heat sink draws heat away from the CPU.
- The fan moves the heat away from the heat sink.
- The heat sink/fan assembly usually has a 3-pin power connector.



INSTALL CPU AND HEAT SINK/FAN ASSEMBLY

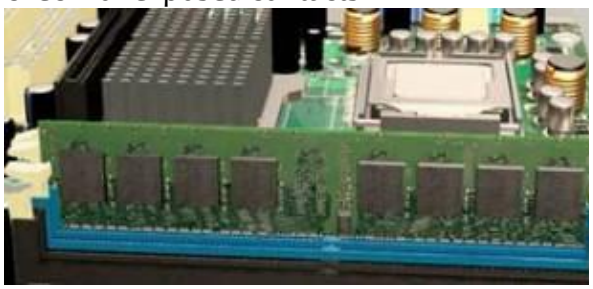
1. Align the CPU so that the Connection 1 indicator is lined up with Pin 1 on the CPU socket.
2. Place the CPU gently into the socket.
3. Close the CPU load plate and secure it by closing the load lever and moving it under the load lever retention tab.
4. Apply a small amount of thermal compound to the CPU and spread it evenly. Follow the application instructions provided by the manufacturer.
5. Line up the heat sink/fan assembly retainers to the holes on the motherboard.
6. Place the heat sink/fan assembly onto the CPU socket, being careful not to pinch the CPU fan wires.

7. Tighten the heat sink/fan assembly retainers to secure the assembly in place.
8. Connect the heat sink/fan assembly power cable to the header on the motherboard.

INSTALL RAM

- **RAM** provides temporary data storage for the CPU while the computer is operating.
- RAM should be installed in the motherboard before the motherboard is placed in the computer case.
- RAM installation steps:

1. Align the notches on the RAM module to the keys in the slot and press down until the side tabs click into place.
2. Make sure that the side tabs have locked the RAM module and visually check for exposed contacts.

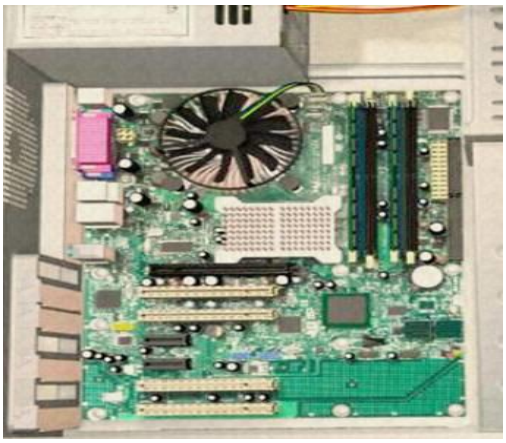


THE MOTHERBOARD

- The motherboard is now ready to install in the computer case.
- Plastic and metal **standoffs** are used to mount the motherboard and to prevent it from touching the metal portions of the case.
- Install only the standoffs that align with the holes in the motherboard.
- Installing any additional standoffs may prevent the motherboard from being seated properly in the computer case.

Install Motherboard

1. Install standoffs in the computer case.
2. Align the I/O connectors on the back of the motherboard with the openings in the back of the case.
3. Align the screw holes of the motherboard with the standoffs.
4. Insert all of the motherboard screws.
5. Tighten all of the motherboard screws.



INSTALL INTERNAL DRIVES

- Drives that are installed in internal bays are called internal drives.
- A hard disk drive (**HDD**) is an example of an internal drive.
- HDD installation steps:
- Position the HDD so that it aligns with the 3.5-inch drive bay.
- Insert the HDD into the drive bay so that the screw holes in the drive line up with the screw holes in the case.
- Secure the HDD to the case using the proper screws.



INSTALL DRIVES IN EXTERNAL BAYS

- Drives, such as **optical** drives (**CD** and **DVD**) and **floppy** drives, are installed in drive bays that are accessed from the front of the case.
- Optical drives and floppy drives store data on removable media.
- Drives in **external bays** allow access to the media without opening the case.

Install Optical Drive

- An **optical drive** is a storage device that reads and writes information to CDs or DVDs.
- Optical drive installation steps:

1. Position the optical drive to align with the 5.25 inch drive bay.
2. Insert the optical drive into the drive bay so that the optical drive screw holes align with the screw holes in the case.

3. Secure the optical drive to the case using the proper screws.



Install Floppy Drive

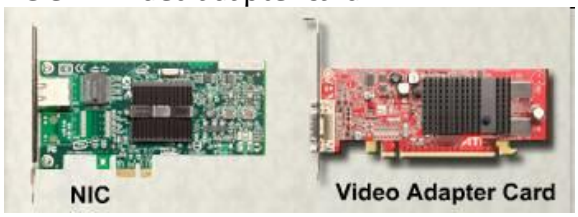
- A floppy disk drive (**FDD**) is a storage device that reads and writes information to a floppy disk.
- FDD installation steps:

1. Position the FDD so that it aligns with the 3.5 inch drive bay.
2. Insert the FDD into the drive bay so that the FDD screw holes align with the screw holes in the case.
3. Secure the FDD to the case using the proper screws.



- Adapter cards are installed to add functionality to a computer.
- Adapter cards must be compatible with the expansion slot.
- Some adapter cards:

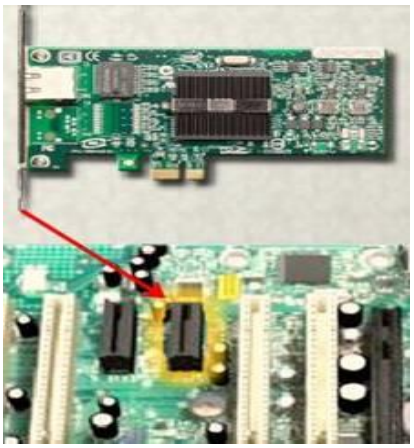
PCIe x1 NIC
PCI Wireless NIC
PCIe x16 video adapter card



INSTALL THE NETWORK INTERFACE CARD (NIC)

- A NIC enables a computer to connect to a network.
- NICs use **PCI** and **PCIe** expansion slots on the motherboard.
- NIC installation steps:
- Align the NIC to the appropriate slot on the motherboard.
- Press down gently on the NIC until the card is seated.
- Secure the NIC PC mounting bracket to the case with the appropriate screw.

Install the Wireless NIC



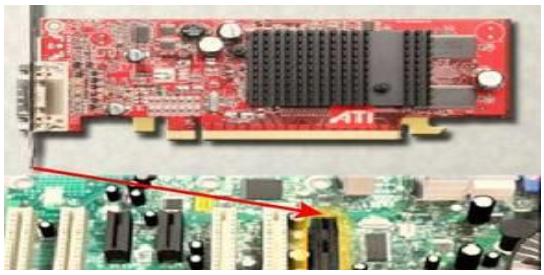
- A wireless NIC enables a computer to connect to a wireless network.
- Some wireless NICs are installed externally with a USB connector.
- Wireless NIC installation steps:

1. Align the wireless NIC to the appropriate expansion slot on the motherboard.
2. Press down gently on the wireless NIC until the card is fully seated.
3. Secure the mounting bracket to the case with the appropriate screw.

INSTALL THE VIDEO ADAPTER CARD

- A video adapter card is the interface between a computer and a display monitor.
- An upgraded video adapter card can provide better graphic capabilities for games and graphic programs.
- Video adapter card installation steps:

1. Align the video adapter card to the appropriate expansion slot on the motherboard.
2. Press down gently on the video adapter card until the card is fully seated.
3. Secure the video adapter card PC mounting bracket to the case with the appropriate screw.



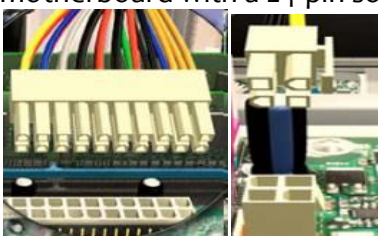
CONNECT INTERNAL CABLES

- **Power cables** are used to distribute electricity from the power supply to the motherboard and other components.
- **Data cables** transmit data between the motherboard and storage devices, such as hard drives.
- Additional cables connect the buttons and link **lights** on the front of the computer case to the motherboard.

CONNECT POWER CABLES

Motherboard Power Connections

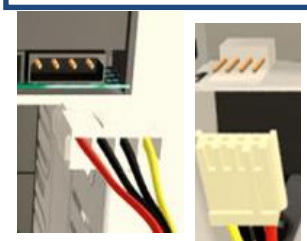
- The Advanced Technology Extended (**ATX**) main power connector has either 20 or 24 pins.
- The power supply may also have a 4-pin or 6-pin Auxiliary (**AUX**) power connector that connects to the motherboard.
- A 20-pin connector will work in a motherboard with a 24-pin socket.



- **SATA** Power Connectors use a 15-pin connector to connect to hard disk drives, optical drives, or any devices that have a SATA power socket.
- **Molex** Power Connectors are used by hard disk drives and optical drives that do not have SATA power sockets.
- **CAUTION:** Do not use a Molex connector and a SATA power connector on the same drive at the same time.
- 4-pin **Berg** Power Connector supplies power to a floppy drive.



SATA



Molex | Berg

POWER CONNECTOR INSTALLATION STEPS

1. Plug the SATA power connector into the HDD.
2. Plug the Molex power connector into the optical drive.
3. Plug the 4-pin Berg power connector into the FDD.
4. Connect the 3-pin fan power connector into the appropriate fan header on the motherboard, according to the motherboard manual.
5. Plug the additional cables from the case into the appropriate connectors according to the motherboard manual.

PATA Cables

- Drives connect to the motherboard using data cables.

Types of data cables are PATA, SATA, and floppy disk.

- The **PATA** cable (sometimes called a **ribbon** cable) is wide and flat and can have either 40 or 80 conductors.

A PATA cable usually has three 40-pin connectors.

If multiple hard drives are installed, the **master** drive will connect to the end connector. The **slave** drive will connect to the middle connector.

- Many motherboards have two PATA cable sockets, which provides support for a maximum of four PATA drives.



SATA Cables

- The **SATA** data cable has a 7-pin connector.

One end of the cable is connected to the motherboard.
The other end is connected to any drive that has a SATA data connector.



Floppy Drive Cables

- The floppy drive data cable has a 34-pin connector and it has a stripe to denote the location of pin 1.

One connector at the end of the cable connects to the motherboard. The other two connectors connect to drives.
If multiple floppy drives are installed, the A: drive will connect to the end connector. The B: drive will connect to the middle connector.

- Motherboards have one floppy drive controller which provides support for a maximum of two floppy drives.

Install Data Cables

1. Plug the motherboard end of the PATA cable into the motherboard socket.
2. Plug the connector at the far end of the PATA cable into the optical drive.
3. Plug one end of the SATA cable into the motherboard socket.
4. Plug the other end of the SATA cable into the HDD.
5. Plug the motherboard end of the FDD cable into the motherboard socket.
6. Plug the connector at the far end of the FDD cable into the floppy drive.

RE-ATTACH PANELS, CONNECT EXTERNAL CABLES

- Now that all the internal components have been installed and connected to the motherboard and power supply, the side panels are re-attached to the computer case.
- The next step is to connect the cables for all computer peripherals and the power cable.

Re-attach Side Panels

- Most computer cases have two panels, one on each side.
- Once the cover is in place, make sure that it is secured at all screw locations.
- Refer to the documentation or manufacturer's website if you are unsure about how to remove or replace your computer case.
- **CAUTION:** Handle case parts with care. Some computer case covers have sharp or jagged edges.



CONNECT EXTERNAL CABLES

- After the case panels have been re-attached, connect the external cables to the back of the computer.
- External cable connections include:

Monitor	USB
Keyboard	Power
Mouse	Ethernet

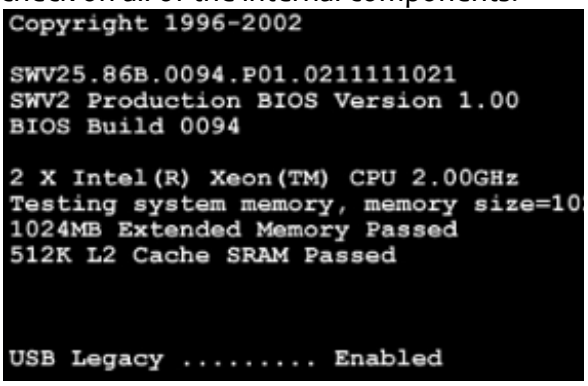
CAUTION: When attaching cables, never force a connection.

- **NOTE:** Plug in the power cable after you have connected all other cables.
- Attach the monitor cable to the video port.
- Secure the cable by tightening the screws on the connector.
- Plug the keyboard cable into the PS/2 keyboard port.
- Plug the mouse cable into the PS/2 mouse port.
- Plug the USB cable into a USB port.
- Plug the network cable into the network port.

- Connect the wireless antenna to the antenna connector.
- Plug the power cable into the power supply.

BOOT COMPUTER FOR THE FIRST TIME

- The BIOS is a set of instructions stored in a **nonvolatile** memory chip.
- When the computer is booted, the basic input/output system (**BIOS**) will perform a power-on self test (**POST**) to check on all of the internal components.



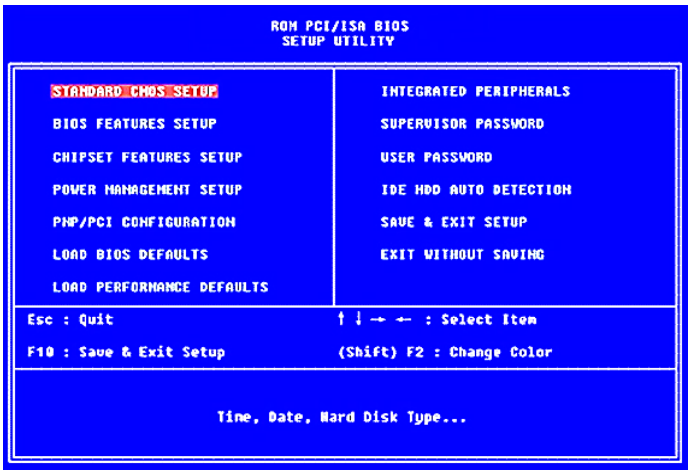
- A special key or combination of keys on the keyboard is used to enter the **BIOS setup** program.
- The BIOS setup program displays information about all of the components in the computer.

BIOS Setup

- The BIOS contains a setup program used to configure settings for hardware devices.
- The configuration data is saved to a special memory chip called a complementary metal-oxide semiconductor (**CMOS**).
- CMOS is maintained by the battery in the computer.
- If this battery dies, all BIOS setup configuration data will be lost.
- Replace the battery and reconfigure the BIOS settings.

BIOS SETUP PROGRAM

BIOS settings are configured in the BIOS setup program.

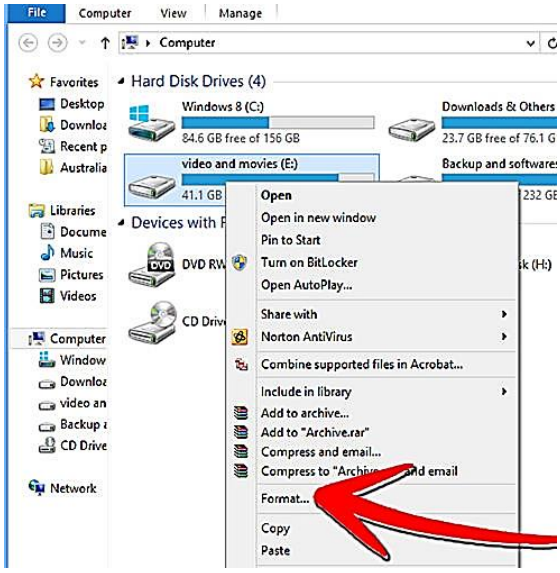


FORMATTING DISKS

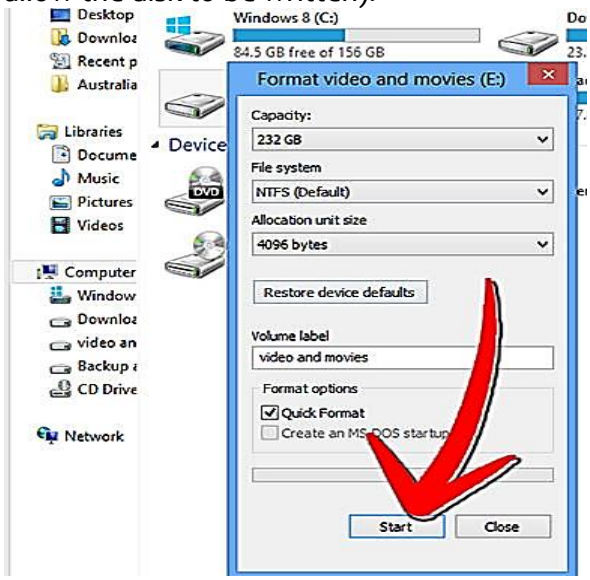
Disk formatting is the process of preparing a data storage device such as a hard disk drive, solid-state drive, floppy disk or USB flash drive for initial use. In some cases, the formatting operation may also create one or more new file systems. The first part of the formatting process that performs basic medium preparation is often referred to as "low-level formatting". Partitioning is the common term for the second part of the process, making the data storage device visible to an operating system. Partitioning divides a disk into one or more regions, writing data structures to the disk to indicate the beginning and end of the regions. The third part of the process, usually termed "high-level formatting" most often refers to the process of generating a new file system. In some operating systems all or parts of these three processes can be combined or repeated at different levels and the term "format" is understood to mean an operation in which a new disk medium is fully prepared to store files.

HOW TO FORMAT A HARD DISK

Check the drive. Choose the drive and display the contents. Back up, copy or move any data to be retained, to another drive or location and exit the window. *Formatting will delete the contents of a drive.*



Display 'My Computer" Locate the icon that represents the disk to be formatted. Select it by right clicking the icon. Find the "Format" choice in the drop down box. If a 3-1/2" diskette drive, slide the write protect tab on diskette so that the opening is blocked (this will allow the disk to be written).



Click "Format" Click format to bring a box of choices based on type of disk and OS (operating system) version. Choose a fast format whenever possible. Volume labels are optional. Choose "Make Bootable" if the diskette is to be used to start the PC. It will not be possible to format the boot drive (usually "C:") from within Windows.

UNIT 3: SOFTWARE INSTALLATION

INSTALLING THE OPERATING SYSTEM

Reasons to perform a clean installation of an OS:

- When a computer is passed from one employee to another
- When the operating system is corrupted
- When a new replacement hard drive is installed in a computer
- When the operating system is severely infected by computer viruses

HARD DRIVE SETUP PROCEDURES

Operating system setup methods:

- Install an OS over a network from a server
- Install from a copy of the OS files stored on the hard drive
- Install from OS files stored on CDs or DVDs

PARTITIONING AND FORMATTING:

- Hard drive must be logically divided (partitioned)
- File system must be created on the hard drive
- During the installation phase, most operating systems will automatically partition and format the hard drive
- A technician should understand the process related to hard drive setup.

PREPARE THE HARD DRIVE

- The first portion of the installation process deals with formatting and partitioning the hard drive.
- The second portion prepares the disk to accept the file system.
- The file system provides the directory structure that organizes the user's operating system, application, configuration, and data files.
- Examples of file systems:
- The FAT32 file system
- The New Technology File System (NTFS)

INSTALL THE OPERATING SYSTEM

- Define currency and numerals
- Text input language
- Name of user

- Name of company
- Product key
- Computer name
- Administrator password
- Date and time settings
- Network settings
- Domain or workgroup information

CREATE ADMINISTRATOR ACCOUNT

- Setup creates the administrator account with the user name "administrator"
- Change this name to keep the administrator account secure
- Only use the administrator account occasionally for critical system changes
- Create a fictitious user account to use as a template
- Use secure passwords
- These should be a minimum of 7 characters, containing at least one of each (letter, number, and symbol)

COMPLETE THE INSTALLATION

- When Windows XP installation completes:
- Computer will reboot
- Log in for the first time
- Register Windows XP and verify that you are using a legal copy of the OS
- Verification enables you to download patches and service packs
- Use Microsoft Update Manager to scan for new software and to:
- Install all service packs
- Install all patches

CHECK DEVICE MANAGER FOR CONFLICTS

- Look for warning icons (yellow exclamation points)
- Double-click to learn about the problem
- Click the plus (+) sign to expand the category
- May be able to ignore an error

INSTALLING APPLICATION AND UTILITY SOFTWARE

Most Application software can easily be installed with the help of a wizard that is usually launched when the installation setup.exe program is executed. The setup comes together with other program files on the installation purchased disk or it can be downloaded from the application developer / distributors' website.

INSTALLING UTILITY PROGRAMS

Although operating systems typically include some built-in utilities, many stand-alone utility programs are available for purchase. For example, you can purchase personal firewall, backup utilities, and screen savers. These stand-alone utilities typically offer improvements over those features built into the operating system or provide features not included in an operating system. Other functions provided by stand-alone utilities include protecting against viruses, removing spyware and adware, filtering Internet content, compressing flies, converting files, playing media files, burning CDs and DVDs, and maintaining a personal computer. These standalone utility programs can also be installed in the same way application software is installed.

UNINSTALLING PROGRAMS

An ***uninstaller*** is a utility that removes a program, as well as any associated entries in the system files. In Windows, you are able to access the uninstaller for many installed programs through the "Uninstall a program" command in the Control Panel. You also are able to access the uninstaller for some programs through that programs folder on the Start menu, or on the program's installation media. When you install program, the operating system records the information it uses to run the software in the system files. The uninstaller deletes files and folders from the hard disk, as well as removes program entries from the system files.

INSTALLING DEVICE DRIVERS

You follow the same general steps to install drivers for any type of hardware. For many devices, the computer's operating system may include the necessary drivers. When you install a new device on your computer, Windows

operating system searches its database of common drivers that can be used to communicate with the new device. If Windows cannot locate a driver for the device, and if you have an Internet connection, Windows will search an online repository of device drivers. If Windows still is unable to find a driver, you can download one from the manufacturer's Web site, or install the drivers from the CD provided with the purchased device. In addition, there are computer software solutions developed to detect devices connected to a system and install their drivers. Examples include the Driver Pack Solution DVD.

UNIT 4: COMPUTER TROUBLESHOOTING

- Regular preventive maintenance reduces hardware and software problems.
- Before beginning any repair, back up the data on a computer.
- The troubleshooting process is a guideline to help you solve computer problems in an efficient manner.
- Document everything that you try, even if it fails. The documentation that you create will become a useful resource for you and other technicians.

•There is a basic troubleshooting process that includes the elimination of variables one at a time in a logical progression. When following a structured approach to troubleshooting, you will avoid following unnecessary leads, which will waste time and cause frustration. A newly employed technician would benefit from following a senior technician on a repair job. Communication skills (soft skills) are very important to the success of a career as a repair technician.

THE PURPOSE OF PREVENTIVE MAINTENANCE

- Reduce the likelihood of hardware or software problems by systematically and periodically checking hardware and software to ensure proper operation.
- Reduce computer down time and repair costs.

HARDWARE MAINTENANCE

Make sure that the hardware is operating properly.

- Check the condition of parts.
- Repair or replace worn parts.
- Keep components clean.
- Create a hardware maintenance program.
- Remove dust from fan intakes.
- Remove dust from power supply unit
- Remove dust from components inside the computer.
- Clean mouse and keyboard.
- Check and secure any loose cables.

SOFTWARE MAINTENANCE

- Review updates
- Follow policies of your organization
- Create a schedule
- Review security updates
- Review software updates
- Review driver updates
- Update virus definition files
- Scan for viruses and spyware
- Remove unwanted programs
- Scan hard drives for errors
- Defragment hard drives

PREVENTIVE MAINTENANCE BENEFITS

- Reduce computer down time.
- Reduce repair costs.
- Reduce loss of worker productivity.
- Increases data protection
- Extends the life of the components
- Increases equipment stability
- Reduces repair costs
- Reduces the number of equipment failures.

THE TROUBLESHOOTING PROCESS

•Explain the purpose of data protection

•Customer information

•Company name, contact name, address, phone number

•Computer configuration

•Operating system, patches and updates, network environment, connection type

•Use a work order to collect information

•Description of problem

•Open-ended questions

• What were you doing when the problem was identified?
•Closed-ended questions
• Are you currently logged into your network?
•**Gather data from the customer**

VERIFY THE OBVIOUS ISSUES

•Is the caps lock key set to ON?
•Is there a non-bootable disk in the floppy drive?
•Are the drive settings and boot order configured correctly in BIOS?
•Can you log on as another user?
•Was the computer turned off without being shut down properly?
•Has the password changed?
•Does the monitor have power?
•Does the display have the correct settings?

TRY QUICK SOLUTIONS FIRST

•Use the Last Known Good Configuration settings
•Enter Safe Mode to troubleshoot video problems
•Uninstall an application that was recently added
•Roll back the system using a System Restore point
•Examine the Device Manager for device conflicts
•Run cleanmgr to clean up temp files
•Run chkdsk/f to repair problems with the hard drive
•Run defrag to speed up the hard drive
•Reboot the computer
•Login as a different user

GATHER DATA FROM THE COMPUTER

•Examine system files.
•Run diagnostic software.
•Refer to the computer user manual or BIOS website for the meaning of beep codes.
•Examine the event logs to determine the cause of computer problems.

EVALUATE THE PROBLEM AND DETERMINE THE SOLUTION

•You may need to conduct further research
•Refer to repair manuals
•Study the product documentation
•Visit the manufacturer's website
•Consult repair journals
•Talk to technicians who may have repaired similar problems.
•Implement the most likely solution first
•Return the computer to the original state before trying the next solution
•It may be necessary to test many potential solutions before the problem is resolved

CLOSE WITH THE CUSTOMER.

When you are confident that the problem is resolved:
☐ Document the customer information, problem description, and steps to resolve the issue in the work order.
☐ Explain to the customer how you solved the problem .
☐ Let the customer verify that the problem has been solved.
☐ Complete all documentation including sales orders, time logs, and receipts.
☐ Complete the work order.
☐ Update the repair journal. You can use the notes from the journal for future reference.

IDENTIFY ALERTS AND BEEP CODES

- POST checks to see that all of the hardware in the computer is operating correctly.
- If a device is malfunctioning, an error or a beep code alerts the technician that there is a problem.
- Typically, a single beep denotes that the computer is functioning properly.
- If there is a hardware problem, the computer may emit a series of beeps.
- Each BIOS manufacturer uses different codes to indicate hardware problems.
- Consult the motherboard documentation to view beep codes for your computer.

COMMON PROBLEMS AND SOLUTIONS

Problem Symptom	Possible Solution

The computer displays the desktop in 16 color VGA mode after updating the video drivers.	Use the "Roll Back Driver" option to remove the new video driver. Remove any unnecessary programs from the Startup tab and reboot the computer.
The computer will no longer boot to Windows and gives the error "Invalid systems disk"	Remove any floppies and CDs from the computer and verify that the HDD is set as a bootable device in the BIOS setup.
The computer will not finish loading Windows.	Boot the computer in safe mode and uninstall any recently installed applications.
Computer displays a blue screen on startup	Disconnect any newly attached hardware and reboot.
Computer program frequently freezes during operation.	Scan the computer for viruses, and also update your programs or patch them up in case of program bugs.

SUMMARY

☐ Consider the customer's needs when selecting an OS.
☐ The main steps in setting up a customer's computer include preparing the hard drive, installing an operating system, creating user accounts, and configuring installation options.
☐ A GUI shows icons of all files, folders, and applications on the computer.
☐ Establish a backup strategy that allows for the recovery of data.
☐ Preventive maintenance helps to ensure optimal operation of the OS.
☐ Tools for troubleshooting an OS problem include Windows Advanced Options menu, event logs, device manager, and system files.

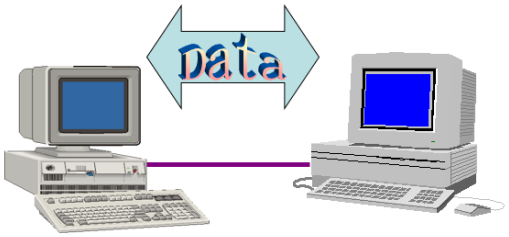
S3 - TOPIC 8: COMPUTER COMMUNICATION AND NETWORKING

UNIT ONE: INTRODUCTION TO COMPUTER COMMUNICATION

Unit Objectives
To be able to:
a) Define terms used in computer communication
b) Explain the importance and limitations of computer communication

DEFINITION OF TERMINOLOGIES

Computer Communication: Computer communication is the transmission of data and information over a channel between two computers. Communication is only complete when there is **feedback**.



Computer Network: A computer Network is a collection of two or more computers and devices connected by channels so that they can communicate with each other and share resources: **Examples of resources**

- data, a single internet connection,
- software,
- Peripheral devices, processing power.

Encoding: This is the process through which Information (e.g. data, text, voice or video) from the sending device is converted into signals which the communication medium can carry.

Transmission: This is the process through which the signals are broad cast/ sent out through the medium to the receiving device.

Decoding: This is the process through which the signals are converted back into the information in its original form in the receiving device.
Telecommunication: This refers to transmission of data and information over a long-distance, e.g. television. Telecommunication includes telephony, telegraphy and television means communication at a distance.
Teleprocessing: This refers to access and modification of computer files located elsewhere.
Downloading: To download is to transfer a file to your computer from another computer on the network.
Uploading: This means to transfer a file from your computer to another computer on the network.
Bandwidth: The amount of signals that can travel over a communications channel in a given amount of time. The higher the bandwidth, the more data and information the channel can transmit.
Data Encryption: This is Process of converting data into coded form (cypher text) to prevent it from being read or understood by unauthorized people. Encrypted data is difficult to decode without a secret key
Communications Software: This refers to a set of instructions (software) needed by a computer before it starts sending and receiving data from other computers.

IMPORTANCE OF COMPUTER COMMUNICATION

- It allows sharing of hardware like printers.
- It allows sharing of software between two or more computers, hence reducing on cost.
- It allows sharing and transfer of data and information stored on other computers on the network.
- Facilitate communications between people e.g. through electronic-mail, Mobile phones, etc.
- Computer communication has security & tight control measures over data access.
- It enables online learning and collaborative research.
- Allow **many** users to **access** programs and data **concurrently**, for example It allows access to common databases for in banks.
- Has enabled improved travel service through e-bookings and e-reservation.
- Provides for online employment e.g. telecommuting.
- Enable **central management** of **resources** like an **antivirus** solution can be easily deployed and managed over a network, i.e. **security updates** are installed only on one Machine (**server**), and then all the Machines receive the update and get protected.
- **Cost saving-** e.g. Expensive **resources** can be shared over the network, reducing the costs.
- **Easier backup** especially in **centralized** databases.
- Make **personal** communication easier.

LIMITATIONS OF COMPUTER COMMUNICATION

- Data theft. If a computer is a standalone, physical access becomes necessary for any kind of data theft. However, if a computer is on a network, a computer hacker can get illegal access.

• Rapid Spread of Computer Viruses: If any computer system in a network gets infected by computer virus, there is a possible threat of other systems getting infected.
• Expensive Set Up: The initial set up cost of a computer network can be high depending on the number of computers to be connected.
• Dependency on the Main File Server: In case the main File Server of a computer network breaks down, the system becomes useless.
• Exposure to External Exploits. Someone on a different computer can send data to the computer in such a way as to attack it - make it lock up or crash, make it slow down, or even take control of it.
• Automatic Downloads. If a computer is connected to a network, it's easier to download and install software from the network onto the computer without any human intervention. If the new software hasn't been tested, it could cause unpredictable behavior.
• Computer Networks can fail. Computer networks can be so powerful and useful that it is very vital for them to be used. All of the computers in an office building might become completely useless if a single network component fails.

UNIT TWO: NETWORKS

Unit Objectives

To be able to:

a) Explain the different types of networks

a. Definitions and Features of various computer network types

b. The Internet and its services; the www and email.

c) Explain the different forms of data transmission

d) Setup & configure a Small Office/Home (SOHO) network

TYPES OF COMPUTER NETWORKS

▪ A network can be relatively small or extensively large. The most common types of computer networks include:
▪ Local Area Networks (LAN)
▪ Peer-to-peer network
▪ Client/server network
▪ Personal area network (PAN)
▪ Wide area network (WAN)
▪ Metropolitan area networks (MANs)
▪ Campus Area Networks (CANs)
▪ Virtual Private Network (VPNs)

LOCAL AREA NETWORK (LAN)

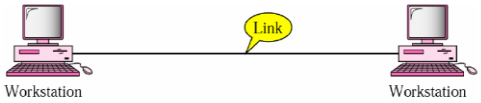
▪ A local area network (LAN) is a network that connects computers in a small geographic area such as a building like a computer laboratory, or an office.
▪ The nodes are connected to the LAN via cables.
▪ **A wireless LAN (WLAN)** is a LAN that does not use physical wires, but uses wireless media such as radio waves.

PEER-TO-PEER NETWORK

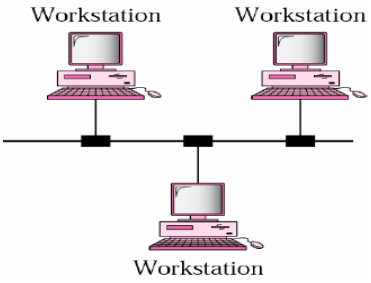
▪ Peer-to-Peer Networks Involve the **sharing** of Information or **resources** between **two** or **more computers connected** to each other **without** the use of a Server. Each

computer stores files on its own storage devices and each computer on the network contains both the network operating system and application software.

▪ It can use either Point to point Connections or Multi point Connections.



• **A point-to-point connection** provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices. For example, when you change television channels by infrared remote control, you are establishing a point-to-point connection between the remote control and the television's control system



• **A multipoint (also called multidrop)** connection is one in which many specific devices share a single link. In a multipoint environment, the capacity of the channel is shared, either spatially or temporally. If several devices can use the link simultaneously, it is a spatially shared connection. If users must take turns, it is a timeshared connection.

Advantages of Peer to Peer Network

▪ A peer-to-peer network is simple to setup i.e. does not require too much configuring.

▪ It is not expensive to set up.

▪ It does not require a dedicated server to control the network.

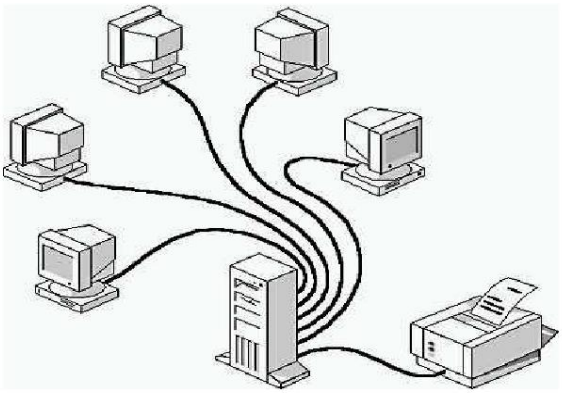
▪ It is perfect for home and small business users.

Disadvantages of a Peer to Peer Network

- The system is not centralized, making administration difficult.
- Limited security i.e. files can be accessed by any one on the network

CLIENT/SERVER NETWORK

- A client/server network has one or more computers acting as a server while the other computers (i.e., clients) on the network can request services from the server.



- A client computer is a computer that can access the resources on a network.
- A server provides a centralized storage area for programs, data, and information.
- Most client/server networks have a network administrator who is in charge of the network.

Advantages of a Client/Server Network

- All Resources are centralized and easier to access.
- Easy management and administration of the network.
- More data security since all network access is controlled through the server.
- The network is flexible, because changes and new technology can be easily included into system.
- Client /Server network is faster than P2P since data and resources are handled by a dedicated machine.
- It is easy to backup all data stored centrally on the server.
- Client Server network can support many computers as compared to a P2P network.

Disadvantages of a Client /Server Network

- It is expensive to set up as compared to a P2P network.
- It requires an extra computer to serve as a dedicated server.
- Maintenance – large networks will require an administrator staff to ensure efficient operation
- Dependence – When the server goes down, operations will cease across the network
- Server can get overloaded since all the processing is controlled at one point.

PERSONAL AREA NETWORK (PAN)

- A personal area network (PAN) is the interconnection of computer devices within the range of an individual person, typically within a range of 10 meters.



- For example, a person traveling with a laptop, a personal digital assistant (PDA), and a portable printer could interconnect them without having to plug anything in, using some form of wireless technology.

▪ Typically, this kind of personal area network could also be interconnected without wires to the Internet or other networks.

WIDE AREA NETWORK (WAN)

▪ A wide Area Network (WAN) is a network that covers a large geographic area.
▪ An example of a WAN is a network that connects the district office computers of a company across the country or across several counties in the world.
▪ Computers are often connected to a WAN via public networks such as the telephone system or by dedicated lines or satellites.
▪ The Internet is the world's largest WAN.

METROPOLITAN AREA NETWORKS (MANS)

▪ A metropolitan area network (MAN) is a large computer network that usually spans a city or a large campus.
▪ A MAN usually interconnects two or more LANs using a high-capacity backbone technology, such as fiber-optical links or other digital media.
▪ A MAN covers a smaller geographic area than a WAN.

CAMPUS AREA NETWORKS

▪ A network that connects two or more LANs but is limited to a specific and contiguous geographical area such as a college campus, industrial complex, or a military base etc.
▪ It spans multiple LANs but smaller than a MAN

VIRTUAL PRIVATE NETWORKS

A virtual private network (VPN) extends a private network across a public network, and enables users to send and receive data across shared or public networks as if their computing devices were directly connected to the private network. Applications running across the VPN may therefore benefit from the functionality, security, and management of the private network.[1]
VPNs may allow employees to securely access a corporate intranet while located outside the office. They are used to securely connect geographically separated offices of an organization, creating one cohesive network.

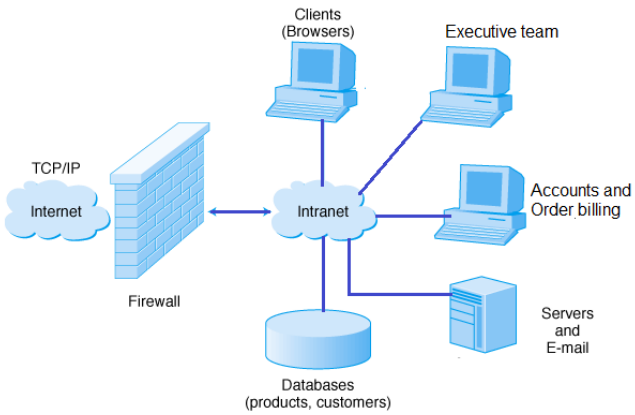
INTRANET, EXTRANET AND INTERNET

▪ Individual Computer networks such LANS and PANs can be interconnected to form extended networks such as intranets, Extranets and the Internet.
QN: *What is the difference between Intranet, Extranet and Internet?*
▪ Intranet is used only within an organization; an Extranet is an extension of an intranet - used even outside the organization, while the Internet is a global WAN.

INTRANET

▪ **Intranet** refers to an inter connection of private computer networks within an organization.

An intranet is an information portal designed specifically for the internal communications of small, medium or large businesses, enterprises, governments, industries or financial institutions of any size or complexity. Intranets can be custom-designed to fit the exact needs of businesses no matter where they are situated. Users of intranets consists mainly of:



- Members of the executive team
- Accounting and order billing.
- Managers and directors.
- Sales people and support staff.
- Customer service, help desk, etc.

▪ An intranet has tools to facilitate communication between organization's employees or workgroups to improve the knowledge and data sharing capability.

▪ Many schools and non-profit groups have deployed intranets

▪ An intranet may consist of an internal email system, company web sites, and databases containing company news, forms, and personnel information.

▪ An example of an intranet is a school network.

ADVANTAGES OF INSTALLING A SCHOOL NETWORK

▪ Speed. Networks provide a very rapid method for sharing and transferring files.

▪ Cost. Networkable versions of many popular software programs are available at considerable savings when compared to buying individually licensed copies.

▪ Security. Files and programs on a network can be safe i.e. passwords can be established for specific directories to restrict access to authorized users.

▪ Sharing resources such as laser printers, fax machines, modems, scanners, etc. is simplified

▪ Electronic Mail. Electronic mail on a LAN can enable students to communicate with teachers and peers at their own school.

▪ Flexible Access. School networks allow students to access their files from computers throughout the school. Students can also work cooperatively through the network.

DISADVANTAGES OF INSTALLING A SCHOOL NETWORK

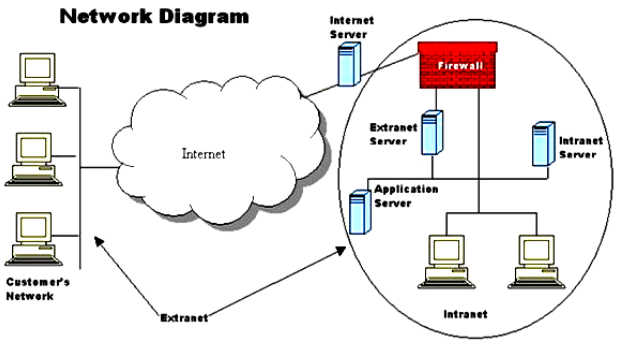
▪ Expensive to Install. Although a network will generally save money over time, the initial costs of installation can be prohibitive.

▪ Requires Administrative Time. Proper maintenance of a network requires considerable time and expertise.

▪ Must Monitor Security Issues. Wireless networks are becoming increasingly common; however, security can be an issue with wireless networks.

EXTRANET

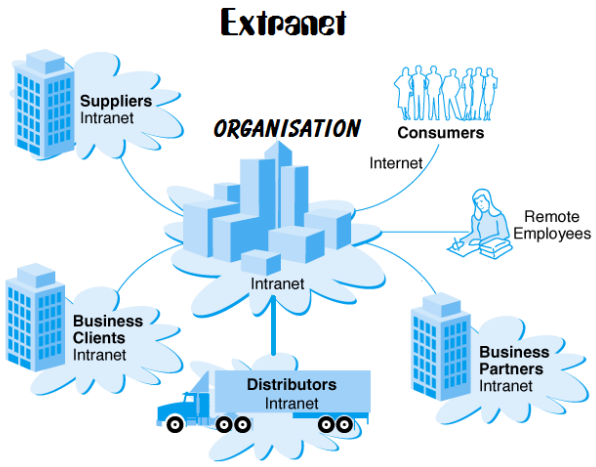
An extranet is a computer network that allows controlled access from the outside for specific business or educational purposes.



- Extranets are extensions to, or segments of, private intranet networks that have been built in many corporations for information sharing.
- Most extranets use the internet as the entry point for outsiders, a firewall configuration to limit access and a secure protocol for authenticating users

Advantages of extranet

- Exchange large volumes of data using Electronic Data Interchange (EDI)
- Share product catalogs exclusively with trade partners
- Collaborate with other companies on joint development efforts
- Jointly develop and use training programs with other companies
- Provide or access services provided by one company to a group of other companies, such as an online banking application managed by one company on behalf of affiliated banks.



- Share news of common interest exclusively

Disadvantages of extranet

- Extranets can be expensive to implement and maintain within an organization (e.g., hardware, software, employee training costs)
- Security of extranets can be a concern when hosting valuable or proprietary information.

INTERNET

- The internet is a global connection of computer networks.
- The internet links together millions of computers, to exchange and share information all over the world.

HISTORY OF INTERNET

- The Internet has its root in a networking project called the ARPANET started by the Pentagon's Advanced Research Projects Agency (ARPA).
- The goal of the project was to build a network that allowed scientists at different locations to share information and work together on military and scientific projects, and could function even if part of the network were disabled or destroyed by a disaster such as a nuclear attack.
- The ARPANET became functional in September 1969, linking scientific and academic researchers in the United Sates.
- In 1986, the National Science Foundation (NSF) connected its huge network of five supercomputer centers, called NSFnet to the ARPANET, and this configuration of complex networks and hosts became known as the Internet.

- Today, a variety of corporations provide networks to handle the Internet traffic.
- These networks, along with telephone companies, cable and satellite companies, and the governments, all contribute toward the internal structure of the Internet.

USES AND ADVANTAGES OF GETTING CONNECTED TO THE INTERNET

- Access a wealth of information, such as news, weather reports, and airline schedules.
- Shop for goods and services through E – commerce
- Use online banking services and manage investments.
- Do research and take online training courses.
- To download files, software etc.
- For Advertisement. People use internet to publish information about themselves or their work.
- Make cheap internet calls, for example via Google talk and Skype.
- Send and receive email to and from other connected users.
- Communicate with others around the world through chat rooms, videoconferencing etc.
- Access sources of entertainment and leisure, such as online games, magazines, and vacation planning guides, listen to music, and watch movies.
- Has **cloud computing** storage where you can store information safely and can access it anywhere.
- It is accessible 24/7 (always on)
- Search Engines like Yahoo, Google can help you get what you want – compared to looking for a information in a Library.

DISADVANTAGES OF INTERNET

- Computer viruses these can be downloaded and spread across machines and have destructive effects.
- Internet provides unsuitable material such as Pornography, the biggest threat related to healthy mental life.
- Privacy violation: Internet can expose your personal information such as name, address, etc. to wrong people such as hackers.
- Spamming: Spamming refers to sending unwanted e-mails in bulk, such as email adverts.
- Online Fraud: There are many thieves on the internet who can use their skills to cheat people or access their credit card numbers and make illegal electronic money transfers.
- Some people are getting addicted to the internet, causing problems to their physical social interactions with friends and loved ones.
- Some of the sites on the internet require passwords to have access to information that you want.
- The initial cost of connecting to the internet is high, e.g. buying computers.
- Many people are computer illiterate and so cannot use internet.
- There is a lot of wrong information on the internet. Anyone can post anything, and much of it is inaccurate/garbage.

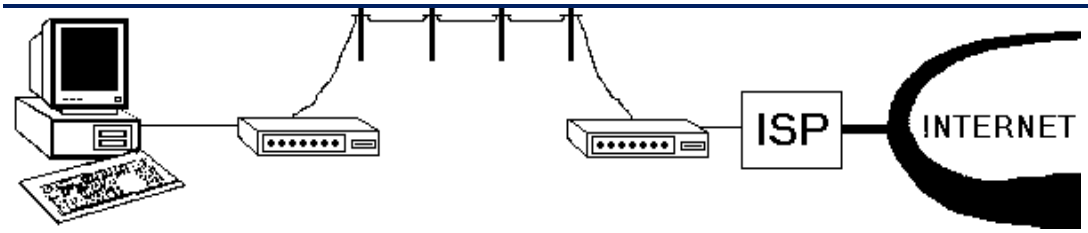
QUESTIONS

1.How can the Internet be useful in the area of education?
2.List at least possible advantages and disadvantages connected with a school being online.
3.State the similarity and difference between intranet and extranet.
4.List and explain some of the services offered by the internet.
5.What is an information network? Give examples of computer networks.

METHODS OF CONNECTING TO THE INTERNET

• As technologies develop, bigger, better and faster Internet connections evolve. The methods of connecting to internet include the
– (a) Dial Up/ Analog access,
– (b) Digital Subscriber Line (DSL),
– (c) Satellite Connection and other
– (d) Wireless connectivity methods.

(A) DIAL UP/ ANALOG ACCESS,

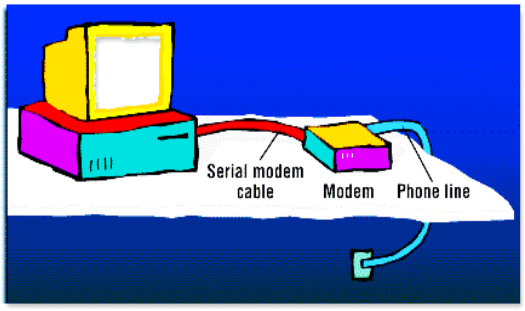


How to connect to internet using the Analog/Dial Up access method

▪ The basic requirements for this type of connectivity are a computer, a modem, a phone line, required software and a contract with an (ISP).

▪ **Computer –** This computer should also be fast enough in handling different tasks. This computer should also support the relevant hardware parts needed in networking e.g. NIC, Modem etc. The hardware should be easy to upgrade in case of any change in technology.

▪ **Modem –** This converts your digital computer information into analogue telephone signals and vice-versa. A transmitting modem converts digital data to analog signals, called **mo**dulation. The receiving modem reconverts the analog signals back to digital data, called **dem**odulation.



▪ **Phone Line –** The cable companies often establish connections ISPs who use phones lines. Examples of ISPs in Uganda include Uganda Telecom and MTN, Africa Online, Infocom etc.

▪ **Required Software –** The computer cannot communicate with the modem without installation of software. Browser software is also required to be installed for the computer to view web pages. The most commonly used browser software include: Microsoft internet Explorer, Netscape Navigator, Mozilla Firefox, etc. The version of your software should be up-to-date for your computer to correctly display all websites.

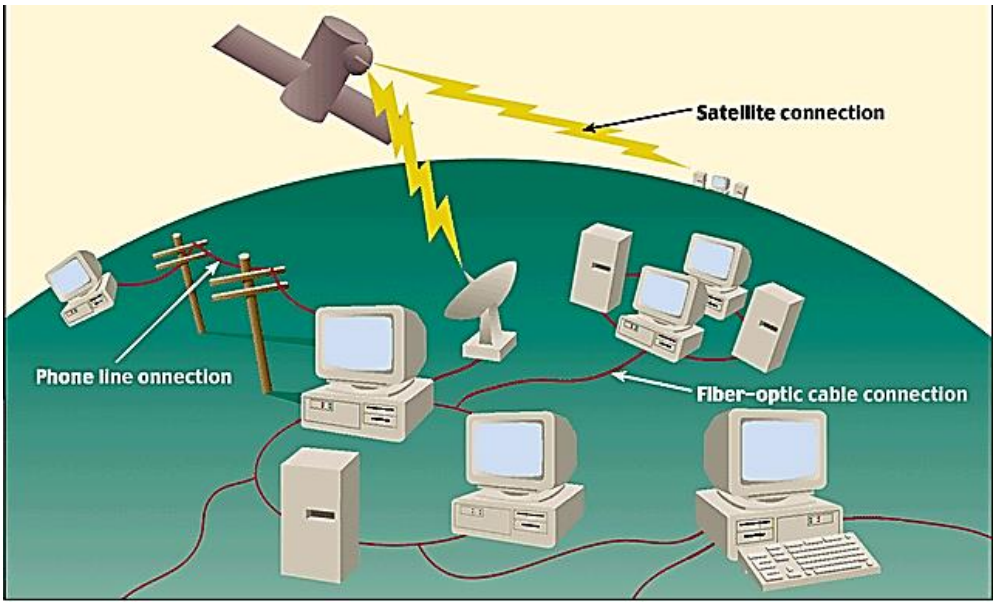
▪ **Internet Service Provider (ISP) -** An Internet Service Provider is the company that takes care of the technical aspects of connecting your computer(s) to the internet. The lights on your modem display when they communicate to the modem of your ISP during the transfer of information in both directions.

▪ The client computer modem **dials up** the preprogrammed phone number for a user's Internet Service Provider (ISP) and connects to one of the ISP's modems.
▪ After the ISP has verified the user's account, a connection is established and data can be transmitted. When either modem hangs up, the communication ends.
▪ Always check and understand the terms and conditions of your ISP before making a contract! Some ISPs are very expensive but you can buy a few hours per month at a cheaper cost.

(B) DIGITAL SUBSCRIBER LINE (DSL)

▪ An "always-on" technology; there is no need to dial up each time to connect to the Internet.
▪ Uses the existing copper telephone lines to provide high-speed data communication between end users and telephone companies.

▪ Asymmetric DSL (ADSL) is currently the most commonly used DSL technology. ADSL has a fast downstream speed, typically 1.5 Mbps but a slower Upload rate.



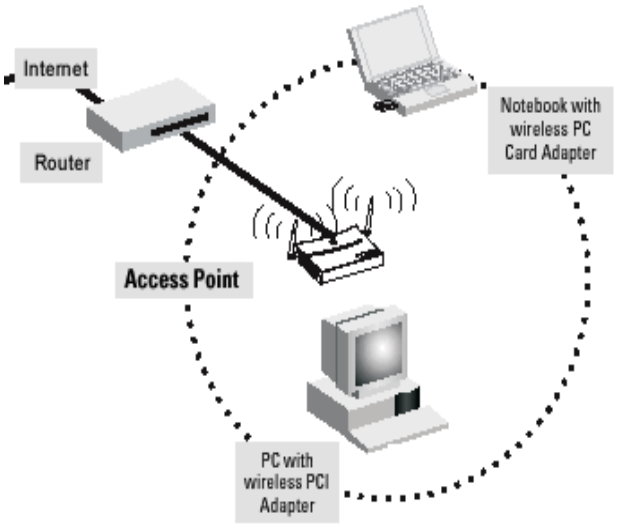
(C) SATELLITE CONNECTION

▪ A satellite Internet connection is an arrangement in which the upstream (outgoing) and the downstream (incoming) data are sent from, and arrive at, a computer through a satellite.
▪ Each subscriber's hardware includes a satellite dish antenna and a transceiver (transmitter/receiver).
▪ Download speeds (downstream) are typically up to 500 Kbps, while uploads (upstream) are closer to 56 Kbps.

- People in rural areas often use satellite broadband because it is a faster connection than dial-up.

(D) OTHER WIRELESS CONNECTIONS

- These methods provide network access to wireless devices such as laptops and PDAs. They Use radio waves to communicate with computers, PDAs, and other wireless **access points**. They have limited range of coverage. Examples of wireless connection technologies include Wi-Fi hotspots and Wi-Max.



FACTORS TO CONSIDER WHEN CHOOSING ISPS

The choice of an ISP depends mainly on the kind of work you are going to do with the internet. The key deciding factor should be service quality and the ability to alter the package at a later date, to meet your developing needs. Here some factors to consider to help you choose the right service for you.

1. **Availability:** You should check the services of your ISP because not all services are available on all locations especially the Wireless access services *(WiFi).* Cables are also limited especially in rural places.
2. **Speed/Performance:** Exactly how important speed is depends on the type and amount of content you need to download plus the number of computers sharing the Internet connection within your organization. 512Kbps is adequate for most Internet tasks.
3. **Security Levels:** The ISP should have security systems set up to ensure that your connectivity is safe enough, to eliminate fears of hackers from the neighborhood accessing your connection. Select a service that will not compromise the privacy of your information
4. **Price:** Cheap Packages for home/personal use and Expensive ones for fast and huge downloads for business use are all available. Choose an ISP with affordable rates after agreeing with the terms and conditions. Some ISPs charge in terms of kilobits transferred and others in terms of time duration.
5. **Support Services / Customer care:** One of the top priorities when choosing an Internet Service Provider is their ability to offer the best customer service and technical support. Clarify how support is offered – 24 hours a day? 7 days a week? Is this done through a premium rate phone number?
6. **Restrictions of use:** Check whether there are restrictions on use. Some ISPs stipulate for only personal Use and hinder Business Use and others limit the amount of information you can download in a given time period .
7. **Length of contract:** Many ISPs ask you to sign up for a specific time – usually a year or eighteen months.
8. **Compatibility:** That the speed of their modems and their software should match the speed of yours.
9. **Reliability:** Consider how long the ISP has been in business and how dependable and stable the services offered are.

10. **Email addresses:** Check whether the ISP has email and WWW services. Most ISPs will set up an email address when you activate your account. This would appear something like name@isp.com.

FACTORS AFFECTING THE SPEED OF AN INTERNET CONNECTION

- 1. **Computer Processor speed**. A person using a Computer with dual Pentium IV processor is most likely to get faster connectivity to the internet as compared to one with a Pentium III or Pentium II processor.
- 2. **Distance the data travels.** Actual Internet speeds will vary, depending on the distance the data travels coupled with how many servers it has to go through and the different speeds of each server. Additionally, the shorter the cables or the closer the computers are to the routers, the faster the connection speed.
- 3. **Heavy traffic on the network.** The greater the number of computers on the network is, the more the internet speed reduces. ISPs are allocated a certain amount of bandwidth which is shared among all of the incoming and outgoing connections.
- 4. **Malware, Spyware and Viruses.** Viruses hinder the operation of programs on the computer, regardless of its processor strength; this in turn slows down the speed of connectivity.
- 5. **Modem speed.** If the modem is substandard with a low rating, or not compatible with your ISP's modem then this will slow down the speed at which data is transmitted.
- 6. **Natural Conditions.** Instability in connection speed is also commonly caused by natural conditions such as stormy weather and thunder, which interfere with the transmission of signals.
- 7. **Positioning of wireless access points.** The access points should not be put below or under tables but should be raised well to be able to send the signals directly to the receiving computers/ laptops.
- 8. **Hardware problems**. A poor network card, video card or signal receiver can seriously reduce the speed of the data being processed by your system, slowing down the speed at which your computer can take the information coming in. If your Internet service comes over the phone line and you have a faulty filter attached, the speed will be compromised.
- 9. **Software problems**. You need good updated web browser software to display the web pages efficiently. Outdated browser versions are unable to display some webpages with advanced features. It is also good to have updated software and device drivers to newer versions for optimum performance.
- 10. **Memory available**. With each program you open on your computer, you are using up more RAM memory. Your computer has to write this data to the disk, and the more memory you are using up on open programs, the less memory there is available to receive the data. Data will slow down if your computer cannot receive it fast enough, making the Internet speed seem slow.
- 11. **Computer internet settings**. Improper computer settings can also affect the speed of your internet connection. Setting your firewall, safe search and other options properly will improve the speed as well.
- 12. **Technological Circumstances**. Slow speed of an internet connection can be due to technical causes such as loose connections of cables or maintenance works being done by the ISP.

▪ 13. **Cookies**. When surfing, the browser collects information, such as passwords and stores it on your local hard drive in a file known as a cookie. Over time, these cookies can compromise the speed of your Internet connection, particularly if you visit many websites during a browsing session.

INTERNET SERVICES

After connecting to the internet, the following are the services that we can access online.

1. **Telnet** – One of the amazing features of the Internet that lets you use the resources of another computer in another part of the world. This is done by remotely logging to the distant computer which is called the host.
2. **Email** – It allows the transfer of messages, documents, and pictures among others, across the Internet.
3. **Mailing list** – This is based on the email protocol. As an electronic mailing list it is very convenient when somebody wants to send a message or newsletter, for example, to many people in one go.
4. **Internet Relay Chat (IRC)** – A live interactive discussion in which parties on the network exchange ideas and observation electronically. Chats are usually organized in what we call chat rooms.
5. **File Transfer Protocol** – The standard method for transferring files, whether downloading or uploading, to and from your computer with another computer on the Internet.
6. **Newsgroups** – Worldwide discussion areas where notices can be posted for anyone to view. They are equivalent to a discussion group or an electronic bulletin board. There are newsgroups for every conceivable topic and more, e.g. educational technology.
7. **World Wide Web** – This refers to the global collection of linked electronic documents called Webpages stored on internet servers all over the world. The www is the most exciting service that has revolutionized the Internet, people use this service to browse for information.

8. Instant Messaging: A combination of real-time chat and e-mail by which short text messages are rapidly exchanged over the Internet, with messages appearing on recipient's display screen immediately upon arrival.

9. Usenet or User's Network: A system of worldwide discussion groups, not an actual physical network. **Netiquette**: A list of simple newsgroup guidelines that keep people from making mistakes.

10. Internet Telephony or Voice over the Internet or Voice over IP: Real-time voice conversations transmitted between computers on the Internet.

11. Web Directory: A listing of Web sites and their URLs, categorized by topic.

12. Electronic Commerce/e-commerce: Conducting commercial activities on the Internet.

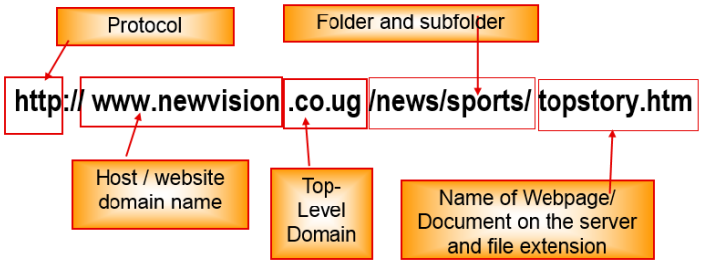
13. **Social Networking** (e.g. Facebook, Twitter): Already has huge impact.
14. **Cloud Computing:** A service in which computer software, hardware and data are accessed from anywhere and used remotely over the Internet, instead of acquiring and using them on a local computer.

15. Search Engines: Software programs that look through the Web to locate sites matching a keyword entered by the user. Keyword: A string of letters or words that indicates the subject to be searched.



The Internet and the WWW

- The World Wide Web (Web or WWW) is a service on the Internet that consists of Web sites around the world.
- A **Web site** refers to a collection of related Web pages hyper-linked to each other.
- **Web pages** are electronic html documents that contain **hyperlinks** (or links) that open other Web pages when you click them.
- You can open a Web page by entering a Web address in the Address bar of a web browser.
- A URL (Uniform Resource Locator) is another term for Web address. Web addresses uniquely identify websites on the www.
- Each Web page has a unique URL composed of the following parts:



- Protocol, a set of rules that allows computers to exchange information.
- Protocols are followed by a colon, two slashes, location of the Web site, a dot, and a suffix ▪ Folders on a site are denoted by a backslash, followed by the folder name.
- Most browsers allow you to save sites of interest by using the 'Add to **bookmarks**' or 'Add to **favorites**' options. These create links/ buttons (bookmarks) that you can use to return to a webpage that interests you particularly, without having to navigate to it from the home page all over again.

Types of Websites

a) Web portal

✓ An internet-based website that can perform many electronic functions and provide the user with quick access to a variety of information and services.

✓ A central website that offers a host of internet resources or links to other sites e.g. Yahoo!

b) Content aggregator

✓ An organization that combines information such as news and entertainment, sports scores, weather forecasts, photographs and video from a variety of sources and makes the combined content available to its customers e.g Web-based feed readers like RSS Feeds, delicious.com, etc.

c) A wiki

✓ A website that allows collaborative editing of its content and structure by its users.

✓ A wiki is a website that allows the easy creation and editing of any number of

interlinked web pages via a web browser using a simplified markup language or a WYSIWYG text editor. E.g. Wikipedia

d) A blog

✓ A blog is a discussion or informational site published on the World Wide Web and consisting of discrete entries ("posts") typically displayed in reverse chronological order (the most recent post appears first).A majority are interactive, allowing visitors to leave comments.

✓ A personal website on which an individual records opinions, links to other sites, etc. on a regular basis.

e) Media sharing website

✓ Media sharing sites allow you to upload your photos, videos and audio to a website that can be accessed from anywhere in the world. E.g youtube.com, dailymotion.com, blip.tv, slideshare.net, archive.org, podbean.com, and many, many others. The general model works like this: you can create an account with one of these websites, and once you are accepted and log in, there's an "upload" button which will prompt you for a file to upload. (Whether the file is a song, sound file, picture, video, or something else, depends on which site you are using.) You can upload media files that you want to share, and each one will have an internet address associated with it. This is a link that you can now share with your colleagues and students. Anyone who follows the link can view or hear your file from their web browser.

f) Online social network

✓ An online service, platform, or site that focuses on building and reflecting of social networks or social relations among people who share interests by posting information, comments, messages, images, eg facebook, twitter, etc.

Exam Type Question:

(a) What is a **social networking website**? (*02 marks*)

✓ *A type of website where users can seek others who share their interests, find out what's going on in their areas of concern, and share information with one another.*

(b) List **two** examples of social networking websites. (*02 marks*)

✓*(i).Facebook* ✓*(ii) Twitter* ✓*(iii) Google Plus, etc.*

(c) State **one** disadvantage of social networking websites. (*01 mark*)

✓*They are addictive.*

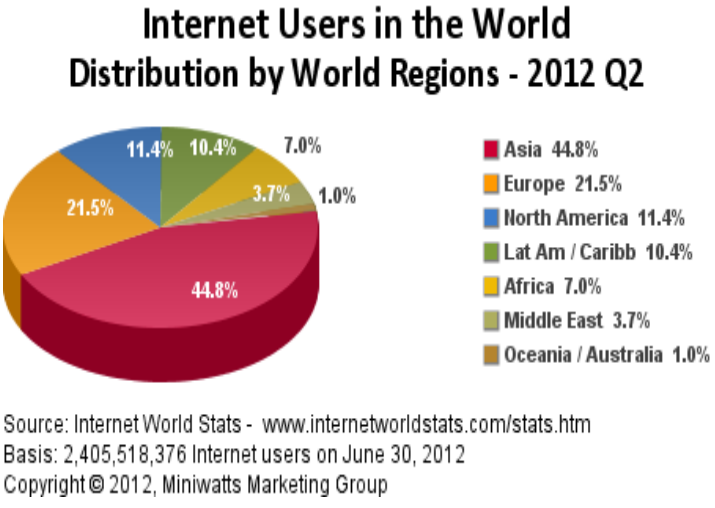
✓*They are not regarded as formal*

✓*In case one forgets his/her password, signing in is not possible and this can lead to loss of information.*

✓*Social Networks may violate privacy in case someone else gets to know your user password.*

✓*Misinterpretation: One has to be careful while posting any kind of information on social networks. If typed in a hurry, the matter could be misinterpreted.*

✓*Junk Messages: Social Networks are used a lot to send unsolicited messages and unwanted advertisements.*



ELECTRONIC MAIL (EMAIL) COMMUNICATIONS

Definition: Email (Electronic Mail) Communications refers to the transmission of messages via a computer network such as; a local area network or the internet. The email can be simple text, or include an attachment such as a word processing document, a graphic, an audio clip or video clip.

ADVANTAGES OF USING EMAIL AS A MEANS OF COMMUNICATION

- Easy to use. Emails applications have user friendly tools that help during composing messages.
- Email supports sending of attachments like documents, zipped files, etc.
- It is very fast in terms of speed: The e-mail is delivered instantly, anywhere across the globe.
- Easy to prioritize: Since the mails have subject lines, it is easy to prioritize them and ignore unwanted mails.
- Email messages can be sent to many recipients at the same time
- Emails can also carry hyperlinks that connect to other webpages with just a click
- One can subscribe to news and other online services through email
- Email software have management features that help users to organize their messages in folders like inbox, sent, draft, etc.
- Easier for reference: When one needs to reply to a mail, there is a provision in the mailing system to attach the previous mails as references. This refreshes the recipient's knowledge, on what he is reading.
- Environment friendly: Postal mails use paper as a medium to send letters. Electronic mail thus, saves a lot of trees from being axed. It also saves fuel needed in transportation.
- Email software have address book features that may be sorted in alphabetical order.
- Email software has a good degree of security features such as username and password before sign in
- Email applications have inbuilt English dictionary which safeguards the sender from incorrect spelling and grammar.
- Email is a relatively cheap means of communication since there are no printing or postage expenses involved.
- There is flexibility in time of opening the e-mail for any time access. At any time of the day or night, one can communicate with friends, relatives, professors and business associates.
- Messages remain permanent for future and frequent accessing from anywhere.
- Use of graphics such as colorful greeting cards and interesting pictures can be sent through e-mails.
- Advertising tool: many individuals and companies are using e-mails to advertise their products, services, etc.

LIMITATIONS OF USING EMAIL AS MEANS OF COMMUNICATION.

- Emails can carry Viruses: The recipient needs to scan the mails, as viruses are transmitted through them and have the potential to harm computer systems.
- Spam and Junk: E-mails when used to send unsolicited messages and unwanted advertisements create nuisance called Spam. Checking and deleting these unwanted mails can unnecessarily consume a lot of time, and it has become necessary to block or filter the unwanted e-mails by means of spam filters.
- E-mail spoofing is another common practice. Spoofing involves deceiving the recipient by altering the e-mail headers or the addresses from which the mail is sent.
- Hacking and email interception: The act of unauthorized attempts to bypass the security mechanisms of an information system or network is termed as hacking. After

the e-mail is sent and before it is received by the desired recipient, it "bounces" between servers located in different parts of the world. Hence, the e-mail can be intercepted by a professional hacker.

- Misinterpretation: One has to be careful while posting any kind of content through an e-mail. If typed in a hurry, the matter could be misinterpreted.
- The content posted via e-mails is considered informal. Therefore, there is a chance of business documents going unnoticed. Thus, urgent transactions and especially those requiring signatures are not managed through e-mails.
- Crowded inbox: Over a period of time, the e-mail inbox may get crowded with mails. It becomes difficult for the user to manage such a huge chunk of mails.
- Need to check the inbox regularly: In order to be updated, one has to check his e-mail account regularly, which may be expensive in the long run.
- Email cannot be used without computers especially in remote areas without electricity
- In case one forgets his/her password, signing in is not possible and this can lead to loss of information.
- Email may violate privacy in case someone else gets to know your user password since the other may check your mails.

COMPONENTS OF AN E-MAIL MESSAGE

- **Headers:** The message headers contain information concerning the sender and recipients. The exact content of mail headers can vary depending on the email system that generated the message.
- **Subject:** The theme of the email message
- **Sender (From):** This is the senders Internet email address.
- **Date and time received (On):** The time the message was received.
- **Recipient (To):** First/last name of email recipient, as configured by the sender.
- **CC:** "Carbon copy" enables copies of the email message to be sent to third party while acknowledging other recipients
- **BCC:** Enables copies of the mail message to be sent to the third party without acknowledging nay other recipients.
- **Reply-to:** This is the Internet email address that will become the recipient of your reply if you click the Reply button.
- **Body:** The body of a message contains text that is the actual content.
- The message body also may include signatures or automatically generated text that is inserted by the sender's email system.
- **Attachments:** Attachments are optional and include any separate files that may be part of the message.
- **Signature:** Personalized information about sender.

EMAIL SOFTWARE

- This refers to the programs that are used to manage email account messages.
- They are in two categories: Application packages locally installed on the computer (email clients), and Online email programs hosted by a website on the www (webmail).
- Examples of email clients include Microsoft Outlook, and Mozilla Thunderbird
- Examples of webmail software include Gmail, Yahoo Mail, Hotmail, Mail.com, AOL Mail, Eudora mail, etc.

DATA TRANSMISSION

This is the process through which the signals are broad cast/ sent out through a channel to between communicating computing devices.

NETWORK TRANSMISSION MEDIA (CHANNELS)

A medium is the **actual path** over which an electronic signal **travels** as it moves from one **device** to **another**.

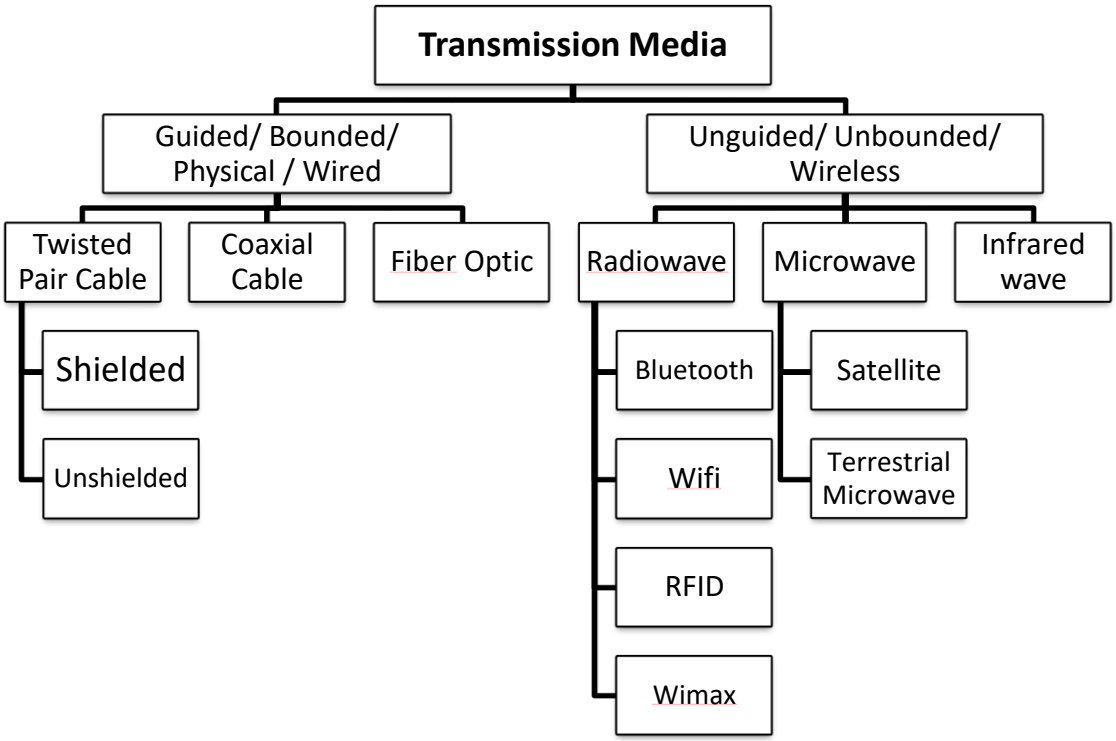
The term transmission media refers to any physical or non-physical link / pathway between two or more devices and in which a signal can be made to flow from source to destination.

• Numerous transmission media types are used for Data Transmission. The choice of medium depends on the **Distance** to be covered, the Desired **Bit Rate** (in bits per second, *bps*) and **Cost** Considerations.

• The Transmitter generates and **encodes** data as energy which it transmits through the medium. Transmitted energy is carried through some a medium such as copper, glass, air, etc. At the destination the energy is **decoded** back into data (Caustic data). The energy can be electrical, light, radio waves etc.

Data communication media can be divided into two:

- 1. Physical /Wired / Bounded/ Guided transmission media
- 2. Wireless / Unbounded / Unguided transmission media



(A) GUIDED / WIRED TRANSMISSION MEDIA

These include (i) twisted pair cable, (ii) Coaxial cable, and (iii) Fiber optic cable.

(I) TWISTED-PAIR CABLE

UTP is a medium that is composed of four pairs of twisted color coded copper wires. Cables are twisted to provide protection against **crosstalk.** Crosstalk is a source of background noise. **Background noise** is unwanted electrical or electromagnetic energy that interferes and degrades the quality of signals and data. When two wires in an electrical circuit are placed close together, the magnetic fields are the exact opposite of each other. The two magnetic fields cancel each other out. They also cancel out any outside magnetic fields. Twisting the wires can enhance this **cancellation effect**.

Twisted pair cable comes in two varieties: Shielded and Unshielded Twisted Pair (UTP). UTP is the most popular

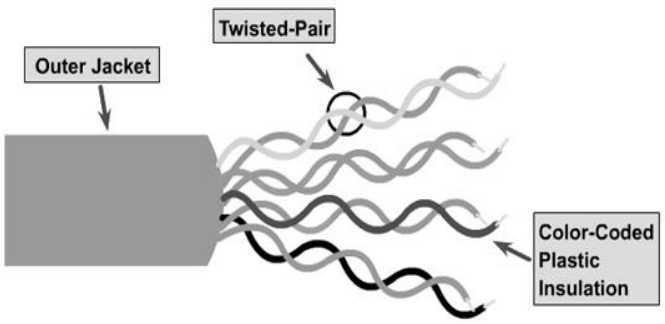
Unshielded Twisted Pair: This consists of the four pairs of twisted wires enclosed in one outer jacket. UTP cable relies **solely** on the **cancellation effect** produced by the twisted wire pairs to limit signal degradation caused by electromagnetic interference (EMI) and radio frequency interference (RFI).

Advantages of UTP:

- It is of low cost
- Small in size
- Easy to install
- It is the most popular and generally the best for schools.

Disadvantages of UTP:

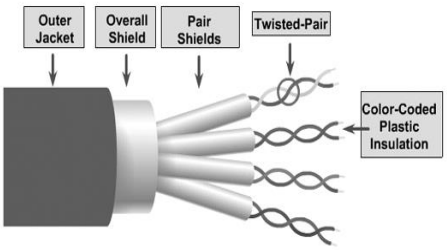
- Subject to interference



▪ Limited distance, usually less than 100 meters

SHIELDED TWISTED-PAIR (STP)

Combines the techniques of shielding, cancellation, and wire twisting. Each pair of wires is wrapped in a metallic foil. The four pairs of wires then are wrapped in an overall metallic braid or foil.



• Has a cancellation effect and a shield to prevent it from attacks like EMI. STP is a better option over UTP for longer distances because the signal interference is reduced.

(II) COAXIAL CABLE

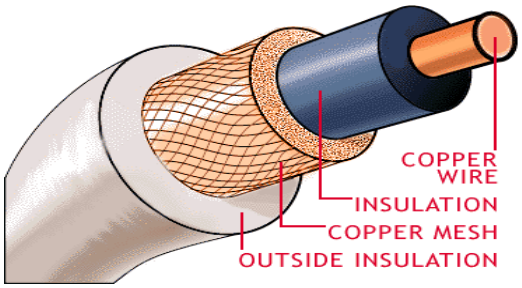
• Consists of a hollow outer cylindrical conductor that surrounds a single inner wire made of two conducting elements. One of these elements, located in the **center** of the cable, is a **copper conductor**. Commonly **used on TV set antennae.**

Advantages

– Coaxial cable is insulated more heavily than twisted-pair cable. So it is highly resistant to signal interference.

– Used for longer distances (300 – 600 meters).

– Transmits faster than twisted-pair cable.



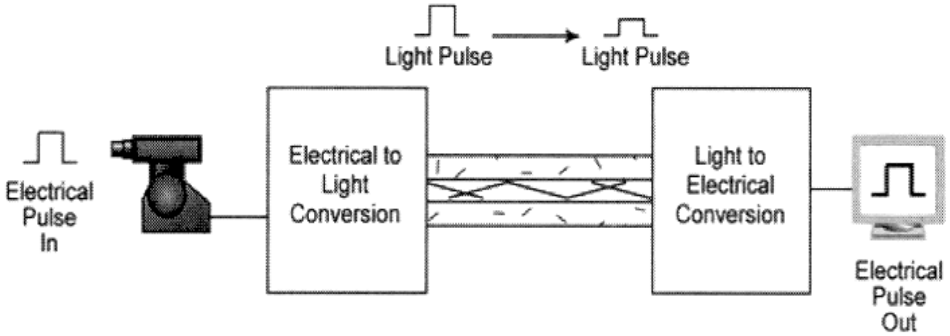
Disadvantages

– Heavy & bulky.

– Needs booster over longer distances.

(III) FIBER-OPTIC CABLE

• A fiber optic cable consists of a bundle of **glass threads**, each of which is **capable** of transmitting messages as **light waves.** A light source -- typically a laser -- switches on and off rapidly at one end of the cable to transmit digital data. The light travels through the glass strands and continuously reflects off of the inside of the mirrored plastic coatings in a process known as total internal reflection.



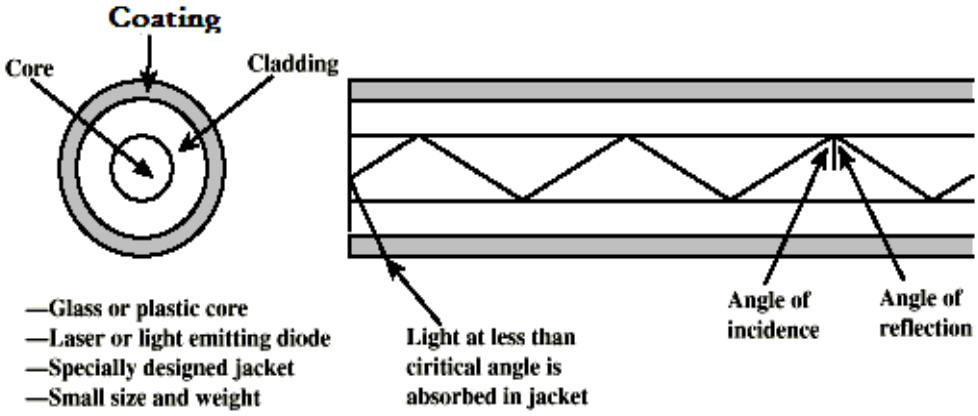
• **Fiber optic cables** are long, thin strands of very pure glass, about the diameter of a human hair. They are arranged in bundles and used to transmit light signals over long distances. Optical fibers are made of extremely **pure optical glass**.

• We think of a glass window as transparent, but the thicker the glass gets, the less transparent it becomes due to impurities in the glass. However, the glass in an optical fiber has far fewer impurities than window-pane glass.

• Hundreds or thousands of these optical fibers are arranged in bundles in optical cables. The bundles are protected by the cable's outer covering, called a **jacket**. If you look closely at a single optical fiber, you will see that it has the following parts:



▪ **Core** - Thin glass center of the fiber where the light travels.
▪ **Cladding** - Outer optical material surrounding the core that reflects the light back into the core
▪ **Buffer coating** - Plastic coating that protects the fiber from damage and moisture.



ADVANTAGES OF FIBER OPTICS

• **Less expensive over long distances** - Several miles of optical cable can be made cheaper than equivalent lengths of copper wire. This saves your provider (cable TV, Internet) and you money.
• **Higher Bandwidth - Faster** data transmission.
• **Thinner** - Smaller size, and much thinner and lighter than other cables.
• Optical fibers can be drawn to smaller diameters than copper wire.
• **Higher carrying capacity** - Fiber Optic cables can carry significantly more signals than other cables. Because optical fibers are thinner than copper wires, more fibers can be bundled into a given-diameter cable than copper wires. This allows more phone lines to go over the same cable or more channels to come through the cable into your cable TV box.
• **Less signal degradation** - The loss of signal in optical fiber is less than in copper wire.
• **Light signals** - Unlike electrical signals in copper wires, light signals from one fiber do not interfere with those of other fibers in the same cable. This means clearer phone conversations or TV reception.
• **Low power** - Because signals in optical fibers degrade less, lower-power transmitters can be used instead of the high-voltage electrical transmitters needed for copper wires. Again, this saves your provider and you money.
• **Digital signals** - Optical fibers are ideally suited for carrying digital information, which is especially useful in computer networks.
• **Security**: Optical cables provide better security for signals during transmission because unauthorized people cannot easily intercept the data.
• **Non-flammable** - Because no electricity is passed through optical fibers, there is no fire hazard.
• **Flexible** - Because fiber optics are so flexible and can transmit and receive light, they are used for purposes such as; **Medical imaging** - in bronchoscopes, endoscopes, laparoscopes, **Mechanical imaging** - inspecting mechanical welds in pipes and engines (in airplanes, rockets, space shuttles, cars) and **Plumbing** - to inspect sewer lines.

Disadvantages of Fiber Optic Cable:

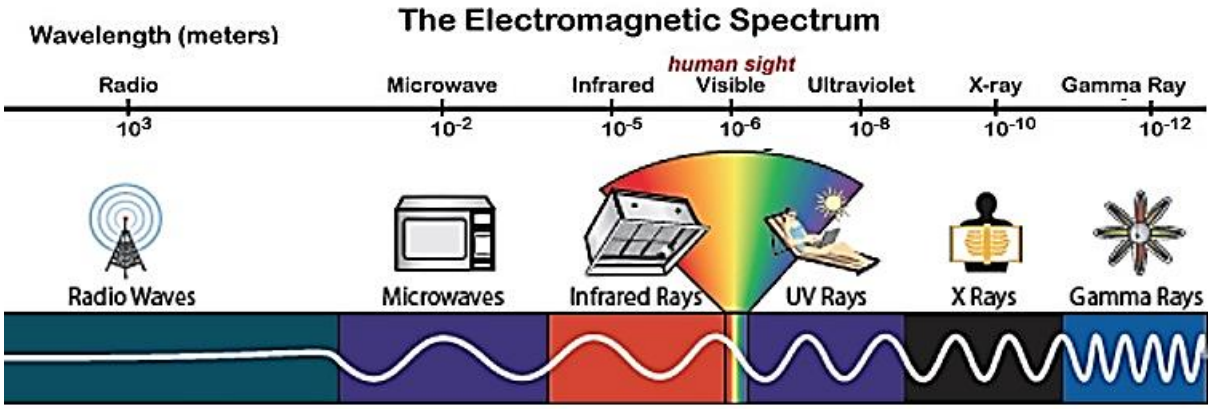
Very expensive to use in small networks, as compared to other media.

Harder to install and modify.

(B) UNGUIDED /WIRELESS TRANSMISSION MEDIA

Wireless or unbounded media is that is where data signals flow through the **air.** In this case transmitting antenna and receivers aerial facilitates the communication. Example of wireless transmission media include:

- The major wireless transmission media include radio waves, microwaves, and infrared which are part of the **electromagnetic spectrum** (the range of all possible frequencies of electromagnetic radiation).



(i) Radio waves

Radio waves frequencies are easy to generate and are widely used for communication, both indoors and outdoors. Examples of communication technologies using radio waves include Bluetooth, Wireless Fidelity (Wifi), and Wimax.

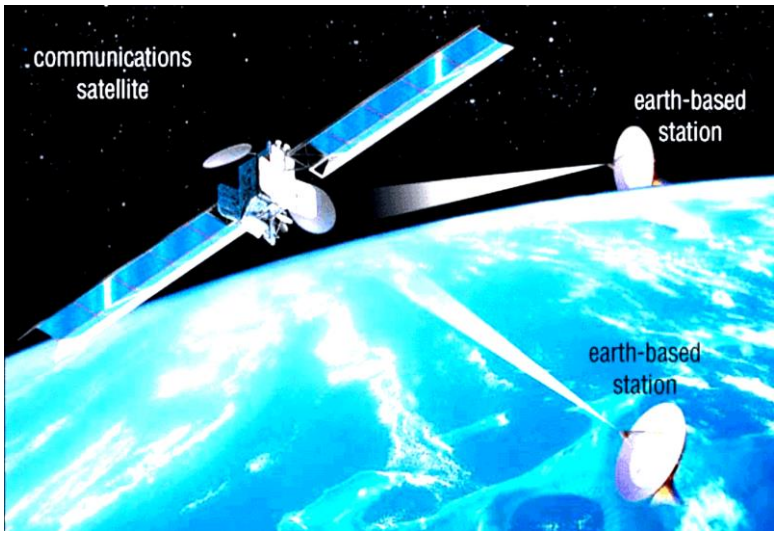
- **Bluetooth** is a short range wireless based information transmission system which works on the basis of a microchips embedded in the digital devices like mobile phones, speakers.
- **Wireless Fidelity (Wifi)** is used to create a hotspots from where information signals can be easily accessed by Wi-Fi enabled devices, forming a wireless local area network (WLAN).
- **Wimax** stands for Worldwide Interoperability for Microwave Access. It is a telecommunication technology providing wireless data over long distances in a variety of ways from point to point links to full mobile cellular type access.
- **Radio-frequency identification (*RFID*)** uses radio waves to automatically identify and track tags attached to objects. The RFID tag can be affixed to an object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to cars, computer equipment, books etc.

(ii) Microwaves

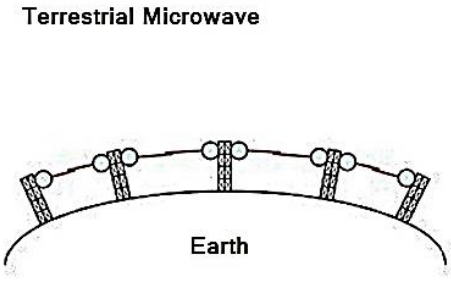
Microwaves are high-frequency electromagnetic radiations that are sent through space to deliver telecommunications services. Microwaves are dependent on line of sight.

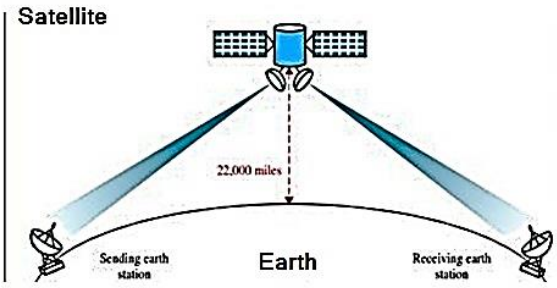
Advantages:

– Speed of light
– Microwave signals can carry thousands of channels at the same time
– Disadvantage:
– Line-of-sight only- (there is need for radio transmitters in networks using to be positioned free of obstacles).

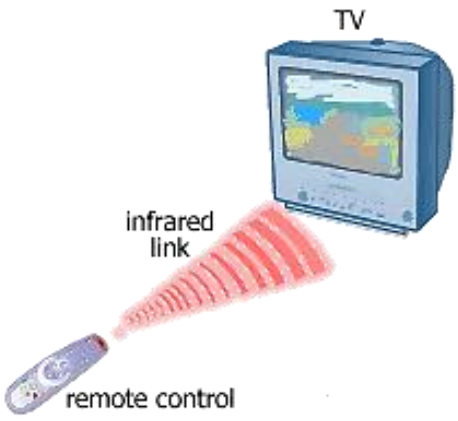


Microwave communication systems are mainly classified into satellite and terrestrial.
Terrestrial microwave signals are sent from one ground-based antenna to another.
Satellite:
A satellite is basically a microwave station placed in outer space. The satellite receives a signal from the earth, amplifies it, and then rebroadcasts it at a different frequency to any number of earth-based stations.
Advantage: Always in sight
Disadvantage: Expensive uplink and downlink facilities.
Satellite microwave signals travel from Earth to a satellite in space and then back to a station on the earth.





(iii) Infrared
Infrared Rays use electromagnetic waves with **smaller wavelength** than **radio and microwaves** to transmit data. IrDA (Infrared Data Association) ports transmit data via infrared light waves. As long as the devices are within a few feet and nothing obstructs the path of the infrared light wave, data can be transferred without the use of cables. A **TV remote control** is an example of an Infrared application.

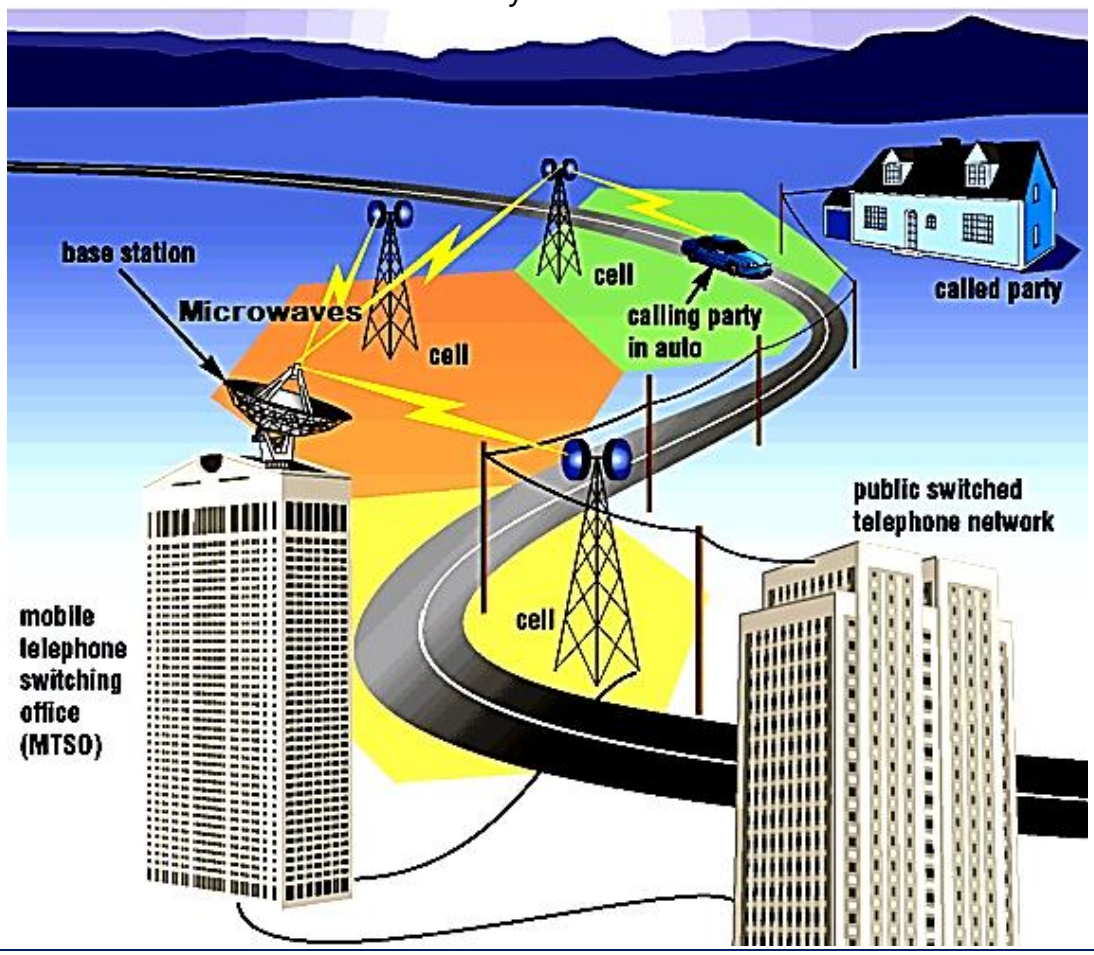


Advantages of physical over wireless transmission media

- Physical media support higher bandwidth
- They can carry voice, data and video signal simultaneously.
- They are more resistant to radio and electromagnetic interference.

Disadvantages of physical transmission media

- Installation is difficult because the cables must be carefully handled.
- They are relatively complex to expand as compared to wireless
- Cover short distance since they use the physical wires
- Inconvenience due to inflexibility of restrictive cables.



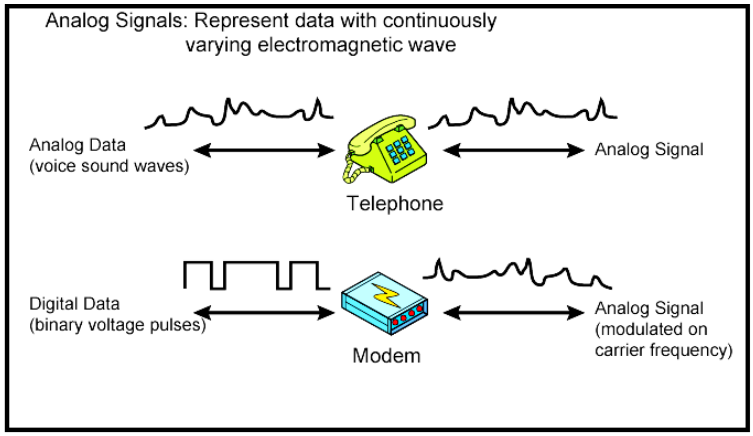
How various wireless and wired transmission media interconnect during a call.

TYPES OF TRANSMISSION SIGNALS:

Computers produce digital signals yet telephone equipment originally was designed to carry only voice transmission in the form of an analog signal.

ANALOG SIGNALS

An analog signal uses variations which are represented by a continuous waveform to convey information. It is particularly useful for wave data like sound waves.
Analog signals are what normal phone line and sound speakers use.



Analog signal Varies in a smooth way over time, **Digital signal** Maintains a Constant level then changes to another constant level.

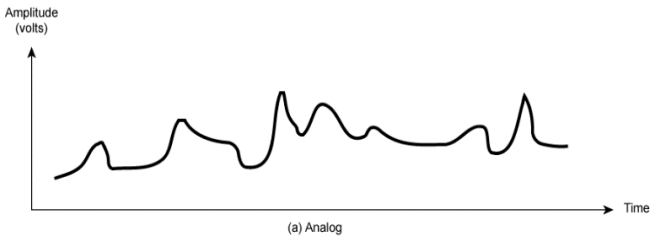
DIGITAL SIGNALS

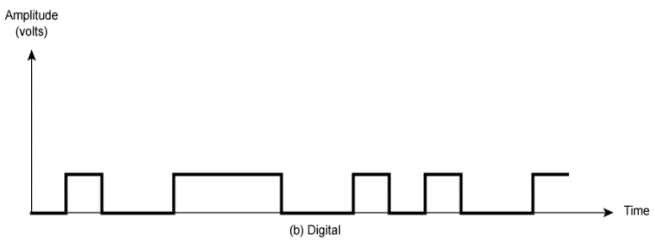
A digital signal is a series of discrete (discontinuous) bits which are indicate the presence or absence of an electric pulse. The state of being off or on represents the binary digit of 0 or 1, respectively.

DIFFERENCES BETWEEN ANALOG AND DIGITAL SIGNALS

Analog Signals	Digital Signals
An analog signal uses variations which are represented by a continuous waveform to convey information.	Uses a series of discrete (discontinuous) binary digits 0 and 1 which are indicate the absence or presence of an electric pulse.
• **Analog signal** Varies in a smooth way over time.	**Digital signal** Maintains a Constant level then changes to another constant level
• Analog signal transmitted without regard to content. (i.e., the signals may represent analog data or digital data).	• Concerned with content
• Attenuated over a distance.	• Integrity endangered by noise, attenuation etc.
• Use amplifiers to boost the signal.	• Repeaters used repeater receives signal, extracts bit pattern and recovers pattern retransmits new signal. Attenuation is overcome.
• Amplifiers also amplify noise, hence loss of quality.	○ Noise is not amplified, signal delivered in its original quality.

ADVANTAGES OF DIGITAL TRANSMISSION:





• **Digital technology:** Makes use of low cost VLSI technology (Large scale integration caused a drop in cost and size of digital circuitry)

• **Data integrity:** Repeaters rather than amplifiers are used so the effects of noise and other impairments are not cumulative. Signals can be propagated for longer distances and over lower quality lines while maintaining integrity.

• **Capacity utilization:** High bandwidth links economical. High degree of multiplexing needed to utilize capacity is easily achieved with digital techniques.
• **Security & Privacy**: Encryption-A digital bit stream is easier to encrypt than an analog stream (=more secure).
• **Integration:** Can treat analog and digital data similarly and economies of scale and convenience can be achieved by integrating voice, video and digital data. (Integrating voice, video and data is simpler with digital transmission than with analog transmission)
• **Simplified Processing**: Digital signals can be further processed by computer.

DISADVANTAGES OF DIGITAL TRANSMISSION

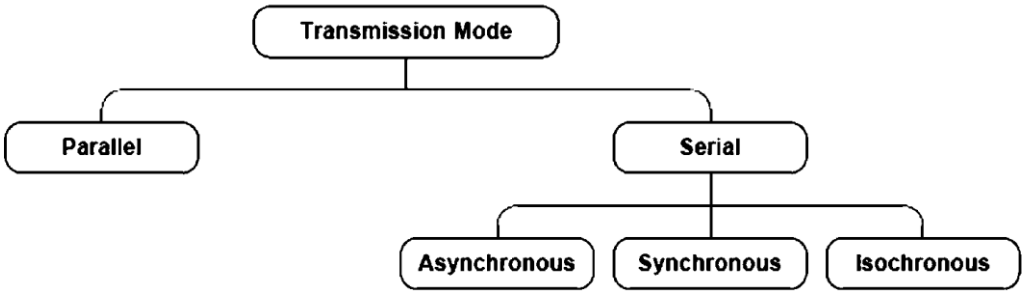
• Widens the digital divide
• Very expensive, especially initial costs – like backbone.
• Complicated to understand- Only technocrats can handle it.
• Obsolescence- A new computer is out of date as soon as you've bought it.
• Fragile- eg CDs, Digital cameras, etc.
• Availability: Once corrupted, everything is lost. It is either On or Off!

TRANSMISSION MODES

A Taxonomy of Transmission Modes[§]

Defn: A *transmission mode* is the manner in which data is sent over the underlying medium. Transmission modes can be divided into two fundamental categories:

- **Serial** — one bit is sent at a time
- **Parallel** — multiple bits are sent at the same time



Parallel transmission allows transfers of multiple data bits at the same time over separate media. It is used with a wired medium. The signals on all wires are synchronized so that a bit travels across each of the wires at precisely the same time. Serial transmission sends one bit at a time. Most communication systems use serial mode, because:

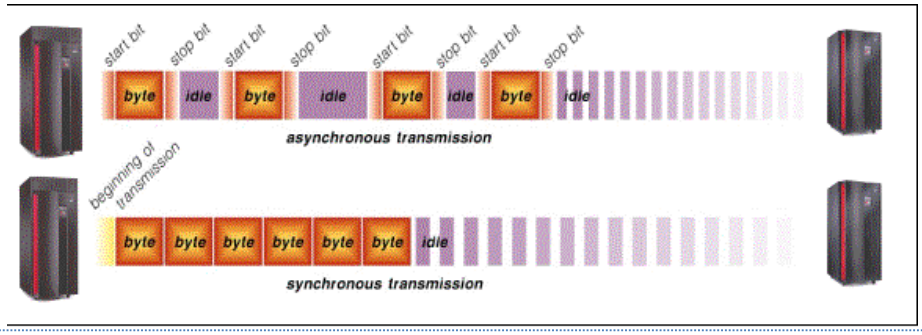
- serial networks can be extended over long distances at less cost
- using only one physical wire means that there is never a timing problem caused by one wire being slightly longer than another

ASYNCHRONOUS TRANSMISSION

Asynchronous transmission transmits one byte at a time over a line at random intervals. Each byte is framed by controls—a start bit for marking the beginning of the byte, a stop bit for marking the end of the byte, and a parity bit for error checking.

[§] Reference: https://goo.gl/iFyDLG

Asynchronous transmission is relatively slow and used for low-speed transmission. Asynchronous transmission allows the physical medium to be idle for an arbitrary amount of time between two transmissions. It is well-suited to applications that generate data at random time intervals. *For example:* a user typing on a keyboard, a user that clicks on a hyperlink.



SYNCHRONOUS TRANSMISSION

Synchronous transmission transmits groups of bytes simultaneously at regular intervals. The beginning and ending of a block of bytes is determined by the timing of the sending device and receiving devices. Although synchronous transmission requires more complicated and expensive communications devices, it provides much higher speeds and greater accuracy than asynchronous transmission.

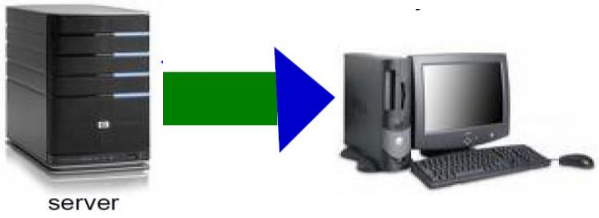
TRANSMISSION DIRECTION

The direction in which data flows along a channel media is characterized as

- simplex,
- half-duplex,
- full-duplex or
- multiplex

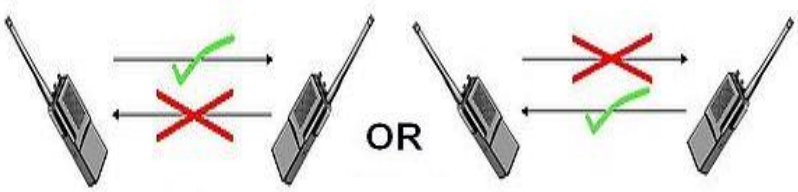
SIMPLEX TRANSMISSION

Simplex transmission sends data in one direction only.
Simplex transmission is used only when the sending device does not require a response from the receiving device. One example of simplex transmission is television broadcasting.



HALF-DUPLEX TRANSMISSION

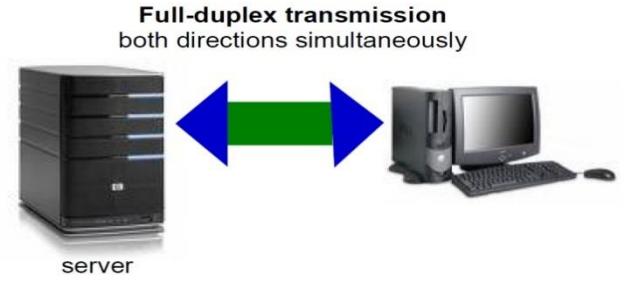
Half-duplex transmission allows data transmission in either direction, but only one way at a time.



Many fax machines, police radio calls, credit card verification systems and automatic teller machines use half-duplex transmission.

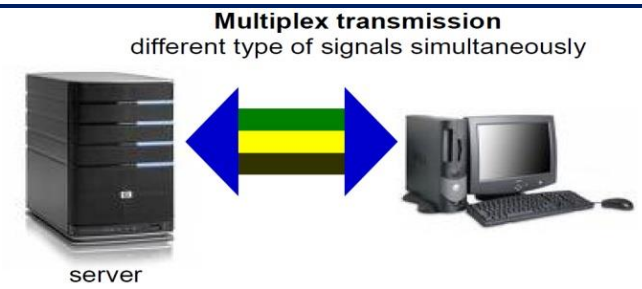
FULL-DUPLEX TRANSMISSION

In *full-duplex transmission, data can flow in both* directions at the same time. A regular telephone line, for example, supports full-duplex transmission, allowing both parties to talk at same time.



MULTIPLEX TRANSMISSION

In *multiplex transmission, several different types of signals can be carried at once through the same line. E.g. during Video calls text audio and video can be multiplexed over the same line.*



PACKET SWITCHING

When a computer sends data over the Internet, the data is divided into small pieces called packets. Each packet contains the data, as well as the recipient (destination), the origin (sender), and the sequence information used to reassemble the data at the destination.
Each packet travels along the fastest individual available path to the recipient's computer via communications devices called routers.
Packet switching is the technique of splitting of data into individual packets before sending the packets along the best route available to the receiving end, where the packets are reunited into the original data and delivered. Most Modern telecommunications technologies use this system.

ADVANTAGES OF PACKET SWITCHING:

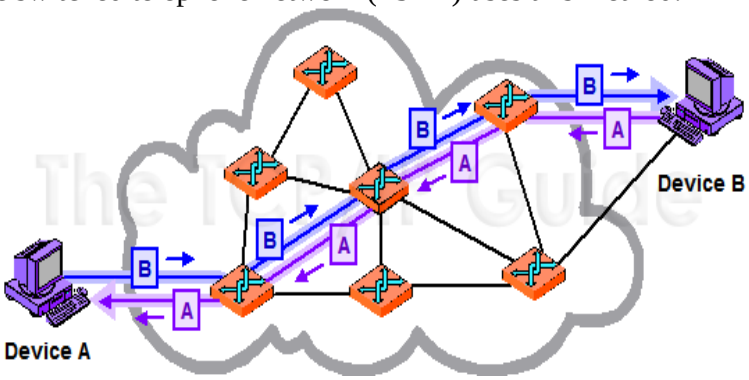
- A packet switched network is more secure than a circuit switched network.
- **Bandwidth** of a packet switched network is used to full potential.
- With packet switching, devices of **different speeds** can communicate.
- A packet switched network is **not affected by line failure** (it redirects the signals)
- **Availability** – no waiting for a direct connection to become available.
- During a crisis or disaster, when the public telephone network might stop working, e-mails and texts can still be sent via packet switching.
- Packet switched networks are more **robust** than the circuit switched networks, and more suitable for transmitting the binary data. (Since that is what packet switching was originally designed for.)
- With the current advancement of the technology, it is **possible to encode voice** and send it in packetized format with minimal problems. In the past it was generally accepted that delay sensitive data (for example voice) was to be handled through a circuit switched network.
- A damaged packet can be resent; this is because **only the damaged part** is sent, no need to resend an entire file.

DISADVANTAGES OF PACKET SWITCHING

- If the packet switched network is under heavy use, there can be a delay.
- Data packets can get lost or become corrupted.
- Protocols are needed for a reliable transfer.
- Not so good for some types data streams (e.g. real-time video streams can lose frames due to the way packets arrive out of sequence.

CIRCUIT SWITCHING

- Circuit Switching is a data transmission technique which requires a dedicated connection between the sender and the receiver before transmission can begin.
- For example, the traditional public switched telephone network (PSTN) uses this method.
- A circuit-switched network consists of a set of switches connected by physical links. A connection between two *devices is a dedicated path made of one or more links. However, each connection uses only one dedicated channel on each link.*



ADVANTAGES OF CIRCUIT SWITCHING

- Circuit is **dedicated** to the connection – no interference, no sharing.
- Guaranteed the **full bandwidth** for the duration of the connection.
- Guaranteed **quality** of service.
- **Simple abstraction:** Reliable communication channel between hosts, No worries about lost or out-of-order packets.
- **Low per-packet overhead:** Forwarding based on time slot or frequency. No IP (and TCP/UDP) header on each packet, No "longest prefix match" on each packet.
- **Simple forwarding**: The forwarding in Circuit Switching is based on time slot or frequency and one would not need to inspect a packet header.

DISADVANTAGES OF CIRCUIT SWITCHING

- Inefficient – the equipment may be unused for a lot of the connection; if no data is being sent, the dedicated line still remains open.
- Blocked connections: When resources are not sufficient, the connection will refuse to be connected and thus, Circuit Switching is unable to offer "okay" service to everybody.
- Connection set-up delay: It takes a relatively long time to set up the circuit. No communication until the connection is set up, Unable to avoid extra latency for small data transfers
- Network state: The network nodes in Circuit Switching must store per-connection information and it is unable to avoid per-connection storage and state failover.
- During a crisis or disaster, the network may become unstable or unavailable.
- It was primarily developed for voice traffic rather than data traffic.
- Wasted bandwidth: Since most traffic occurs in bursts, in Circuit Switching this may leads to idle connection during silent period. Because it is unable to achieve gains from statistical multiplexing that relies in identifying, predicting and allocating more time for the generally more active paths.

In the modern and fast paced world, what we are looking for is efficiency, low costs and reliability and packet-switched networks seems to fulfill most of the criteria that the society is looking for. It would only be a matter of time before circuit switching becomes a thing of the past.

NETWORKING HARDWARE

Networking hardware includes all computers, peripherals and Communications devices that enable two or more computers to exchange items such as data, instructions, and information with each other.

Examples include: 1. Server, 2. Work stations, 3. Network interface card, 4. Modems, 5. Hub, 6. Switch, 7. Repeater, 8. Router, 9. Network Bridge, 10. Brouter, 11. Multiplexer, 12.

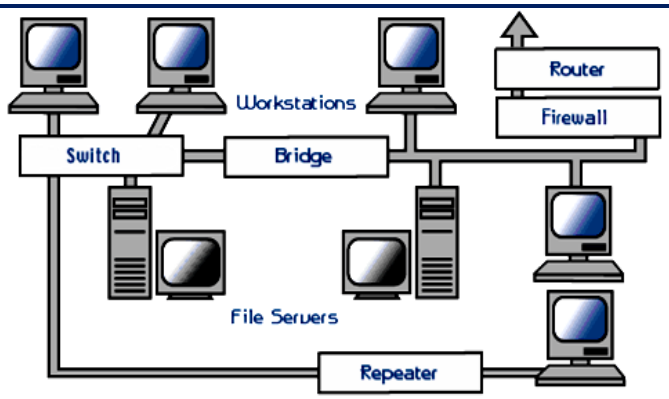
Gateway, 13. Access point, 14. Protocol Converter, 15. Network Address Translator, 16 Firewall, etc.

1. SERVERS

- A server is the host or central computer that manages the resources on a network. A server provides a centralized storage area for programs, data, and information.
- A dedicated server performs a specific task. Examples of dedicated Servers include: file server(stores and manages files on a network), print server(manages printers and print jobs), database server(stores and provides access to a database), and a network server(manages network traffic)

2. WORKSTATIONS / CLIENTS

Computers that humans use are broadly categorized as workstations. A typical workstation is a computer that is configured with a network interface card, networking software, and the appropriate cables. Workstations do not necessarily need large storage hard drives, because files can be saved on the file server. Almost any PC can serve as a network workstation.

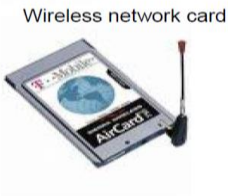


3. NETWORK INTERFACE CARD

- A network card, also called network interface card (NIC), is a device that enables the computer or node that does not have built-in networking capability to access a network.
- It puts the data into packets and transmits the packets onto the network. An NIC may be wired or wireless. Examples include adapter card, PC Card, USB network adapter, flash card e.t.c

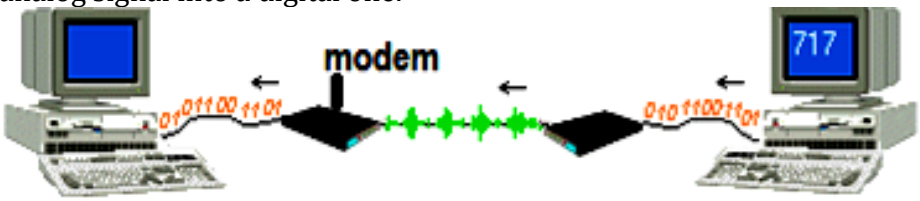






4. MODEMS (SIGNAL CONVERTERS)

- The modem, is a device which **mod**ulates a digital signal from computers into an analog one to send data out over a phone line. For an incoming signal, it **dem**odulates the analog signal into a digital one.



5. HUBS

- A hub, (also called a multi-station access unit (MAU)) is a device that provides a central point for cables in a network. It is an **unintelligent** network device that sends one signal to all of the nodes connected to it.
- Traditionally, hubs are used for star topology networks, but they are often used with other configurations to make it easy to add and remove computers without bringing down the network. Hubs reside on Layer 1 of the OSI model.



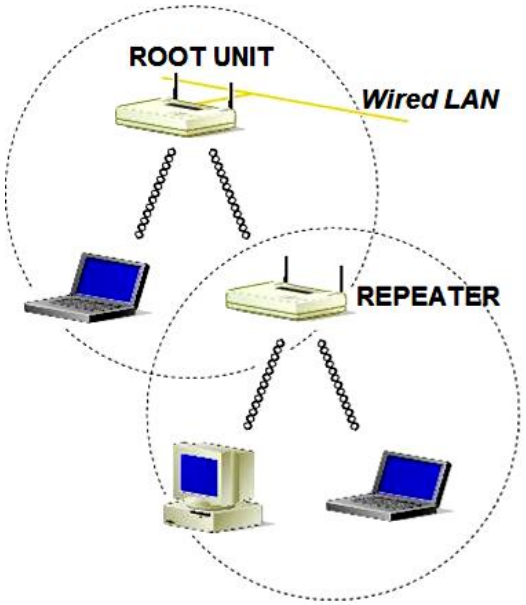
6. SWITCHES

- Unlike the hubs, a switch does not broadcast the data to all the computers, it sends the data packets only to the destined computer.
- It Understands when two devices want to talk to each other, and gives them a *switched* connection.
- It Helps prevent data collisions and reduces network congestion, increasing network performance.
- Most home users get very little, if any, advantage from switches, even when sharing a broadband connection.
- A switch resides on Layer 2 of the OSI model.

7. REPEATER

- A repeater is a device that accepts a signal from a transmission medium, regenerates it, and retransmits it over the medium.
- As a signal travels over a long distance, it undergoes a reduction in strength, an occurrence called **attenuation**. A repeater can be used to boost the signal between two cable segments or wireless access points.
- However, a repeater cannot connect different network architecture. Also, it does not simply amplify the signal, it regenerates the packets and retimes them.

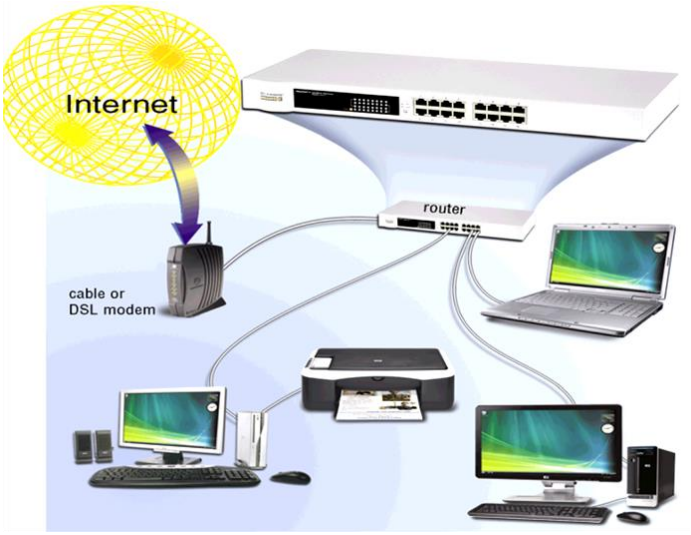
A Repeater Resides on Layer 1 of the OSI model.



8. A ROUTER

- A Router connects multiple networks and routes communications traffic to the appropriate network using the fastest available path.

It uses standardized protocols to move packets efficiently to their destination across LANS.

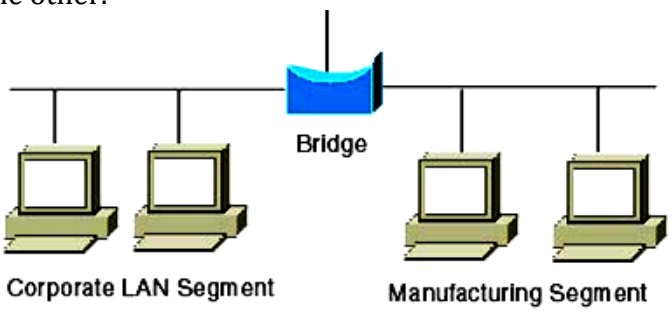


- It is More sophisticated than bridges, connecting networks of different types (for example, star and token ring)
- It forwards data depending on the Network address (IP), not the Hardware (MAC) address.
- Routers are the only one of these four devices that will allow you to share a single IP address among multiple network clients.
- A router allows multiple computers to share a single high-speed Internet connection such as through a cable modem.
- A router resides on Layer 3 of the OSI model.

9. NETWORK BRIDGE

- Just like a physical geographical *bridge that connects two pieces of land together offering a path from one to another,* A **network bridge** is device that connects two networks making each accessible to the other.

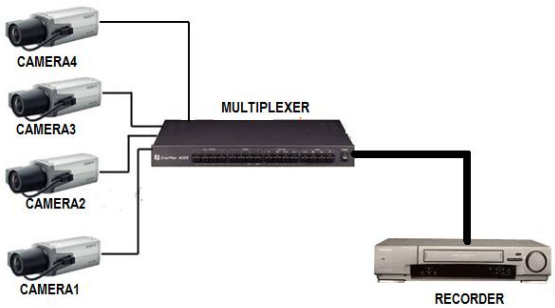
A bridge knows all of the addresses on each side of the bridge and can send information accordingly. It connects the two LANs and forwards or filters data packets between them.



- Creates an extended network in which any two workstations on the linked LANs can share data.
- A bridge is transparent to protocols and to higher level devices like routers. It forwards data depending on the Hardware (MAC) address, not the Network address (IP).
- A bridge resides on Layer 2 of the OSI model.

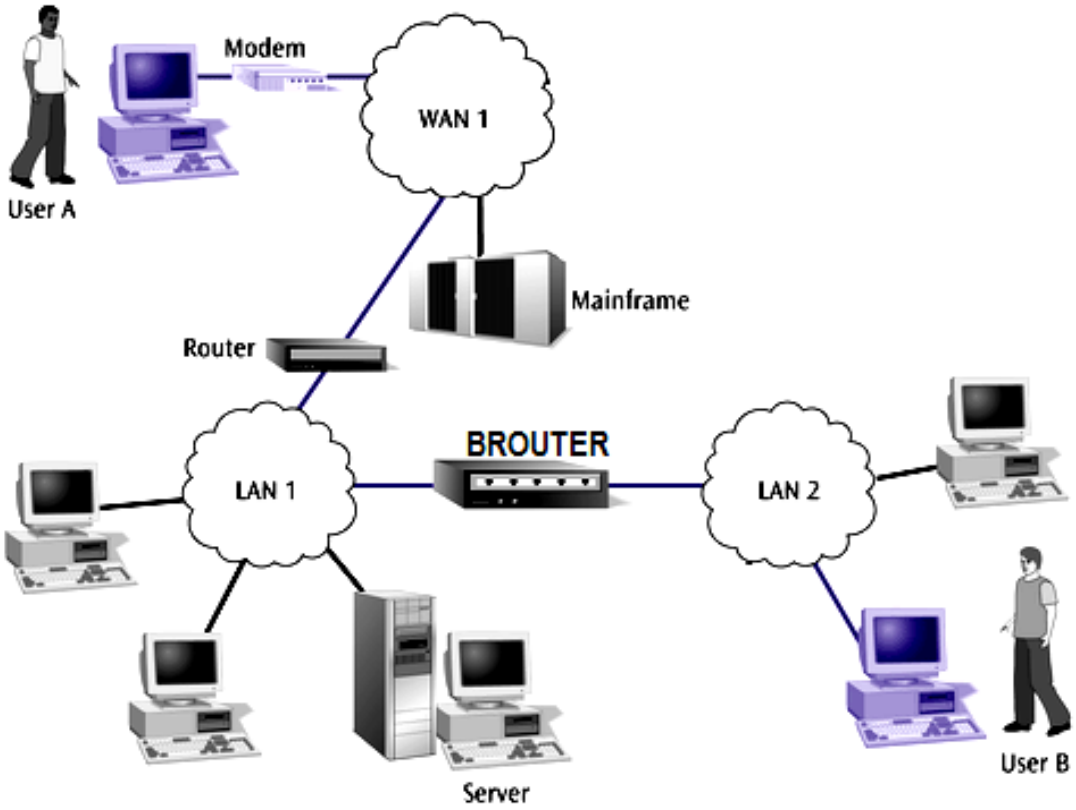
10. MULTIPLEXER

- A *multiplexer is a* device that combines two or more input signals from various devices into a single stream of data and then transmits it over a single transmission medium.
- By combining the separate data streams into one, a multiplexer increases the efficiency of communications and reduces the need for using multiple separate transmission media.



11. BRIDGE ROUTER (BROUTER):

- A device that combines router and bridge functionality and therefore works on OSI layers 2 and 3.



12. A GATEWAY

A gateway can be used as a connecting device between internetworks that use different models. A gateway is normally a computer that operates in all five layers of the Internet or seven layers of OSI model. A gateway takes an application message, reads it, and interprets it.

For example, a network designed to use the OSI model can be connected to another network using the Internet model. The gateway connecting the two systems can take a frame as it arrives from the first system, move it up to the OSI application layer, and remove the message. Gateways can provide security, and can be used to filter unwanted application-layer messages.

A gateway works on OSI layers 4 to 7.

13. ACCESS POINT

A wireless **access point** is a device that allows wireless devices to connect to a wired network using Wi-Fi, or related standards. The access point usually connects to a router (via a wired network) as a standalone device, but it can also be an integral component of the router itself. Access points don't have built-in technology for sharing Internet connections. To share an Internet connection, you must plug an access point into a router or a modem with a built-in router.

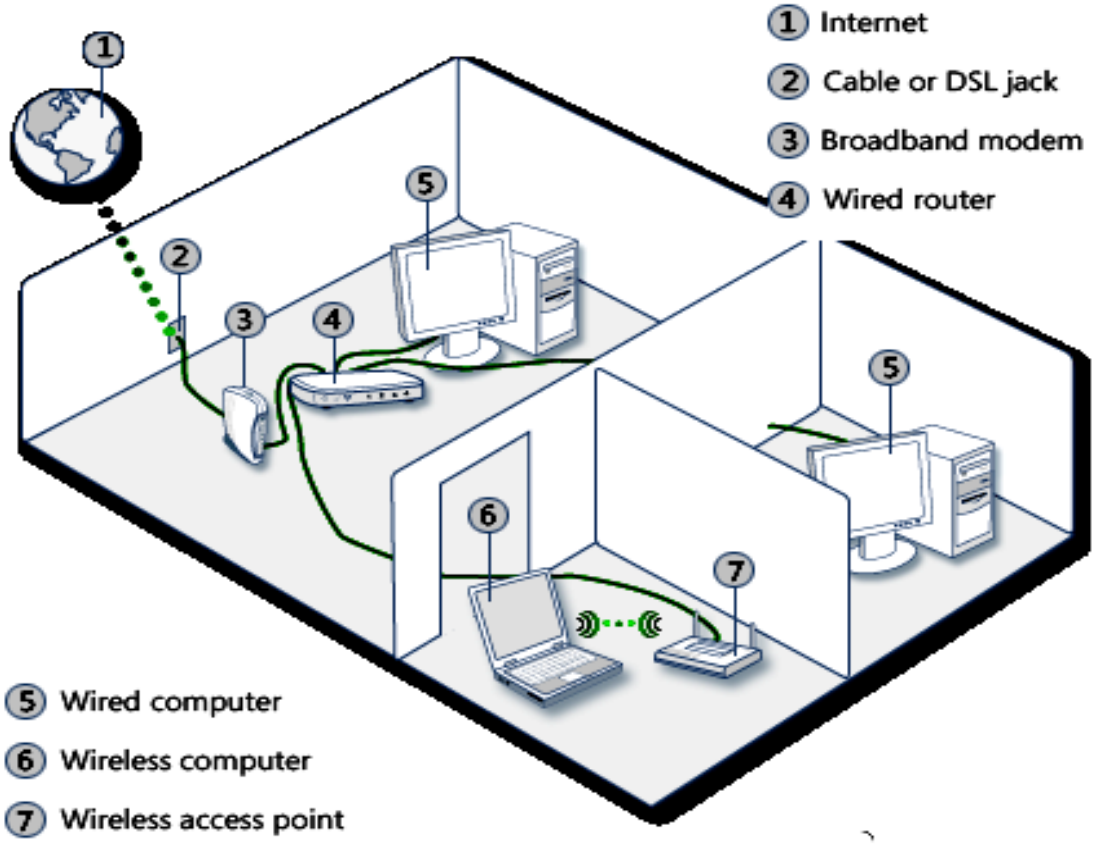


Figure 1 **A SOHO (small office/home office) network** with an access point

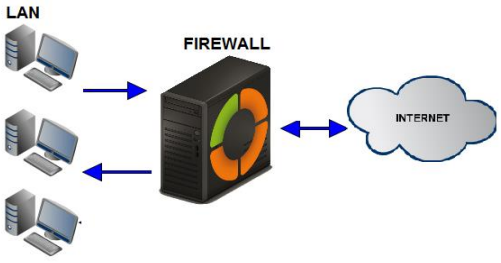
14. PROTOCOL CONVERTER:

A protocol converter is a hardware device that converts between two different types of transmission, such as asynchronous and synchronous transmissions.

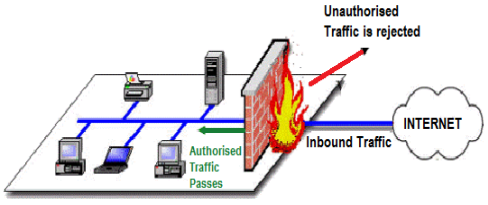
15. NETWORK ADDRESS TRANSLATOR (NAT):

A network address translator is a network service provided as hardware or software that converts internal to external network addresses and vice versa.

16. A FIREWALL



- A firewall is a networking device that is installed at the entrance to a LAN, particularly when connecting a private network to a public network, such as the internet.
- The firewall uses rules to filter inbound traffic into the private network, to protect the private network users and data from malevolent hackers.
- Unauthorized traffic is rejected, and authorized traffic passes as illustrated below.



Packet filtering firewalls work mainly on the first three layers of the OSI reference model, which means most of the work is done between the network and physical layers, with a little bit of peeking into the transport layer to figure out source and destination port numbers.

NETWORKING SOFTWARE

The principal functions of networking / communications software are network control, access control, transmission control, error detection/correction, and network security.

NETWORKING OPERATING SYSTEM

- A network operating system (NOS) is the system software that organizes and coordinates the activities on a network.
- *NOS software consists of programs that help* users establish a connection to another computer or network and manage the transmission of data, instructions, and information.
- The principal functions of NOS include network control, access control, transmission control, and error detection /correction, and network security, System maintenance tasks such as backup, File management tasks, and Prioritizing print jobs on the network.
- Examples of NOSs include: Novell NetWare, Microsoft Windows server 2003, 2008, 2012, AppleShare, Unix /NFS, Sun Solaris, etc.

NETWORK APPLICATION SOFTWARE

These are programs that provide an interface for users to communicate over computer networks. A variety of examples of application software for communications include:

- E-mail client applications,
- FTP programs,
- Web browsers,
- Newsgroup/ message boards,
- Chat rooms,
- Instant messaging,
- Video conferencing applications e.g. Skype, and
- VoIP.

NETWORK PROTOCOLS

This refers to a set of rules and procedures governing transmission between components in a computer network.

The principal functions of protocol in a network include:

- identifying each device in the communication path;
- securing the attention of the other device;
- verifying correct receipt of the transmitted message;
- determining that a message requires retransmission if it is incomplete or has errors;
- Performing recovery when errors occur.

Common protocols

1 **TCP/IP (**Transmission Control Protocol/Internet Protocol) - A network standard that defines how messages (data) are routed
From one end of a network to the other, ensuring the data arrives correctly.
2 **HTTP (**Hypertext Transfer Protocol)
It allows Web browsers and servers to send and receive Web pages.
3 **SMTP (**Simple Mail Transfer Protocol)
It is TCP/IP's own messaging system for e-mail.
4 **TCP (**Transmission Control Protocol)
TCP provides transport functions, ensuring, among other things, that the amount of data received is the same as the Amount transmitted.
5 **IP (**Internet Protocol)
IP provides the addressing and routing mechanism that acts as postmaster.
6 **FTP (**File Transfer Protocol)
It allows files containing text, programs, graphics, numerical data, and so on to be downloaded off or uploaded onto a network.

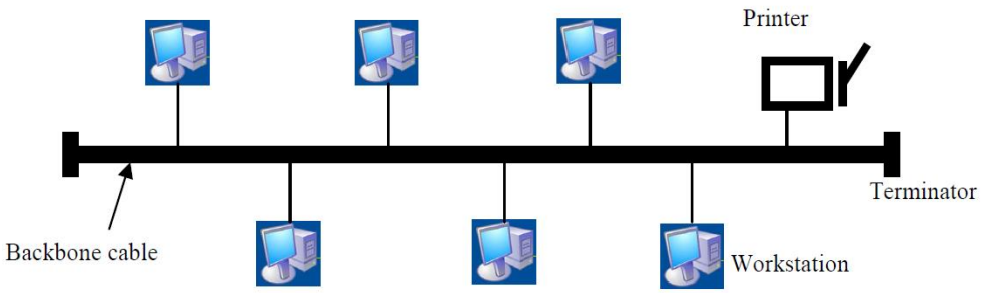
7 **ATM (**Asynchronous Transfer Mode) Also known as cell relay protocol, ATM involves the transmission of all data in packets of a fixed size (53 Bytes).
8 **FDDI (**Fibre Distributed Data Interface) Protocol that uses dual ring topology to enable transmission over long distances at high speeds, mainly over fiber optic cable.
9 **SNTP (**Simple Network Management Protocol) It allows the management of networked nodes to be managed from a single point.
10 **UDP (**User Datagram Protocol)A connectionless, unreliable transport protocol. It does not add anything to the services of IP except to provide process-to-process communication instead of host-to-host communication.
11 **PPP (**Point to Point Protocol)
Designed for simple links which transport packets between two peers.
12 **ICMP (**Internet Control Message Protocol)
The Internet Control Message Protocol (ICMP) is one of the core protocols of the Internet Protocol Suite. It is used by network devices, like routers, to send error messages indicating, for example, that a requested service is not available or that a host or router could not be reached. ICMP can also be used to relay query messages
13 **Ethernet** Widely used LAN protocol synonymous with IEEE 802.3 standard, comprising of a system for connecting a number of computer systems to form a local area network, with protocols to control the passing of information and to avoid simultaneous transmission by two or more systems.
14 **Telnet** Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.
15 **POP (**Post Office Protocol) Allows you to fetch email that is waiting in a mail server mailbox. POP defines a number of operations for how to access and store email on your server.
16 **POP3 (**Post Office Protocol version 3) A TCP/IP protocol that permits workstations to dynamically access a mail drop on a server host
17 **NNTP (**Network News Transfer Protocol). Posts or reads Usenet news. Is the basis for tens of thousands of newsgroups that provide a public forum for millions of Internet users.

NETWORK TOPOLOGIES

- A network topology is a description of the possible physical connections within a network. In other words, a topology is the physical arrangement of the devices in a communications network.
- Three commonly used network topologies are bus, ring, and star. However, Most computer networks are hybrids—combinations of these topologies.
- In a network topology, any networking hardware device is also called a node or host.

BUS TOPOLOGY

A bus or linear network topology consists of a single central cable that connects all computers and devices together.
The physical cable that connects the computers and other devices is known as the bus or the backbone.



MERITS OF BUS TOPOLOGY

- Easy to implement and extend (quick setup)

- Cheaper than other topologies.
- Computers and devices can be attached and detached at any point on the bus without disturbing the rest of the network.
- Failure of one device usually does not affect the rest of the bus network.
- Data, instructions, and information in a bus network can be transmitted in both directions.
- Cable faults are easily identified.
- Weight reduction due to less wires

DEMERITS OF BUS TOPOLOGY

- If there is a problem with the cable, the entire network goes down.
- There is no central host computer to control the network.
- Only one device can transfer items at a time.
- If many computers are attached, the amount of data flowing along the cable increases, data collisions occur and the network slows down.
- Limited cable length and number of stations.
- Performance degrades as additional computers are added or on heavy traffic.(shared bandwidth)
- It is slower than the other topologies.

RING TOPOLOGY

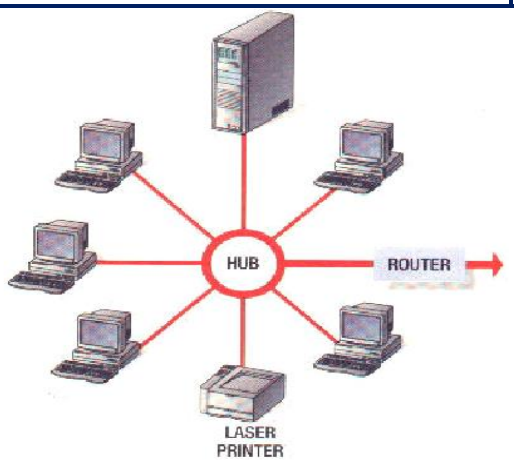
Ring network consists of a cable forming a closed ring, or loop, with all the computers and devices in a network
A ring network links all nodes together in a circular chain.
The node examines any data that passes by to see if it is the addressee; if not, the data is passed on to the next node in the ring.



ADVANTAGES OF RING TOPOLOGY

- Ring topology Can cover a larger distance as compared to a bus network and is commonly used in wide area networks (WAN)
- No collisions occur because data takes one direction only
- Very orderly network where every device has access to the token and the opportunity to transmit
- The speed of data transmission is faster than in a bus topology.

DEMERITS OF A RING TOPOLOGY



- Ring Topology Network is more difficult to establish.
- If the cable fails, the whole network goes down.
- Data messages travel in only one direction from device to device around the entire ring
- If a node on a ring network fails, all nodes after the failed nodes cannot function.
- There is no central host computer to control the network.
- Moves, adds and changes of devices can affect the network

STAR TOPOLOGY

On a star network, all of the computers and devices (nodes) on the network connect to a central hub or switch. All data that is transferred from one computer to another passes through the hub.

MERITS OF A STAR TOPOLOGY

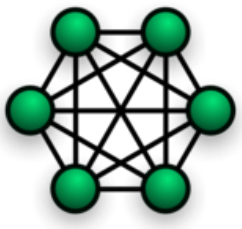
- Easy to install and maintain.
- Better performance: The star topology prevents the passing of data packets through an excessive number of nodes.
- Computers and devices can be added to or removed from the network with little or no disruption to the network.
- Reliable because each device connects directly to the hub, if one device fails, only that device is affected.

DEMERITS OF A STAR TOPOLOGY

- If the hub fails, the entire network fails
- Lots of cable required so that the installation cost is expensive.
- Network size is limited by the number of connections that can be made to the hub.
- Performance for the entire network depends on the capabilities of the hub.
- Set up of the system can be very complex.

MESH TOPOLOGY

This is the type of network topology in which each of the nodes of the network is connected to each of the other nodes in the network.



Fully connected Mesh topology makes it possible for data to be simultaneously transmitted from any single node to all of the other nodes.

MERITS OF MESH TOPOLOGY

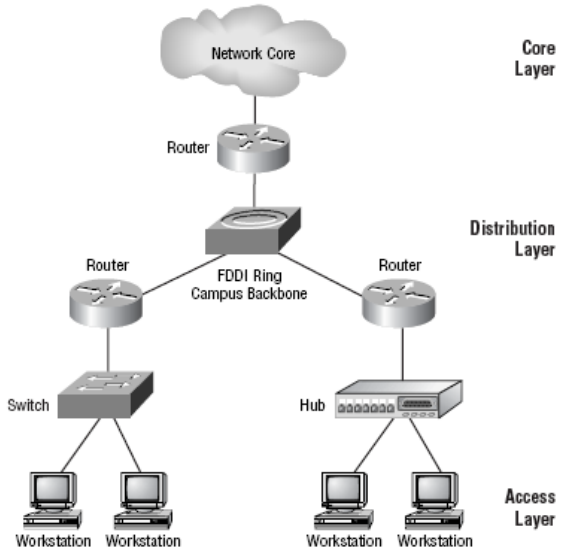
- Data will always be delivered.
- All of the data that is transmitted between nodes in the network takes the shortest path between nodes.
- In the case of a failure or break in one of the links, the data takes an alternate path to the destination.

DEMERITS OF MESH TOPOLOGY

- Mesh topology is generally too costly and complex for practical networks, and very hard to setup.
- Lots of cable required so that the installation cost is expensive.
- Network size is limited by the number of interconnections that can be made between the computers.
- It requires that the nodes of the network possess some type of logical 'routing' algorithm to determine the correct path to use at any particular time.

TREE TOPOLOGY

Tree network topology is also known as the hierarchical network topology.
This is because it contains different levels of hierarchy.
The type of network topology in which a central 'root' node (the top level of the hierarchy) is connected to one or more other nodes that are one level lower in the hierarchy (i.e., the second level),
Each of the second level nodes will also have one or more other nodes that are one level lower in the hierarchy (i.e., the third level) connected to it.



The hierarchy of the tree is symmetrical - Each node in the network having a specific fixed number, of nodes connected to it at the next lower level in the hierarchy.
It usually has three layers: the core layer, the distribution layer and the Access layer.

FACTORS TO CONSIDER WHEN CHOOSING A TOPOLOGY:

- Cost.
- Future growth:
- Length of cable needed.
- Number of computers to be connected
- Level of security required

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC EIGHT

1. Which of the following best distinguishes a WAN from a LAN? The
a. Number of computers connected
b. Distance between connected computers
c. Model of computers connected
d. Type of operating system used in the network
2. Which of the following characterises an Analogue Quantity?
A. Discrete levels represent changes in quantity
B. it's values follow a logarithmic response curve
C. It can be described with a finite number of steps
D. has a continuous set of values over a given range
3. Asynchronous transmission may be defined as
A. communication where the receiver clock must be in approximate synchronism with that of the transmitter
B. communication where the receiver will operate satisfactorily even if its clock frequency is different from that of the transmitter
C. communication where the receiver clock is arranged to be in exact synchronism with that of the receiver
D. None of the above
4. Transmission media are usually categorised as

A. Fixed or Unfixed
B. Guided or Unguided
C. Determinate or Indeterminate
D. Metallic or Non Metallic

5. Which of the communication medium listed below is best for connecting computers and transmitting data across a desert, lakes or rivers?
A. Optic Fiber Cables
B. Coaxial Cables
C. Infrared devices
D. Microwave Link Stations

6. What is the most widely used Network adaptor or Network Interface Card (NIC)?
A. ethernet
B. Arpanet
C. token ring
D. none of the following

7. _____ refers to the physical or logical arrangement of a network
A. Data flow
B. Mode of operation
C. Topology
D. Protocol

8. A _____ is a set of rules that governs data communication
A. forum
B. protocol
C. standard
D. software

9. Which of the following types of computers will you most likely use as a server on a complex network?
A. Dell Desktop Tower PC
B. Main frame computers
C. Mini computers
D. Micro Computers

10. A Router
A. Determines on which outgoing link a packet is to be forwarded
B. Forwards a Packet to the next free outgoing Link
C. Forwards a Packet to all outgoing links except the link upon which the packet originated
D. Broadcasts Wi-Fi wireless signals for computers to connect

11. The main difference between a peer to peer network and the client server network model is:
A. Peer to Peer Networks requires dedicated servers while the client server model doesn't.
B. Peer to Peer Networks allows each workstation to act as a server only while client server model have a centralised machine to act as the server while others are clients.
C. They both require dedicated servers to properly channel data from one point to another.
D. Peer to Peer networks are used by people of the same age group, such as teenagers, while client server networks are used by professionals.

12. "Transmission Channels are not perfect; so often the received signal is not the same as the sent or transmitted signal." Which one of the following isn't a source of errors on communication or transmission channels?
A. Attenuation
B. Signal Amplifiers
C. Crosstalk
D. Noise

13. A link is a….
A. bridge
B. path
C. blue, underlined word
D. connection

14. Networked computers can share
A. Data
B. Peripherals
C. A single Internet connection
D. All the above

15. The capacity of a communication channel is called
A. Gateway.
B. Bandwidth
C. A bridge
D. Frequency

16. A regular telephone line supports
A. simplex transmission.
B. half-duplex transmission.
C. full-duplex transmission.
D. multiplex transmission.

17. What is a firewall in computer networking?
A. The physical boundary of a network
B. An operating system of computer network
C. A system designed to filter network traffic
D. A software that detects viruses over the network and eliminates them.

18. _____ is the software that enables people to view webpages on their computer
A. Web browser.
B. HTML.
C. Internet Icon.
D. Search Engine.

19. Which of the following is not a network operating system?

A. Netware.
B. UNIX.
C. Windows 8
D. Windows Server 2008.

20. Which of the following is **not** a representation of a type of network topology?
A. Hub
B. Ring
C. Bus
D. Star

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STRUCTURED QUESTIONS

1 (a) **i)** Define data communication
ii) Give three channels of data transmission

2. Discuss the view that 'internet is a necessary evil'

3. a) Explain four factors that affect the speed of an internet connection.
b) What should be considered when choosing an ISP?

4. a) State the difference that distinguishes the dial up from the wireless internet connectivity.
b) Explain the requirements of getting connected to internet using the Analog access.

5. a) Explain any six services of the Internet that you know.
b) The difference and similarity between internet, intranet and extranet.

6. a) Write the following in full:
i) ISDN, ii) DSL, iii) ISPs, iv) NIC, v) Kbps, vi) EDI, vii)IRC.
b) Give the meaning of the following words as used in computer studies i) Compatibility ii) Upgrade iii) Downloading iv) Uploading
c) What is browsing? Give three examples of browser software (5mrks)

7. Why is internet referred to as "a network of networks?"

8. Explain how individual computers and server computers interact on the internet.

9. Explain the purpose of hyperlinks and their role on the World Wide Web.

10. Discuss internet crimes that are commonly committed by users over the internet and how they can be solved

S3 - TOPIC 9: WEB DESIGN (FOR UCE)

UNIT ONE: INTRODUCTION TO WEB DESIGN

- With the World Wide Web's explosion of popularity, millions of individuals and businesses around the globe have tried their hand at publishing their own website.
- While the hypertext markup language (HTML) is easy to learn, its necessary learning curve delays the web development process. Web authoring software removes this learning curve and allows users to quickly and easily publish on the Web.
- Web Design and Publishing is the process of planning, creating, manipulating, saving and uploading hyperlinked html documents (web pages) to a computer network so that they can be viewed via web browsers.

WEBSITE DESIGN RELATED TERMINOLOGIES

- **Bookmark :**A bookmark is an anchor tag that defines and links to a specific location in an HTML document. Bookmarks are useful when you have long pages that are divided into logical sections, or when you want to jump from one central list of links to multiple locations on a page.
- **HTML:**(Hypertext Markup Language) A tagging system used to code documents so that they can be published on the World Wide Web and viewed with a browser
- **HYPERLINK:** The text or graphic that users click on to go to a file, a location in a file, an Internet or intranet site, page, location, and so on. Hypertext is text with hyperlinks.
- **INDEX PAGE:** The home page or URL of a website, usually serving as an introduction and having links to other pages in the website.
- **DOMAIN NAME:** The unique name that identifies a website on the internet. A domain name is an identification label that defines a dominion of control on the Internet, based on the Domain Name System (DNS).
- **PAGE TITLE:** The text that is displayed on the page banner of a Web page and in the title bar of a Web browser.
- **URL :**(Uniform resource locator) The alphanumeric address that Web visitors use to locate your Web site on the World Wide Web.
- **TAGS: HTML** tags are codes, of keyword elements enclosed by the lesser than (<) and greater than (>) brackets, which give commands to a browser. eg <u> is an HTML tag that tells the browser to underline text on the webpage.
- **WEB AUTHORING SOFTWARE:** A Web site development program that allows Web pages to be visually created like a desktop publishing program. It generates the required HTML code for the pages and is able to switch back and forth (in varying degrees) between the page layout and the HTML.
- **Web Browser:** Is application software which enables a user to display and interact with text, images, and other information on a Web page (Examples: Opera, Google Chrome, Mozilla Firefox, Internet Explorer, Netscape, etc)
- **WEB MAILPROVIDER:** A hosting company that primarily provides end users access to internet services such as e-mail.
- **WEB SERVER:** A computer that stores and delivers (serves up) websites and their related files for viewing on the Internet.
- **WEBMASTER:** A person who creates and manages the information and content, organizes and maintains of a Web site
- **WEBSITE:** A collection of related or hyperlinked web pages
- **WYSIWYG:** (What You See is What You Get) implies a user interface that allows the user to view something very similar to the end result while the document is being created.

FEATURES OF WEB AUTHORING SOFTWARE

These are the basic features common to the working environment of most popular web authoring software programs.

- **Views.** Most web authoring software provides multiple views of the web page you're working on.
  - Standard, normal, or design view - This is typically the default view, which is a blank screen on which you type, paste, or insert content. It uses the WYSIWYG principle. This is very similar to a word processor screen.
  - Code view - Allows you to view and work directly with the HTML code created for you by the web authoring software.
  - Split - Both of the above views are displayed simultaneously in separate windows.

2. Creating Headings and Subheadings: In Normal or Design View, Web authoring software. A text formatting toolbar typically includes buttons for bolding and italicizing text, and probably additionally includes some means of identifying a heading or subheading.

3. Inserting Links: In web authoring software products, you add a link to a document by selecting *Insert* from the menu, then *Link* or *Hyperlink*. Most web authoring software tools additionally provide a button or icon that allows you to quickly insert a link.

4. Inserting Images: In many web authoring software products, you add an image to a document by selecting *Insert* from the menu, then *Image* or *Picture*.

- After you have inserted the image into your webpage, you can edit its attributes in a Properties dialog box or panel. You can change the image's height and width, put a border around it, make it into a link, and add alternate text for users who can't see the image

5. Some web authoring packages use built-in **file transfer protocol (FTP)** capabilities to publish the designed pages to a web server and allow the user to edit publish files while making real-time changes.

6. Web authoring software also allow users to create **cascading style sheets (CSS)** and web design templates, create and add specialized scripts (including JavaScript applications) and even automatically affix file properties like create date, author information, and copyright data

7. Themes: This feature provides a ways to accomplish a consistent look and feel for all pages on web site at once.

8. Task panes. A dropdown arrow allows you to switch.

- Between various Panes offering options to work of different items.

9. Help Feature Most web authoring software also have a help area which users can use to find information about the software.

Demerit of web authoring software: Web authoring software is detrimental to a designer's HTML programming skills, as users rarely need to actually apply those skills to their design projects.

- Instead, web authoring software users simply design web pages much like they would design a word processing or desktop publishing document, dragging items into the desired location instead of using HTML commands to properly position the image.
- For this reason, seasoned web design professionals insist on designing their pages and sites exclusively in text-based HTML, some using simple word processing applications, rather than building a reliance on a graphical interface.

QUALITIES OF A GOOD WEBSITE

- The web must have a home page. This means a page at the top of any tiered structure or at the centre of a web you design on paper.
- You should name the home page Index.htm (or Index.html) in line with web server protocol.
- Should not have too much on one page. It's better to use lots of pages with a small amount of information on each.

- Should have links to other areas on all pages for easy navigation through the website
- Should load quickly
- Should have a title and brief summary about the page
- Should have date of last Update
- Page (file) names should be eight characters or less. Although many servers and systems now support long filenames, it isn't universal by any means.
- Should have a feedback page or a link to the webmaster who will be the first contact for your website's visitors
- Should have Simplicity = Elegance

IMPORTANCE OF A WEBSITE

- Making of a website favors publishing of data and information in a bid to create awareness about something on the internet.
- A website is an avenue for sharing knowledge through intercontinental interaction for example through teleconferencing and discussion boards.
- Website development enhances skill building such as writing, editing, layout and design; providing motivation and pride of ownership

LIMITATIONS OF A WEBSITE

- Expenses: Websites are not easy to setup and maintain due to annual subscription to ISPs or web hosts
- Timely updating issues: Information keeps on changing and this requires constant revision and effecting changes as necessary.
- Copyright issues: It is a crime to publish information from copyrighted sources without permission from the original authors.

CONSIDERATIONS FOR WEBMASTERS

Webmasters should have the following points in mind when designing a website:

- They should be original and avoid violating copyright laws.
- The web pages should have valuable content for public consumption, tailored for consumer requirements
- They should take into account the type of browsers the clients have: some versions may not be able to display advanced webpage elements
- They should use minimum graphics
- They should limit the use of frames

WHY A SCHOOL SHOULD HAVE A WEBSITE

A website is a collection of hyperlinked html documents (web pages) with related information, meant to creating awareness about something on the internet.

In a school setting, there is a lot of awareness required between the administration, staff, students and parents. Below are the major reasons why a school should have a website:

1. Making of a website quickens the publishing of information to the community such as abrupt announcements, circulars, results, etc. Once uploaded, it will be already accessible to the targeted readers
2. Through a website, the school can get feedbacks from the community through online user comments and questions.
3. If students are involved in the Website development process, this enhances skill building such as writing, editing, layout and design.
4. A school website provides motivation and pride of ownership. This can be evidenced through use of customized email. Eg xxx@abc.sc.ug instead of xxx@yahoo.com
5. Information listed on a school website removes doubt. Information such as school fees, and everything presented at the site appears in a positive light, as compared to information from other sites about the school which may be false.

6. If a school has a website, they can use the web mail service to send parents and other stakeholders items such as newsletters, remainders etc.
7. A website increases ways of contact. Once you have a website you can list your website address on your business cards, report cards, and even the school signpost.
8. Internet today is being used 24 / 7 and is accessible from every house. People are becoming highly dependent on the internet. By having a web presence, the market of the school expands your significantly.
9. A school website helps students and parents to make a wise academic choice after using the vast quantities of information about a given college or university.
10. In conclusion, a well-designed website is just as important a public relations tool as school catalogs and brochures. If a school has web presence, it can be listed in web search engines and know worldwide. Today everything you need is achieved at the click of a button.

STEPS OF PUBLISHING WEB PAGES ON THE WEB

From a theory perspective, a group of web pages together form a website. When a browser locates a web document on a server, it needs a way to interpret what it finds. To create a web document, requires you to use a special language that the browser can read, called the "HYPERTEXT Markup Language-HTML". It identifies elements of a page so that a browser can render that page on your computer screen.

HTML lets you mix regular text with "Markup" tags describing the text. For instance in the phrase; <B>SARAH</B>. SARAH is the regular text; <B> tags tell the browser to BOLD the name Sarah.

The activities under this unit require you to learn the general structure of the Web pages, and HTML elements guided by your tutor and great bit of self-led practice to come up with a professional design. Refer to our UCE Computer Studies students Workbook Volume 2 to enjoy this experience.

Below are hints on building a professional website;

(a) **Plan the Website**: This is the basis and most vital stage of a web author. It involves thinking about the issues that could affect the design of your site. You should identify the purpose of the site, and target audience of the website. Determine how your design can be unique, and how to keep your site content current and exciting.

(b) **Specify the Requirements**: Source for what materials, skills, and Information will be required to let you start the design. Do you need a scanner, a digital camera, webcam, video camera or?

(c) **Design the Website**: A website can be simple or complex, dynamic or static. Your design should determine ways to meet the goals identified in steps (a) and (b) above. You should specify which layouts spans your scope and whether you need frames, tables, videos, audios, text or a combination to bring out a selling site.

(d) Create the document: Text editors such as notepad, notepad++, html editor, Dreamweaver, and more. Advanced HTML editors ease your work by automatically inserting quick codes for you like tables, forms and frames.

(e) Post the document on the web: You need internet and **HTTP** server (the Web server) which can be local or remote. FTP is a method used to upload or '**POST**' files to the server.

(f) Validate the Site: This renders to ensure that no errors on the pages uploaded.

UNIT TWO: WEB DESIGN

INTRODUCTION TO HTML CODING

Learning Hyper Text Markup Language is fundamental for all website developers. Below are the basics of the language.

- HTML tags, are enclosed by the (<) and (>) angle brackets.
- The opening bracket is followed by an element, which is a browser command, and ends with the closing bracket.
- An element may also be followed by attributes, which are words describing the properties of the element, and further instruct the browser.
- Attributes are separated by a space and followed by an equal (=) sign.
- The value follows the equal sign and is at times enclosed in quotes.
- For examples: in <font size=2> font is the element, size is the attribute and 2 is the value.
- In <IMG SRC="images/photo.jpg"> "images/photo.jpg" is the value of the SRC attribute of the IMG element.

Basic HTML Document Code Structure

```
<html>
<head>
<title>Title goes here </title>
</head>
<body>
This area will contain everything that will be visible through a web browser, such as text and graphics.
</body>
</html>
```

PROCEDURE FOR CREATING WEBPAGES USING A TEXT EDITOR

- Launch notepad through Start/All Programs/Accessories
- Type the above codes
- Save as basic.html on desktop.
- Open the saved html document with a browser such as Mozilla firefox or Google Chrome.

BASIC HTML DOCUMENT CODE STRUCTURE EXPLANATION

- **<head>** - Contains information about the page such as the TITLE, META tags for proper Search Engine indexing, STYLE tags, which determine the page layout, and JavaScript coding for special effects.
- **<title> -** The TITLE of your page. This will be visible in the title bar of the viewers' browser.
- **</title> -** Closes the HTML <title> tag.
- **</head> -** Closes the HTML <head> tag.
- Basic HTML Document Code Structure explanation (cont)
- **<body> - This is where you will begin writi**ng your document and placing your HTML codes.
- **</body> - Closes the HTML <body> tag.**
- **</html> - Closes the <html> tag.**

HEADERS

- Headers are a simple form of text formatting that varies text size based on the header's level. HTML has six levels of headers,

- Headers appear in a larger font than normal text and often are used to define new sections in a page.
- The general syntax for a header tag is:<H*n*>*Heading Text*</H*n*>

ACTIVITY: HEADERS

```
<HTML>
<HEAD>
<TITLE>Header Example</TITLE>
</HEAD>
<BODY>
<CENTER> <!-- Centers everything in the CENTER element -->
<H1>Level 1 Header</H1>
</CENTER>
<H2>Level 2 Header</H2>
<H3>Level 3 Header</H3>
<H4>Level 4 Header</H4>
<H5>Level 5 Header</H5>
<H6>Level 6 Header</H6>
</BODY>
</HTML>
```

Activity Note

- NB: The <CENTER> element causes all the material between its <CENTER> and </CENTER> tags to be centered horizontally in the browser window.
- The code line
- <!-- Centers everything in the CENTER element --> is a comment.
- Comments list other useful information that helps other programmers understand the code, and assist in debugging
- Comments in HTML always begin with <!-- and end with -->. The browser ignores any text and/or tags placed inside a comment.

Paragraphs

Paragraphs are very useful and should be used. They can be created by using the following code: < P>This is a paragraph.</P >
< P>This is a second paragraph.</P >

New Lines/Spacing

New lines are very important for making any website. In order to create a new line you would add the following code:
< BR >
Spacing is also very important. When using HTML, you can use just a space, but only up to the first space. Beyond the first space, the web-browser will just ignore. In order to do any amount, you must use the following code for each space wanted:

Horizontal rules

Horizontal lines can be added by doing the following code:
< HR >

You can also change the width of the line as well as align them to the left or right, as can be seen here:

< HR ALIGN="left" WIDTH="50%" >

Please note that you can have the width in pixels instead of percentages as well. You can also change the height in pixels by doing the following: < HR SIZE="5" >

Comments

Comments are very useful for people that want to identify things in their HTML. They are used when multiple people update website. They are also used to "block" the HTML code. The user does not see a comment unless they view the source code. You can add a comment by doing the following:

<!-- This is the comment -->

Changing Font Color/Face/Size

Changing the font color, face and size are all relatively simple, and are all contained within the same HTML function. In order to just change the color, you can do the following:

< FONT COLOR="red">This is the text that the color applies to</FONT >

This is the text that the color applies to

Within the color field you may name a color, as shown, or you may use the HEX code of the color, which is the preferred method, as seen below:

< FONT COLOR="#FF0000">This is the text that the color applies to</FONT >

This is the text that the color applies to

The color in hex code has a lot more ability and I would recommend that you use it so that you can have a unique website. The hex code of red then green and blue, all up to 255 but in hexadecimal code. Please note that not all monitors display all colors.

Changing the face of a font is also very simple and useful. You can change the face of the font to whatever font you wish, but be careful, if a user does not have that font installed on their computer, then it will just show the default font. You can change the face by using the following code:

< FONT FACE="Webdings">This is the text that it applies to</FONT >

Because people may not have the specific font type that you want it is a good idea to have backup font types separating them by commas, as seen here:

< FONT FACE="BobsFont,Wingdings,Times New Roman,Times,Courier New">This is the text that it applies to</FONT>

You can change the font size using two basic methods. You can do it by using the size attribute, or by using the style attribute. The code for the size attribute:

< FONT SIZE="5">This is the text that it applies to</FONT >

This is the text that it applies to

Using this method, you can change the font from 1 to 7. I would not recommend this method. You could also make the font change, compared to what it was right before as can be seen here:

< FONT SIZE="+2">This is the text that it applies to</FONT >

This is the text that it applies to

As you can notice the font size increased by two font sizes from what it was right before. You can go from -7 to +7, where the -7 decreases the font size by seven and the positive increases it by seven. Another method of changing the font size it by using the following:

< SMALL>The small text<SMALL >

The small text

< BIG>The big text<BIG >
The big text
The more commonly seen font size can be changed by using the font style attribute. You can use this code for modifying that:
< FONT STYLE="Font-Size:20px;">This is the text that it applies to</FONT >
This is the text that it applies to
By using this, you can easily modify the font size from 1 and on. this is what most programs and websites use as their font size.

Bolding/Italicizing/Underlining/Striking

You may also want to bold, italicize, or underline some of you website. It is very good for making things stand out. You can bold something using the following code:
< B>This is the text that it applies to</B >
This is the text that it applies to
Or you may bold by doing the following:
< STRONG>This is the text that it applies to</STRONG >
This is the text that it applies to
Or you may italicize using the following:
< I>This is the text that it applies to</I > *This is the text that it applies to* And another way to italicize is:
< EM>This is the text that it applies to</EM >
This is the text that it applies to
Or you may underline using the following:
< U>This is the text that it applies to</U >
This is the text that it applies to
Or you may strikethrough text by using the following:
< STRIKE>This is the text that it applies to</STRIKE >
~~This is the text that it applies to~~

Making Links

Links are extremely useful for bringing the user to another page that may be within your website, or may be another website that you think would be useful to others. You can create a simple link using the following code: < A HREF="tutorials.php">This is the text that it applies to</A > This is the text that it applies to
There are several different types of links, for local pages, you would use something like the above. For links to other sites, you may use something like the following:
< A HREF="http://bobbys.us/tutorials.php">This is the text that it applies
to</A > This is the text that it applies to
There are many different things that you can do besides just simple links, but this is still very useful.

Making Links in new windows

You may occasionally need to open a new window for the user because you may not want them to leave you website or another reason. Many people these days do not like new windows though, and will just block all new windows. In fact in many 'top ten website mistakes', people place having new windows within the list. But if you want to make new windows, you can use the following code:

< A HREF="http://bobbys.us/tutorials.php" TARGET="_BLANK">This is the text that it applies to</A >
This is the text that it applies to

Making Links to email addresses

Many times you may also want to have a link to your email address. I personally do not like the method and would recommend using a script to send the mail for you, but it is always a good thing to know. To add a link to ayou can use the following code:

< A HREF="mailto:admin@bobbys.us">E-mail me</A >
E-mail me

Please be warned, it is dangerous to place your email address like this, there are many crawlers out there just looking for emails like this. Once crawlers collect emails, lists are sold to spammers. This is how many people get a lot of spam.

Adding images

You may also want to create image. Images are simple to add, and are very useful for showing pictures or diagrams.

To add an image you can use the following code:

<IMG SRC="images/one.gif" ALT="alternate text"> Once you add an image, you may notice that there is a border when you make the image a link. In order to get rid of this you will have to change the border attribute. Here is an example of how to change the border to a size of 0:

< IMG SRC="images/one.gif" ALT="alternate text" BORDER="0" >

Centering Text

When making your page, you may also want to center your header or whatever else. In order to center text you make use the following code:

< CENTER>This is the text that it applies to</CENTER >

This is the text that it applies to

Special Characters

In many cases you may find that you may need to insert special characters. They are very simple to insert, if you know what each character is. As you may remember we added a space by using . Other special characters can be added by doing & followed by the code for them, which can be found here (please note: this is not on my site), and then you would place a semi-colon afterwards. here are some examples:

© produces ©
& produces &
¢ produces ¢
® produces ® ±
produces ±
² produces _ etc...

Lists

You may also have lists of items that you will need to add. There are several types of lists. The two most common ones are ordered and unordered lists. Ordered lists are called ordered lists because they have numbers for people to be guided by. Here is an example of an ordered list:

< OL >
< LI>Item one</LI >
< LI>Item two</LI >
< LI>Item three</LI >

< /OL >

1. Item one
2. Item two
3. Item three

There are also different types of ordered lists. Here is an example of a specific type of ordered list:

< OL TYPE="I" >
< LI>Item one</LI >
< LI>Item two</LI >
< LI>Item three</LI >
< /OL > I. Itm one

II. Item two
III. Item three

The 'TYPE' attribute can contain one the following types: 1, a, A, i, or I.

Unordered lists are similar to ordered lists, except that they have bullets instead of numbers. Here is an example of an unordered list:

< UL >
< LI>Item one</LI >
< LI>Item two</LI >
< LI>Item three</LI >
< /UL >

- Item one
- Item two
- Item three

Tables

Tables are used in many websites. Although they are not always seen, tables are very good at aligning certain things. In fact, this website uses tables, but you probably cannot see them. Tables have many attributes that can be modified to fit exactly what you want. Simple tables can be added by doing the following:

< TABLE BORDER="1" >
< TR >
< TD>top left</TD >
< TD>top right</TD >
< /TR >
< TR >
< TD>bottom left</TD >
< TD>bottom right</TD >
< /TR >
< /TABLE >

top left	top right
bottom left	bottom right

USING FRAMES ON A WEB PAGE

- Frames let you divide the current window into various rectangular cells, each associated with a separate HTML document.
- Before you start creating your framed presentation on the Web, you should first plan their appearance and use. There are several issues to consider:
- What information will be displayed in each of the frames?
- How do you want the frames placed on the Web page? What is the size of each frame?
- Which frames will be static -- that is, always showing the same content?
- Which frames will change in response to hyperlinks being clicked?
- What Web pages will users see first when they access the site?
- Do you want to allow users to resize the frames and change the layout of the page?

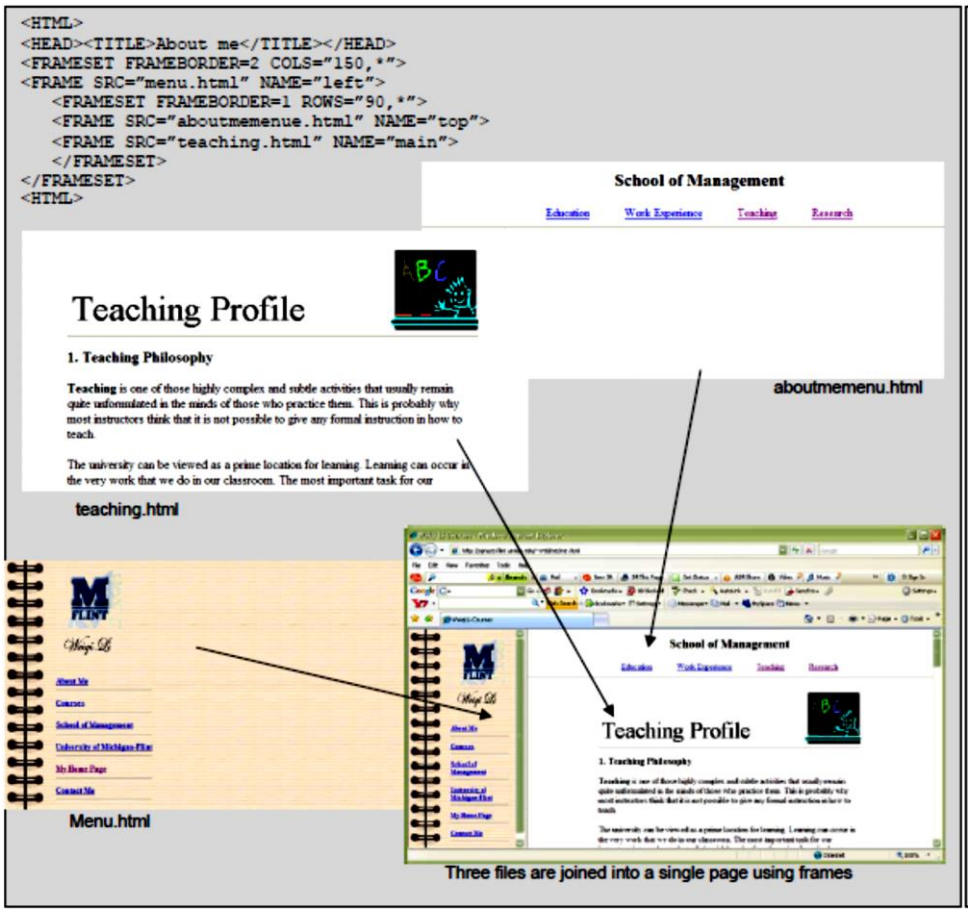
CREATING A FRAME LAYOUT

- Frame layout is defined using the <FRAMESET> tag. The general syntax for the <FRAMESET> tag in your HTML file is:
- <HTML>
- <HEAD><TITLE>Page Title</TITLE></HEAD>
- <FRAMESET>
- Frame and nested FRAMESET entries
- </FRAMESET></HTML>
- Notice that this code does not include the <BODY> tag. Upon reflection, the reason for this should be clear: a page with frames displays the content of other pages. There is no page body to speak of.
- The <FRAMESET> tag has two basic attributes: *ROWS and COLS*
- You cannot use both attributes at once. The syntax for specifying the row or column layout for the <FRAMESET> tag is:
- <FRAMESET ROWS="row_height, row_height, ...">
- or
- <FRAMESET COLS="column_width, column_width, ...">

ACTIVITY: INTRODUCTION TO FRAMES

First create three pages: Home.html,

- <HTML>
- <HEAD><TITLE>About me</TITLE></HEAD>
- <FRAMESET FRAMEBORDER=2 COLS="150,*">
- <FRAME SRC="menu.html" NAME="left">
- <FRAMESET FRAMEBORDER=1 ROWS="90,*">
- <FRAME SRC="aboutmemenue.html" NAME="top">
- <FRAME SRC="teaching.html" NAME="main">
- </FRAMESET>
- </FRAMESET>
- <HTML>



Much more...

There are also many more attributes and elements that we did not cover. You can visit http://www.w3.org/ to find all of the types of elements, and more activities to help you master HTML.

INTRODUCTION TO MICROSOFT EXPRESSION WEB AUTHORING SOFTWARE

Microsoft Expression Web is a full-featured professional tool for designing, developing, and publishing feature-rich websites that conform to web standards. You can use Expression Web to create web pages and sites that let you transfer files between your computer and your hosting account. The latest version is Expression Web 4, which requires .NET Framework 4.0 to run. Expression Web is free to download and use and can be a good introduction for those looking to learn more about creating web pages.

In December 2012, Microsoft announced that Expression Studio would no longer be a standalone product, Expression Blend was to be integrated into Visual Studio, while Expression Web and Expression Design would now be free products.

Features of web authoring software

UNEB questions usually state, "Using web authoring software of your choice, create a website for..." (See 2017 UCE Exam Web design question). There are many website authoring software, the common ones being Dreamweaver, Microsoft Expression Web, Microsoft Office Publisher 2007, BlueGriffon,

Aloha Editor,Mobirise Free Website Builder Software, Namo WebEditor, Antenna Web Design Studio, etc. The following are some of the features to consider when choosing a web authoring software.

1. **Views** ▪Most web authoring software provides multiple views of the web page you're working on. ▪Standard, normal, or design view – This is typically the default view, which is a blank screen on which you type, paste, or insert content. It uses the WYSIWYG principle. This is very similar to a word processor screen. ▪Code view – Allows you to view and work directly with the HTML code created for you by the web authoring software. ▪Split – Both of the above views are displayed simultaneously in separate windows.

2. **Creating Headings and Subheadings** In Normal or Design View, Web authoring software. A text formatting toolbar typically includes buttons for bolding and italicizing text, and probably additionally includes some means of identifying a heading or subheading.

3. **Inserting Links** In web authoring software products, you add a link to a document by selecting Insert from the menu, then Link or Hyperlink. Most web authoring software tools additionally provide a button or icon that allows you to quickly insert a link.

4. **Inserting Images** ▪In many web authoring software products, you add an image to a document by selecting Insert from the menu, then Image or Picture. ▪After you have inserted the image into your webpage, you can edit its attributes in a Properties dialog box or panel. You can change the image's height and width, put a border around it, make it into a link, and add alternate text for users who can't see the image.

5. Some web authoring packages use **built-in file transfer protocol (FTP) capabilities** to publish the designed pages to a web server and allow the user to edit publish files while making real-time changes.

Why is Expression web software the best for creating static HTML webpages required at UCE?

Microsoft Expression Web software is more recommended because:

1. It is a fully fledged Web Authoring Software which provides both a WYSIWYG design interface and an HTML interface which you can switch in between as you work, unlike Publisher and text editors like notepad.
2. It is totally free and available for download from Microsoft's Official Website: *https://www.microsoft.com/en-us/download/details.aspx?id=36179*, unlike Dreamweaver which is not free and thus not easily obtainable.
3. Expression Web (latest release 4) is still current (not older than 10 years as per the UNEB guidelines), unlike Publisher 2007 and FrontPage.
4. Expression web creates clean code which is universally supported in all browsers, unlike Ms. Publisher which generates lots of obsolete objects in its code.
5. Expression Web is not heavy and does not require computers with very high specifications to run, Dreamweaver which is heavier.
6. Expression Web has some website templates which students can base on as general website layouts to quickly get a starting point, unlike Bluegriffon, Dreamweaver and Notepad.
7. Microsoft Expression web has icons which are similar to Microsoft office applications and inter-works well with them (e.g importing clip art) hence more user friendly to the students as compared to DreamWeaver or Bluegriffon.

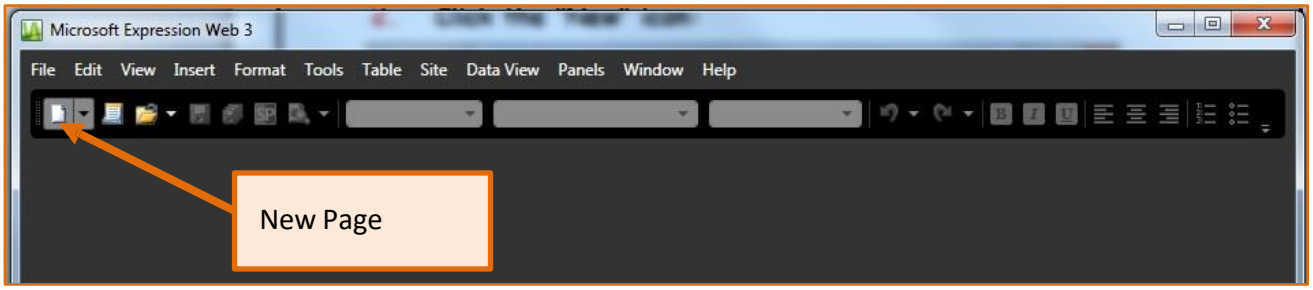
8. Expression Web has a larger international user community which includes universities, colleges and examination bodies like IGCSE which teach and examine using the software for website design, with lots of tutorials on YouTube unlike Ms. Publisher. Despite the fact that Microsoft has since discontinued product support, it still has great community support.
9. Expression Web makes use of Master Pages known as Dynamic Web Templates – which help manage web pages centrally. Despite the name, DWTs are static web pages that EW knows how to manage. It's a very simple idea – pages are attached to the DWT and whenever the master is updated, so are all the attached pages.
10. The latest version of Expression Web 4 is supported by the latest Windows 10 and has support for HTML5 which will remain universally supported for many years, and the HTML knowledge learnt can be used with any other editor, such as a text editor or Dreamweaver.

Learning the Expression Web Interface and creating web pages

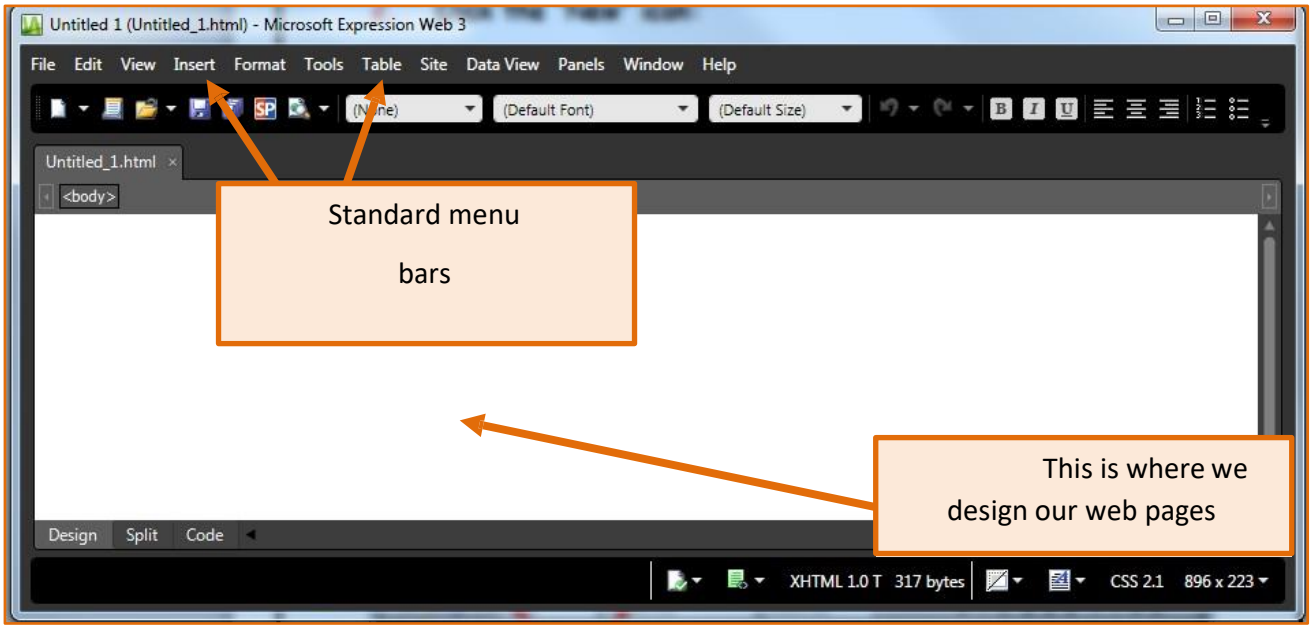
After you have installed Microsoft Expression Web you should be ready to start working on it. Let's first learn how to create a new website from scratch, to get familiar with the interface.

1. Open MS Expression (Start → All Programs → Microsoft Expression → Microsoft Expression Web)

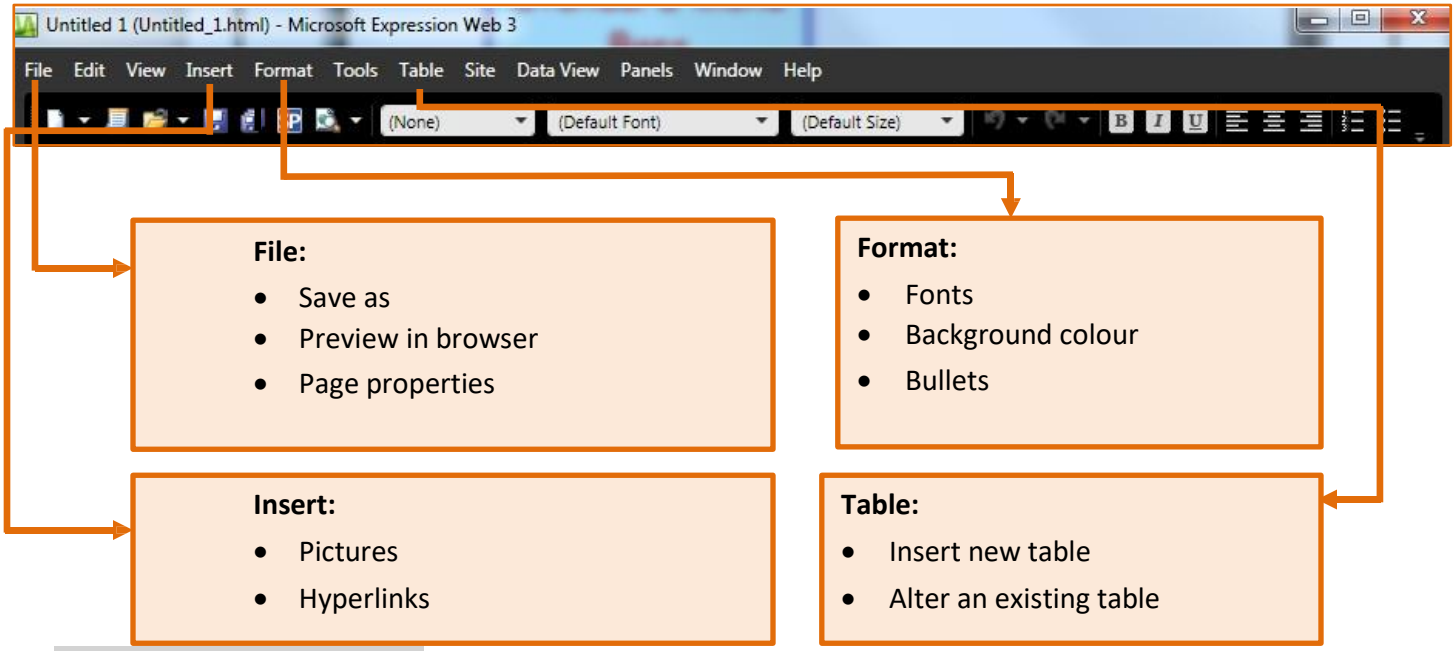
2. Click the "New" icon.



3. You are now ready to make a website.



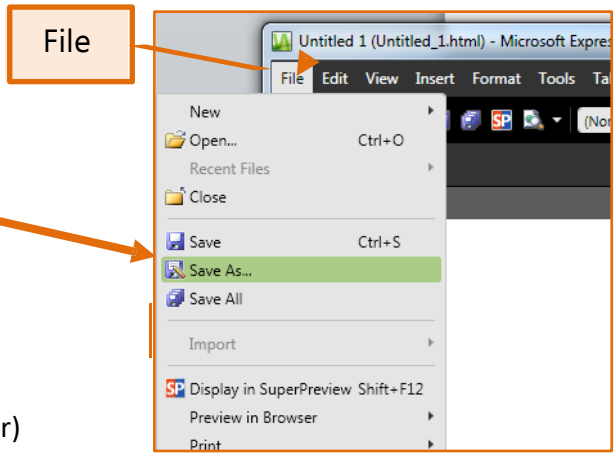
4. Menu bar commands we need to know:



How to Save your Web Pages

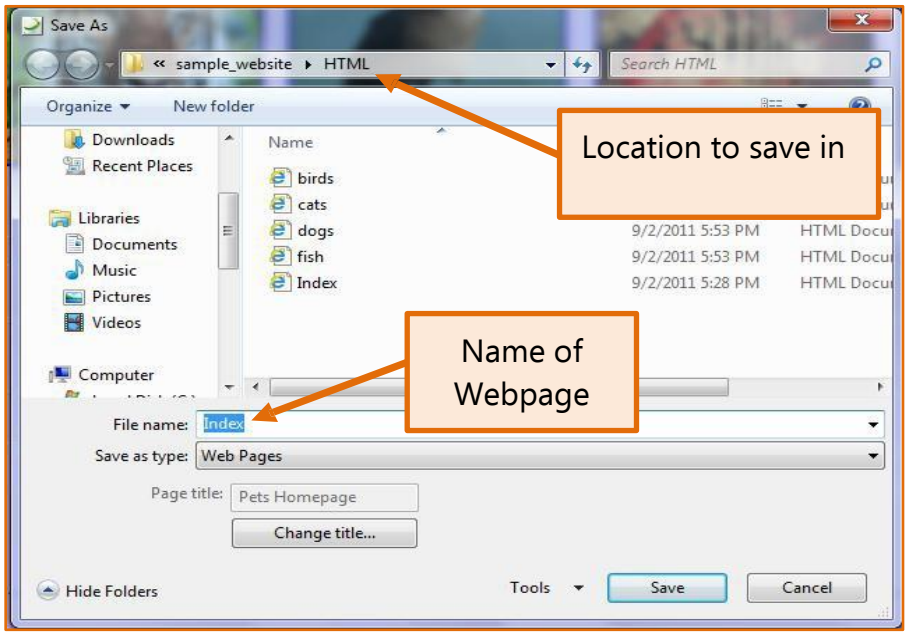
This is how you save your file as a web page:

1. Click File → Save As.



2. A new window will pop up:

- Choose where to save your file
  (Web Design → My Website → HTML folder)
- File name of homepage should be index.htm
- Click Save.



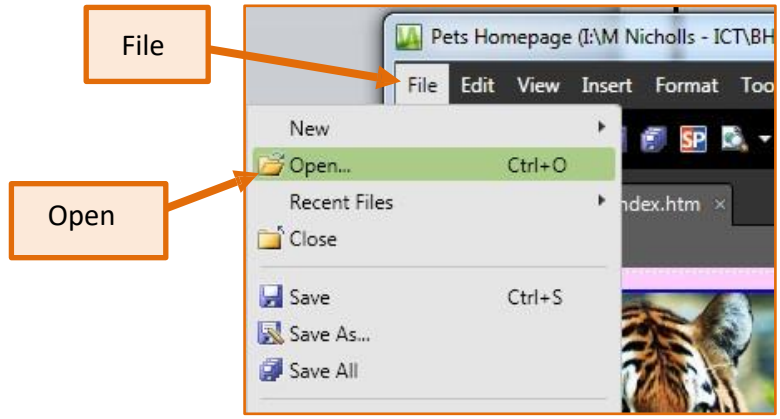
Remember!

The file extension for a web page is .html

Opening an existing Web Page

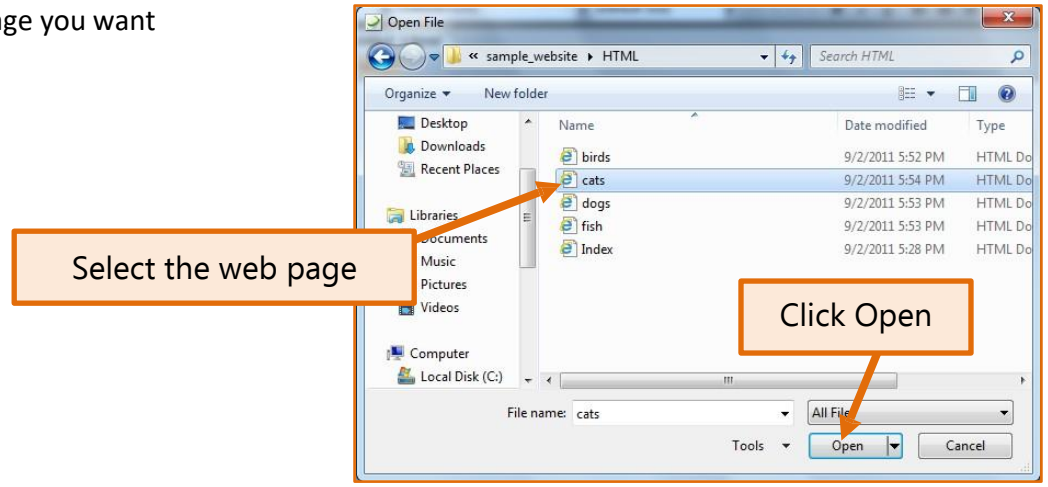
When you need to open a web page in order to edit it or make changes, you should use the following steps:

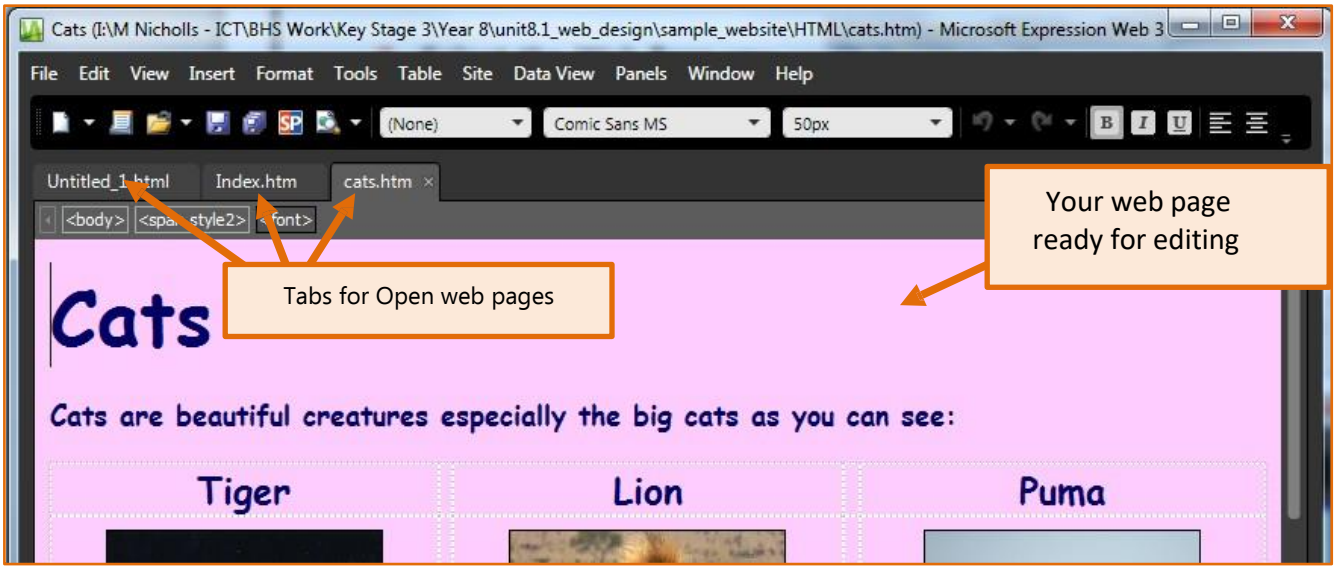
1. Click:
   - File → Open.



2. Select the web page you want to open.

3. Click Open.





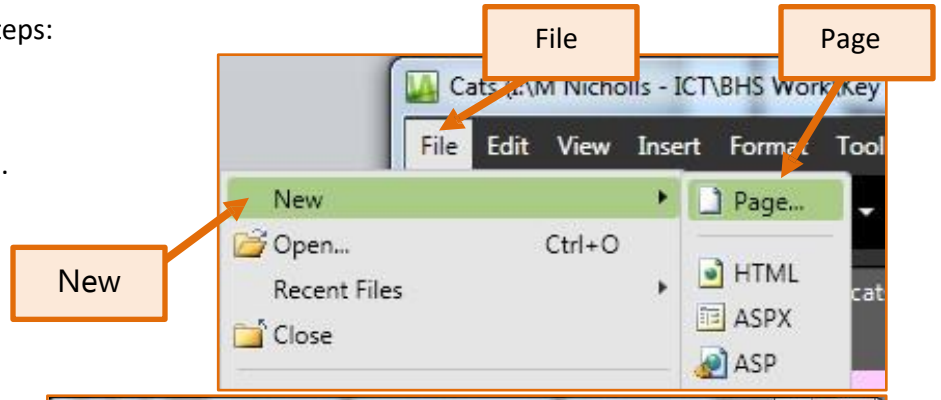
Creating more Web Pages

Your website is to be made up of more than one page. You need to be able to create these pages using Microsoft Expression.

To create new pages follow these steps:

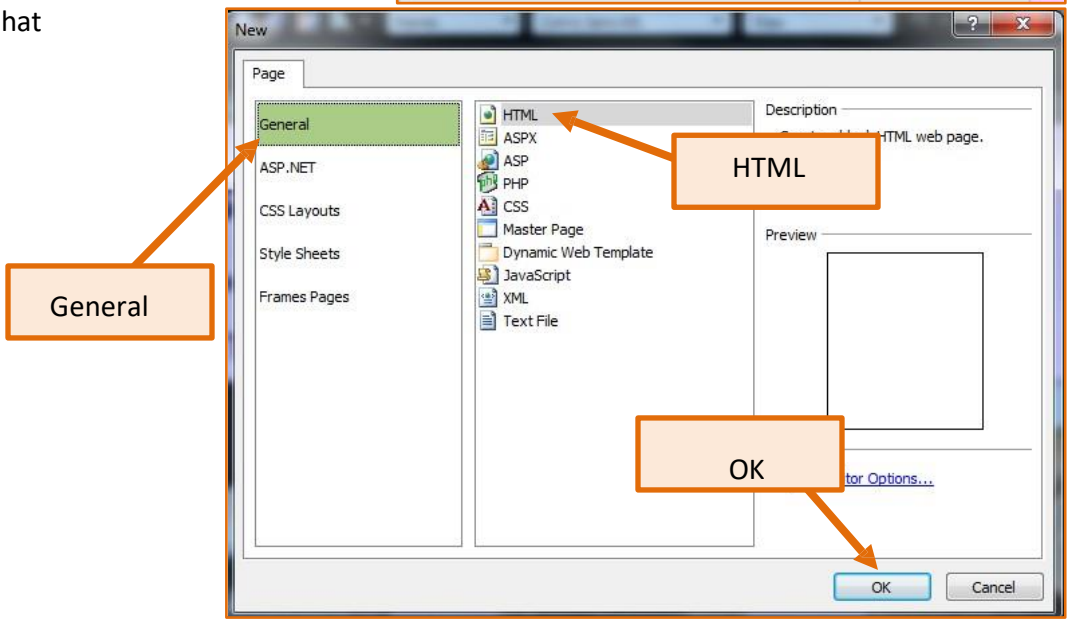
1. Click:

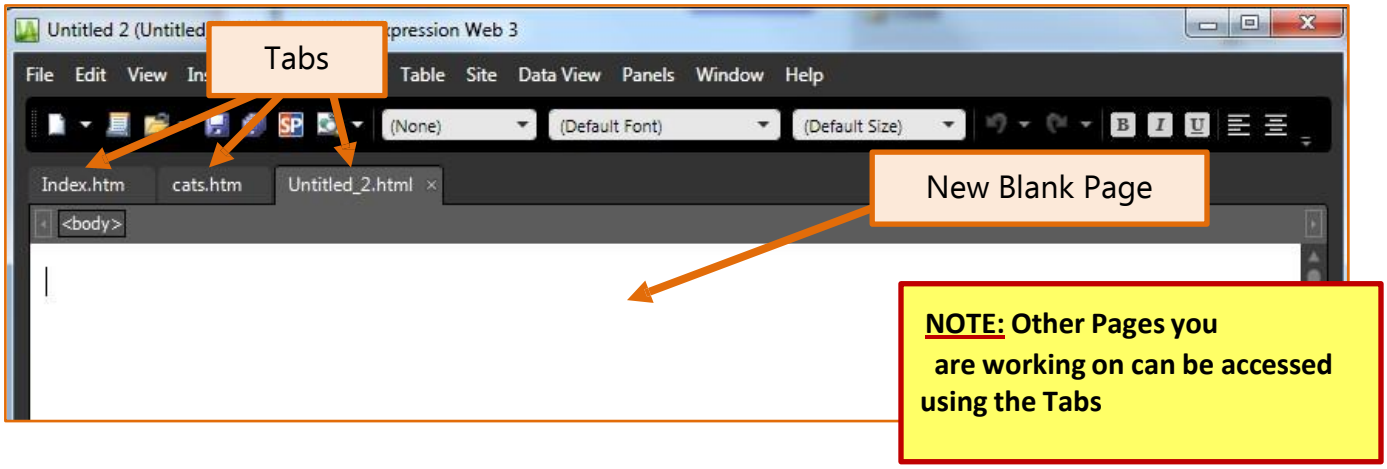
- File → New → Page.



2. In the window that appears click

- General
- HTML
- OK.



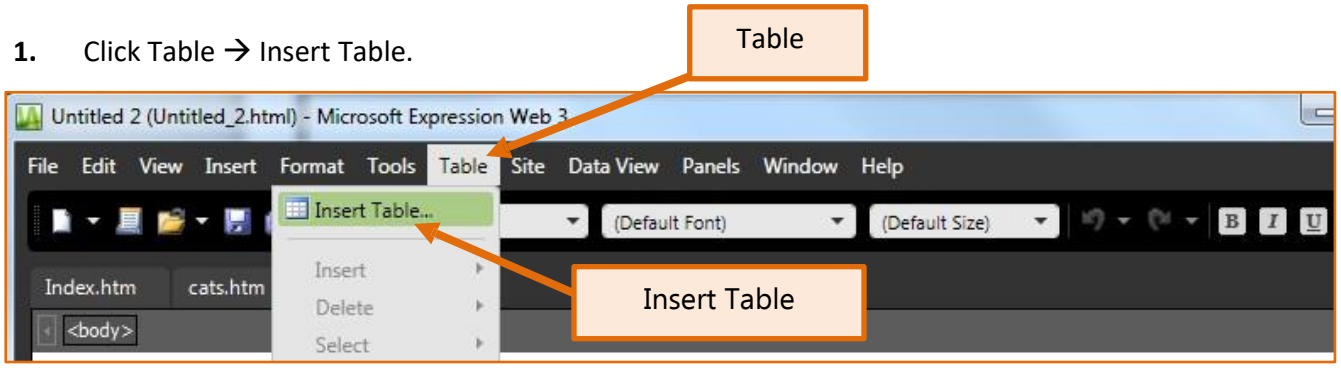


NOTE: Other Pages you are working on can be accessed using the Tabs

Adding and Amending a Table

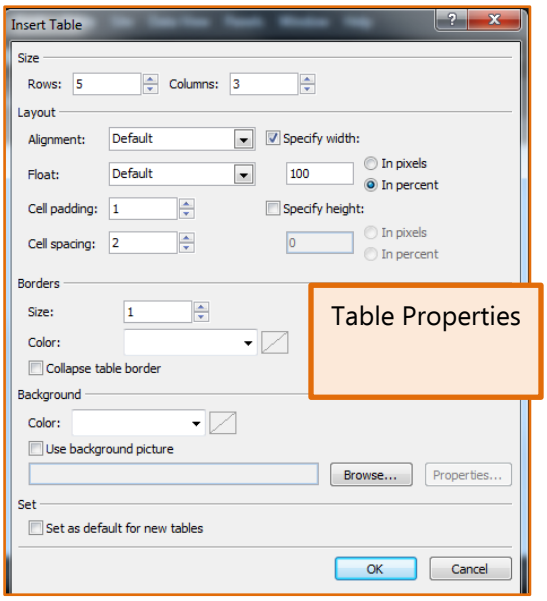
Tables are used to create the layout and structure of your web pages. To insert tables you should do the following:

1. Click Table → Insert Table.

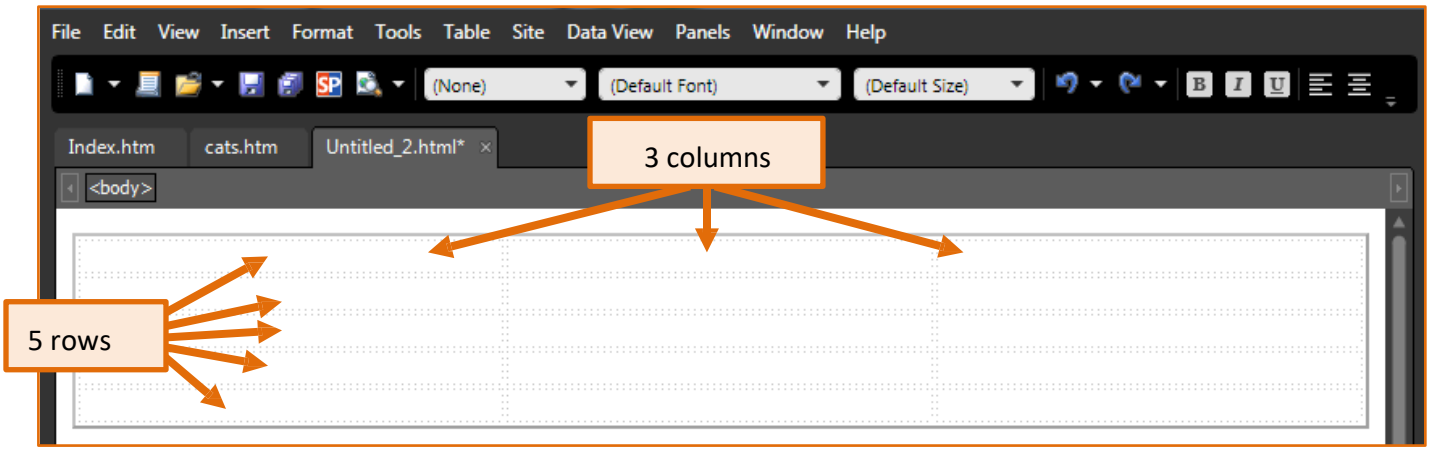


2. You now see the properties box.
   Here you can:
   - Set number of columns/Rows
   - Set the Width of the table (should be 100%)
   - Set border thickness
   - Select colours
   - Etc.

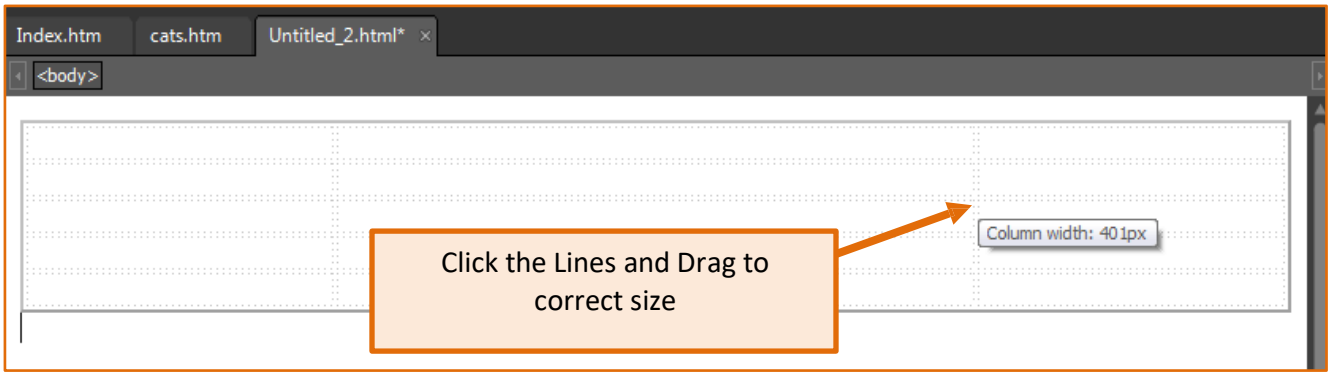
All of these settings can be changed later on (click here to see how)



3. We now have a table with 5 rows and 3 columns:

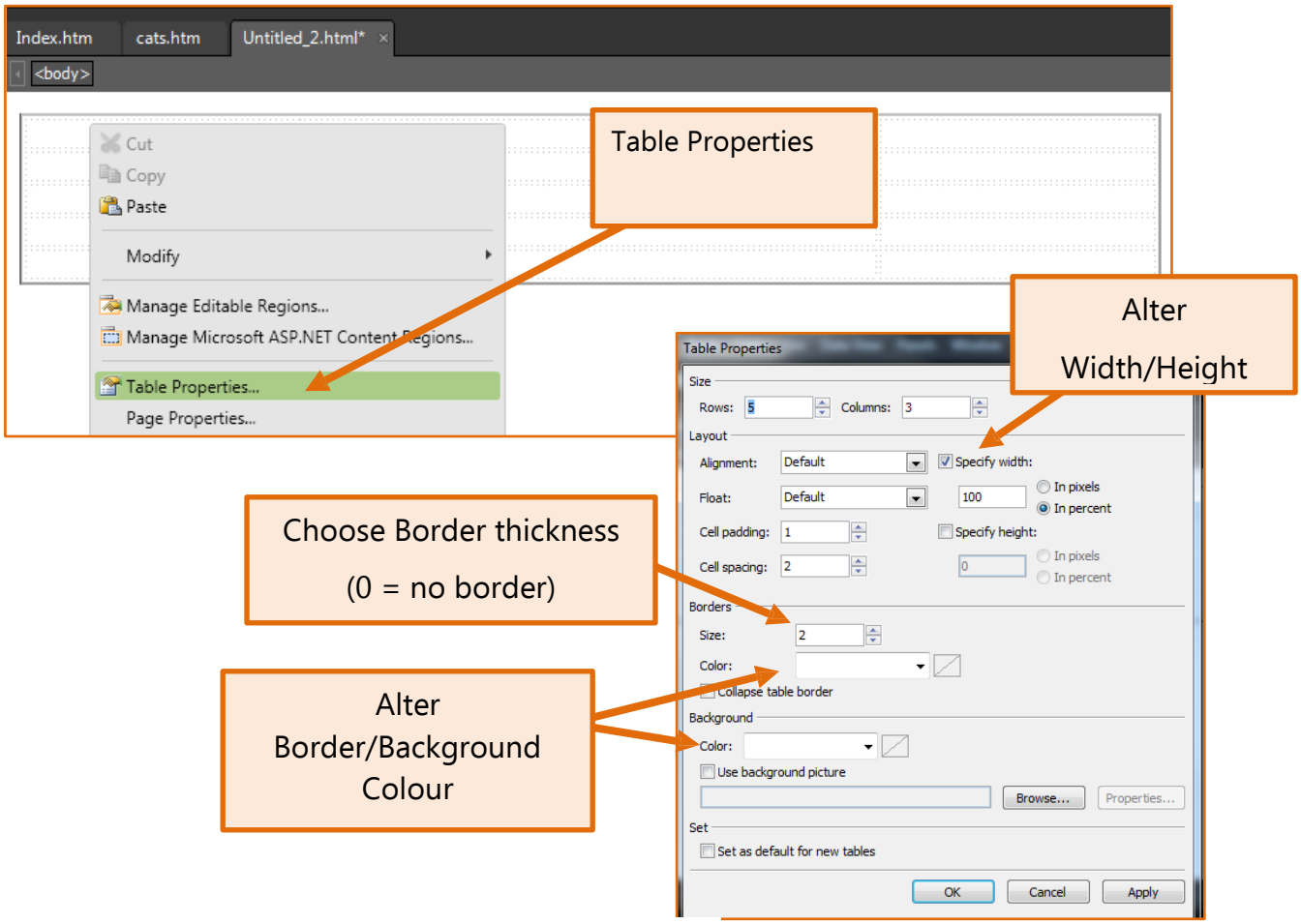


4. Each column or row can be resized by clicking on the appropriate line and dragging:

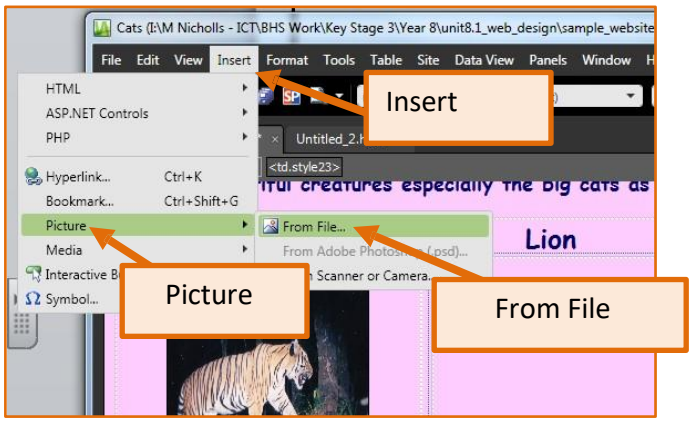


5. You can also change table properties to make alterations after the table has been created (Sizes, Borders, Border Colour etc):

- Right click the table and select Table Properties.



Inserting Images



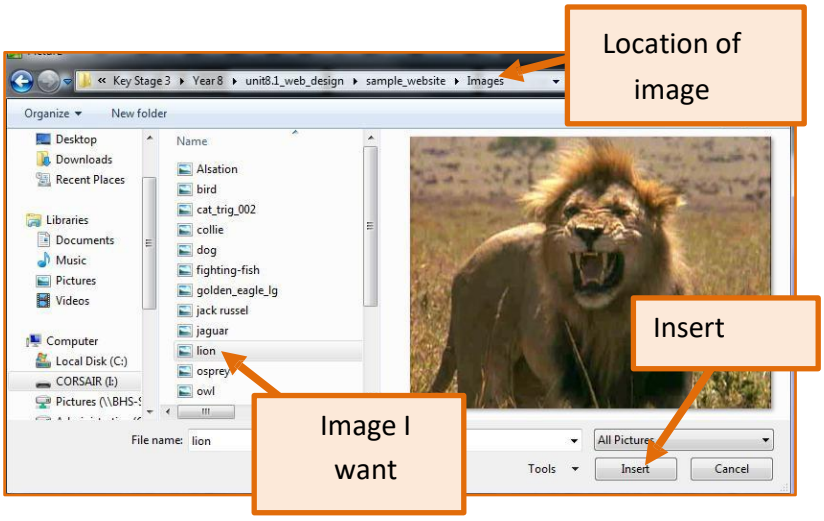
1. Click in the area where you want to put the image.

2. Click Insert → Picture → From File.

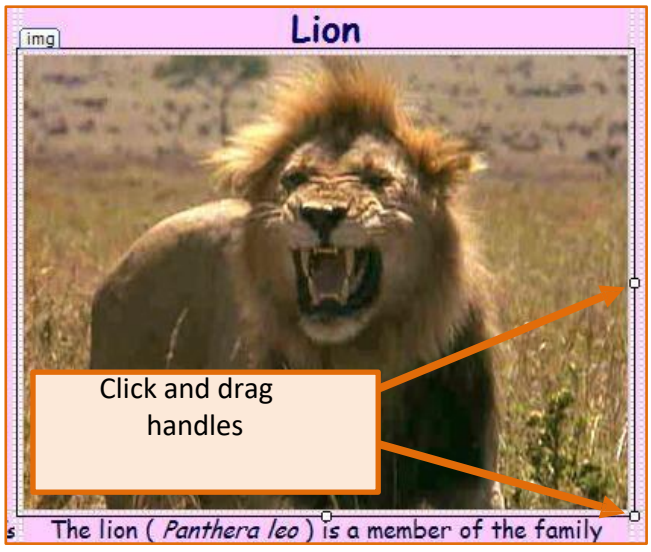
3. A new window will pop up.

4. Browse to where your images are stored.

5. Select the image you want then click Insert. NB: You can also simply copy clip art images from other programs and simple paste into Expression Web



6. Resize the image to the correct size by clicking and dragging the handles.

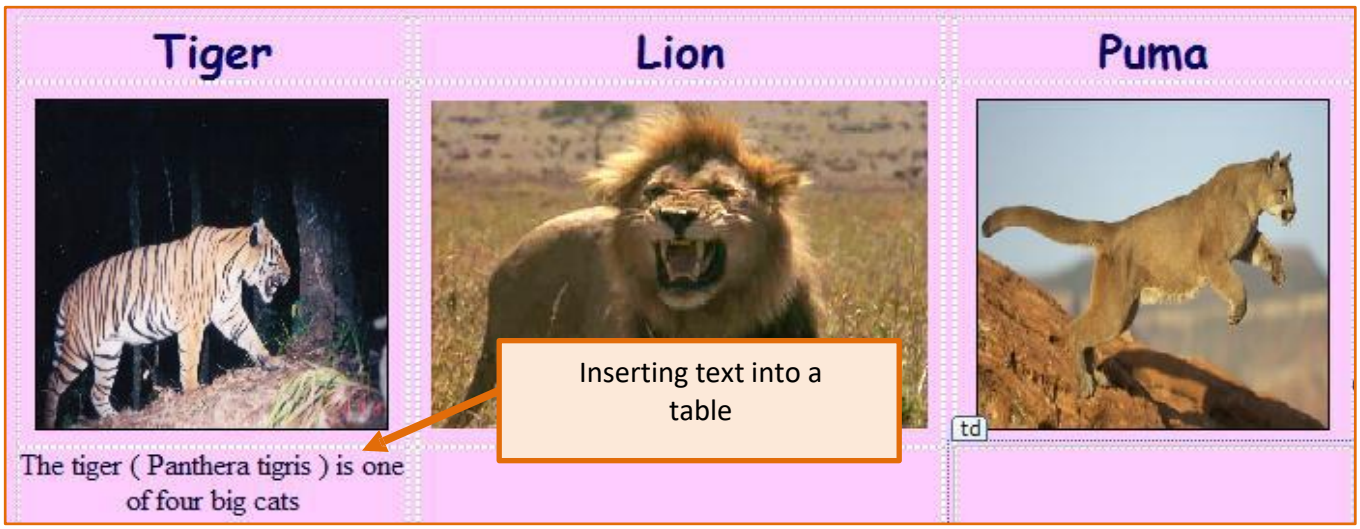




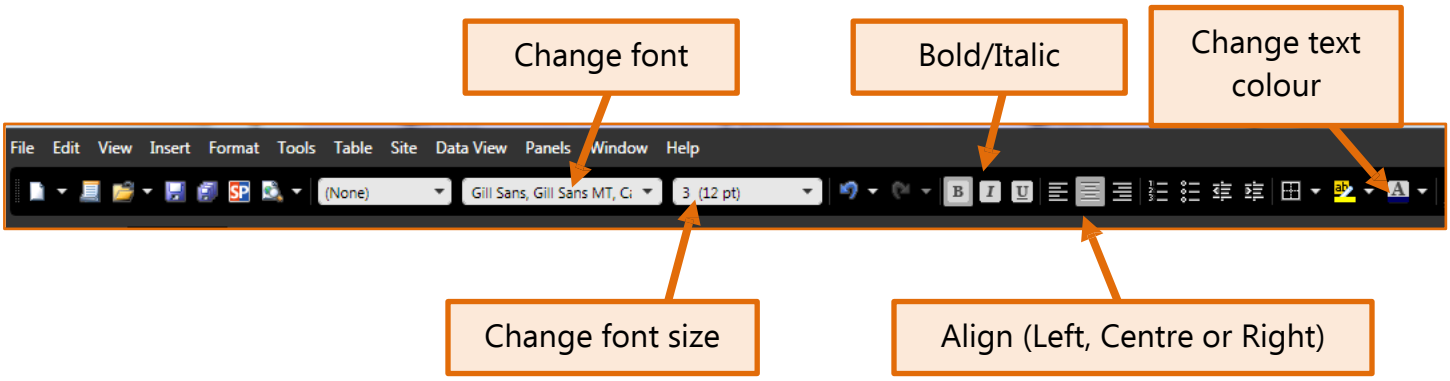
Inserting and Formatting Text

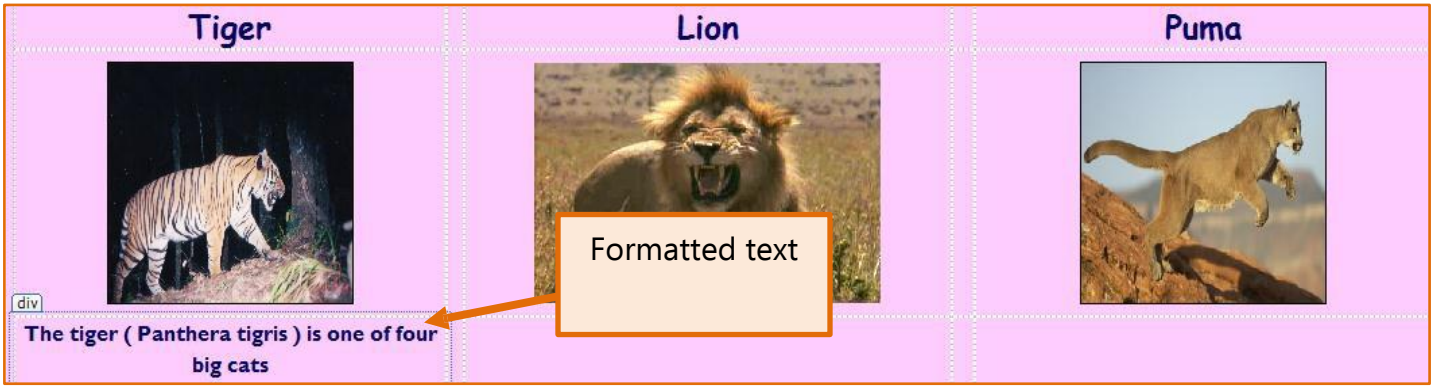
1. Inserting text is very simple (Very similar to using Microsoft Word).

2. Choose where you want to input your text.



3. Text can be formatted (Like in Word) by highlighting it and using the Properties Window to make changes:





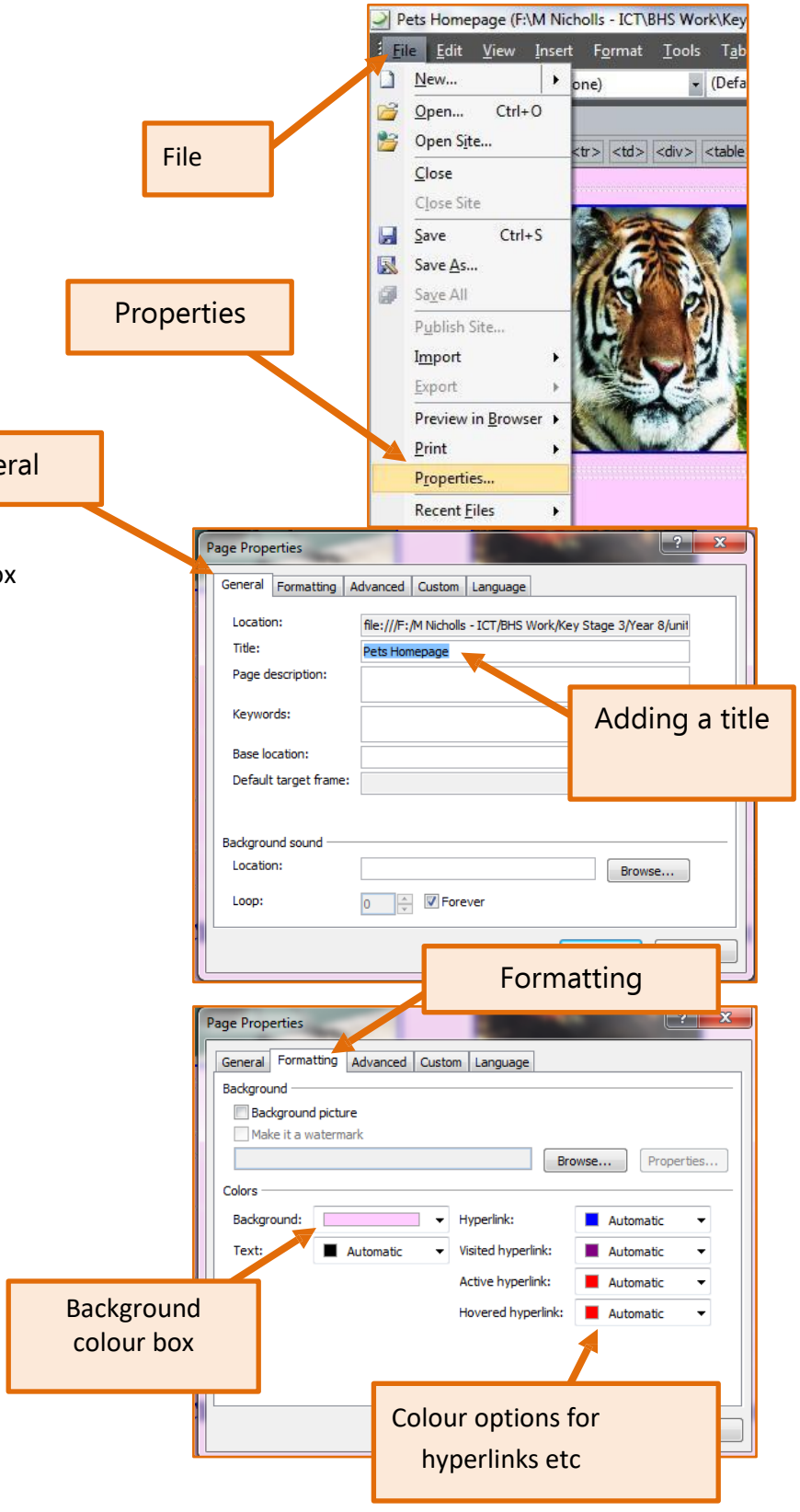
Changing Background Colour and Adding a Title

Access the web page's properties:

1. Click File → Properties.

2. To change the Title:
   - Click General
   - Add your title into the title box
   - Click Ok.

3. To change Background Colour:
   - Click Formatting option
   - Click Background colour box
   - Select the new colour
   - Click Ok.



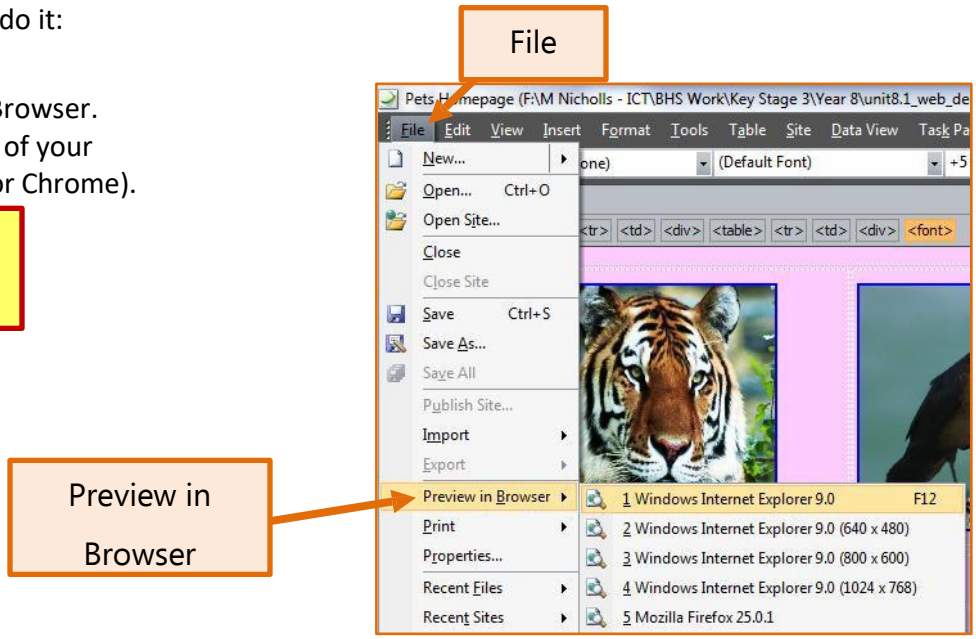
How to Preview your work

At times you will need to be able to see what your web pages will look like on the actual Internet.

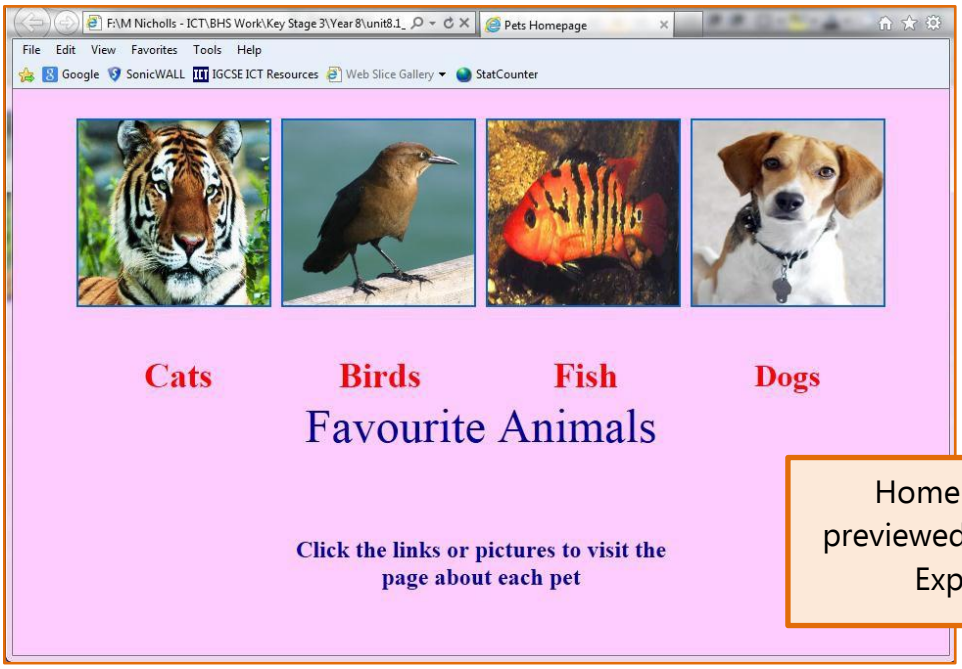
To do this you need to be able to preview your work in a web browser (Internet Explorer for example). This is how you do it:

1. Click File → Preview in Browser.
2. Select the latest version of your browser (e.g. Mozilla Firefox or Chrome).

NOTE: You can also press F12



3. Your web page will now appear in Internet Explorer and shows you exactly how it will appear online



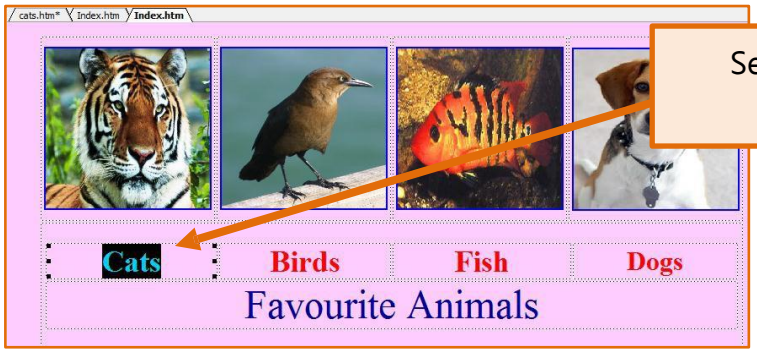
Homepage as previewed in Internet Explorer

Adding hyperlinks

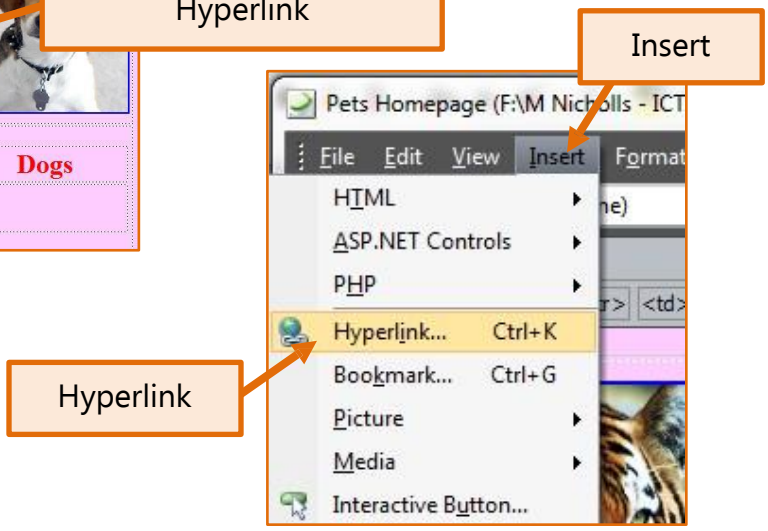
The pages in your website should be joined together using hyperlinks so that users can navigate around. Microsoft Expression makes creating these links very, very easy.

You can use either images or text as your hyperlink.

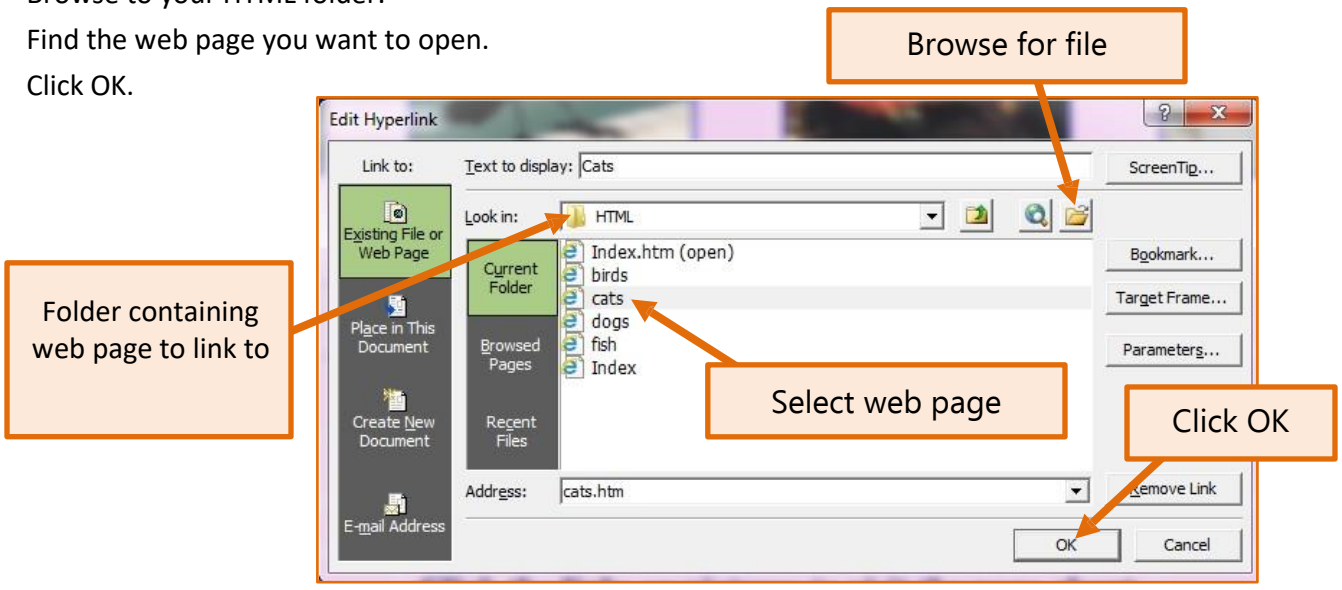
1. Select the text / image which you want to be your hyperlink.

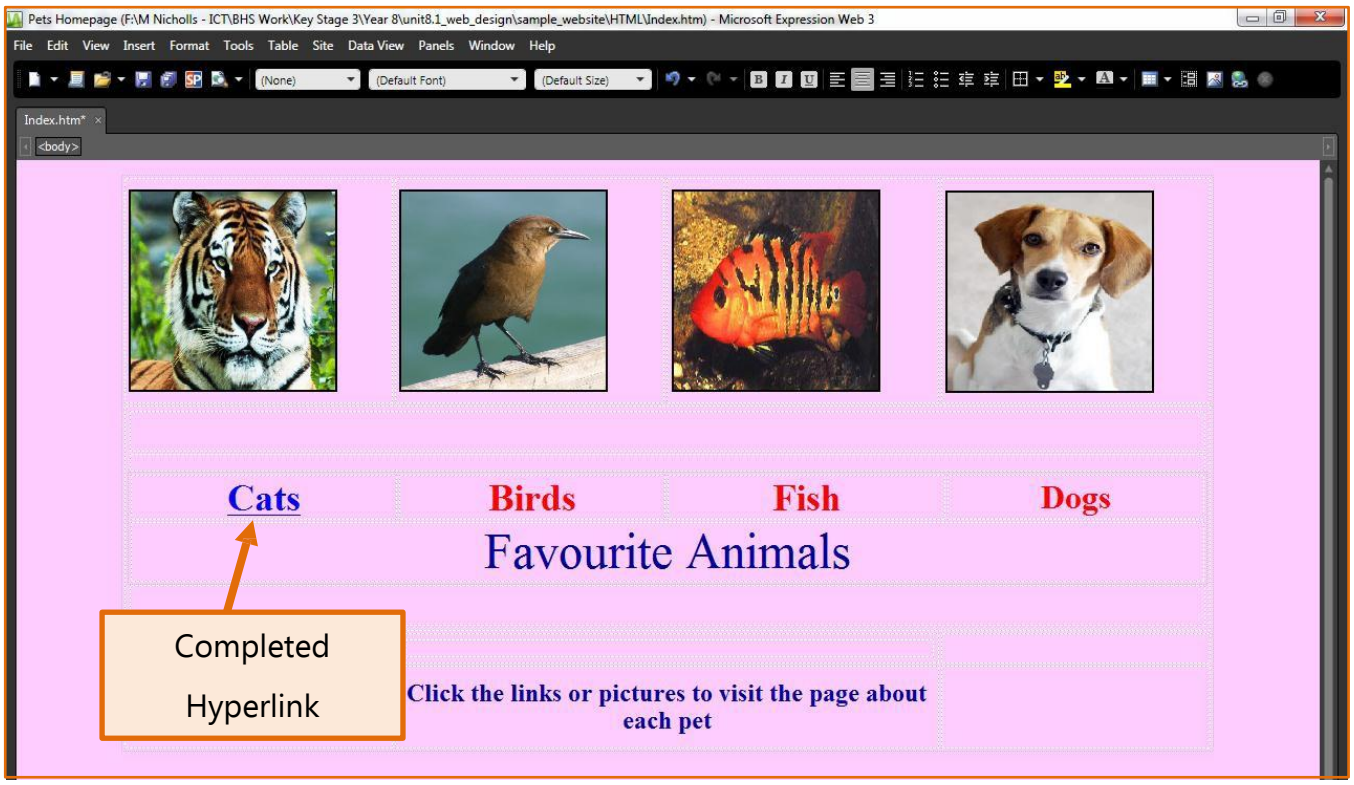


2. Click Insert → Hyperlink.



3. Click the "Browse for File button".
4. Browse to your HTML folder.
5. Find the web page you want to open.
6. Click OK.





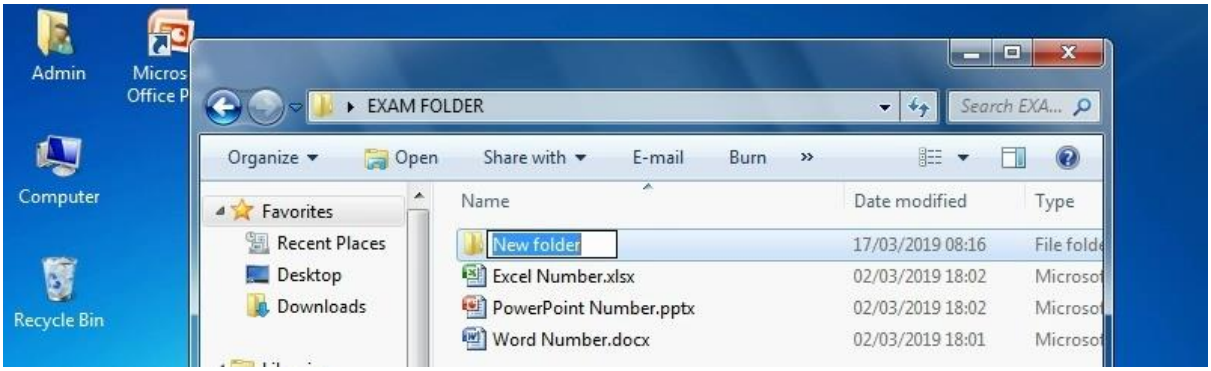
QUICK STEP BY STEP TUTORIAL FOR CREATING EXAM WEBSITES BASED ON MASTER TEMPLATES IN EXPRESSION WEB

Basing on how the practical examination questions are set, requiring candidates to create complete websites of about 5 pages, with features like shared banners, tables, lists, images, etc, it is impossible to code manually all the webpages required in the question within about 40 minutes available for each section B number in the UCE exam 840/2. To be able to finish a website within the available time, the candidates can follow the following set of procedures.

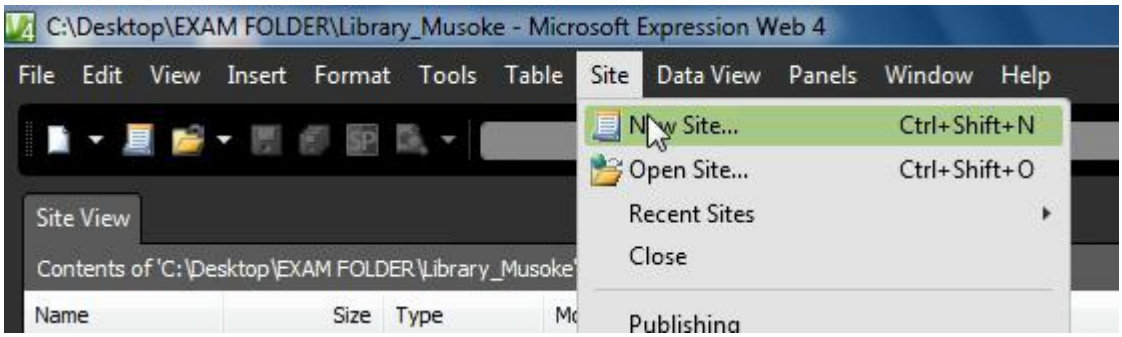
NB: All the steps below are demonstrated in the video at *ew.mukalele.net* or *ictteachersug.net/expressionweb* or on YouTube (search for UNEB WEB DESIGN using Expression Web) and a full exam number can be done in 40 minutes or less.

In exams, a website can be created in expression web using the following steps:

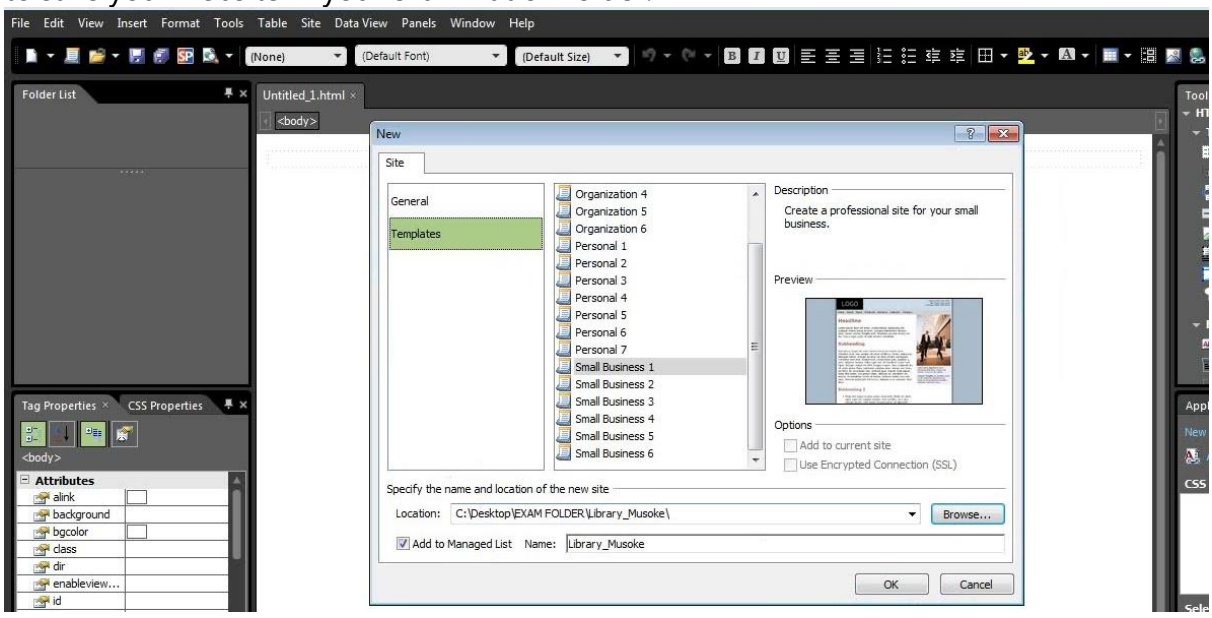
1. Create a Website folder as a sub folder inside your examination folder



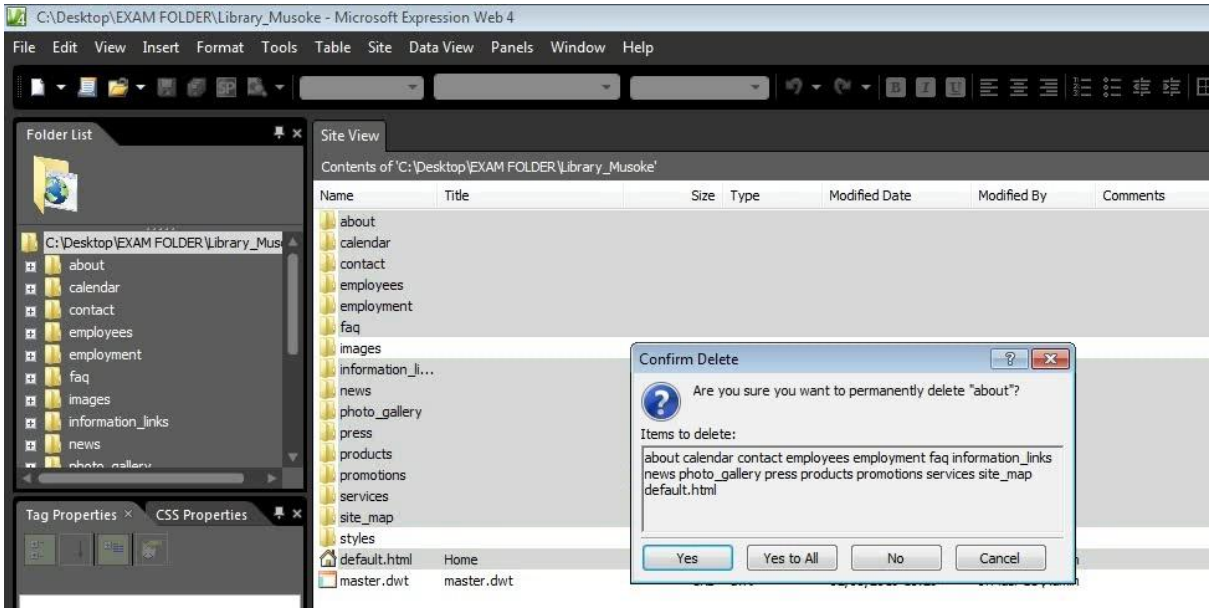
2. Open Expression Web and Create a New Site using the Site Menu



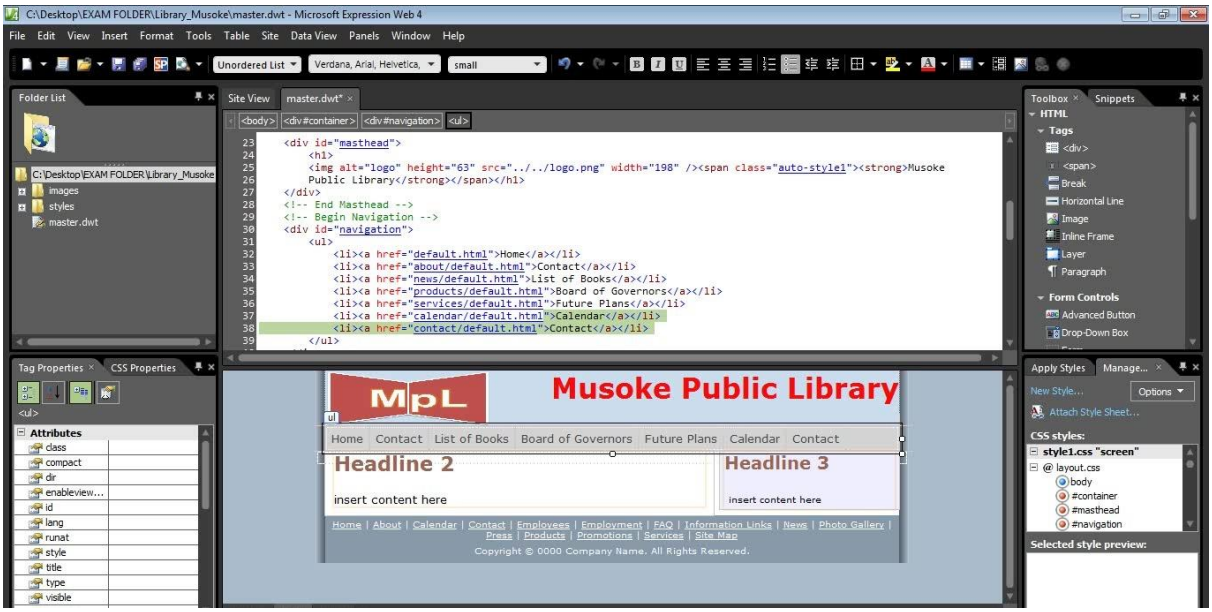
3. Choose a Template to base on for the general layout of your website and browse to save your website in your examination folder.



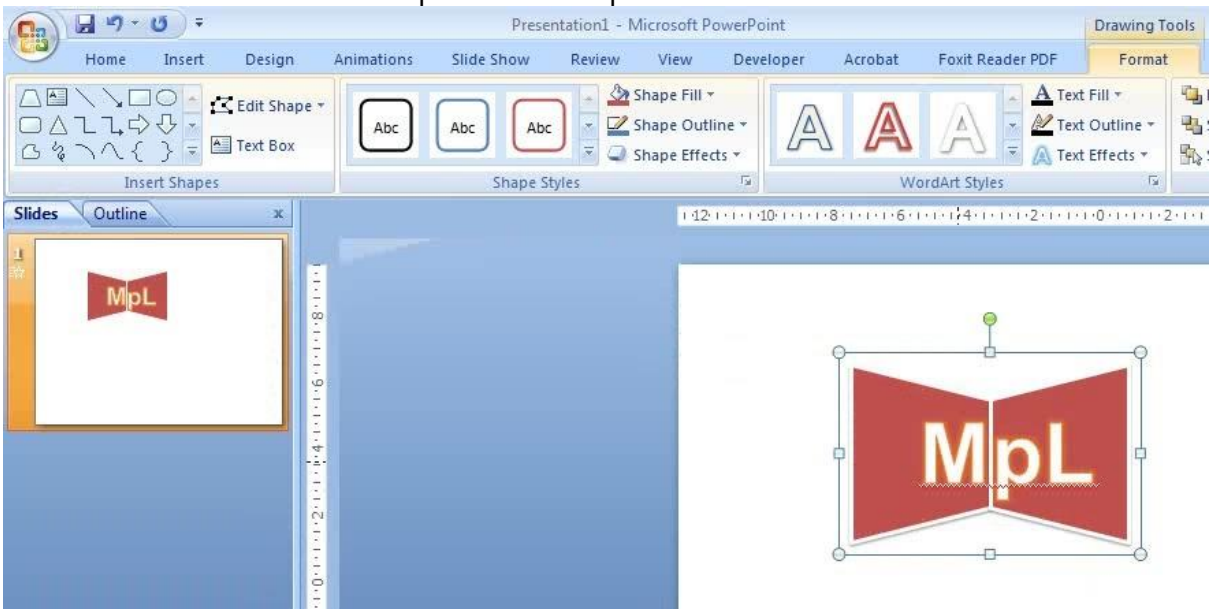
4. Delete all the folders except the master page (master.dwt), the styles and images folder.



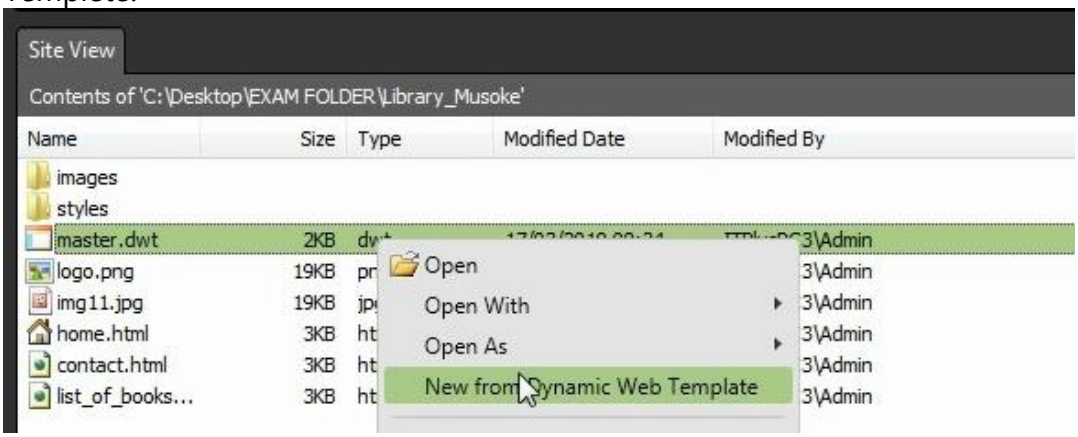
5. Open the Master Page and edit it using the design or code views which are easily interchangeable to include your desired logo, menus, colors and footer.



6. NB: Simple logos and clip art can be designed and copied from other programs like Microsoft PowerPoint and pasted into expression web.

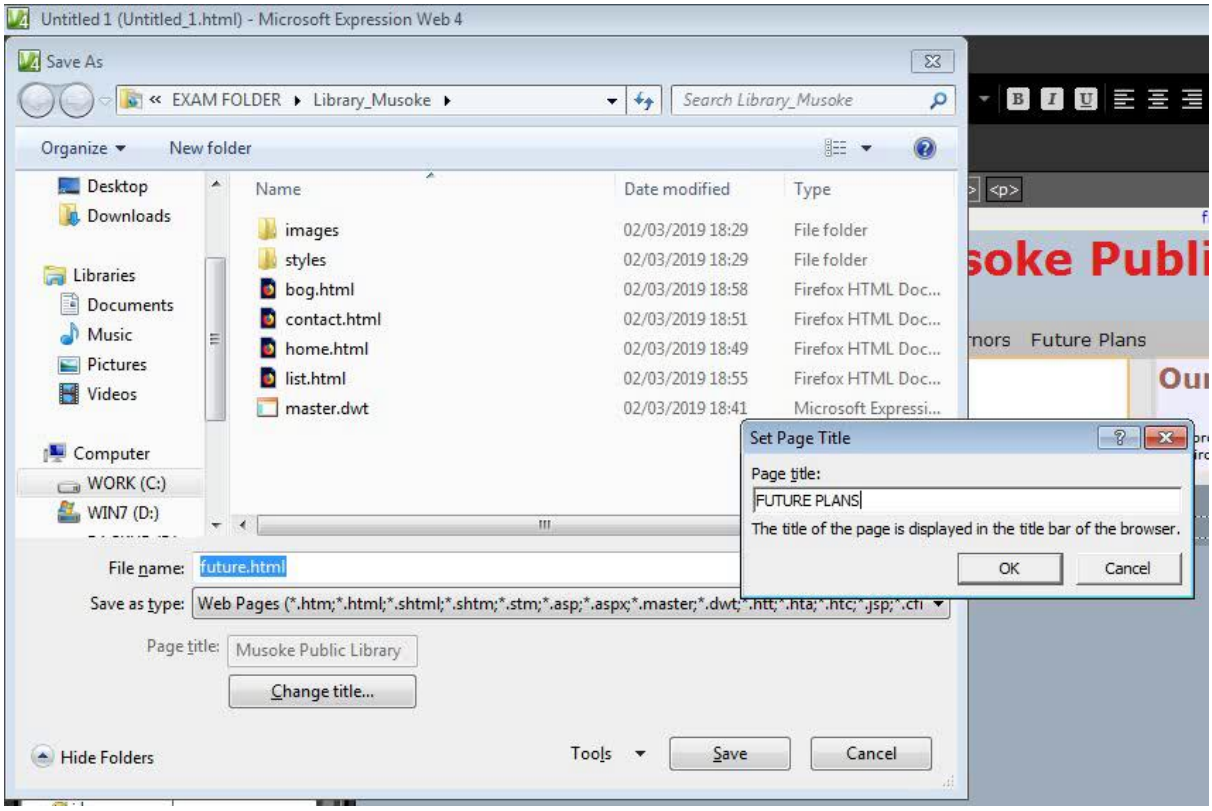


7. Create the needed web pages from the master for a consistent layout. You click on the Site View Tab, right click on master.dwt and select New From Dynamic Web Templete.

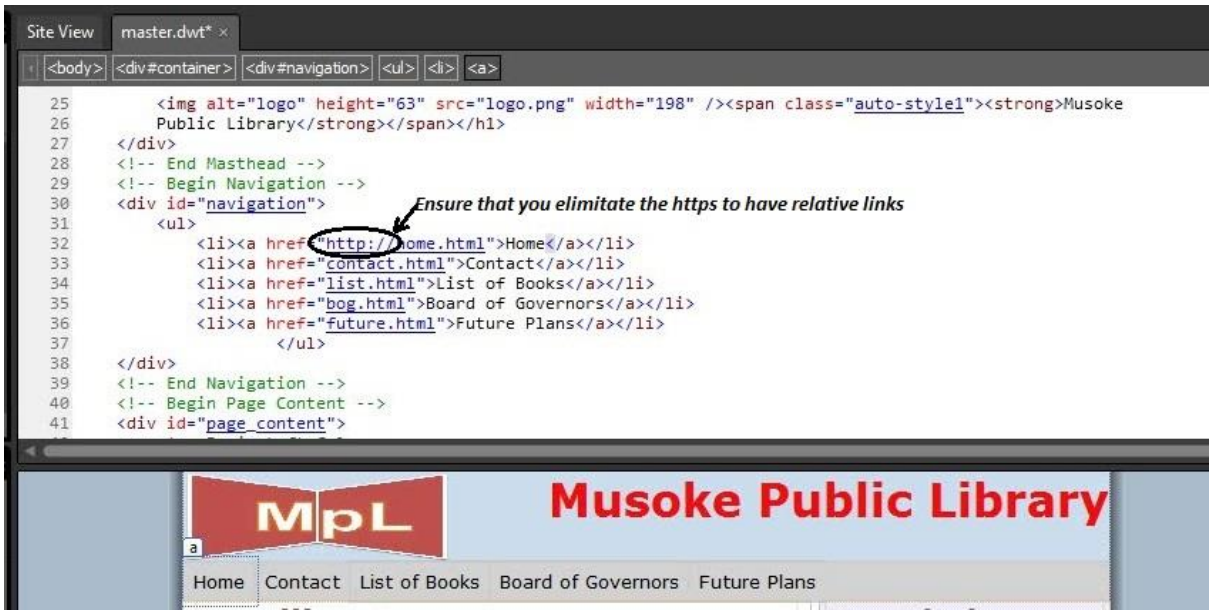


A new page will be created having the layout of the master page designed in step 5, and you will only have to add the unique content for that particular and page

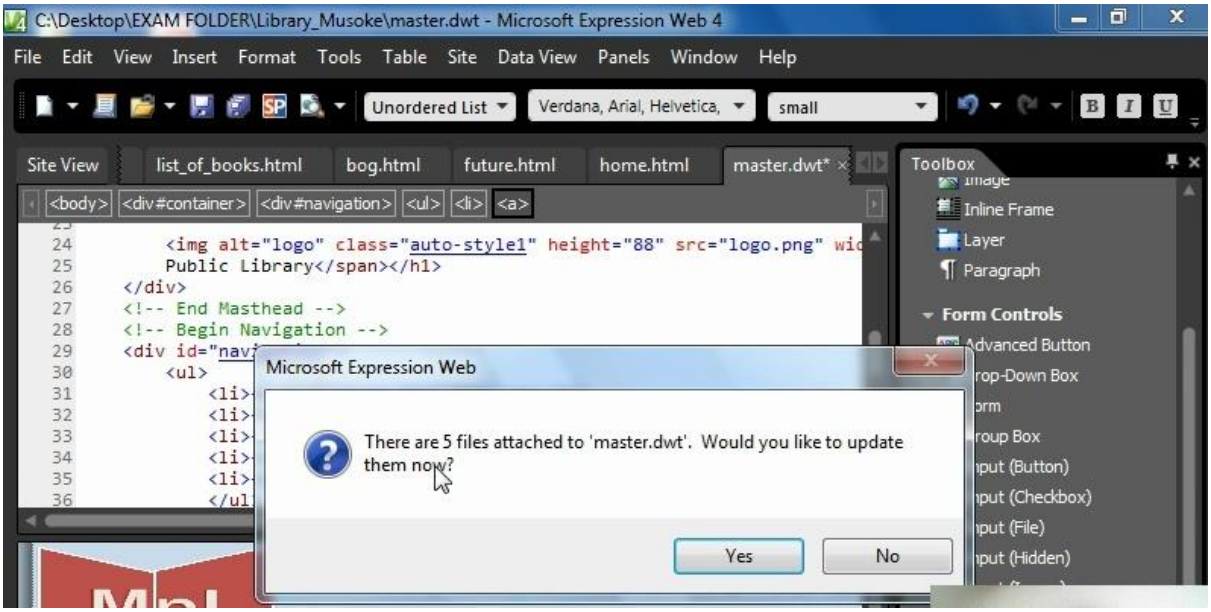
8. Save your web page (Ctrl + S) and specify both the file name and a page title. Repeat Step 7 and 8 until all your required web pages are created and saved.



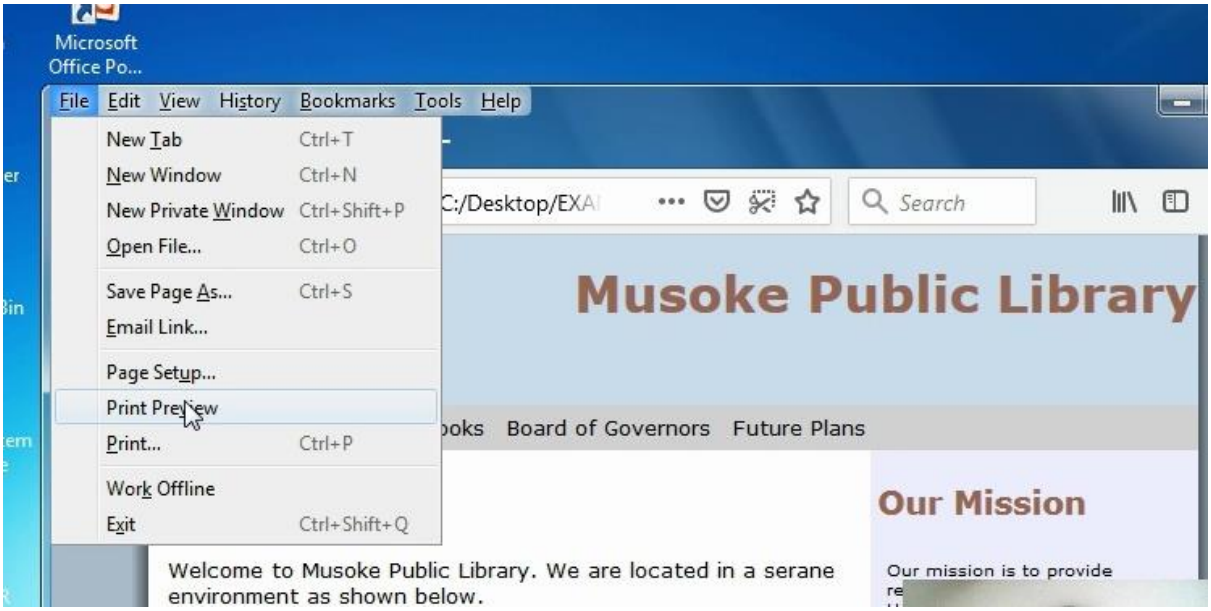
9. After creating all your pages when they are still open, go back to the master page to update the menu hyperlinks. Ensure that you eliminate http:// on the links, so that you only have relative file names e.g *home.html* as illustrated below.



10. Save the master and all your pages. A dialog will as you if you like to update all the pages attached to the master. Click 'Yes'.



11. Preview your work in a browser before printing it out as required on the question paper. You can also setup headers and footers within the browser before printing, under page setup, if needed.



PRACTICAL WEB DESIGN LAB ACTIVITIES

ACTIVITY 1

You have been awarded the contract of designing a site made up of four pages for KLA FM radio station. The station manager gives you the following information to be included on the website.

Page One: Index Page: Should be a homepage with a page title, "KLA F.M"

a) A shared banner with the station logo and motto "Your life. Your music. Your Info."

b) A marquee with words "Welcome to KLA F.M Online" slightly after the page banner. (this should not be shared).

c) Active links to other pages of the site.
d) Message about the radio including
- When the radio station was started (The date it first went on air)
- Mission statement of the radio (to develop significant radio signals that will enhance development and social mobilization in Kampala).

Page two: Program Lineup: Add a table and think of your own programs with the times at which they are on air. Eg News, sports, Music countdown, etc.

Page three: Photo Gallery - Add about 8 well organized photos from the clip art collection to represent how this page will be used.

Page four: Contact us: Add on this page in a bulleted format:

- Telephone Contact (Office)
- Telephone contact (Studio Line)
- Location of the radio station.
- Postal Address of the station.
- Feedback link (mailto) which a visitor to the website can follow to send an email.

NB: Assign imaginary corresponding numbers and addresses to the above.

e) Insert your name in the right bottom corner (footer) on each webpage.
f) Print each of the four web pages.
g) Save and Rename your web folder as KLA WEBSITE.

ACTIVITY 2

Using any available web publishing software, design a web site about your personal information.

(a) Create a home page for your personal information with appropriate links to other following pages.
(b) Create other pages with the following information:

Page I: Page title, Bio-data e.g. name, age, nationality and religion.
Page II: A table of schools attended, period of attendance and qualifications acquired.
Page III: A bulleted list of activities and responsibilities held e.g. head prefect.
Page IV: Hobbies and special skills.

Note:

(i) Create a moving (marquee) page title.
(ii) Use appropriate graphics.
(iii) Insert a personal email address (email hyperlink) on the home page.
(iv) Save your work as your name and index number.

Print your work.

ACTIVITY 3

It is now fashionable that even individuals have personal websites where they can e-transact, post relevant documents, and hold topical discussions.

Using any appropriate web publishing software, design a couple of web sites about yourself, based on the following tasks;

(a) A home page with relevant general welcoming information to your visitors. Other pages with the following information:

Page II: Family background, and friends.
Page III: Academic qualifications, leadership and work profile
Page IV: Hobbies and interests
Page V: Personal spiritual life with a statement about your person relationship with God.

Note:

(i) Create a moving marquee page title for the home page.
(ii) Use appropriate graphics for the different pages.
(iii) Appropriate background color mix.
(iv) Include your contact details as the website designer.

(v) Include page navigation hyperlinks.
(vi) Save your website with your name and index number.

ACTIVITY 4

As a webmaster, you are required to design a website for KEZEEKIA POULTY FARM with the following pages:

(a) Index page – (*7 marks*)

Should have the title: **KEZEEKIA POULTY FARM WEB PORTAL.**

(i) A good navigation structure with hyperlinks to all the other pages on the website.
(ii) A brief welcome message and information about the Farm of **not less than** 20 words.
(iii) A hit counter.

(b) Products page – (*7 marks*)

(i) Should have the title: **PRODUCTS OF KEZEEKIA POULTRY FARM**
(ii) A table showing products such as Eggs, 1-day old chicks, Layers, Broilers, Turkeys, Ducks, Chicken Feed, e.t.c, with their corresponding prices.
(iii) A few related photos (from the clip art section or otherwise) with their corresponding captions.

(c) Contact page – (*5 marks*)

(i) Should have the title: **CONTACTS OF KEZEEKIA POULTRY FARM**
(ii) Physical Address: Plot 14, Ssezibwa Avenue, Mukono.
Postal Address: P. O. Box 100017, Mukono
Telephone: +256414988988, (Office) +256774988988 (Mobile)
(iii) Email (with active mailto hyperlink): info@kezeekia.com
Website: www.kezeekia.com.

(d) Also Required:

(i) A top shared boarder with a logo and the motto: ***"The source of superior poultry products"*** (*4 marks*)
(ii) Apply a suitable uniform theme thought the website. (*2 marks*)
(iii) Add your Index Number and Name as Footer of each of the webpages and Print each of the three pages. (*3 marks*)

(e) Save Your Web Directory as **KPM.**(*2 marks*)

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC NINE

1. A web page on the World Wide Web has a unique address called….
   A. Uniform Resource Locator
   B. Hyper Text Transfer Protocol
   C. Virtual Reality Modeling
   D. Transmission Control Protocol/Internet Protocol

2. Which of the following statements are correct?
   I. Each web browser has a unique IP address
   II . HTTP is a communications protocol
   III. An Internet domain may be referred to as HTML
   IV. The internet is a network of networks
   A. I, II and III
   B. I II and IV
   C. II and IV
   D. II only.

3. A …… is a term used in web design to connect one document or file to another
   A. linker
   B. hyperlink
   C. hypertext
   D. hyper web

4. Achen wants to get some information from the internet on designing success cards for her Fine Art examination. What kind of software would she need to use to get this information?
   A. Web browser
   B. Photoshop and graphic design software.
   C. E-mail software.
   D. Desktop Publishing

5. A website or similar online resource which allows anyone to set up a resource in which content can be created collectively is known as
   A. blog
   B. portal

C. wiki
D. search engine

6. Which of the following best describes the purpose of a web page?
A. Making money on the Internet
B. Creating awareness about something on the internet
C. For connecting with friends through Email
D. Downloading files from the internet

7. Choose the correct HTML tag for the largest heading
A. <h7>
B. <h1>
C. <head>
D. <heading>

8. What is the correct HTML for creating a hyperlink in a webpage?
A. Computer Studies
B. Computer Studies.
C. Computer Studies
D. <a> index.html

9. Which of these tags are all <table> tags?
A. <thead><body><tr>
B. <table><tr><td>
C. <table><tr><tt>
D. <table><head><tfoot>

10. How can you make a list that lists the items with bulletted outlines points?
A. <dl>
B.
C.
D. <list>

11. The following are web authoring software except
A. Microsoft FrontPage
B. Adobe Dream weaver
C. Microsoft Expression Web
D. Mozilla Firefox

12. _____ is not a file extension for a graphic format file on a computer
A. .jpg
B. .png
C. .gif
D. .mdb

13. Which of the following is a not quality of a good website?
A. the website should have all information about the subject on the same page.
B. the website should have hyperlinks to other areas on all pages for easy navigation
C. the website should have a feedback page
D. the website should have a title and brief summary about the page

14. A WYSIWYG web builder is
A. A system in which content displayed onscreen during editing appears in a form exactly corresponding to its appearance when on a webpage
B. a software that helps the webmaster to preview and see how a designed webpage will appear when published
C. a program that helps the builder to get what he sees on the screen
D. None of the above.

15. The work of webmasters involves
I. Planning websites
II. Designing websites
III. Uploading websites
IV. Updating websites
A. I and II only
B. II and III
C. I, II and III
D. I, II, III and IV

16. …… enables a user to send multiple e-mails without the first addressee knowing that others have received the same copy.
A. C.C
B. Trash
C. Send to all
D. BCC

17 ……. are used to track visitor on a given website.
A. Gophers
B. Bookmarks
C. Cookies
D. Webmasters

18. In html coding, an RGB triplet uses ……. to represent mixture variation proportions of colors Red, Green and Blue to generate all the other colors.
A. Hexadecimal Numbering system
B. Binary digits (bits)
C. Color names
D. Font element tags.

19. All the following items can be included in a webpage as hypermedia elements except
A. Digital Video
B. Folders
C. Animations
D. Audio

20. Which of the following is a correctly written URL?
A. http://www.newvision.co.ug
B. http//:www.newvision.co.ug
C. www.http//.newvision.co.ug
D. http//:www.newvision.ug.co

S4 - TOPIC 10: DATABASES

UNIT ONE: INTRODUCTION TO DATABASES

Think of an address book you might buy in a bookshop. In it, you will write all your important contacts; friends, family, relatives, companies, and other people in your circles. The address book contains all names, addresses, location, phone numbers and whatever you need to contact anyone at any time.

The world generates an enormous amount of data from almost every aspect of life; Filing Cabinets, school records, credit cards, store merchandise, telephone systems, web sites, among others. Some time ago, manual effort was used to track and report this information. Today, database management systems manage this information.

What is Data?

- Data is made up of text, numbers, symbols, images, sounds, etc. that can be processed into information or stored by a computer.
- **Information (Info) –** Refers to the meaningful and processed data.

What is a Database?

- A structured collection of logically related data that is stored so that it can easily be accessed. Logically related data comprises entities, attributes, and relationships of an organization's information.

In normal daily life we make frequent use of databases, and probably don't realize it. Here are a number of simple examples:

- Filing Cabinet
- Personal Address Book
- The Telephone Directory
- Customer Lists
- Membership Lists
- Purchases from the supermarket
- Purchases using your credit card
- Booking a holiday at the travel agents
- Using the local library
- Renting a video
- Using the Internet (Client - Server architecture involved).

Examples of Database Management software (Programs)

- The following are some of the examples of Database Programs:
    - *Microsoft Access*
    - *Oracle*
    - *dBASE*
    - *FoxPro*
    - *Paradox*
    - *FileMaker Pro*
    - *Lotus Approach*
    - *Microsoft Access*
    - *etc...*

DATABASE TERMINOLOGIES

- **Table:** A collection of records that contain the same fields.
- **Form :**Forms are used to add, modify or even view the data in underlying data tables
- **Query:** Queries are used to repeatedly retrieve database records that match specific criteria and to display them in a specific order. A **Query**: Is a question you ask about your data.
- **Report:** A document (printed or on screen) that presents information in a structured way.
- **Datasheet View:** A view of a database table where you see information presented in rows and columns, with several records visible at the same time.
- **Design View**: A view in which you can change the organizational structure of your table. You create an index in Design View
- Relationships: in database, a relationship is an association defined between fields in two or more data tables
- **Filtering:** Is a process of reducing the amount of information displayed by Access, either by showing fewer fields in each record, or by showing only those records that match certain criteria.
- **Form View:** A view in a database table that presents all or selected information from a single record only.
- **Grouped Report:** A report in which information is grouped by the values in one or more fields. Calculations may be performed on the data within each group
- **Schema**: The general structure (or plan) of the database.
- **Primary Key:** Is a field which uniquely identifies each record in a table. It stores unique record identification numbers different from one another eg social security number, Reg No., etc.
- **Foreign Key:** A field in one table that acts as a primary key of another related table.
- **Relationship:** A relationship is defined an association or link among entities i.e how data in one table are related to data in another table.
- **Candidate Key: –** It is a field with unique values that can act as a primary key though it is not set as a primary key.

Alternative terminology

The terminology for the relational model can be quite confusing. The table below shows alternative terminology for database terms:

Alternative 1	Alternative 2	Alternative 3
File	Table	Relation
Record	Row	Tuple
Field	Column	Attribute

ELECTRONIC DATABASES VS MANUAL DATABASES

Electronic databases allow the user to carry out the same tasks as **paper-based/manual** databases but with the following advantages:

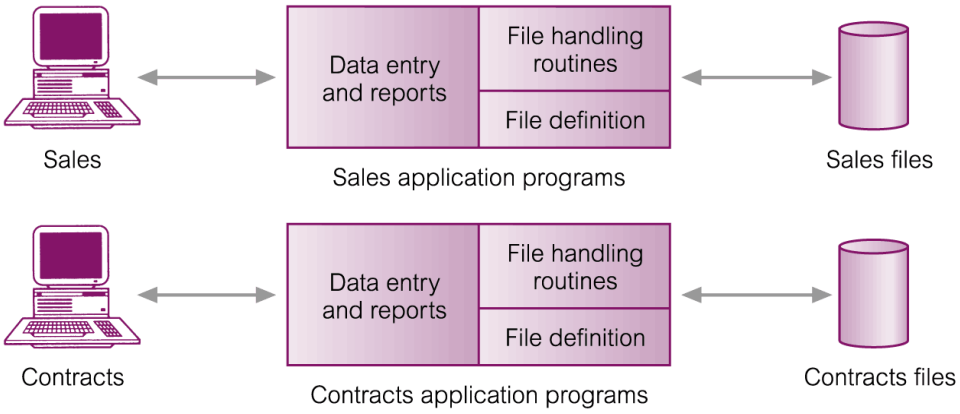
- Increased speed
- Store very large amounts of data
- Allow for easy inputting and editing of data
- Automatic updating and recalculating of data

- Allow for easy searching and selection of data
- Format, arrange and present information in the way that you want it
- Share the information with other software applications/programs
- On networks, electronic databases allow you to share one set of information amongst many users and therefore reduce duplication
- Reduction of duplication prevents the problem of keeping several copies of the same data and easier data updates

TYPES OF ELECTRONIC DATABASES

Two types of electronic databases: (i) **Flat File Databases (FFD) and (ii) Relational databases.**

- **Flat File Databases (FFD)** – These are basically used for simple lists and may have duplications of data much like a simple record card system. FFDs consist of only one table.

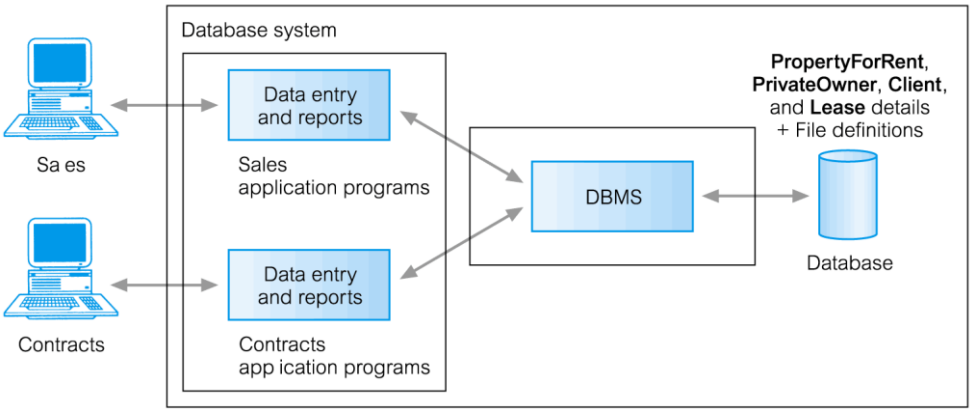


Limitations of File-Based Approach

1. **Separation and isolation of data:** Each program maintains its own set of data, Users of one program may be unaware of potentially useful data held by other programs.
2. **Duplication of data :** Same data is held by different programs, Wasted space and potentially different values and/or different formats for the same item.
3. Changes to an existing structure are difficult to make due to program data dependence.
4. **Incompatible file formats:** Programs are written in different languages, and so cannot easily access each other's files.
5. **Fixed Queries of application programs:** Programs are written to satisfy particular functions, Any new requirement needs a new program.

(ii) **Relational Databases (RDBs)**

These are databases where the data is held in a number of cross-referenced tables.



Advantages of Relational Databases

1. **Control of data redundancy:** The database approach attempts to eliminate the redundancy by integrating the files so that multiple copies of the same data are not stored.

2. **Data consistency:** If a data item is stored only once in the database, any update to its value has to be performed only once and the new value is available immediately to all users. If a data item is stored more than once and the system is aware of this, the system can ensure that all copies of the item are kept consistent.

3. **Sharing of data:** Typically, files are owned by the people or departments that use them. On the other hand, the database belongs to the entire organization and can be shared by all authorized users. In this way, more users share more of the data.

4. **Improved data integrity:** Database integrity refers to the validity and consistency of stored data. Integrity is usually expressed in terms of constraints, which are consistency rules that the database is not permitted to violate.

5. **Improved security:** Database security is the protection of the database from unauthorized users. Without suitable security measures, integration makes the data more vulnerable than file-based systems. However, integration allows the DBA to define, and the DBMS to enforce, database security. This may take the form of user names and passwords to identify people authorized to use the database.

6. **Economy of scale:** Combining all the organization's operational data into one database, and creating a set of applications that work on this one source of data, can result in cost savings.

7. **Improved data aaccessibility and responsiveness**: Again, as a result of integration, data that crosses departmental boundaries is directly accessible to the end-users. This provides a system with potentially much more functionality that can, for example, be used to provide better services to the end-user or the organization's clients.

8. **Improved maintenance** through data independence

9. **Increased concurrency:** Many DBMSs manage concurrent database access, ensuring that two or more users are allowed to access the same file simultaneously, without interfering with each other, or resulting in loss of information or its integrity.

10. **Improved backup and recovery services:** modern DBMSs provide facilities to minimize the amount of processing that is lost following a failure.

DISADVANTAGES /LIMITATIONS OF A DBMS ENVIRONMENT

1. **Complexity**: The provision of the functionality we expect of a good DBMS makes the DBMS an extremely complex piece of software. Database designers and developers, the data and database administrators, and end-users must understand this functionality to take full advantage of it. Failure to understand the system can lead to bad design decisions, which can have serious consequences for an organization.

2. **Size:** The complexity and breadth of functionality makes the DBMS an extremely large piece of software, occupying many megabytes of disk space and requiring substantial amounts of memory to run efficiently.

3. **Cost of DBMS:** The cost of setting up DBMSs varies significantly, depending on the environment and functionality provided.

4. **Additional hardware costs:** The disk storage requirements for the DBMS and the database may necessitate the purchase of additional storage space, perhaps even a machine dedicated to running the DBMS. The procurement of additional hardware results in further expenditure

5. **Cost of conversion:** This includes the cost of converting existing applications to run on the new DBMS and hardware plus the cost of training staff to use these new systems, and possibly the employment of specialist staff to help with the conversion and running of the system.

6. **Performance:** Typically, a file-based system is written for a specific application, such as invoicing. As a result, performance is generally very good. However, the DBMS is written to be more general, to cater for many applications rather than just one. The effect is that some applications may not run as fast as they used to.
7. **Higher impact of a failure:** The centralization of resources increases the vulnerability of the system. Since all users and applications rely on the availability of the DBMS, the failure of certain components can bring operations to a halt.

COMMON DATA TYPES

These include:

(a) Text (Character) - Alphabetic text or numbers that can't be calculated. Examples of such fields are names, addresses, subject names, Course names, Telephone number, etc. It can contain up to 255 characters.

(b) Number (Integer) - Numerical data you can calculate but not relating to money eg Age, height, weight, Course Duration, Score, Number of items in stock, etc. (whole number or fractional).

(c) Currency - Are numerical monetary values that can be calculated and may have a currency symbol or not such as £56000.05, 56,000.05/=, 56000.05, etc. Suitable for fields like salary, Gross pay, Net pay, PAYE, School dues, etc.

(d) Memo - It is for lengthy descriptive text and numbers usually several sentences or paragraphs. It can contain a maximum of 32,000 characters. Suitable for fields like Remarks, Comments, particulars, Descriptions, etc.

(e) Date/Time – For month, date and time values that are in the form dd/mm/yy or dd-mm-yy ie date / month /Year for the dates and Hr:Min:Sec ie Hour:Minutes:Seconds for time values. Suitable for fields like Date of birth, Date of Joining, On/Off set date/time, Date/Time of Departure/Arrival, etc.

(f) AutoNumber (Counter) – a number that automatically increments for each record you enter. It stores sequential numbers entered automatically by MS Access starting with one. They are unique ie different from each other and can make good primary keys. Suitable for fields like Reg. No, ID No., Membership no. Employee Id, etc.

(g) Yes/No (Logical) – Where you can enter and Store only one value or answer out of the available two options but not both. Suitable for fields like True/False, On/Off, Smoker/Non-smoker, Ugandan/Non-Ugandan, In/Out, Cash/Credit, etc. It is also called Logical or Boolean data type.

(h) Object Linking and Embedding (OLE) ¬– For object data and other binary info such as sounds, symbols, graphics/pictures such as signatures, thumbprints, company logos, one's photo, etc.

(i) Hyperlink – Stores data in form of hyperlinks, which are the blue-colored hotspots or connections that can be clicked to open other pages or documents e.g. e-mail address, website, Bookmarks, etc.

(j) Lookup Wizard – refers to a list of items in form of a list box from which you can choose a desired item during data entry especially if that data exists in another table or form. It's suitable for repetitive data such as marital status: Single, Married, Separated, Divorced, Widowed, Never married, etc.

UNIT TWO: DATABASE DESIGN WITH MICROSOFT OFFICE ACCESS

Why use Microsoft Access?

- Microsoft Access is a relational database management system that together with Word, Excel, PowerPoint etc., makes up Microsoft Office Professional.

- It provides a powerful way of storing, sorting, manipulating and retrieving data.
- As it was developed by the same company that developed other packages in the Microsoft Office suite and so it has a familiar interface.
- The power of Access is that it is easy for beginners, using basic functions, to start developing simple databases straight away. It1 is also used for the development of sophisticated application systems.
- Access allow users to easily modify fields and tables after you have entered data.

WORKING WITH DATABASES AND OBJECTS

Getting Started Window



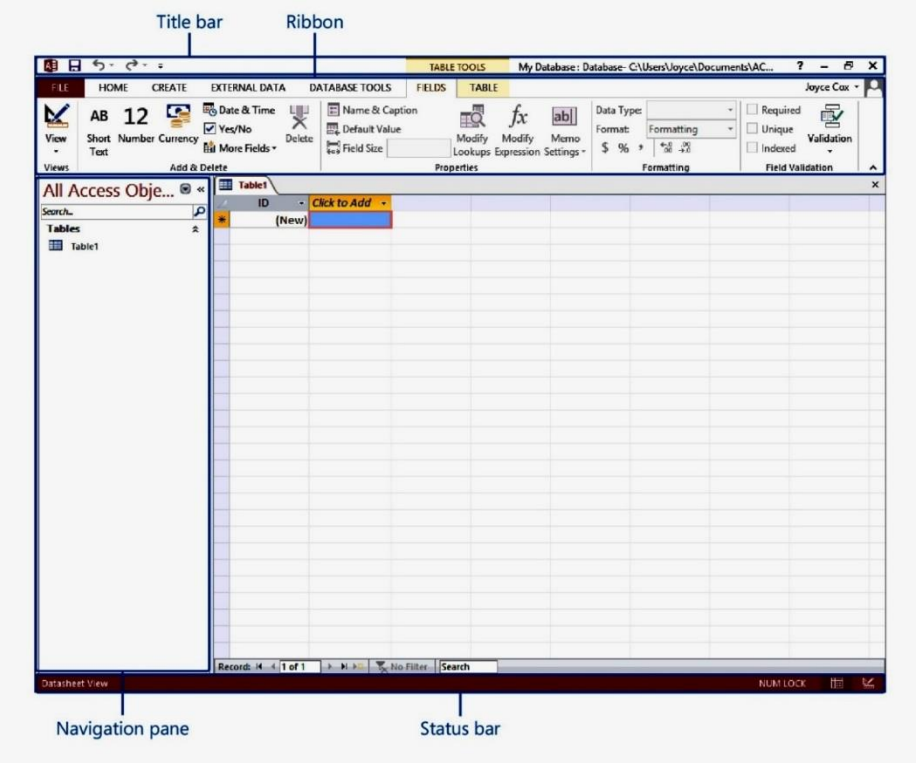
To Create a Database: Click a template category in the list and click the template you want to use. Click **Create**. Or, click the **Blank Database** button.

To Open an Existing Database:

Click a database in the Open Recent Database list or click **More** and browse for it.

Database Objects

- **Tables** store related data in rows (records) and columns (fields).
- **Queries** view, filter, calculate, change, sort, and examine the data stored in tables.
- **Forms** are custom screens that provide an easy way to enter and view data in a table.
- **Reports** present data from a table or query in a printed format.
- **Macros** automate common tasks and can be run by clicking a button or pressing a shortcut key.
- **Modules** are groups of procedures written in Visual Basic and used to automate tasks.
- **Page** objects have been replaced by Windows SharePoint Services. Pages in old databases can still be viewed—but not edited—in Internet Explorer.
- **To Open an Object:** Double-click the object in the Navigation Pane.



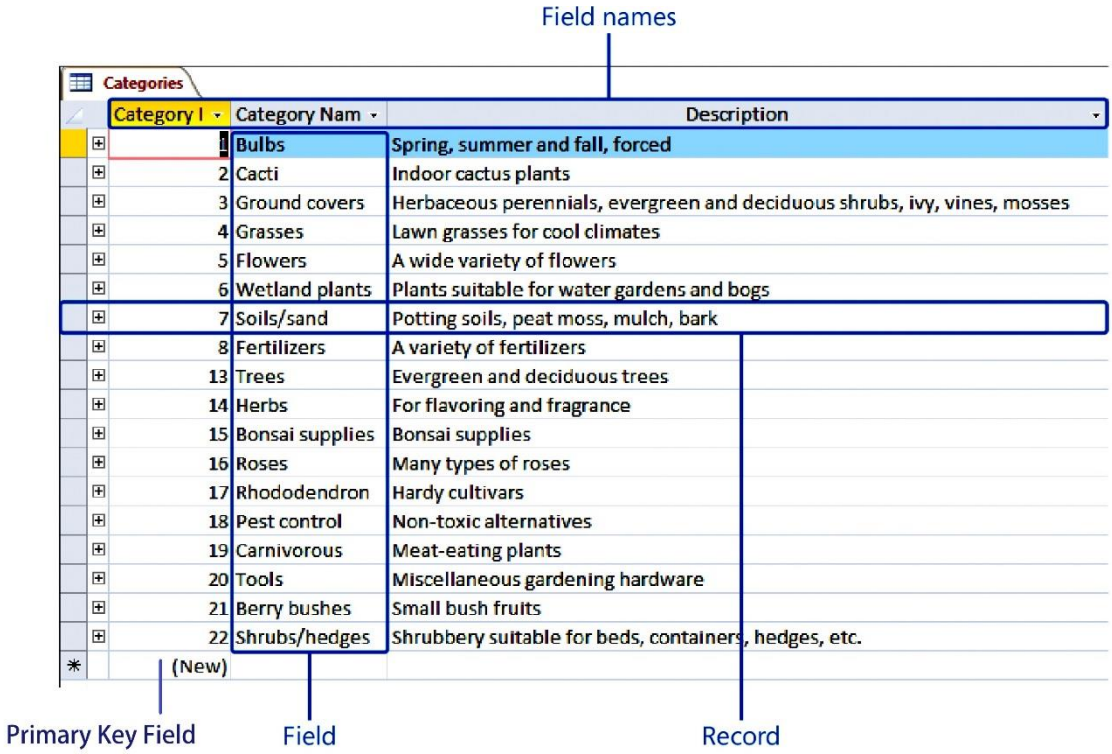
WORKING WITH TABLES

Tables are database objects which store related data in rows (records) and columns (fields).

To Create a New Table: Click the **Create** tab on the Ribbon and click a button for the Table.

For tables, the two most common views are Datasheet view, in which you can display and modify the table's data, and Design view, in which you can display and modify the table's structure. To open a table in Datasheet view, either double-click its name in the Navigation pane, or right-click its name and then click Open. To open a table in Design view, right-click its name and then click Design View. When a table is open in Datasheet view, clicking the View button in the Views group on the Home tab switches to Design view; when it is open in Design view, clicking the button switches to Datasheet view. You can also switch the view by clicking one of the buttons on the View Shortcuts toolbar in the lower-right corner of the program window.

Datasheet view displays the table's data in columns (fields) and rows (records). The first row contains column headings (field names).



It is advisable to first create a table using Design View where the table fields and their data types are specified.

Data Types

Common data types include:

(b) Text (Character) - Alphabetic text or numbers that can't be calculated. Examples of such fields are names, addresses, subject names, Course names, Telephone number, etc. It can contain up to 255 characters.

(b) Number (Integer) - Numerical data you can calculate but not relating to money eg Age, height, weight, Course Duration, Score, Number of items in stock, etc. (whole number or fractional).

(c) Currency - Are numerical monetary values that can be calculated and may have a currency symbol or not such as £56000.05, 56,000.05/=, 56000.05, etc. Suitable for fields like salary, Gross pay, Net pay, PAYE, School dues, etc.

(d) Memo - It is for lengthy descriptive text and numbers usually several sentences or paragraphs. It can contain a maximum of 32,000 characters. Suitable for fields like Remarks, Comments, particulars, Descriptions, etc.

(e) Date/Time – For month, date and time values that are in the form dd/mm/yy or dd-mm-yy ie date / month /Year for the dates and Hr:Min:Sec ie Hour:Minutes:Seconds for time values. Suitable for fields like Date of birth, Date of Joining, On/Off set date/time, Date/Time of Departure/Arrival, etc.

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(g) Yes/No (Logical) – Where you can enter and Store only one value or answer out of the available two options but not both. Suitable for fields like True/False,

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Saving, editing and deleting objects

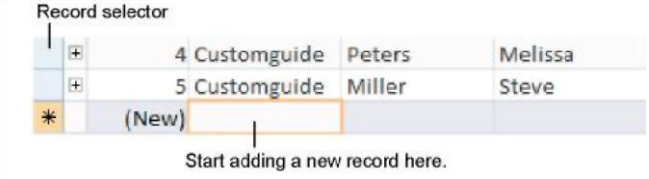
- **To Modify an Object:** Open the object or click its tab in the window, click the Format tab on the Ribbon, click the **View** button in the Views group and select **Design View** or **Layout View**.
- **To Delete an Object:** Select the object and press **<Delete>**. Click **Yes**.
- **To Rename an Object:** Right-click the object, select **Rename** from the contextual menu, enter the new name, and press **<Enter>**.
- **To Repair/Compress a Database:** Click the **Office Button** and select **Manage → Compact and Repair Database**.
- **To Import Data:** Click the **External Data** tab on the Ribbon and click the type of file you want to import from in the Import group. Follow the onscreen instructions.
- **To Export Data:** Click the **External Data** tab on the Ribbon and click the type of file you want to export to in the Export group. Follow the onscreen instructions.

WORKING WITH TABLE DATA

Database information can be directly added and modified from tables and some queries and forms.

To Add a Field to a Table: Enter data in the cell below the Add New Field column header. Or, click and drag a field from the Field Templates pane to the table (to display the Field Templates pane, click the **Datasheet** tab on the Ribbon and click the **New Field** button in the Fields & Columns group).

To Add a New Record: Enter data in the bottom row of the table.



To Select a Record: Click the **Record selector** to the left of the record.

To Delete a Record: Select the record, click the **Home** tab on the Ribbon and click the **Delete** button in the Records group. Click **Yes**.

To Spell Check: Click the **Home** tab on the Ribbon and click the **Spelling** button in the Records group.

To Find Information: Place the cursor in the field that contains the value you want to search for, click the **Home** tab on the Ribbon and click the **Find** button in the Find group or press **<Ctrl>** + **<F>**. Type the value you want to search for in the **Find What** box and click **Find Next**.

To Replace Information: Place the cursor in the field that contains the value you want to replace, click the **Home** tab on the Ribbon and click the **Replace** button in the Find group or press **<Ctrl>** + **<H>**. Type the value you want to search for in the **Find**

What box and the new value in the **Replace With** box. Click **Find Next** until you've found what you're looking for, then click **Replace** or **Replace All** to replace every instance of the value.

To Sort Information: Place the cursor in the field that you want to sort by, click the Home tab and click either the **Ascending** or **Descending** button in the Sort & Filter group.

To Filter Information: Place the cursor in the field that contains the values you want to filter by, click the **Home** tab on the Ribbon and click the **Filter** button in the Sort & Filter group. Check the boxes for the values you want to filter for.

To Remove a Filter: Click the **Toggle Filter** button in the Sort & Filter group.

To Change a Field's Data Type: Select the field you want to change, click the **Datasheet** tab on the Ribbon, and click the **Data Type** list arrow in the Data Type & Formatting group. Select a data type.

TABLE RELATIONSHIPS

Linking Tables tells Access how two tables are related to each other. The fields that you use to link two tables must contain the same concept in two different tables. *A primary key* field from one table is often used when linking two tables.

1. Click the **Datasheet** tab on the Ribbon and click the **Relationships** button in the Relationships group.
2. If necessary, click the **Show Table** button in the Relationships group on the Design tab. In the Show Table window, select a table you want to link, click the **Add** button, and repeat for each table. Click **Close**.
3. Drag a field from one table and drop it on the related field in the second table. (Optional) Check the **Enforce Referential Integrity** box. Click **Create**.

Types of Relationships

There are three types of relationships namely;

- One-to-one (1:1),
- One-to-many (1:M) and
- Many-to-many (M:N).

(a) **One-to-one:** where a particular field in one table has only one matching record in the other table and vice-versa. E.g One Office is occupied by only one manager who is placed there.

Examples of One-to-one (1:1) relationships include;

- One office manager heads one office
- One vehicle ID number is assigned to one vehicle
- One driver drives one delivery truck.
- One faculty member is chairperson of one department

(b) **One-to-many Relationship:** Means that for one field in one table, there are several matching records in the other table. Examples of one-to-many (1:M) relationships include;

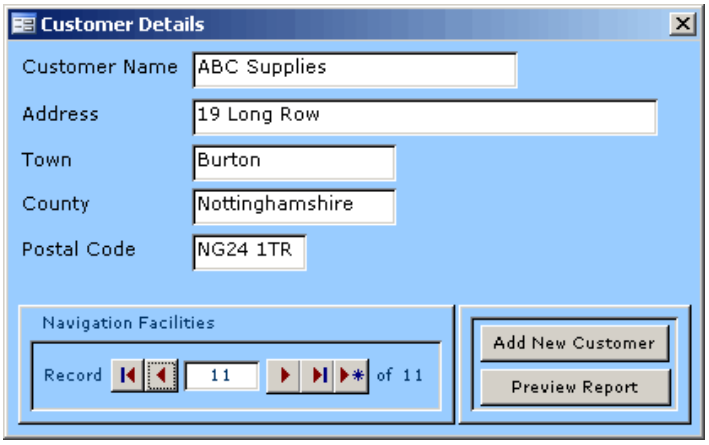
- Sex /gender (F/M) is shared by many persons.
- One book publisher can publish many books.
- One lecturer / teacher teaches many students.
- One doctor attends to many patients.

(c)**Many-to-many:** Where a field in one table contains many records that have many other matching records in the other table. This type of relationship is rare and difficult to process.

- A student enrolls in one or more classes, and each class has one or more students registered
- A passenger buys tickets for one or more flights, and each flight has one or more passengers
- An order lists one or more products, and each product is listed on one or more orders

Working WITH FORMS

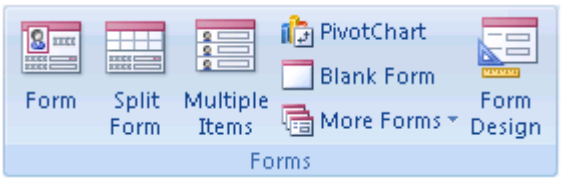
A form is a database object that you can use to enter, edit, or display data from a table or a query. You can use forms to control access to data, such as which fields or rows of data are displayed. For example, certain users might need to see only several fields in a table with many fields. Providing those users with a form that contains just those fields makes it easier for them to use the database. You can also add buttons and other functionality to a form to automate frequently performed actions. Think of forms as windows through which people see and reach your database. An effective form speeds the use of your database, because people don't have to search for what they need. A visually attractive form makes working with the database more pleasant and more efficient, and it can also help prevent incorrect data from being entered. Microsoft Office Access gives you new tools to help you create forms quickly, and provides new form types and features that improve the usability of your database.



Create a form by using the Form tool

You can use the Form tool to create a form with a single mouse-click. When you use this tool, all the fields from the underlying data source are placed on the form. You can begin using the new form immediately, or you can modify it in Layout view or Design view to better suit your needs.

- In the Navigation Pane, click the table or query that contains the data you want to see on your form.
- On the Create tab, in the Forms group, click Form.



- Access creates the form and displays it in Layout view. In Layout view, you can make design changes to the form while it is displaying data. For example, you can adjust the size of the text boxes to fit the data, if necessary.

Understand Layout view and Design view

Layout view Layout view is the most intuitive view to use for form modification, and it can be used for nearly all the changes you would want to make to a form in Office Access. In Layout view, the form is actually running, so you can see your data much as it will appear in Form view. However, you can also make changes to the form design in this view. Because you can see the data while you are modifying the form, this is a very useful view for setting the size of controls or performing almost any other task that affects the appearance and usability of the form.

Certain tasks cannot be performed in Layout view and require switching to Design view. In certain situations, Access displays a message telling you that you must switch to Design view to make a particular change.

Design view Design view gives you a more detailed view of the structure of your form. You can see the Header, Detail, and Footer sections for the form. The form is not actually running when it is shown in Design view, so you cannot see the underlying data while you are making design changes; however, there are certain tasks you can perform more easily in Design view than in Layout view.

You can:

- Add a wider variety of controls to your form, such as labels, images, lines, and rectangles.
- Edit text box control sources in the text boxes themselves, without using the property sheet.
- Resize form sections, such as the Form Header or the Detail section.
- Change certain form properties that cannot be changed in Layout view (such as Default View or Allow Form View).

Fine-tune your form in Design view

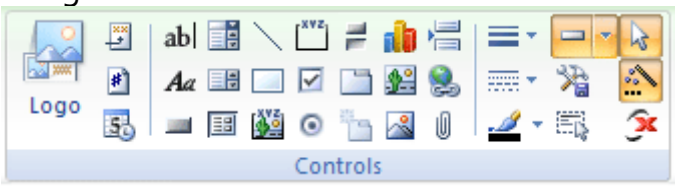
You can also fine-tune your form's design by working in Design view. You can add new controls and fields to the form by adding them to the design grid. The property sheet gives you access to a large number of properties that you can set to customize your form.

- To switch to Design view, right-click the form name in the Navigation Pane and then click Design View  .
- Access shows the form in Design view.
- You can use the property sheet to modify the properties for the form and its controls and sections. To display the property sheet, press F4.

- You can use the Field List pane to add fields from the underlying table or query to your form design. To display the Field List pane, do one of the following:
- On the Formatting tab, in the Controls group, click Add Existing Fields.
- Press ALT+F8.
- You can then drag fields directly from the Field List pane onto your form.
- To add a single field, double-click it or drag it from the Field List pane to the section on the form where you want it displayed.
- To add several fields at once, hold down CTRL and click the fields that you want to add. Then drag the selected fields onto the form.
- To add a single field, double-click it or drag it from the Field List pane to the section on the form where you want it displayed.
- To add several fields at once, hold down CTRL and click the fields that you want to add. Then drag the selected fields onto the form.

Add controls to your form

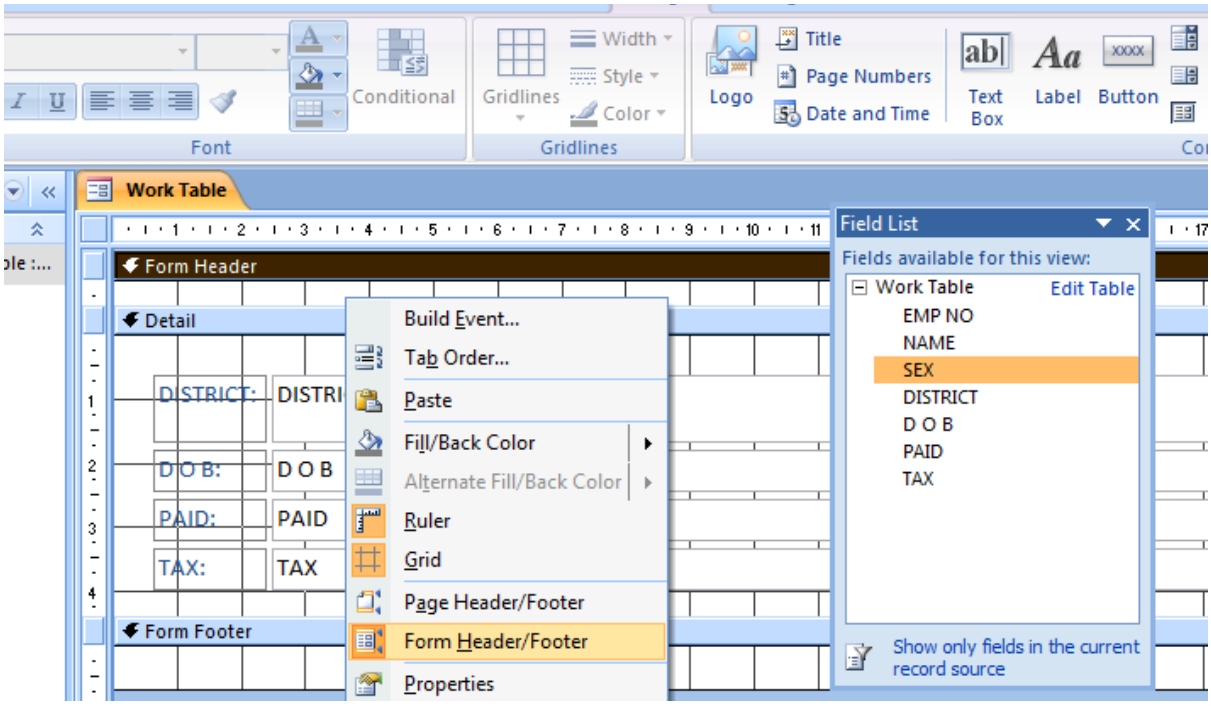
Some controls are created automatically, such as the bound control that is created when you add a field from the Field List pane to your form. Many other controls can be created in Design view by using the tools in the Controls group on the Design tab.



Click the Microsoft Office Button / File Menu, and then click Save.
Alternatively, click Save on the Quick Access Toolbar, or press CTRL+S.
If the form is untitled, type a name in the Form Name box, and then click OK.

Add Form Header / Footer

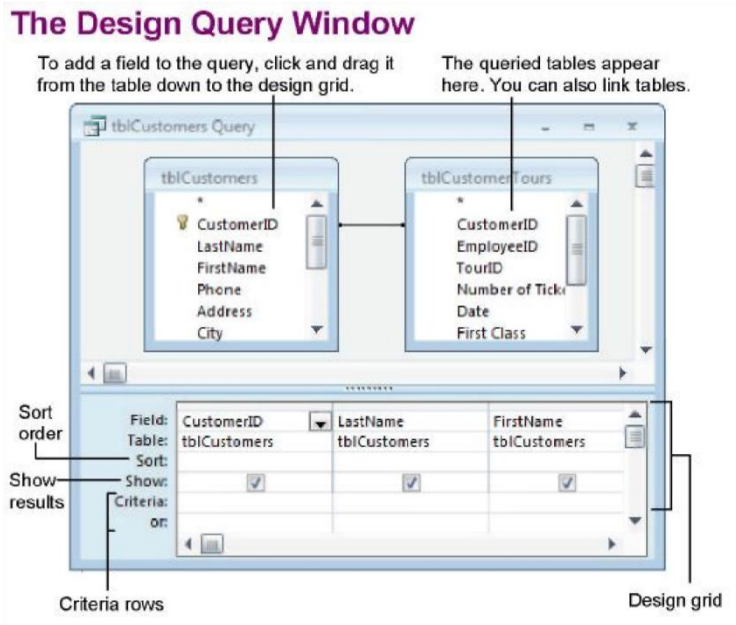
- Display the form in Design view.
- Right-click on the design surface and select Form Header/Footer from the shortcut menu.
- Select Form Header/Footer



- The header and footer sections are added to the design surface.
- You can now use controls like textboxes in the footer/header sections to add text or other items.

WORKING WITH QUERIES

To Create a Select Query: Click the **Create** tab on the Ribbon and click the **Query**



Wizard button in the Other group. Click **Simple Query Wizard** and click **OK**. Follow the onscreen instructions to select the fields you want to use from the desired tables and create the query. If you want to filter records, view the query in Design view and enter the criteria in the Criteria row.

To Switch Views: Click the **Home** tab on the Ribbon and click the **View** button in the Views group.

To Summarize Values: Open the Query in Datasheet View, click the **Home** tab on the Ribbon and click the **Totals** button in the Records group. Click the list arrow in a column in the Total row in the query select a calculation type (Sum, Average, etc.).

EXAMPLES OF QUERY CRITERIA

When you want to limit the results of a query based on the values in a field, you use query criteria. A criterion is similar to a formula — it is a string that may consist of field references, operators, and constants. Query criteria are also referred to as expressions in Microsoft Office Access 2007.

The following tables show some sample criteria and explains how they work

Criteria	Description
>25 and <50	This criterion applies to a Number field, such as Price or UnitsInStock. It includes only those records where the Price or UnitsInStock field contains **a value greater than 25 and less than 50**.
DateDiff ("yyyy", [BirthDate], Date()) > 30 Or Year(Date())-Year([BirthDate])>30	This criterion applies to a Date/Time field, such as BirthDate. Only records where **the number of years between a person's birthdate and today's date is greater than 30** are included in the query result.
Is Null	This criterion can be applied to any type of field to show records where **the field value is null**.

As you can see, criteria can look very different from each other, depending on the data type of the field to which they apply and your specific requirements. Some criteria are simple, and use basic operators and constants. Others are complex, and use functions, special operators, and include field references.

To include records that...	Use this criterion	Query result
Exactly match a value, such as China	"China"	Returns records where the CountryRegion field is set to China.
Do not match a value, such as Mexico	Not "Mexico"	Returns records where the CountryRegion field is set to a country/region other than Mexico.
Begin with the specified string, such as U	Like U*	Returns records for all countries/regions whose names start with "U", such as UK, USA, and so on. **Note** When used in an expression, the asterisk (*) represents any string of characters — it is also called a wildcard character.
Do not begin with the specified string, such as U	Not Like U*	Returns records for all countries/regions whose names start with a character other than "U".
Contain the specified string, such as Korea	Like "*Korea*"	Returns records for all countries/regions that contain the string "Korea".
Do not contain the specified string, such as Korea	Not Like "*Korea*"	Returns records for all countries/regions that do not contain the string "Korea".
End with the specified string, such as "ina"	Like "*ina"	Returns records for all countries/regions whose names end in "ina", such as China and Argentina.
Contain null (or missing) values	Is Null	Returns records where there is no value in the field.

Do not contain null values	Is Not Null	Returns records where the value is not missing in the field.
Contain zero-length strings	"" (a pair of quotes)	Returns records where the field is set to a blank (but not null) value. For example, records of sales made to another department might contain a blank value in the CountryRegion field.
Follow a value, such as Mexico, when sorted in alphabetical order	>= "Mexico"	Returns records of all countries/regions, beginning with Mexico and continuing through the end of the alphabet.
Fall within a specific range, such as A through D	Like "[A-D]*"	Returns records for countries/regions whose names start with the letters "A" through "D".
Match one of two values, such as USA or UK	"USA" Or "UK"	Returns records for USA and UK.
Match a specific pattern	Like "Chi??"	Returns records for countries/regions, such as China and Chile, whose names are five characters long and the first three characters are "Chi". **Note** The characters **?** and _, when used in an expression, represent a single character — these are also called wildcard characters. The character _ cannot be used in the same expression with the **?** character, nor can it be used in an expression with the ***** wildcard character. You may use the wildcard character _ in an expression that also contains the **%** wildcard character.
Exactly match a value, such as 2/2/2006	#2/2/2006#	Returns records of transactions that took place on Feb 2, 2006. Remember to surround date values with the # character so that Access can distinguish between date values and text strings.
Contain values that fall outside a range	<#2/2/2006# or >#2/4/2006#	Returns records where the transactions took place before Feb 2, 2006 or after Feb 4, 2006.
Contain today's date	Date()	Returns records of transactions that took place on the current day. If today's date is 2/2/2006, you see records where the OrderDate field is set to Feb 2, 2006.
Contain a date that fell during the last 30 or 31 days	Between Date( ) And DateAdd("M", -1, Date( ))	A month's worth of sales records. If today's date is 2/2/2006, you see records for the period Jan 2, 2006. to Feb 2, 2006

For Yes/No fields, In the **Criteria** row, type **Yes** to include records where the check box is selected. Type **No** to include records where the check box is not selected.

CONDITIONS, RANGES AND WILDCARDS

A wide range of other symbols and syntax may be used to define criteria more precisely.

Number ranges	> < >= <= Between ... And ...	greater than less than greater or equal to less than or equal to (insert values)

Date ranges	**>** **<** **>=** **<=** Between … And …	after before on or after on or before (insert #dates#)
Not equal to	Not *or* <>	
No data ('empty' fields)	A special value of **NULL** is provided for use when locating or excluding records that contain no value in a specific field. A Null value is not the same as a numeric field having a value of zero. **Is Null** – displays only records where no value is entered **Is Not Null** – displays only records where a value is present	

Wildcards for partial matching

Wildcards are symbols like ?, *, and **!** that represent one or more characters when specifying criteria. When using wildcards, the expression must be preceded by the keyword **Like**.

The asterisk symbol * matches 1 or more characters:

- **Like "ch*"** would return any names that begin with Ch such as Charles and Charlotte.
- **Like "*.co.uk"** would return any email addresses that end with .co.uk.
- **Like "*Theory*"** would return 'Quantum Theory for Beginners" and "Thermodynamics Theory".

A question mark ? will match a single character:

- **Like "al?n"** would return 'Alan' and 'Alun' but not 'Allen' Square brackets [] are used to match a list or range of values:
- **Like "[a,e,i,o,u]*"** returns any value beginning with a vowel.
- **Like "[a-d]*"** returns any value beginning with the letter a,b,c or d.

To exclude a character use the ! symbol:

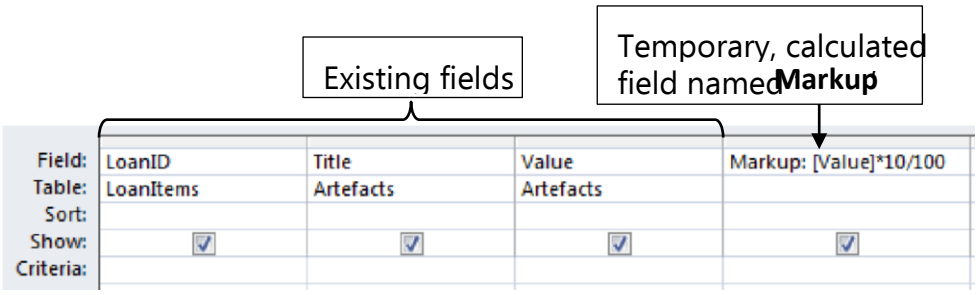
- **Like "[!a]*"** returns all values that do not begin with the letter a.

CALCULATIONS IN QUERIES

A query can carry out various operations, including calculations, on the data retrieved from tables and display it in a temporary field. In Access this is done by entering the details in an empty column in the QBE grid:

- The name of the temporary field must be followed by a colon
- Fields used in the expression must be present in the tables in the query and field names must be enclosed in square brackets
- Additional text must be enclosed in double quotes and the ampersand character (&) used to join items

- Further manipulation, including fields can be carried out in reports and forms

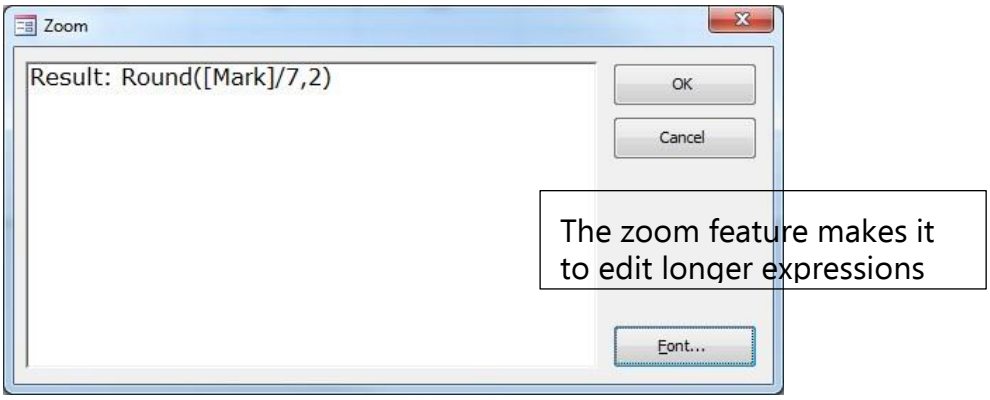


Zoom feature

To help with editing expressions in the **Field** row you can zoom the contents:

- **Right-click** on existing contents in the Field row and choose **Zoom...** *or* whilst editing contents in the Field row use **SHIFT + f2**

The contents are shown in a pop-up dialogue and can be edited here. Use the Font... control to change the display in the zoom control (this doesn't affect the query display).



Calculated fields with numeric data

- The common arithmetic operators can be included (+ - * / ^)
- Brackets can be used to control the order of precedence or avoid ambiguity
- Numbers can be used but must not be enclosed in quotes
- Mathematical functions such as Sqr()or Round() can be used

Examples:

[Cost] * [Quantity] * 10%

[Price] – [Discount]

Round([Mark]/5,2) Date() + 14

Number format

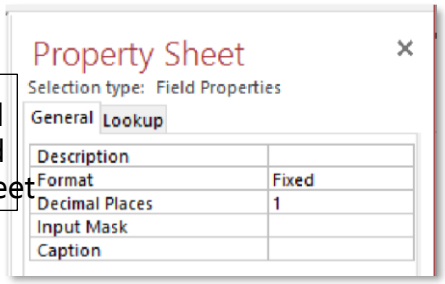
If the result is of a query will be used to generate a report or form (see later) then you would probably want to decide on number formats at this later stage. However, if you need to control the number format for the datasheet view of a query, you can do this via the query properties.

1 With the query in design view, select **Query Tools > Design > Show/Hide > Property Sheet** to view the properties sheet.

2 The property sheet will always show properties for the current object – click anywhere in the field to be formatted to show the property values for this field.

3 On the **General** tab, choose the appropriate format from the Format drop-down. If you choose **Fixed** decimal places, also enter the number of decimal places to display. Access will round values correctly when using this option.

The format of individual fields can be configured using the properties sheet



WORKING WITH REPORTS

Reports offer a way to view, format, and summarize the information in your Microsoft Access database. For example, you can create a simple report of phone numbers for all your contacts, or a summary report on the total sales across different regions and time periods.

Create a report in Access

You can create reports for you Access desktop database by following the steps below:

Step 1: Choose a record source

The record source of a report can be a table, a named query, or an embedded query. The record source must contain all of the rows and columns of data you want display on the report.

Step 2: Choose a report tool

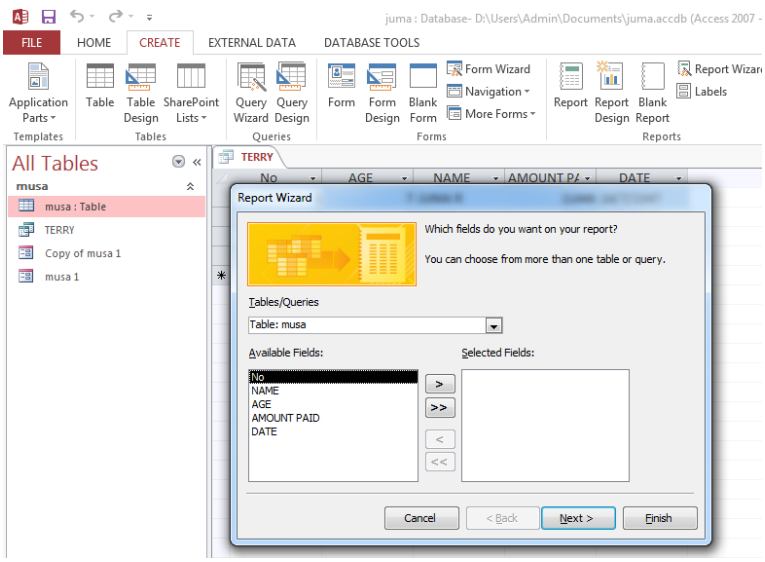
The report tools are located on the Create tab of the ribbon, in the Reports group. Report tools include:

- Report - Creates a simple, tabular report containing all of the fields in the record source you selected in the Navigation Pane.
- Report Design - Opens a blank report in Design view, to which you can add the required fields and controls.
- Blank Report - Opens a blank report in Layout view, and displays the Field List from where you can add fields to the report
- Report Wizard - Displays a multiple-step wizard that lets you specify fields, grouping/sorting levels, and layout options.

Step 3: Create the report

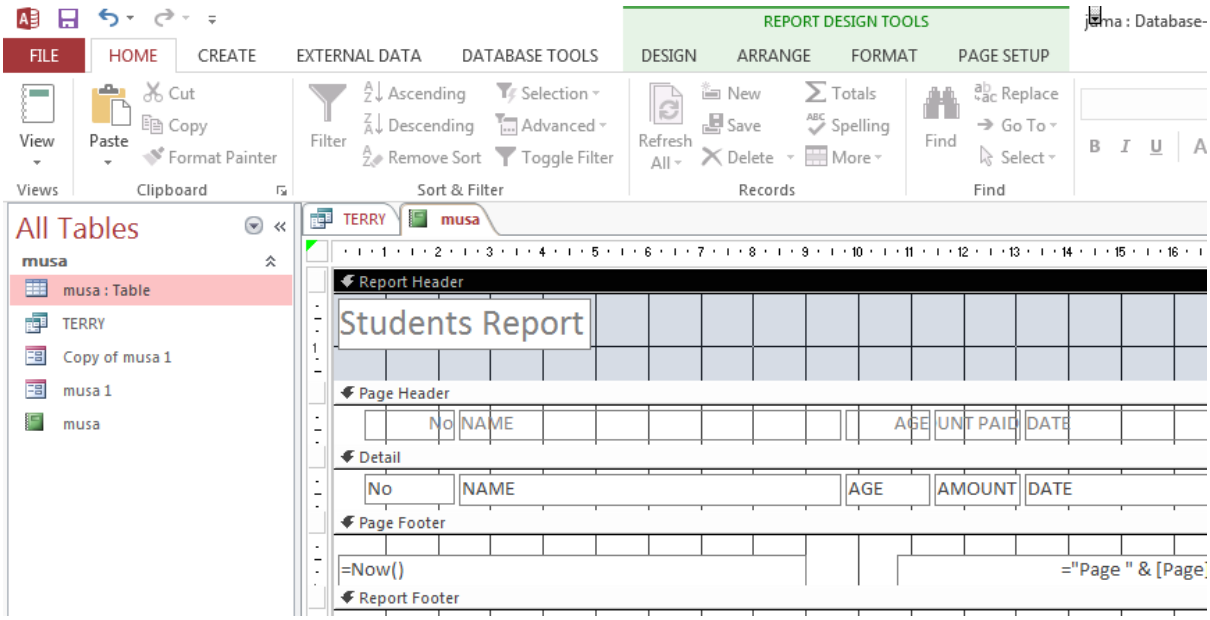
- Click the button for the tool you want to use. If a wizard appears, follow the steps in the wizard and click Finish on the last page.
- Access displays the report in Layout view.
- Format the report to achieve the looks that you want:

- Resize fields and labels by selecting them and then dragging the edges until they are the size you want.
- Move a field by selecting it (and its label, if present), and then dragging it to the new location.
- Right-click a field and use the commands on the shortcut menu to merge or split cells, delete or select fields, and perform other formatting tasks.



Add a logo or background image

- You can add a logo or background image to a report and If you update the image, the update is automatically made wherever the image is used in the database.
- To add or remove an image:
- In the Navigation Pane, right-click the report and click Layout View.
- In the report, click the position where you want to add the image and on the Design tab, in the Header/Footer group, click Logo.
- Navigate to the image, and click Open. Access adds the image to the report.
- To remove the image, right-click the image and click Delete from the shortcut menu.



Preview and print a report

Preview a report

- Right-click the report in the Navigation Pane and click Print Preview. You can use the commands on the Print Preview tab to do any of the following:

- Print the report
- Adjust page size or layout
- Zoom in or out, or view multiple pages at a time
- Refresh the data on the report

- Export the report to another file format.
- Click Close Print Preview.

Print a report

- To print a report without previewing it:
- Right-click the report in the Navigation Pane and click Print. The report is sent to your default printer.
- Note: If you select the report in the Navigation Pane and select Print from the File tab, you can select additional printing options such as number of pages and copies and specify a printer.
- To open a dialog box where you can select a printer, specify the number of copies, and so on, click Print.

PRACTICAL DATABASE LAB ACTIVITIES

ACTIVITY 1

Your country is about to hold a referendum and the electoral commission is looking for a good database administrator. You have been contacted to design and test your database with the following records.

ECTABLE

Voter	Name	Sex	DoB	Constituency	Salary
U01	Mafabi	M	19-Nov-80	Buwekula	560,000
U02	Mufulusi	M	02-Apr-72	Agago	760,000
U03	Kikami	M	13-Jul-84	Kyegegwa	990,000
U04	Serena	F	01-Jun-69	Kampala Central	450,000
U05	Patricia	F	01-Dec-81	Wobulenzi	390,000
U06	Badaru	F	13-Jan-79	Masaka	685,000
U07	Petr	M	15-Feb-60	Katikamu	845,000

a) Create a database and name it electoral commission

b) Create a table above in design view and name it EC table

c) Create a simple form and use it to enter the records shown in the above table. Use it to calculate the PAYE which is deducted from salary at a rate of 5%. Name it form **EC-FORM.**

d) Create a query displaying all fields. Use it to calculate the Net pay. Name it Netpay.

e) Create a query for all male voters born before 1980. Name it Aged males

f) Create another query displaying only female voters, name it Females only.

g) Create a report displaying all fields from the table above. Name it ***All voters***.

h) Produce printouts of your work.

ACTIVITY 2

(a) Create a database structure (table) using appropriate data types in relation to the table given below. Set staff No. as the primary .Save the table as staff table.

Staff NO.	Surname	First Name	Sex	Department	Salary
UTS523	Natukunda	Halima	F	Physics	275,000
UTS452	Kawuma	Musa	M	Chemistry	265,000
UTS105	Kavuma	Jamil	M	Economics	500,000
UTS358	Namuli	Mariam	F	Physics	275,000

UTS465	Biriggwa	Imran	M	Economics	490,000
UTS256	Namagembe	Nhuru	F	Chemistry	310,000
UTS145	Kalungi	Badru	M	Economics	850,000
UTS107	Mwesigwa	Johnan	M	Physics	290,000
UTS397	Kakaire	Ibrahim	M	Chemistry	540,000

(b) Create a form using the staff table in (a) above and use it to input the records above. Save the form as staff form.

(c) Create a query showing staff no, surname and department to filter out only staff in physics department. Save it as query 1.

(d) Create a report-using query 1 table.

(e) Create another report, which will produce a list of staff that are in Economics department earning a salary of less than Sh.600, 000.

ACTIVITY 3

The table below gives information about a small home business in Kampala. Study the tables carefully to answer their related questions.

Table (1): Transaction table

TransID	Qty Sold	Trans Date	Price	CustID	ProdID	Total Amount
T1120	*500*	*20-01-13*	*200*	*C2240*	*P3200*	
T1121	*325*	*21-01-13*	*400*	*C2241*	*P3201*	
T1122	*425*	*22-01-13*	*450*	*C2242*	*P3202*	
T1123	*150*	*23-01-13*	*120*	*C2243*	*P3203*	
T1124	*85*	*24-01-13*	*250*	*C2244*	*P3204*	
T1125	*450*	*25-01-13*	*800*	*C2245*	*P3205*	
T1126	*512*	*25-01-13*	*500*	*C2246*	*P3206*	

NB: Total Amount is a product of "***Price***" and ***"Qty Sold"***

Table (2): Customer Table:

CustID	CustName	Gender	CustPhone	CustLocation
C2243	Titus	M	+256 258	Kisumu
C2240	Timothy	M	+256 312	Kampala
C2242	Theresa	F	+256 100	Mbarara
C2241	Joweria	F	+250 654	Kigali
C2245	Teddy	F	+255 220	Dares salam
C2244	Tobias	M	+254 909	Nairobi

You are required to:

i) Create a database and save it as "HomeInventory" in the folder you created.

ii) Design table 1 assigning appropriate data types, and using a look up wizard for the "Gender" field.

iii) Design table 2 assigning appropriate data types

iv) Create a simple one to one relationship between the two tables.

v) Create a query for Kampala and Kisoro customers, and save it as "Royals" with fields of; CustID, CustNames, CustPhone, CustLocation, and Qty bought.

vi) Create a calculated query to return the "Total Amount" of the products sold. Save it as "Calc Query".

vii) Query table 1 and get out those transactions that took place between 21st January and 25th January. Save it as "Early bird".

viii) Create a report using table1 (Register) and save it as "My Report".

ACTIVITY 4

Jinja Movie Library (JML) keeps a database of members who have taken movies on a computer system as shown below:

CODE	NAME	GENRE	CHARGE	CLEARED	PHONE NO	BIRTH DATE
M001	Muwanguzi	Nigerian	Shs.3000	☑	0773294625	11/Dec/97
M011	Kitamirike	Horror	Shs.2000	☑	0712453674	04/Jan/88
M025	Mukasa	Horror	Shs.1000	☐	0772756484	15/May/86
M037	Olietho	Action	Shs.1500	☑	0782759815	18/Feb/96
M057	Matende	Action	Shs.4500	☐	0702456785	21/Jul/90
M073	Ochieng	Nigerian	Shs.1500	☑	0753297684	09/Feb/98
M096	Musasizi	Action	Shs.2500	☐	0712765492	03/Sep/87
M102	Onyayo	Horror	Shs.4000	☐	0792451843	22/Apr/95
M124	Ashaba	Nigerian	Shs.1500	☑	0773298746	14/Apr/99
M139	Dramani	Horror	Shs.1000	☑	0702768798	09/Jan/94

(a) Create a table called 'Members' to store the above data. (*7 marks*)

(b) Create a data entry form. Save it as **MemberCard** and use it to populate the above table. (*5 marks*)

(c) Using paint program or otherwise, create a graphic logo with the initials **JML** and insert it into the **MemberCard** form design. Add your name as form footer and print out a hardcopy. (*6 marks*)

(d) Create a query called **ChargeOver2k** that will filter the members who have taken movies for charges greater than Shs. 2000 and have not yet cleared. (*3 marks*)

(d)Create a query called **Adults** to filter out members of 18 years and older.(*3 marks*)

(e) Create a report of all the members grouped according to GENRE and sorted by their phone numbers in ascending order. Save it as **Customer Report**. (*3 marks*)

(f) Add your name and index number as footer to the report in (e) above and print it. (*2 marks*)

(g)Save your database as **"jml DATABASE"** (*1 mark*)

OBJECTIVE-TYPE REVIEW QUESTIONS ON TOPIC TEN

1. A field in a table that appears as a match of the primary key in another table is called a
   A. Candidate key.
   B. Secondary Key.
   C. Foreign Key.
   D. Composite Key.
2. Which of the following is **not** a database object?
   A. Table. B. Query.
   C. Form. , Reporting.
3. What are the **columns** and **rows** called in a **database**?
   A. Fields and Records.
   B. Records and Fields.
   C. Fields and Strings.
   D. Strings and Fields.
4. This Key Uniquely Identifies Each Record
   A. Primary Key
   B. Key Record
   C. Unique Key
   D. Field Name
5. What method can you use to add a new table to your database?
   A. Use Design View to create a table
   B. Enter data directly by using a datasheet
   C. Both of above
   D. None of the above
6. A ……. is a request for specific data from a database.
   A. Function, B. Query.
   C. Formula. D. Sort.
7. The main advantage of a computerized database is that allows the user to
   A. Reduce data redundancy
   B. do word processing
   C. use a spreadsheet
   D. save a soft copy for future use.
8. The information in a database is divided into

A. fields B. records
C. files. D. cells

9. Which is not a logical operator in a DBMS?
A. EDIT B. NOT
C. AND D. OR

10. Which is not a field type for a DBMS program?
A. Logical field, B. Text field
C. Numeric field D. ASCII field

11…….. are custom screens that provide an easy way to enter and view data in a database table.
A. Modules B. Forms
C. Queries. D. Reports

12. Which is not a database operation?
A. Creating B. Editing
C. Searching D. Mailing

13. Which of these will prevent you from entering the wrong type of data?
A. Field lengths
B. Field types
C. Validity checks
D. Record format

14. Which of the following is a Boolean type of field?
A. Yes/No field
B. Date/Time field
C. Currency filed
D. Memo field

15. The function of a record pointer is ____in a database.
A. to locate the position of a record
B. to print a record
C. to sort the records
D. to pack the records

16. Complex queries can be made by using
A. arithmetic operators
B. relational operators
C. logical operators
D. None of the above

17. The table below is an extract from the Database of Matende & Sons Crafts Enterprises.

CRAFT_NAME	COUNTRY	YEAR	PRICE
APOLLO23	UG	1995	$95
GEMINNI IV	GER	2002	$301
MBUGO 19	UG	2005	$79
SOYUZ 3	USSR	2009	$320
APOLLO25	KEN	2004	$120
FACTSO	RSA	1998	$200
MVUMA	TZ	991	$153

The Query criteria CRAFT_NAME=*M* OR PRICE<100 is applied. The names of all the crafts that will be returned in the query are:

A. GEMINNI IV, MBUGO 19, MVUMA and APOLLO 23.
B. GEMINNI IV and MBUGO 19 only.
C. MBUGO 19 only.B
D. GEMINNI IV, MBUGO 19, and MVUMA only.

18. Which of the following is the odd man out?
A. Microsoft Access
B. OpenOffice.org Base
C. Corel Paradox
D. Apple Numbers

19. Which of the following is not a wildcard character usable in query criteria?
A. * B. @
B. ? D. %

20. A view of a database table where you see information presented in rows and columns, with several records visible at the same time is
A. Design view
B. Datasheet view
C. Query View
D. Print Preview

S4 - TOPIC 11: ELEMENTARY COMPUTER PROGRAMMING

INTRODUCTION TO PROGRAMMING

Computer Program:

A computer *program* is a set of coded instructions given to the computer, and represents a logical solution to a problem. It directs a computer in performing various operations/tasks on the data supplied to it.

Computer programs may be written by the hardware manufacturers, Software houses, or a *programmer* to solve user problems on the computer.

Programming:

Programming is the process of designing a set of instructions (computer programs) which can be used to perform a particular task or solve a specific problem.
It involves use of special characters, signs and symbols found in a particular programming language to create computer instructions.
The programming process is quite extensive. It includes analyzing of an application, designing of a solution, coding for the processor, testing to produce an operating program, and development of other procedures to make the system function.
The program created must specify in detail the logical steps to be taken & the method of processing the data input into the computer in order to carry out the specified task.

A computer program performs the following:

1. Accepts data from outside the computer as its input.
2. Carries out a set of processes on the data within the computer memory.
3. Presents the results of this processing as its output, and
4. Stores the data for future use.

Programming Languages:
A *programming language* is a set of symbols (a language) which a computer programmer uses to solve a given problem using a computer.
The computer must be able to translate these instructions into machine-readable form when arranged in a particular sequence or order.
Source program (source code)
The term *Source program* refers to program statements that the programmer enters in the program editor window, and which have not yet been translated into machine-readable form.
Source code is the code understood by the programmer, and is usually written in high-level language or Assembly language.
Object code (object program).
The term *Object code* refers to the program code that is in machine-readable (binary) form.
This is the code/language the computer can understand, and is produced by a *Compiler* or *Assembler* after translating the Source program into a form that can be readily loaded into the computer.

LANGUAGE TRANSLATORS

A computer uses & stores information in binary form, and therefore, it cannot understand programs written in either high-level or low-level languages. This means that, any program code written in Assembly language or high-level language must be translated into Machine language, before the computer can recognize & run these programs.
A ***Translator*** is special system software used to convert the ***Source codes*** (program statements written in any of the computer programming languages) to their ***Object codes*** (computer language equivalents).
The Translators reside in the main memory of the computer, and use the program code of the high-level or Assembly language as input data, changes the codes, and gives the output program in machine-readable code.
In addition, translators check for & identify some types of errors (e.g., *Syntax/grammatical errors*) that may be present in the program being translated.

They will produce error messages if there is a mistake in the code.
Each language needs its own translator. Generally, there are 3 types of language translators:

1. Assembler.
2. Interpreter.
3. Compiler.

Note. Interpreters & Compilers translate source programs written in high-level languages to their machine language equivalents.

ASSEMBLER

An *assembler* translates programs written in Assembly language into machine language that the computer can understand and execute.

Functions of an Assembler.

1). It checks whether the instructions written are valid, and identifies any errors in the program. The Assembler will display these errors as well as the complete source and object programs. If the program has no errors, the job control will let it run immediately, or save the object program so that it may run it later without translating it again.

2). It assigns memory locations to the names the programmer uses.
E.g., the Assembler keeps a table of these names so that if an instruction refers to it, the Assembler can easily tell the location to which it was assigned.

3). It generates the machine code equivalent of the Assembly instructions.
Usually, the Assembler generates a machine code only when no errors are detected. Some of the errors include;

- Typing mistakes.
- Using the wrong format for an instruction.
- Specifying a memory location outside the range 0 – 2047.

Note. The Assembler cannot detect **Logic errors**. The programmer knows of these errors only when the program is run & the results produced are incorrect (not what the programmer expected). The programmer must therefore, go through the program & try to discover why an incorrect result was being produced.

INTERPRETER

An *interpreter* translates a source program word by word or line by line. This allows the CPU to execute one line at a time.
The Interpreter takes one line of the source program, translates it into a machine instruction, and then it is immediately executed by the CPU. It then takes the next instruction, translates it into a machine instruction, and then the CPU executes it, and so on.
The translated line is not stored in the computer memory. Therefore, every time the program is needed for execution, it has to be translated.

COMPILER

A ***compiler*** translates the entire/whole source program into object code at once, and then executes it in machine language code. These machine code instructions can then be run on the computer to perform the particular task as specified in the high-level program.

The process of translating a program written in a high-level source language into machine language using a compiler is called **Compilation**.
For a given machine, each language requires its own Compiler. E.g., for a computer to be able translate a program written in FORTRAN into machine language; the program must pass through the FORTRAN compiler (which must 'know' FORTRAN as well as the Machine language of the computer).
The object code file can be made into a fully executable program by carrying out a **Linking** process, which joins the object code to all the other files that are needed for the execution of the program. After the linking process, an executable file with an *.EXE* extension is generated. This file is stored on a storage media.

Points to note.

- The job of a Compiler is much more difficult than that of an Assembler in that, a single statement in a high-level language is equivalent to many machine instructions.
- The format of an Assembly instruction is fairly fixed, while high-level languages give a lot of freedom in the way the programmer writes statements.

Functions of a compiler.

A Compiler performs the following tasks during the compilation process:

1). It identifies the proper order of processing, so as to execute the process as fast as possible & minimize the storage space required in memory.
2). It allocates space in memory for the storage locations defined in the program to be executed.
3). It reads each line of the source program & converts it into machine language.
4). It checks for **Syntax errors** in a program (i.e., statements which do not conform to the grammatical rules of the language). If there are no syntax errors, it generates machine code equivalent to the given program.
5). It combines the program (machine) code generated with the appropriate subroutines from the library.
6). It produces a listing of the program, indicating errors, if any.

DIFFERENCES BETWEEN COMPILERS AND INTERPRETERS

Interpreter	Compiler
1. Translates & executes each statement of the source code one at a time. The source code instruction is translated & immediately obeyed by the computer hardware before the next instruction can be translated. (Translation & execution go together).	**1.** Translates all the source code statements at once as a unit into their corresponding object codes, before the computer can execute them. A Compiler translates the entire source program first to machine code, and then the code is executed by the CPU. (Translation & execution are separate phases)
2. Translates the program each time it is needed for execution; hence, it is slower than compiling.	**2.** Compiled programs (object codes) can be saved on a storage media and run when required; hence executes

3. Interpreted object codes take less memory compared to compiled programs. **4.** For an Interpreter, the syntax (grammatical) errors are reported & corrected before the execution can continue. **5.** An Interpreter can relate error messages to the source program, which is always available to the Interpreter. This makes debugging of a program easier when using an Interpreter than a Compiler.	faster than interpreted programs. **3.** Compiled programs require more memory as their object files are larger. **4.** For a Compiler, the syntax errors are reported & corrected after the source code has been translated to its object code equivalent. **5.** Once the source program has been translated, it is no longer available to the Compiler, so the error messages are usually less meaningful.

LINKERS & LOADERS

Computer programs are usually developed in **Modules** or **Subroutines** (i.e., program segments meant to carry out the specific relevant tasks). During program translation, these modules are translated separately into their object (machine) code equivalents.
The **Linker** is a utility software that accepts the separately translated program modules as its input, and logically combines them into one logical module, known as the **Load Module** that has got all the required bits and pieces for the translated program to be obeyed by the computer hardware.
The **Loader** is a utility program that transfers the load module (i.e. the linker output) into the computer memory, ready for it to be executed by the computer hardware.

Syntax

Each programming language has a special sequence or order of writing characters. The term **Syntax** refers to the grammatical rules, which govern how words, symbols, expressions and statements may be formed & combined.

Semantics

These are rules, which govern the meaning of syntax. They dictate what happens (takes place) when a program is run or executed.

LEVELS OF PROGRAMMING LANGUAGES

There are many programming languages. The languages are classified into 2 major categories:

1). Low-level programming languages.
2). High-level programming languages.

Each programming language has its own grammatical (syntax) rules, which must be obeyed in order to write valid programs, just as a natural language has its own rules for forming sentences.

LOW-LEVEL LANGUAGES

These are the basic programming languages, which can easily be understood by the computer directly, or which require little effort to be translated into computer understandable form.
They include:

1. Machine languages.
2. Assembly languages.

Features of low-level languages

- They are machine hardware-oriented.
- They are not portable, i.e., a program written for one computer cannot be installed and used on another computer of a different family.
- They use Mnemonic codes.
- They frequently use symbolic addresses.

Machine languages (**1st Generation languages**)

Machine language is written using machine codes (binary digits) that consist of 0's & 1's.

The computer can readily understand Machine code (language) instructions without any translation.

A programmer is required to write his program in strings of 0's & 1's, calculate & allocate the core memory locations for his data and/or instructions.

Different CPU's have different machine codes, e.g., codes written for the *Intel Pentium* processors may differ from those written for *Motorola* or *Cyrix processors*. Therefore, before interpreting the meaning of a particular code, a programmer must know for which CPU the program was written.

A machine code instruction is made up of 2 main parts;

(i). An **Address** (**operand**):
It specifies the location (address) of the computer memory where the data to be worked upon can be found.

(ii). A **Function** (**operation**) **code**:
It states to the Control Unit of the CPU what operation should be performed on the data/item held in the address, e.g., Addition, Subtraction, Division, Multiplication, etc.

Note. The computer can only execute instructions which are written in machine language. This is because; it is the only language which the computer can understand. Therefore, any program written in any other programming language must first be translated into machine language (binary digits) before the computer can understand.

Assembly language (2nd Generation Languages).

Assembly languages were developed in order to speed up programming (i.e., to overcome the difficulties of understanding and using machine languages).

The vocabulary of Assembly languages is close to that of machine language, and their instructions are symbolic representations of the machine language instructions.

- Assembly language programs are easier to understand, use & modify compared to Machine language programs.
- Assembly language programs have less error chances.

To write program statements in Assembly language, the programmer uses a set of symbolic operation codes called **Mnemonic codes**.

A program written in an Assembly language cannot be executed/obeyed by the computer hardware directly. To enable the CPU understand Assembly language instructions, an **Assembler** (which is stored in a ROM) is used to convert them into Machine language.

The Assembler accepts the source codes written in an Assembly language as its input,

and translates them into their corresponding computer language (machine code/ object code) equivalent.
Comments are incorporated into the program statements to make them easier to be understood by the human programmers.
Assembly languages are machine-dependent. Therefore, a program written in the Assembly language for a particular computer cannot run on another make of computer.

Advantages of Low-level languages

1. The CPU can easily understand machine language without translation.
2. The program instructions can be executed by the hardware (processor) much faster. This is because; complex instructions are already broken down into smaller simpler ones.
3. Low-level languages have a closer control over the hardware, are highly efficient & allow direct control of each operation.
   They are therefore suitable for writing *Operating system software* & *Game programs*, which require fast & efficient use of the CPU time.
4. They require less memory space.
5. Low-level languages are stable, i.e., they do not crash once written.

Disadvantages of Low-level languages

Very few computer programs are actually written in machine or Assembly language because of the following reasons;

1. Low-level languages are difficult to learn, understand, and write programs in them.
2. Low-level language programs are difficult to debug (remove errors from).
3. Low-level languages have a collection of very detailed & complex instructions that control the internal circuiting of the computer. Therefore, it requires one to understand how the computer codes internally.
4. Relating the program & the problem structures is difficult, and therefore cumbersome to work with.
5. The programs are very long; hence, writing a program in a low-level language is usually tedious & time consuming.
6. The programs are difficult to develop, maintain, and are also prone to errors (i.e., it requires highly trained experts to develop and maintain the programs).
7. Low level languages are machine-dependent (specific), hence *non-portable*.
   This implies that, they are designed for a specific machine & specific processor, and therefore, cannot be transferred between machines with different hardware or software specifications.
8. It is not easy to revise the program, because this will mean re-writing the program again.

HIGH-LEVEL PROGRAMMING LANGUAGES

High-level languages were developed to solve (overcome) the problems encountered in low-level programming languages.
The grammar of High-level languages is very close to the vocabulary of the natural languages used by human beings. Hence; they can be read and understood easily even by people who are not experts in programming.
Most high-level languages are general-purpose & problem-oriented. They allow the programmer to concentrate on the functional details of a program rather than the

details of the hardware on which the program will run.
High-level language programs are *machine-independent*, (i.e., they do not depend on a particular machine, and are able to run in any family of computers provided the relevant translator software is installed).
Programs written in a high-level language cannot be obeyed by the computer hardware directly. Therefore, the source codes must be translated into their corresponding machine language equivalent. The translation process is carried out by a high-level language software translator such as a **Compiler** or an **Interpreter**.

Features of high-level programming languages.

- They contain statements that have an extensive vocabulary of words, symbols, sentences & mathematical expressions, which are very similar to the normal English language.

  Example;

```
Read (TaxablePay);
IF TaxablePay<1000 THEN
Tax: =0;
ELSE
Tax: =TaxRate * TaxablePay;
Write (Tax: 6:2);
```

- Allow modularization (sub-routines).
- They are 'user-friendly' and problem-oriented rather than machine-based. This implies that, during a programming session, the programmer concentrates on problem-solving rather than how a machine operates.
- They require one to be obey a set of rules when writing the program.
- Programs written in high-level languages are shorter than their low-level language equivalents, since one statement translates into several machine code instructions.
- The programs are portable between different computers.

Purpose of High-level languages.

1. To improve the productivity of a programmer. This is because; the source programs of high-level languages are shorter than the source programs of low-level languages, since one statement translates into several machine code instructions.
2. To ease the training of new programmers, since there is no need to learn the detailed layout of a procession/sequence.
3. To speed up testing & error correction.
4. To make programs easy to understand & follow.

Advantages of High-level languages.

1. They are easily **portable**, i.e., they can be transferred between computers of different families and run with little or no modification.
2. High-level language programs are short, and take shorter time to be translated.
3. They are easy to lean, understand and use.
4. They are easy to debug (correct/remove errors), & maintain.
5. High level language programs are easy to modify, and also to incorporate additional features thus enhancing its functional capabilities.
6. They are 'user-friendly' & problem-oriented; hence, can be used to solve problems arising from the real world.
7. They enable programmers to adapt easily to new hardware. This is because; they don't have to worry about the hardware design of the computer.

8. High-level language programs are self-documenting, i.e., the program statements displays the transparency of purpose making the verification of the program easy.
9. High level languages are more flexible; hence, they enhance the creativity of the programmer and increase his/her productivity in the workplace.

Disadvantages of using High-level languages

1. High-level languages are not machine-oriented; hence, they do not use of the CPU and hardware facilities efficiently.
2. The languages are machine-independent, and cannot be used in programming the hardware directly.
3. Each high-level language statement converts into several machine code instructions. This means that, they use more storage space, and it also takes more time to run the program.
4. Their program statements are too general; hence, they execute slowly than their machine code program equivalents.
5. They have to be interpreted or compiled to machine-readable form before the computer can execute them.
6. The languages cannot be used on very small computers.
   The source program written in a high-level language needs a Compiler, which is loaded into the main memory of the computer, and thus occupies much of memory space. This greatly reduces the memory available for a source program.

TYPES OF HIGH-LEVEL LANGUAGES.

High-level languages are classified into five different groups:

1. Third generation languages (Structured / Procedural languages).
2. Fourth generation languages (4GLs).
3. Fifth generation languages (5GLs)
4. Object-oriented programming languages (OOPs).
5. Web scripting languages.

The various types of high-level languages differ in:

- The data structures they handle.
- The control structures they support.
- The assignment instructions they use.
- Application areas, e.g., educational, business, scientific, etc.

THIRD GENERATION (STRUCTURED / PROCEDURAL LANGUAGES)

A structured (procedural) language allows a large program to be broken into smaller sub-programs called ***modules***, each performing a particular (single) task. This technique of program design is referred to as ***structured programming***.
Structured programming also makes use of a few simple control structures in problem solving. The 3 basic control structures are Sequence, Selection and Iteration (looping).

Advantages of structured programming.

1. It is flexible.
2. Structured programs are easier to read.
3. Programs are easy to modify because; a programmer can change the details of a section without affecting the rest of the program.
4. It is easier to document specific tasks.
5. Use of modules that contain standard procedures throughout the program saves

development time.

6. Modules can be named in such a way that, they are consistent and easy to find in documentation.
7. Debugging is easier because; each module can be designed, coded & tested independently.

Examples of Third generation programming languages include:

1). BASIC (**B**eginners **A**ll-purpose **S**ymbolic **I**nstructional **C**ode).

BASIC is a simple general-purpose high-level language used in most computer processing tasks such as developing business and educational applications.
It is easy to learn & use; hence, suitable for students who wish to easily learn programming.
Translation in most versions of BASIC is carried out by an **Interpreter**.

2). PASCAL

PASCAL is a general-purpose, high-level programming language, which was named after a French mathematician called **Blaise Pascal**.
It was developed as an academic tool to help in the teaching and learning of structured programming.
PASCAL supports structured programming, i.e., it uses procedures & functions, which allow a '**top-down**' approach to solving problems.

- It is not easy to learn because; it has strict rules in its grammar on typing of variables (data names) & declarations.
- It is poor (has limited ability) on handling of data files.

3). COBOL (**CO**mmon **B**usiness **O**riented **L**anguage)

COBOL is designed for developing programs that solve business problems, e.g., can be used to develop commercial data processing applications such as computer-based inventory control systems.
COBOL is mostly used where large amounts of data are to be handled, because it supports powerful data & control structures.
COBOL programs are *semi-compiled*, and the intermediate code is *interpreted*.

Advantages of COBOL.

- It is easy to read.
- It is portable, i.e., can be used on different types of computers. This is because; it has an *American National Institute* standard.
  American National Standards Institute (ANSI): – An international organization that devised/ invented the group of standardized symbols used in flowcharting.
- It is widely used, and has a pool of skilled programmers.

Disadvantage of COBOL.

- The structure of a COBOL program is too long even for simple programs.
  E.g., consider the following assignment statement:
  DIVIDE A into **B** giving **C.**
  This statement when used in BASIC language can much short '**C=A/B**'.
  However, notice that the COBOL statement above is more self defining.

4). FORTRAN (**FOR**mula **TRAN**slator)

It was developed for mathematicians, scientists and engineers. It provides an easier way of writing scientific & engineering applications.
FORTRAN statements are mostly in form of mathematical expressions; hence, it is

useful in writing of programs that can process numeric data.
FORTRAN programs are *compiled* and portable, i.e. can be used on different types of computers but not suited for business applications.

5). Ada

This language was named after the first lady programmer **Ada Lovelace**.
It is suitable for developing *military*, *industrial* and *real-time* systems.

6). C

C is mainly used for developing system software such as the operating system as well as developing the application packages.
It has powerful commands that permit the rapid development of programs, and allows direct control over the hardware.
Disadvantage of C: It is difficult to read & learn because of its strict dialect rules.

7). Python

Python is a widely used high-level programming language for general-purpose programming, created by Guido van Rossum and first released in 1991. An interpreted language, Python has a design philosophy that emphasizes code readability (notably using whitespace indentation to delimit code blocks rather than curly brackets or keywords), and a syntax that allows programmers to express concepts in fewer lines of code than might be used in languages such as C or Java.

FOURTH GENERATION LANGUAGES (4GL'S).

4GLs make programming even easier than the 3GLs because; they present the programmer with more programming tools, such as command buttons, forms, textboxes etc. The programmer simply selects graphical objects called ***controls*** on the screen, and then uses them to create designs on a form by dragging a mouse pointer.
The languages also use *application generators* (which in the background) to generate the necessary program codes; hence, the programmer is freed from the tedious work of writing the code.
4GLs are used to enquire & access the data stored in database systems; hence, they are described as the **Query languages**.
While 3GLs like C, C++, C#, Java, and JavaScript remain popular for a wide variety of uses, 4GLs as originally defined found narrower uses. Some advanced 3GLs like Python, Ruby, and Perl combine some 4GL abilities within a general-purpose 3GL environment.

Examples of 4GLs are:

- Visual Basic
- Delphi Pascal
- Visual COBOL (Object COBOL)
- Other examples of 4GLs include the UNIX shell, PostScript, Mathematica, SQL (Structured Query Language) etc. They may include special facilities for automatic report generation or interaction with the database.

Advantages of fourth generation languages.

1. They are user-based, and therefore, easy to learn & understand.
2. The grammar of 4GL's is very close to the natural English language. It uses menus & prompts to guide a non-specialist to retrieve data with ease.

3. Very little training is required in order to develop & use 4GL programs.
4. They provide features for formatting of input, processing, & instant reporting.

FIFTH GENERATION LANGUAGES (5GL'S).

The 5GL's are designed to make a computer solve a problem by portraying human-like intelligence.
The languages are able to make a computer solve a problem for the programmer; hence, he/she does not spend a lot of time in coming up with the solution. The programmer only thinks about what problem needs to be solved and what conditions need to be met without worrying about how to implement an algorithm to solve the problem.
5GLs are mostly used in artificial intelligence.
Examples of 5GLs are:

- PROLOG
- LISP
- Mercury

Common misconception: Vendors have been known on occasion to advertise their languages as 5GL. Most of the time they actually sell 3GLs and 4GLs with a higher level of automation and knowledge base.

OBJECT-ORIENTED PROGRAMMING LANGUAGES (OOPS)

Object-Oriented Programming is a new approach to software development in which data & procedures that operate on data are combined into one object.
OOPs use **objects**. An ***Object*** is a representation of a software entity such as a user-defined window or variable. Each object has specific data values that are unique to it (called *state*) and a set of the things it can accomplish called (*functions* or *behaviour*). Several objects can be linked together to form a complete program. Programs send messages to an object to perform a procedure that is already embedded in it. This process of having data and functions that operate on the data within an object is called **encapsulation**.
The data structure & behaviour of an object is specified/described by a template (called a ***class***). Classes are hierarchical, and it is possible to pass the data & behaviour of an object in one class down the hierarchy.
Object-Oriented programming enables rapid program development. Every object has properties such as **colour**, **size**, **data source**, etc, which can be set easily without much effort. In addition, every object has events associated with it that can be used to trigger certain actions, e.g. remove the window from the screen on clicking the 'Close' button.
OOP has contributed greatly to the development of *graphical user interface operating systems* and *application programs*.
Examples of Object-oriented programming languages are: -

- Simula
- C++
- SmallTalk
- Java

  Java is sometimes associated with development of websites, but it can be used to create whole application programs that do not need a web browser to run.

JAVA

Java is an OOP language that resembles **Object C** (a simplified form of **C++**).
The code of Java displays graphics, accesses the network, and interfaces with users via a set of capabilities known as ***classes***. Classes define similar states & common methods for the behavior of an object.
JAVA programs are not compiled into machine code; instead, they are converted into a collection of bytes that represent the code for an abstract ***Java Virtual machine*** (**VM**). A Java interpreter running on a physical machine is then used to translate those bytes into local actions, such as printing a string or drawing a button.

WEB SCRIPTING LANGUAGES.

Web scripting languages are mostly used to create or add functionalities on web pages.
Web pages are used for creating Web sites on the Internet where all sorts of advertising can be done.
Web pages are hypertext (plain-text) documents written using a language called ***HyperText Markup Language*** (***HTML***). HTML documents have a file extension of **.Html** or **.Htm**.
Note. HTML doesn't have the declaration part and control structures, and has many limitations. Therefore, to develop functional websites, it must be used together with other web scripting languages like *JavaScript*, *VBScript* and PHP (PHP *Hypertext Preprocessor*.)

COMPARISON OF PROGRAMMING LANGUAGES.

Machine language	Assembly language	High-level languages
1. Instruction set is made up of binary digits (0's & 1's).	**1.** Instruction set is made up of Mnemonics & labels.	**1.** Instruction set is similar to English language statements & mathematical operators.
2. Instruction is made of 2 parts: *operation code* & *operand*.	**2.** Instruction is made up of 2 parts: *operation code* & *operand*, but comments can be added.	**2.** The instruction varies depending on the particular language.
3. No translation is needed. (This is the computer language; hence, the computer understands it directly).	**3.** Uses an Assembler to convert the assembly language source codes to their object code equivalents	**3.** Uses compiler or interpreter **Compiler** translates all the source code at once into object code; **Interpreter** translates line by line.
4. Executed by the hardware directly & is faster.	**4.** Executed faster than High-level, but slower than the machine code programs.	**4.** Translation & execution is very slow.
5. Difficult to learn, develop & maintain.	**5.** It's easier to learn, develop & maintain as compared to machine code programs.	**5.** Easy to learn, develop, maintain and use.
6. Programs are lengthy & tedious.		

7. It is time-consuming to develop machine code programs.	**6.** Like machine code language, the programs are lengthy & tedious.	**6.** Programs are shorter & simpler than Machine & assembly lang. programs.
	7. They take a shorter time to develop as compared to machine code programs, but take longer than High-level language programs.	**7.** Developing High-level language programs takes very short time.
8. Used in applications where efficient use of the CPU time is necessary, e.g., developing Operating systems & other Control programs that coordinate the working of peripherals.	**8.** Like machine language, Assembly language programs are used in applications where efficient use of the CPU time is necessary.	**8.** Most High-level languages are general-purpose, & can be used to do almost all computer-processing tasks.

FACTORS TO CONSIDER WHEN CHOOSING A PROGRAMMING LANGUAGE.

The following factors should be considered when choosing a Programming language to use in solving a problem:

1). The availability of the relevant translator

2). Whether the programmer is familiar with the language

3). Ease of learning and use

4). Purpose of the program, i.e., application areas such as education, business, scientific, etc.

5). Execution time

Applications that require quick response are best programmed in machine code or assembly language. High-level languages are not suitable for such application because, they take long to be translated & executed.

6). Development time

Development time is the time a programmer takes to write and run a program. High-level languages are easy to read, understand and develop; hence, they require less development time. Machine code & Assembly languages are relatively difficult to read, understand and develop; hence, they are time-consuming.

7). Popularity

The language selected should be suitable and/or successful in the market with respect to the problems to be solved.

8). Documentation

It should have accompanying documentation (descriptions) on how to use the language or maintain the programs written in the language.

9). Maintenance

Programs are developed to solve specific problems, and the problems keep on changing; hence, the programs are also changed to perform the new functions. **Program maintenance** is the activity of incorporating more routines onto the program, modifying the existing routines or removing the obsolete routines to

make the program adapt to a functionally enhanced environment.
The maintenance is made easier if the language used is easy to read and understand.

10). Availability of skilled programmers

The language selected should have a pool of readily available programmers to ease the programming activity, and reduce development time.

REVIEW QUESTIONS.

1. Define the following terms:
- **(i).** Computer program.
- **(ii).** Programming.
- **(iii).** Programming language.

2. With reference to programming, distinguish between Source program and Object code.

3. What is the function(s) of: Assemblers, Interpreters and Compilers in a computer system?

4. (a). What are the main functions of a Compiler?
(b). Differentiate between a Compiler and an Interpreter.

5. (a). What is a Programming language?
(b). Explain the two levels of programming languages.

6. (a). What is meant by 'Machine language'?
(b). Explain why machine language programming is so error-prone.
(c). Show the difference between Machine language and Assembly language.
(d). Give two advantages & three disadvantages of Machine language programming.

7. (a). What are High-level languages?
(b). Give the features/characteristics of high-level programming languages.
(c). Describe briefly how a program written in high-level programming language becomes a machine code program ready for operational use.
(d). Explain the advantages and disadvantages of using a High-level programming language for writing a program.
(e). List four examples of high-level programming languages. Indicate the application of each language in computing.

8. (a). What is meant by *program portability*?
(b). Why are low-level languages not considered to be portable?

9. List 8 factors that need to be considered when selecting a programming language.

PROGRAM DEVELOPMENT CYCLE

STAGES INVOLVED IN THE PROGRAM DEVELOPMENT CYCLE.

The process of program development can be broken down into the following stages:

1. Problem recognition (Identification of the problem).
2. Problem definition.
3. Program design.
4. Program coding.
5. Program testing & debugging.
6. Program Implementation and maintenance.

7. Program documentation.

PROBLEM RECOGNITION

Problem recognition refers to the understanding and interpretation of a particular problem.

The programmer must know what problem he/she is trying to solve. He/she must also understand clearly the nature of the problem & the function of the program.

In order to understand a problem, look for the keywords such as *compute*, *evaluate*, *compare*, etc.

Usually, a programmer identifies problems in the environment and tries to solve them by writing a computer program.

There are 3 situations that cause the programmer to identify a problem that is worth solving:

1. *Problems* or undesirable situations that prevent an individual or organizations from achieving their purpose.
2. *Opportunity* to improve the current program.
3. A *new directive* given by the management requiring a change in the current system.

Sample problem: Develop a program that can be used to calculate/find the area of a circle. Use the equation $A = \pi * r^2$.

PROBLEM DEFINITION (PROBLEM ANALYSIS).

In Problem definition, the programmer tries to define (determine) the:

(i). Output expected from the program.

(ii). Inputs needed to generate the output information.

(iii). Processing activities (requirements), and

(iv). Kind of files which may be needed.

- The programmer should write a narrative on what the program will do, and how it is meant to achieve the intended purpose. Within this narrative, he/she is required to determine what data is to be input & what information is to be output.

For example: In calculating the area of any circle, the parameters needed to determine the area of any circle are:

1. Input: (a) Pie (π) which is a constant.
   (b) The radius of the circle.
2. Process: The formula for calculating area of a circle, which is π * radius * radius.
3. Output: The area of the circle (A).

At the end of the problem definition, the programmer is required to write a requirements report/document for the new program. This document will enable the programmer to come up with a program design that meets the needs at hand.

Note. Problem definition should be done thoroughly to ensure user satisfaction, and to facilitate the subsequent stages in the program development cycle. A failure at this stage usually results in a system that will not work as intended.

PROGRAM (ALGORITHM) DESIGN

Program design is the development of the program's process or problem solving logic called the *Algorithm*.

It involves identifying the processing tasks required to be carried out in order to solve the problem.

The design stage enables the programmer to come up with a model of the expected

program (or a general framework (outline) of how to solve the problem, and where possible, break it into a sequence of small & simple steps.
The models show the flow of events throughout the entire program from the time data is input to the time the program gives out the expected information.

- √ The processing tasks must be in order & systematic. Therefore, the programmer identifies the processing tasks required, and the exact order in which they are to be carried out.
- √ The design process does not take account of the programming language to be used in the final product, since it only defines program logic.
- √ Program design provides for easy maintenance.

Note. It is important to design programs before entering them into the computer. The programmer should only attempt to covert a design into a program code after ensuring that it is logically correct. If possible, check the logical order on the desk. Some programmers produce rough & ready solutions at a Keyboard, and continue to amend the programs until eventually the program appears to do what was expected. This is not recommended in programming because of the following reasons:

1. The final code may not be easy to follow, since it was just cobbled together.
2. Variable names & specific items of code may not be documented.
3. Programs produced by continuous amendments & changing of codes mostly lead to unforeseen side effects.
   E.g., there may not have been plan for testing the program or procedures, hence, the program may easily fail.
4. A programmer may be asked to modify the code at a later date. Without sufficient documentation, the programmer will be forced to trace through the program in order to gain an insight into how the program functions.

Modular programming

Many programs are *non-monolithic* (i.e., they are not usually made up of one large block of code). Instead, they are made up of several units called **modules**, that work together to form the whole program with each module performing a specific task. This approach makes a program flexible, easier to read, and carry out error correction.

Program design Tools.

Algorithms can be illustrated using the following tools:

1). Pseudocodes.
2). Flowcharts.
3). Decision Tables.
4). Decision Trees.

Note. For any given problem, the programmer must choose which algorithm (method) is best suited to solve it. More details on developing of algorithms using pseudo code and flow charts during program design will be covered in the next section.

PROGRAM CODING

Program coding is the actual process of converting a design model into its equivalent program.
Coding requires the programmer to convert the design specification (algorithm) into actual computer instructions using a particular programming language.
For example; The programmer may be required to write the program code either in

Pascal, *C++*, *Visual Basic* or *Java*, and develop (invent) suitable identifiers, variable names, & their data types. However, remember that, at this stage the coding is still a Pencil & paper exercise.

The end result of this stage is a source program that can be translated into machine readable form for the computer to execute and solve the target problem.

Rules followed in coding a program.

1. Use the standard identifiers or reserved words.
2. Make the program more readable by using meaningful identifiers.
3. Don't use similar variables.
4. Keep spellings as normal as possible.
5. Use comments to explain variables & procedures. This makes the program readable.
6. Avoid tricks – write the program using straightforward codes that people can readily understand.
7. Modularize your program.

PROGRAM TESTING AND DEBUGGING

After designing & coding, the program has to be tested to verify that it is correct, and any errors detected removed (debugged).

TESTING:

Testing is the process of running computer software to detect/find any errors (or bugs) in the program that might have gone unnoticed.

During program testing, the following details should be checked;

- The reports generated by the system.
- The files maintained in connection to the system's information requirements.
- The input to the system.
- The processing tasks.
- The controls incorporated within the system.

Note. The testing process is a continuous process, and it ends only when the Programmer & the other personnel involved are satisfied that when operational, the program will meet the objectives and the growing demands of the organization.

Types of program errors

There are 5 main types of errors that can be encountered when testing a program. These are:

1. Syntax errors.
2. Run-time (Execution) errors.
3. Logical (arithmetic) errors.
4. Semantic errors.
5. Lexicon errors.

Syntax errors

Every programming language has a well-defined set of rules concerning formal spellings, punctuations, naming of variables, etc. The instructions are accepted only in a specified form & and must be obeyed by the programmer. ***Syntax errors*** are therefore, programming errors/mistakes that occur if the grammatical rules of a particular language are not used correctly.

Examples:

(i). Punctuation mistakes, i.e., if the programmer does not use the right punctuations & spaces needed by the translator program, e.g., omitting a comma or a

semicolon.

(ii). Improper naming of variables.

(iii). Wrong spellings of user defined and ***reserved words***.

Reserved words are those words that have a special meaning to the programming language, and should not be used by the programmer for anything else.

Syntax errors are committed by the programmer when developing, or transcribing the program, and can be detected by the language translators, such as the **Compiler** as it attempts to translate a program. Such errors must be corrected by the programmer before the program runs.

Logical (arithmetic) errors.

These are errors in the program logic.

Logical errors relate to the logic of processing followed in the program to get the desired results. E.g., they may occur as a result of misuse of logical operators.

Logical errors cannot be detected by the translator. The programmer will detect them when the program results are produced.

The program will run, but give the wrong output or stop during execution.

Run-time (Execution) errors.

These errors occur during program execution.

Run-time (execution) errors occur when the programmer introduces new features in the program, which are not part of the translator's standards.

For example; they may occur if:

(i). The computer is asked to divide a number by zero.

(ii). The number generated as a result of an instruction is too large to fit in a memory location.

(iii). When you raise a number to a very big power that cannot be accommodated in the Register's structure of the computer.

(iv). In case of a closed loop in the program, leading to a set of instructions being executed repetitively for a long time.

Execution errors are not detected by the translator programs, but are detected by the computer during execution. Sometimes, execution errors may lead to premature end of a program.

To detect and eliminate Execution errors, a test run should be performed on the program after it has been translated.

Semantic errors.

These are meaning errors. They occur when the programmer develops statements, which are not projecting towards the desired goal. Such statements will create deviations from the desired objectives.

Semantic errors are not detected by the computer. The programmer detects them when the program results are produced.

Lexicon errors.

These are the errors, which occur as a result of misusing **Reserved words** (words reserved for a particular language).

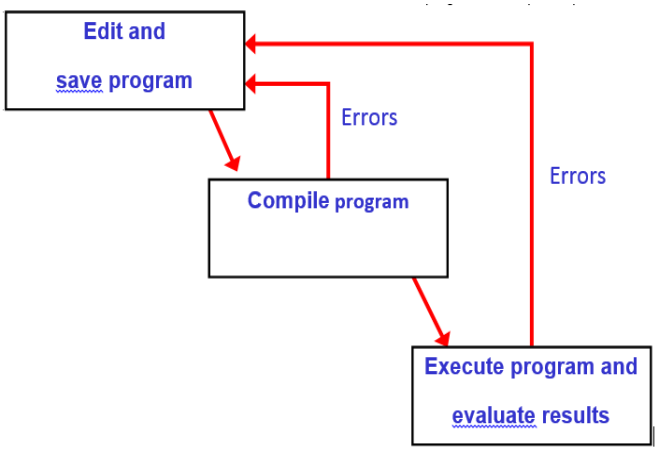
DEBUGGING:

The term ***Bug*** is used to refer to an error in a computer program.

Most programming errors often remain undetected until an attempt is made to translate a program.

The most common errors include:-

- Improperly declared Constants and Variables.
- A reference to undeclared variable.
- Incorrect punctuation.



Debugging is therefore, the process of detecting, locating & correcting (removing, eliminating) all errors (mistakes or bugs) that may exist in a computer program. This is illustrated below.

TYPES OF TESTING (**Methods of error detection**)

For the program to be assumed as correct, several testing needs to be conducted by the programmer to ascertain/establish their validity.

There are several methods of testing a program for errors. These include:

1. Dry running (Desk checking).
2. Translator system checking.
3. Functional testing.
4. Use of Test data.
5. Use of debugging utilities.
6. Diagnostic procedures.
7. System test with actual data.

Dry Running (Desk checking):

Dry running is a method of checking a program for errors by making the corrections on a paper before entering it in the program editor.

It involves going through the program while still on paper verifying & validating its possible results. If the final results agree with the original test data used, the programmer can then type the program into the computer and translate it.

√ Dry running helps the programmer to identify the program instructions, detect the most obvious syntax and logical errors, & the possible output.

√ Dry running is much faster. This is because; it involves the use of human brain as the processor, which has got a well inbuilt common sense.

Translator system checking:

This involves the computer & the translator programs. After entering the program, it is checked using a translator to detect any syntax errors. The translator can be a **Compiler** or an **Interpreter**, which goes through the set of instructions & produces a list of errors, or a program/statement listing which is free from errors.

Functional testing (White-box testing):

This type of testing is based upon examining the internal structure of a program & selecting test data, which give rise to the alternative cases of control flow.

Use of Test data.

The accuracy of a program can be tested by inputting a set of values referred to as **Test data**. The test data is designed to produce predictable output.

There are 2 types of test data;

(a). Real data (**live data**): - test data obtained from the real problem environment (practical applications).

(b). Dummy data: - assumed test data.

The programmer invents simple test data, which he/she uses to carry out trial runs of the new program. At each run, the programmer enters various data variations including data with errors to test how the system will behave. For example, if the input required is of numeric type, the programmer may enter alphabetic characters. The programmer will then compare the output produced with the predicted (actual) output.

Notes.

- Where possible, the program should be tested using the same test data that was used for desk checking. More strict/rigid tests should be applied on the program in order to test the program to its limits.
- Only **Logical errors** & **Semantic errors** can be corrected by the programmer using test data.
- A good program should not crash due to incorrect data entry but should inform the user about the irregularity and request for the correct data to be entered.

Use of debugging utilities.

After the program has been entered in the program editor, debugging utilities which are built in the computer can be run during translation to detect any syntax errors in the program.

The errors are corrected and the debugging process is repeated again to find out more errors, before the program is executed.

Diagnostic procedures.

For complex programs, diagnostic procedures, such as **Trace routines**, may be used to find logical errors.

A Trace prints out the results at each processing step to enable errors to be detected quickly.

System Test with actual data.

This is whereby the new program is run in parallel with the existing system for a short time so that results can be compared and adjustments made. In such cases, the system test is made using actual data.

IMPLEMENTATION AND MAINTENANCE

IMPLEMENTATION

Implementation refers to the actual delivery, installation and putting of the new program into use.

The program is put into use after it is fully tested, well documented, and after training the staff who will be involved in the running of the new program.

Structured Walk Through:

It is an organized style of evaluating/reviewing a program by a team of other programmers, which then reports to the programming team.

REVIEW AND MAINTENANCE.

Once the program becomes operational, it should be maintained throughout its life, i.e., new routines should be added, obsolete routines removed, & the existing routines adjusted so that the program may adapt to enhanced functional environments.

The main objective of maintenance is to keep the system functioning at an acceptable

level.
Program maintenance mainly involves: -
√ Correcting errors that may be encountered after the program has been implemented or exposed to extensive use.
√ Changing procedures.
√ Hardware and software maintenance.
√ Changing parameters and algorithms used to develop the original programs.
√ Making any adjustments as new technology comes.
Note. Program maintenance runs parallel to the maintenance of the program documentation, i.e., any time maintenance is carried out on the program, the documentation should also be updated to convey the right image of the system.

PROGRAM DOCUMENTATION.

After writing, testing, and debugging a program, it must be documented. In other words, the programmer should describe all what he was doing during the program development stages.
Program documentation is the writing of supportive materials explaining how the program can be used by users, installed by operators, or modified by other programmers.
Note. All the program development activities (i.e., from the initial stage up to the complete program) should be documented/recorded in order to assist in the development of the program, future modification of the program, general maintenance, machine & software conversion at a later date, and program changeover.
Documentation can either be; **Internal** or **External**.
Internal documentation is the writing of non-executable lines (comments) in the source program that help other programmers to understand the code statements.
External documentation refers to reference materials such as user manuals printed as booklets.

Types of program documentation.

There are 3 target groups for any type of documentation:

1. **User-oriented documentation.**
   This enables the user to learn how to use the program as quickly as possible, and with little help from the program developer.
2. **Operator-oriented documentation:**
   This is meant for computer operators such as the technical staff. It is used to help them install & maintain the program.
3. **Programmer-oriented documentation:**
   This is a detailed documentation written for skilled programmers. It provides the necessary technical information to help in future modification of the program.

Some documents used in program documentation.

(1). <u>User guide/ manual.</u>
This is a manual provided for an end-user to enable him/her use or operate the program with minimal or no guidance.
A User guide is used in user-oriented documentation.

(2). <u>Reference guide.</u>
It is used by someone who already knows how to use the program but needs to be reminded about a particular point or obtain more detailed information about a

particular feature.

(3). Quick Reference guide.

This could be a single sheet or card small enough to fit into a pocket. It is used by the user to get help for the common tasks carried out within the program.

(4). Technical manuals.

They are intended for System analysts & Programmers. They assist in maintaining & modifying the program design and code.

Contents in a program document.

Documentation includes:

1. Title of the program.
2. Function of the program.
3. Language used.
4. Hardware & Software required to support the processing of the system.
5. File specifications (details of the data structures used, & details of how data files are to be organized, accessed, and kept secure).
6. Limitations of the program.
7. Format of the input & the output expected.
8. Design of the program using the design tools (i.e., detailed algorithms & procedures used).
9. A listing of the Source program and the program flowcharts.
10. A carefully devised set of Test data, and a table of expected results.
11. Detailed instructions on how to run the program.

Review Questions.

1. State the three types of errors that can be experienced in program testing, and how each can be detected.
2. Syntax errors can be detected by the help of translators while logical errors are detected differently. Explain FIVE methods which can be used to detect Logical errors.
3. What is program designing?
4. **(a).** Define program documentation.
   (b). What does a program documentation contain?
5. Briefly explain how each of the following documents are useful in programming?
   (a). User manual / guide.
   (b). Reference guide.
   (c). Quick reference guide.
6. Program documentation is different from Implementation. Explain.
7. Outline and briefly explain the stages involved in program development.

DEVELOPING OF ALGORITHMS

After carefully analyzing the requirements specification, the programmer usually comes up with the algorithm.

Definition of an Algorithm:

- An ***Algorithm*** is a limited number of logical steps that a program follows in order to solve a problem.
- A step-by-step (a set of) instructions which when followed will produce a solution to a given problem.

√ Algorithms take little or no account of the programming language.
√ They must be precise/ accurate, unambiguous/clear and should guarantee a solution.

PSEUDOCODES

❖ A *pseudocode* is a method of documenting a program logic in which English-like statements are used to describe the processing steps.
❖ These are structured English-like phrases that indicate the program steps to be followed to solve a given problem.
√ The term "**Code**" usually refers to a computer program. This implies that, some of the words used in a pseudocode may be drawn from a certain programming language and then mixed with English to form structured statements that are easily understood by non-programmers, and also make a lot of sense to programmers. However, pseudocodes are not executable by a computer.

Guidelines for designing a good pseudocode.

1. The statements must be short, clear and readable.
2. The statements must not have more than one meaning (i.e., should not be ambiguous).
3. The pseudocode lines should be clearly outlined and indented.
4. A pseudocode must have a **Begin** and an **end**.
   i.e., a pseudocode should show clearly the start and stop of executable statements and the control structures.
5. The input, output and processing statements should be clearly stated using keywords such as PRINT, READ, INPUT, etc.

Example 1:

Write a pseudocode that can be used to prompt the user to enter two numbers, calculate the sum and average of the two numbers and then display the output on the screen.

```
START
        PRINT "Enter two numbers"
        INPUT X, Y
        Sum = X + Y
        Average = Sum/2
        PRINT Sum
        PRINT Average
STOP
```

Example 2:

Write a structured algorithm that would prompt the user to enter the Length and Width of a rectangle, calculate the Area and Perimeter, then display the result.

Solution

Step 1: Draw the rectangle of Length (L) and Width (W).
Step 2: Write down the Pseudocode.

```
        START
                PRINT "Enter Length and Width"
                READ L, W
                Area = L * W
                Perimeter = 2 (L + W)
                PRINT Area
```

PRINT Perimeter
STOP

Example 3:

Write a pseudocode that can be used to calculate the Diameter, Circumference and Area of a circle and then display the output on the screen.

START
Set π to 3.14
Prompt the user for the Radius (R)
Store the radius in a variable (R)
Set Diameter to 2 * Radius
Set Circumference to π * 2 * Radius
Set Area to π * Sqr (Radius)
PRINT Diameter
PRINT Circumference
PRINT Area
STOP

Example 4:

Write a pseudocode for a program that would be used to solve equation: $E = MC^2$.

START
Enter values from M to C
E = M * C * C
Display E
STOP

✓ It is important to use program control structures when writing Pseudocodes. The most common constructs are:

(i). Looping (Repetition / Iteration) – used where instructions are to be repeated under certain conditions.

(ii). Selection – used when choosing a specified group of instructions for execution. The group chosen depends on certain conditions being satisfied.

Example 5:

Write a pseudocode for a program that can be used to classify people according to age. If a person is more than 20 years; output "Adult" else output "Young person".

START
PRINT "Enter the Age"
INPUT Age
IF Age > 20 THEN
PRINT "Adult"
ELSE
PRINT "Young person"
STOP

Note. Pseudocodes make an algorithm easier to understand. This is because; the algorithm can be read from top to bottom without the need for jumping backwards or forwards to follow the logic of the algorithm as in flowcharts.

FLOWCHARTS

❖ A **Flowchart** is a diagrammatic or pictorial representation of a program's algorithm.

❖ It is a chart that demonstrates the logical sequence of events that must be performed to solve a problem.

Types of Flowcharts.

There are 2 common types of Flowcharts:

1). System flowchart.

A *System flowchart* is a graphical model that illustrates each basic step of a data processing system.

It illustrates (in summary) the sequence of events in a system, showing the department or function responsible for each event.

2). Program flowchart.

This is a diagram that describes, in sequence, all the operations required to process data in a computer program.

A *program flowchart* graphically represents the types of instructions contained in a computer program as well as their sequence & logic.

PROGRAM FLOWCHARTS.

A Flowchart is constructed using a set of special shapes (or symbols) that have specific meaning. Symbols are used to represent operations, or data flow on a flowchart. Each symbol contains information (short text) that describes what must be done at that point.

The symbols are joined by arrows to obtain a complete Flowchart. The arrows show the order in which the instruction must be executed.

SYMBOLS USED IN PROGRAM FLOWCHARTS.

Below is a standard set of symbols used to draw program flowcharts as created by ***American National Standard Institute*** (***ANSI***).

1. <u>Terminal symbol</u>.



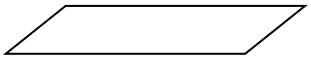
Ellipse (Oval in shape)

It is used to indicate the point at which a flowchart, a process or an algorithm begins & ends.

√ All Flowcharts must have a START & STOP symbol. The START/BEGIN symbol is the first symbol of a flowchart, & identifies the point at which the analysis of the flowchart should begin. The STOP/END symbol is the last symbol of a flowchart, & indicates the end of the flowchart.

√ The words **Begin** & **End** (or **Start** & **Stop**) should be inserted in the Terminal symbol.

2. <u>Input or Output symbol</u>.



(*Parallelogram*)

- It is used to identify/specify an input operation or output operation.

For example;



Input operation

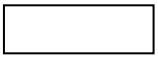


Output operation

Note. The words mostly associated with I/O operations are **READ** & **PRINT**. READ describes the entry of computer data, while PRINT relates to the printed

output of information.

3. **Process symbol.**

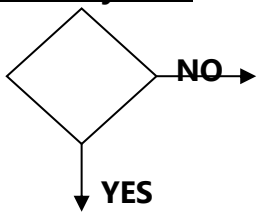
 (*Rectangle*)

- **Process symbol** is used to indicate that a processing or data transformation is taking place.

The information placed within the process symbol may be an algebraic formula or a sentence to describe processing.

SUM = A + B	Commission is computed at 20% of Total
Processing defined as a Formula	***Processing defined as a Sentence***

4. **Decision symbol.**



(*Rhombus*)

- It is used to indicate/ specify a condition or to show the decision to be made.

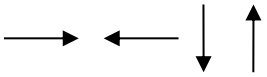
There are 2 main components of a Decision symbol:

(i). A question asked within the Decision symbol, that indicates the comparison / logical operation.

(ii). The results of the comparison (which are given in terms of **YES** or **NO**).

The arrows labeled YES or NO lead to the required action corresponding to the answer to the question.

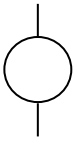
5. **Flow lines.**



Flow lines with arrowheads are used to indicate the direction of processing of the program logic, i.e., they show the order in which the instructions are to be executed. The normal flow of a flowchart is from *Top* to *Bottom*, and *Left* to *Right*.

Note. Flow lines should never cross each other.

6. **Connector symbol.**



Sometimes, a flowchart becomes too long to fit in a single page, such that the flow lines start crisscrossing at many places causing confusion & also making the flowchart difficult to understand. The **Connector symbol** is used as a connecting point for arrows coming from different directions. A Connector symbol is represented by a Circle, and a letter or digit is placed within the circle to indicate the link. **Note**. Connectors do not represent any operation. They are used to connect two parts of a flowchart, indicating that the flow of data is not broken.

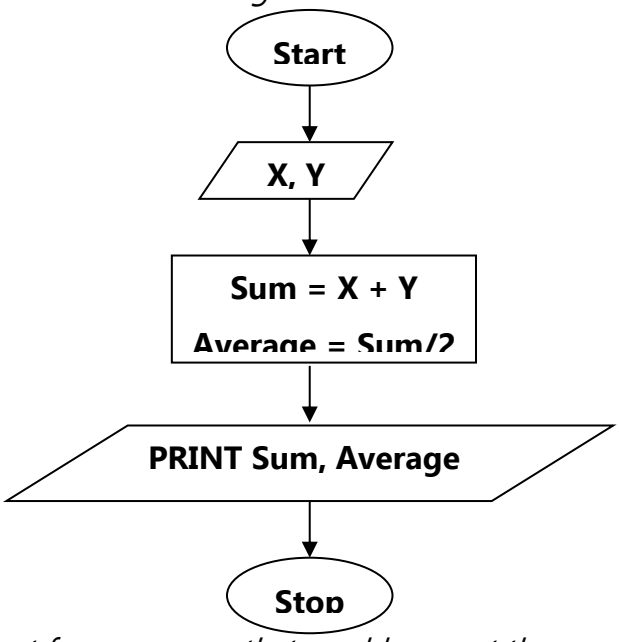
General guidelines for drawing a program flowchart.

1. A flowchart should have only one entry/starting point and one exit point (i.e., ensure that the flowchart has a logical start and finish).
2. The flowchart should be clear, neat and easy to follow.

3. Use the correct symbol at each stage in the flowchart.
4. The flowchart should not be open to more than one interpretation.
5. Avoid overlapping the lines used to show the flow of logic as this can create confusion in the flowchart.
6. Make comparison instructions simple, i.e., capable of YES/NO answers.
7. The logical flow should be clearly shown using arrows.
   Note. A flowchart should flow from the Top to Bottom of a page, and from the Left to the Right.
8. Where necessary, use Connectors to reduce the number of flow lines.
   Connectors are helpful when a flowchart is several pages long, and where several loops are needed in the logic of the flowchart.
9. Check to ensure that the flowchart is logically correct & complete.

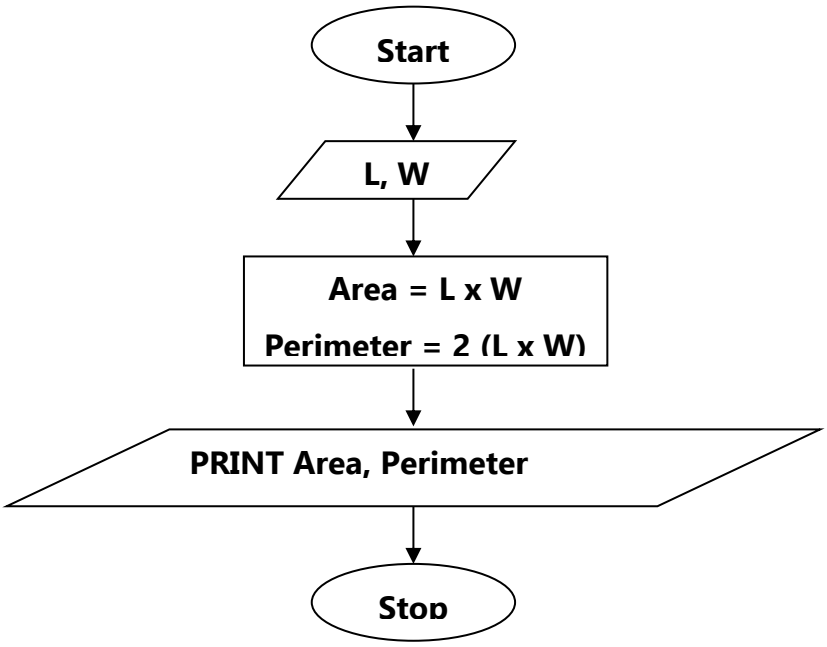
Example 1:

Draw a flowchart for a program that can be used to prompt the user to enter two numbers, find the sum and average of the two numbers and then display the output on the screen.



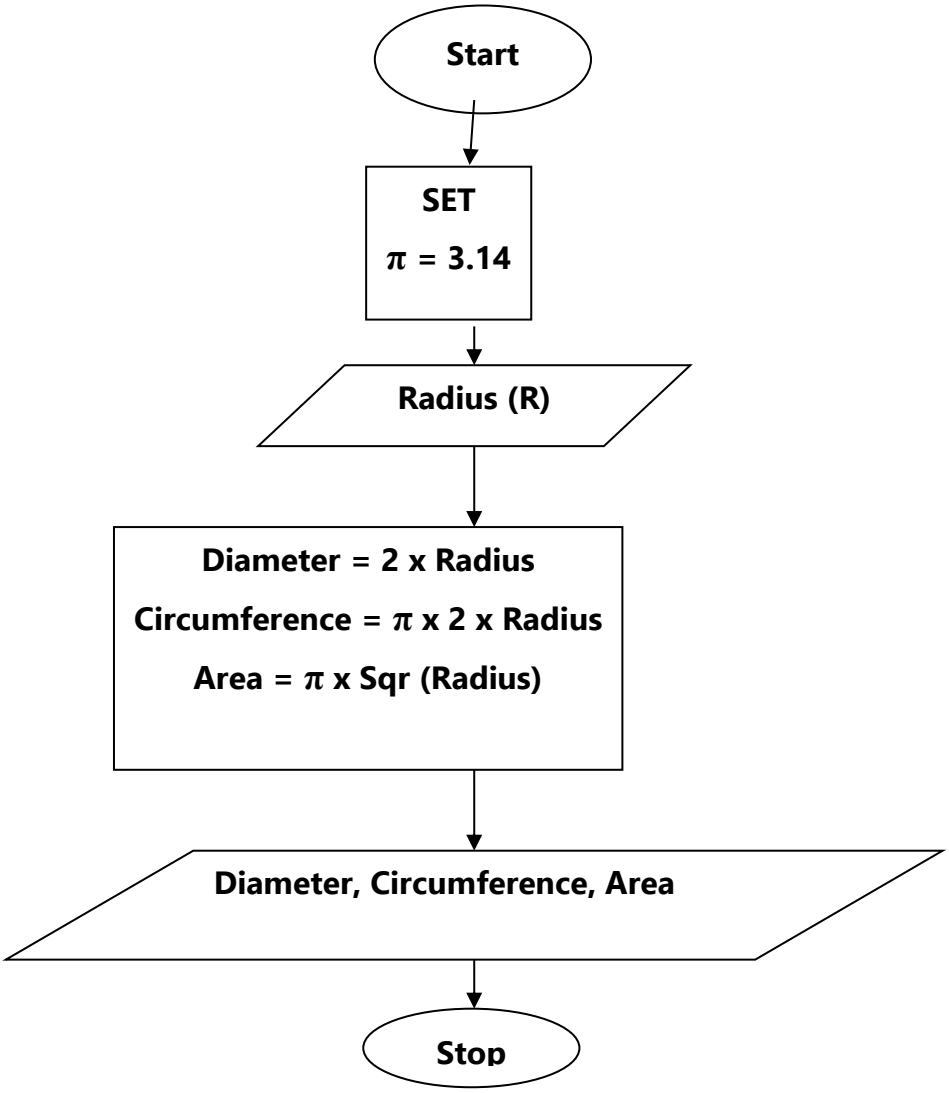
Example 2:

Draw a flowchart for a program that would prompt the user to enter the Length and Width of a rectangle, calculate the Area and Perimeter, then display the result.

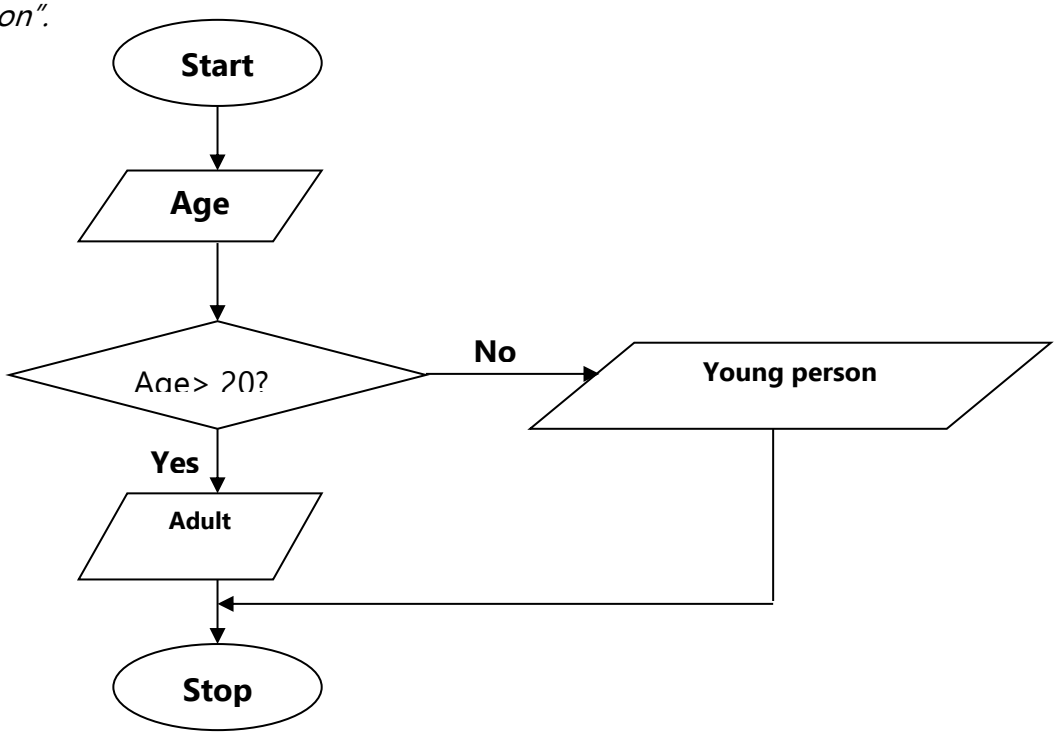


Example 3:

Draw a flowchart for a program that can be used to calculate the Diameter, Circumference and Area of a circle and then display the output on the screen.

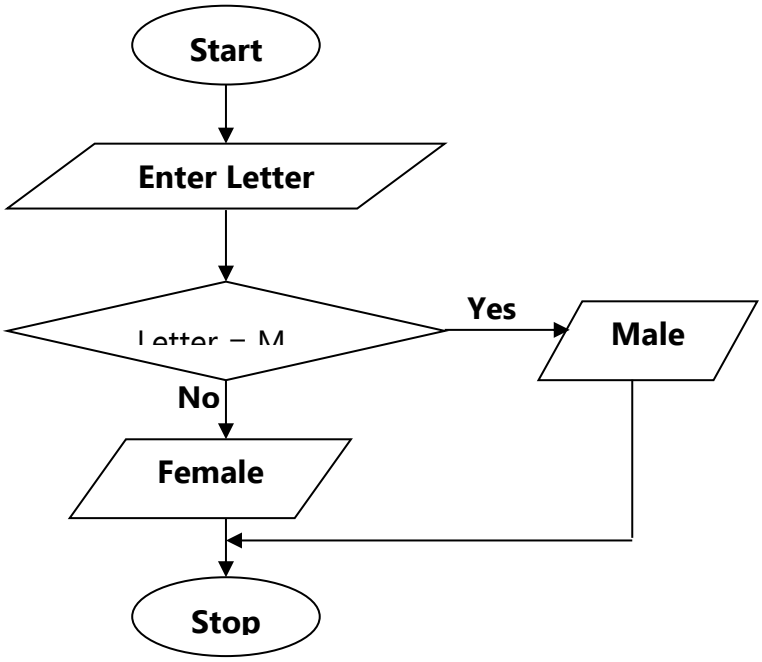


Example 4: *Design a flowchart for a program that can be used to classify people according to age. If a person is more than 20 years; output "Adult" else output "Young person".*



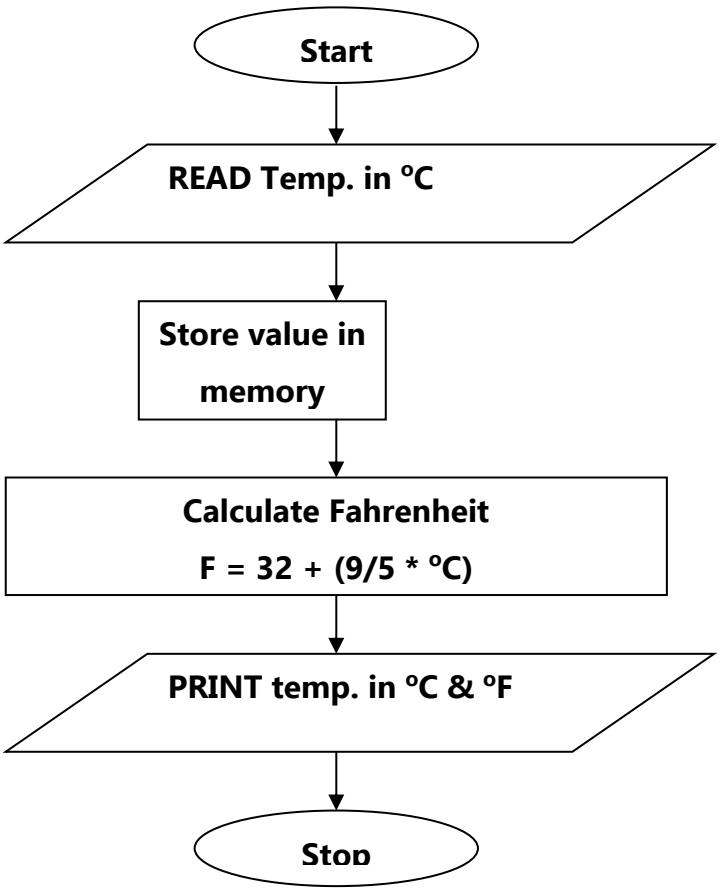
Example 5:

Draw a flowchart for a program that would be used to classify animals according to sex. If a letter M is input, the program should display 'Male' otherwise it should display "Female".



Example 6:

Write a program using a flowchart to convert temperature from ^{0}C to ^{0}F.
Fahrenheit =32 + (9° x C/5).



Notes.

- A flowchart must have a **Start** and an **end**.
- A flowchart is useful when the algorithm is short & the flowchart can fit conveniently on a single page. If the flowchart is too large, it is recommended to use Pseudocodes for long & complicated programs.

Advantages of using Flowcharts.

The following are the benefits of Flowcharts:

(i). Quicker understanding of relationships.
They assist programmers to understand procedures more quickly.
A programmer can represent a lengthy procedure more easily with the help of a flowchart than describing it by means of written notes.

(ii). Effective synthesis.
Flowcharts may be used as working models in the design of new programs and systems.

(iii). Proper program documentation.
Program flowcharts serve as good program documentation, which is needed for the following reasons:

(a). If programs are modified in future, the flowcharts will direct the programmer on what was originally done.

(b). When staff changes occur, the flowcharts may help new employees understand the existing programs.

(c). Flowcharts assist in program conversion when new hardware/software are acquired.

(iv). Effective coding.
Program flowcharts act as a guide during the program preparation stage.
Instructions coded in a programming language may be checked against the flowchart to ensure that no steps are omitted.

(v). Orderly debugging and testing of programs.
Flowcharts help in detecting, locating and removing mistakes.
The programmer can refer to the flowchart as he/she re-checks the coding steps, & the logic of the written instructions.

(vi). Efficient program maintenance.
Flowcharts facilitate the maintenance of operating programs. They help the programmer to concentrate on the part of the information flow which is to be modified.

Limitations of using Flowcharts.

(i). Flowcharts are complex, clumsy & become unclear, especially when the program logic is complex.

(ii). If changes are to be made, the flowchart may require complete re-drawing.

(iii). Reproduction of flowcharts is usually a problem, since the flowchart symbols cannot be typed.

(iv). No uniform practice is followed for drawing flowcharts as it is used as an aid to the program.

(v). Sometimes, it becomes difficult to establish the link between various conditions, and the actions to be taken upon a particular condition.

Revision Exercise.

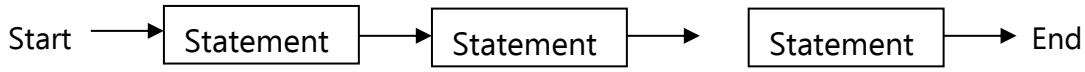
1. Define the following:
   (a). Algorithm.
   (b). Pseudocode.
   (c). Flowchart.
2. **(a).** State the various types of flowcharts.
   (b). Discuss the advantages and disadvantages of flowcharts.

PROGRAM CONTROL STRUCTURES

Control structures are blocks of statements that determine how program statements are to be executed.
Control statements deal with situations where processes are to be repeated several number of times or where decisions have to be made.
There are 3 control structures used in most of the structured programming languages:
1). Sequence.
2). Selection.
3). Iteration (looping).

SEQUENCE CONTROL STRUCTURES

In Sequence control, the computer reads instructions from a program file line-by-line starting from the first line sequentially towards the end of the file. This is called ***Sequential program execution***.



Note. Sequential program execution enables the computer to perform tasks that are arranged consecutively one after another in the code.

SELECTION (DECISION) CONTROL STRUCTURES

Selection involves choosing a specified group of instructions/statements for execution.
In Selection control, one or more statements are usually selected for execution depending on whether the condition given is *True* or *False*.
The condition must be a Boolean (logical) expression, e.g., X >= 20
In this case, the condition is true if x is equal to or greater than 20. Any value that is less than 20, will make the condition false.
Generally, there are 4 types of selection control structures used in most high-level programming languages:
1). IF – THEN
2). IF – THEN – ELSE
3). Nested IF
4). CASE – OF
Note. These control structures are used in a program based on a sequence of instructions, which require that a choice (decision) be made between two or more alternatives.
In such a situation, the computer must be programmed to compare data, and take action depending on the outcome of the comparison.

IF – THEN

IF – THEN structure is used if only one option is available, i.e., it is used to perform a certain action if the condition is true, but does nothing if the condition is false.

The general format of the IF-THEN structure is:

IF < ***Condition*** > THEN

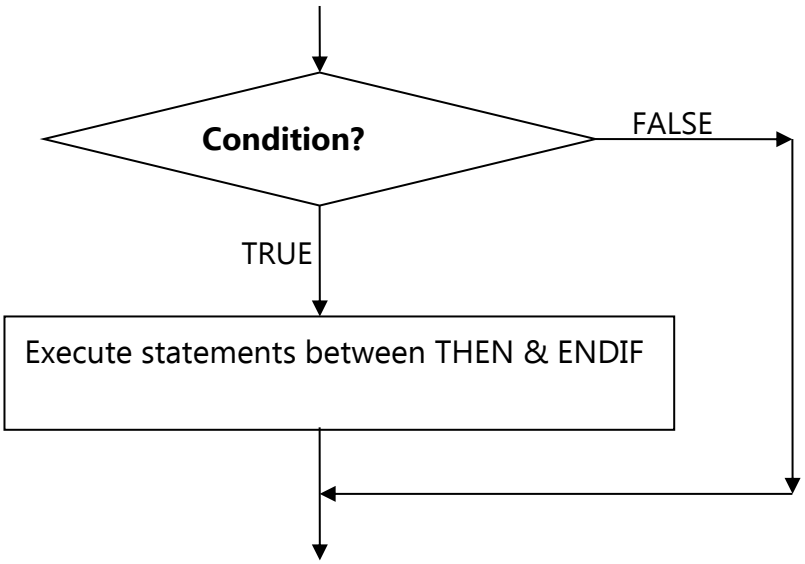
Program statement to be executed if condition is true;

ENDIF

If the condition is TRUE, the program executes the part following the keyword 'THEN'.

If the condition is FALSE, the statement part of the structure is ignored, and the program continues with the statements below the ENDIF.

The diagrammatic expression of the IF-THEN structure is:



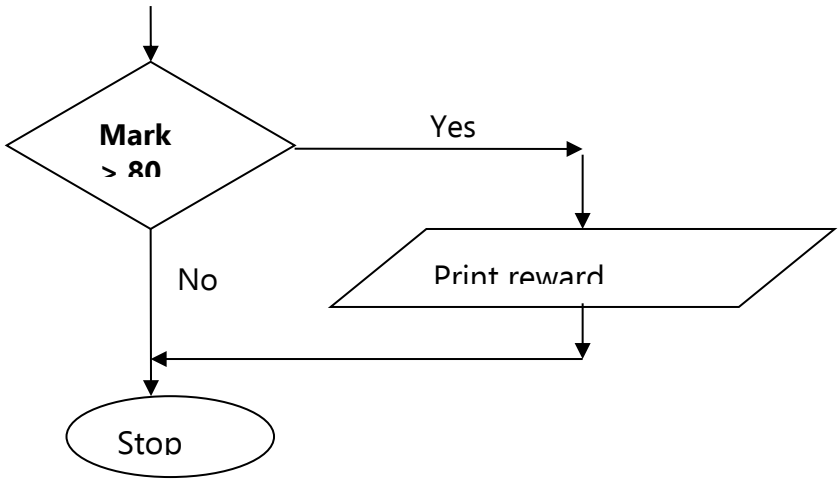
Example 1;

In a school, the administration may decide to reward only those students who attain a mean mark of 80% and above.

Pseudocode

```
IF Mark > 80 THEN
        Print " Give reward"
ENDIF
```

Flowchart



Example 2;

A user is asked to enter a set of positive numbers, one at a time. She enters a 0 (zero) to indicate that she has no more numbers to enter.

Develop an algorithm to print the largest number entered.

Pseudocode

START
    Prompt the user for a number, **Largest**
    Prompt the user for another number, **NewNumber**
        IF *NewNumber > Largest* **THEN**
        Set *Largest* to *NewNumber*
        ENDIF
    Prompt the user for a number, **NewNumber**
    Output ('The largest number entered is', **Largest**)
STOP

As each number is entered, the algorithm checks if the number entered is larger than the previous ones. If it is larger, it is saved as the largest. If it is smaller, it is ignored, and holds onto the largest number so far.

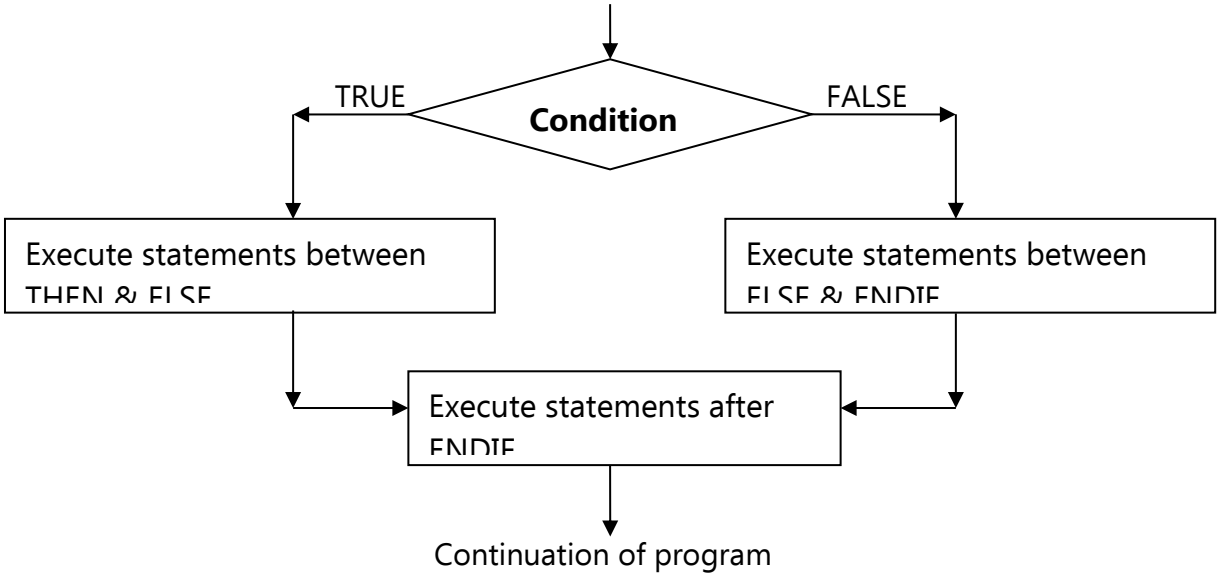
IF – THEN -ELSE

The IF-THEN-ELSE structure is suitable when there are 2 available options to select from.

The general format of the IF-THEN-ELSE structure is:

IF < ***Condition*** > THEN
        Statement 1; (called the THEN part)
ELSE
        Statement 2; (called the ELSE part)
ENDIF (indicates the end of the control structure)

The diagrammatic expression of the IF-THEN-ELSE structure is:



When the IF-THEN-ELSE structure is encountered:

1). The Condition is tested.

2). If the Condition is TRUE, the statements between THEN & ELSE (i.e., the THEN part) are executed.
The ELSE part is skipped, and execution continues with the statement following ENDIF.

3). If the Condition is FALSE, the THEN part is skipped. The statements between ELSE & ENDIF (i.e., the ELSE part of the structure) are executed, and execution continues with the statement following ENDIF.

After either group of statements has been executed, the program will then continue executing the program statements after the last ENDIF.

Note. Using IF-THEN-ELSE, for any given test of the condition, only one set of statements is selected for execution (not both statements).

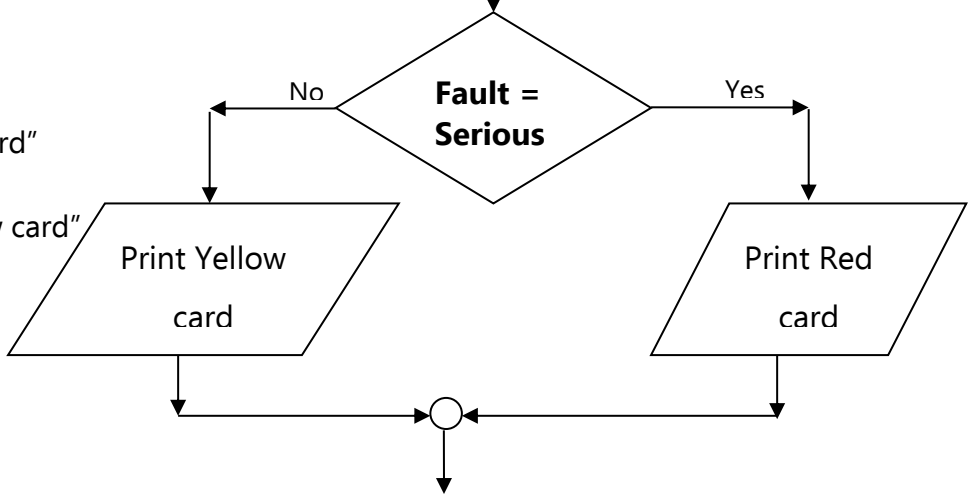
Example 1;

In a football match, if a player makes a mistake which is considered serious by the rules of the game, he/she is given a Red card. Otherwise, he/she is given a Yellow card.

Pseudocode

```
IF Fault = Serious THEN
        Print " Give red card"
ELSE
        Print " Give Yellow card"
ENDIF
```

Flowchart



Example 2;

Write an algorithm which asks a user for two numbers; A and B, and calculates the value of A divided by B. However, if B is 0, a message is printed which says that division by 0 is not allowed.

Pseudocode

START
    Prompt the user for the two numbers, **A** and **B**
        IF *B = 0* **THEN**
        Writeln ('Division by 0 is not allowed') **ELSE**
        Set C to A/B
        ENDIF
    Output A, B, and C
STOP

Explanation.

- Suppose the user enters 1 for A and 0 for B in response to the prompt. The algorithm will test if B=0. Since B is 0, the condition is True. Therefore, the THEN part is executed printing the message: 'Division by 0 is not allowed'.
- Suppose the user enters 20 for A and 5 for B in response to the prompt. The algorithm will test if B=0. Since B is not 0, the condition is False. Therefore, the statements between ELSE & ENDIF are executed (i.e., A is divided by B, and the result is stored in C).

NESTED IF

Nested IF structure is used where 2 or more options have to be considered to make a selection.

The general format of the Nested IF structure is:

```
IF < Condition 1 > THEN
        Statement 1
ELSE
    IF < Condition 2 > THEN
            Statement 2
    ELSE
        IF < Condition 3 > THEN
                Statement 3
        ELSE
        Statement 4;
        ENDIF
    ENDIF
ENDIF
```

Example;

In an Olympics track event, medals are awarded only to the first three athletes as follows:

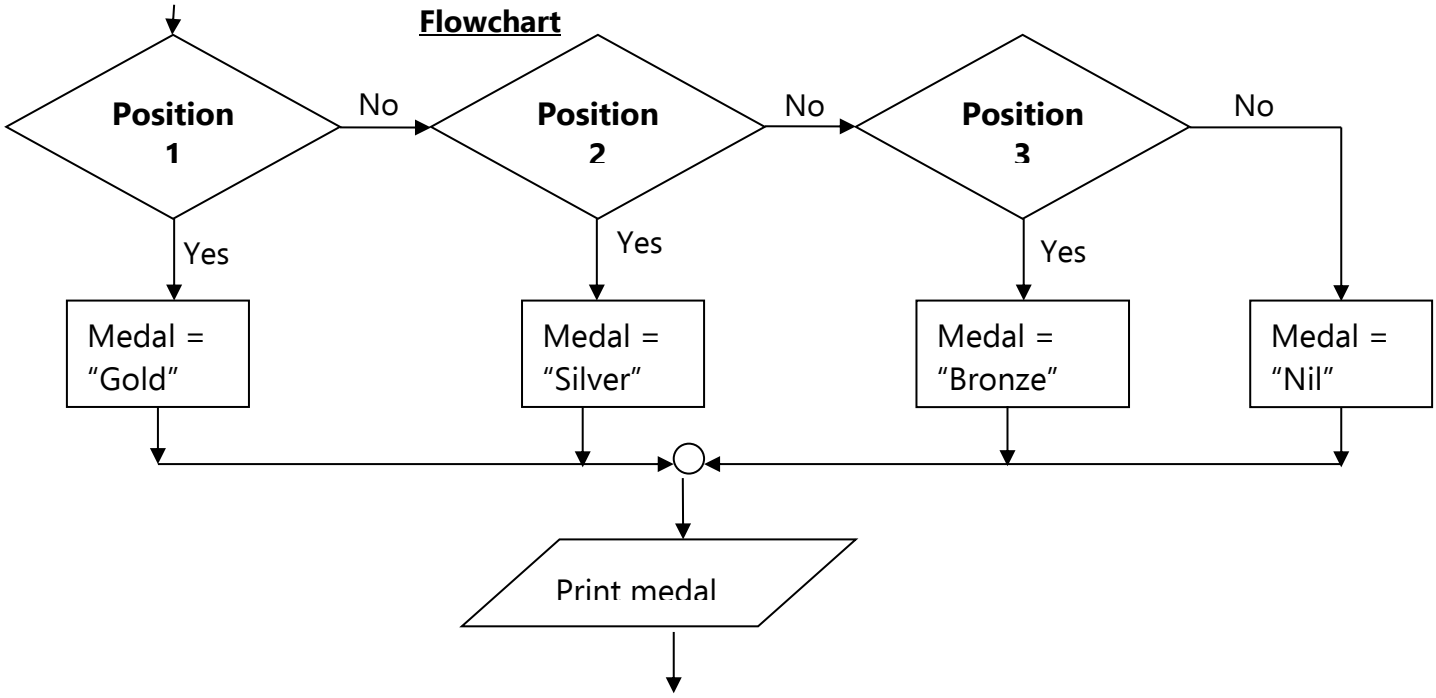
a). Position 1: Gold medal
b). Position 2: Silver medal
c). Position 3: Bronze medal

The pseudocode and flowchart below can be used to show the structure of the Nested IF selection.

Pseudocode

```
IF Position = 1 THEN
        Medal = "Gold"
ELSE
    IF Position = 2 THEN
        Medal = "Silver"
    ELSE
        IF Position = 3 THEN
        Medal = "Bronze"
        ELSE
        Medal = "nil"
        ENDIF
    ENDIF
ENDIF
```

Flowchart



When IF statements are embedded within one another, they are said to be **Nested**.
Note. Each IF-THEN or IF-THEN-ELSE is terminated with the comment {ENDIF}. The number of {End If's} must be equal to the number of ELSE's.

The CASE structure

CASE-OF allows a particular group of statements to be chosen from several available groups.
It is therefore used where the response to a question involves more than two choices/alternatives.
The general format of the CASE structure is:

CASE ***Expression*** OF
Label 1: statement 1
Label 2: statement 2
Label 3: statement 3
.
.

.
Label n: statement n
ELSE
Statement m
ENDCASE

√ The Boolean expression for the CASE structure can only be expressed using *Integers* or *alphabetic characters* only. Hence;
CASE *Integer* OF or CASE *Char* OF

√ A statement is executed only if one of its corresponding labels matches the current value of the expression. This implies that, the current value of the expression determines which of the statements will be executed.

Example 1;

Write a pseudocode of a program that requests the user to type a number from 1 to 7. The program then prints the corresponding day of the week.

Pseudocode

START
Prompt the user for a number from 1 to 7, **Day**
CASE *Day* **OF**
1: PRINT ('Sunday');
2: PRINT ('Monday');
3: PRINT ('Tuesday');
4: PRINT ('Wednesday');
5: PRINT ('Thursday');
6: PRINT ('Friday');
7: PRINT ('Saturday');
ENDCASE
STOP

The CASE structure consists of:

- The word CASE.
- A Control variable (e.g., **Day**).
- The word OF.
- A group of one or more statements, each group labeled by one or more possible values of the control variable.
- The word ENDCASE, indicating the end of the construct.

When a CASE statement is encountered, the value of the control variable is used to determine which group of statements is executed, e.g., if the value of Day is 5, then the group of statements labeled 5 is selected for execution, and the statement; '**Thursday**' is printed.

After executing this group of statements, execution continues at the statement following ENDCASE.

NOTES:

i). The programmer should ensure that the value of the control variable appears as a **label**. E.g., suppose the value entered for Day was 9. Since 9 does not label any statement within the CASE construct, an error will result.

ii). A given label can be used on only one group of statements. E.g., 5 can't be used to label two groups of statements. If this is done, the computer will not know which group to select & unpredictable results can occur.

Example 2; Write a pseudocode of a program that requests the user to type a number from 1 to 7. Depending on the number entered, print the message, 'It is a School day' or 'It is on a Weekend'.

Pseudocode

```
Prompt the user for a number from 1 to 7, Day
    IF (Day < 1) OR (Day >7) THEN
        Print ('Invalid number entered ---', Day)
    ELSE
    CASE Day OF
    2, 3, 4, 5, 6: PRINT ('It is a School day');
    1, 7: PRINT ('It is on a Weekend');
    ENDCASE
    ENDIF
STOP
```

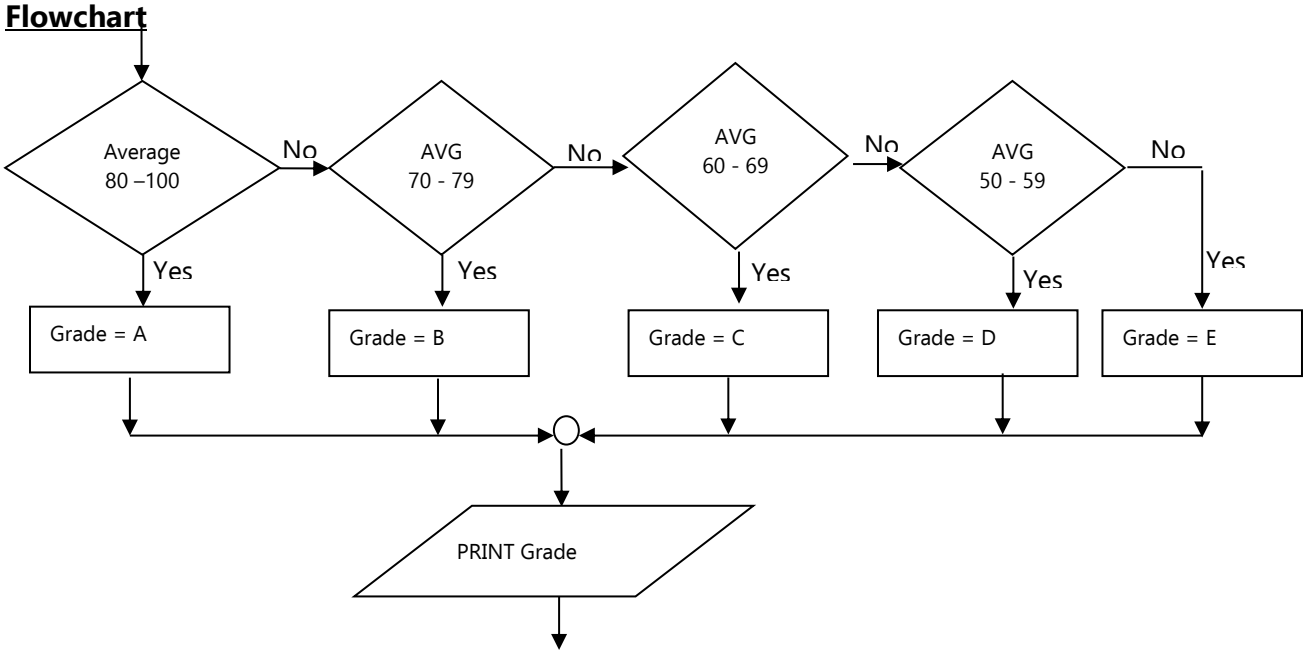
In this pseudocode, the IF statement has been used to validate the value of Day. This ensures that, only valid data gets processed by the CASE statement.
Otherwise, if the ELSE part is executed, we are sure that the value of Day will lie between 1 and 7 inclusive.

Example 3;

Pseudocode

```
CASE Average OF
80 .. 100: Grade = 'A'
70 .. 79: Grade = 'B'
60 .. 69: Grade = 'C'
50 .. 59: Grade = 'D'
40 .. 49: Grade = 'E'
ELSE
    Grade = 'F'
ENDCASE
```

Flowchart



ITERATION (LOOPING / REPETITION) CONTROL STRUCTURES

Looping refers to the repeated execution of the same sequence of statements to process individual data. This is normally created by an unconditional branch back to a previous/earlier operation.

The loop is designed to execute the same group of statements repeatedly until a certain condition is satisfied.

Note. Iteration is important in situations where the same operation has to be carried out on a set of data many times.

The loop structure consists of 2 parts:

1). Loop body, which represents the statements to be repeated.

2). Loop control, which specifies the number of times the loop body is to be repeated.

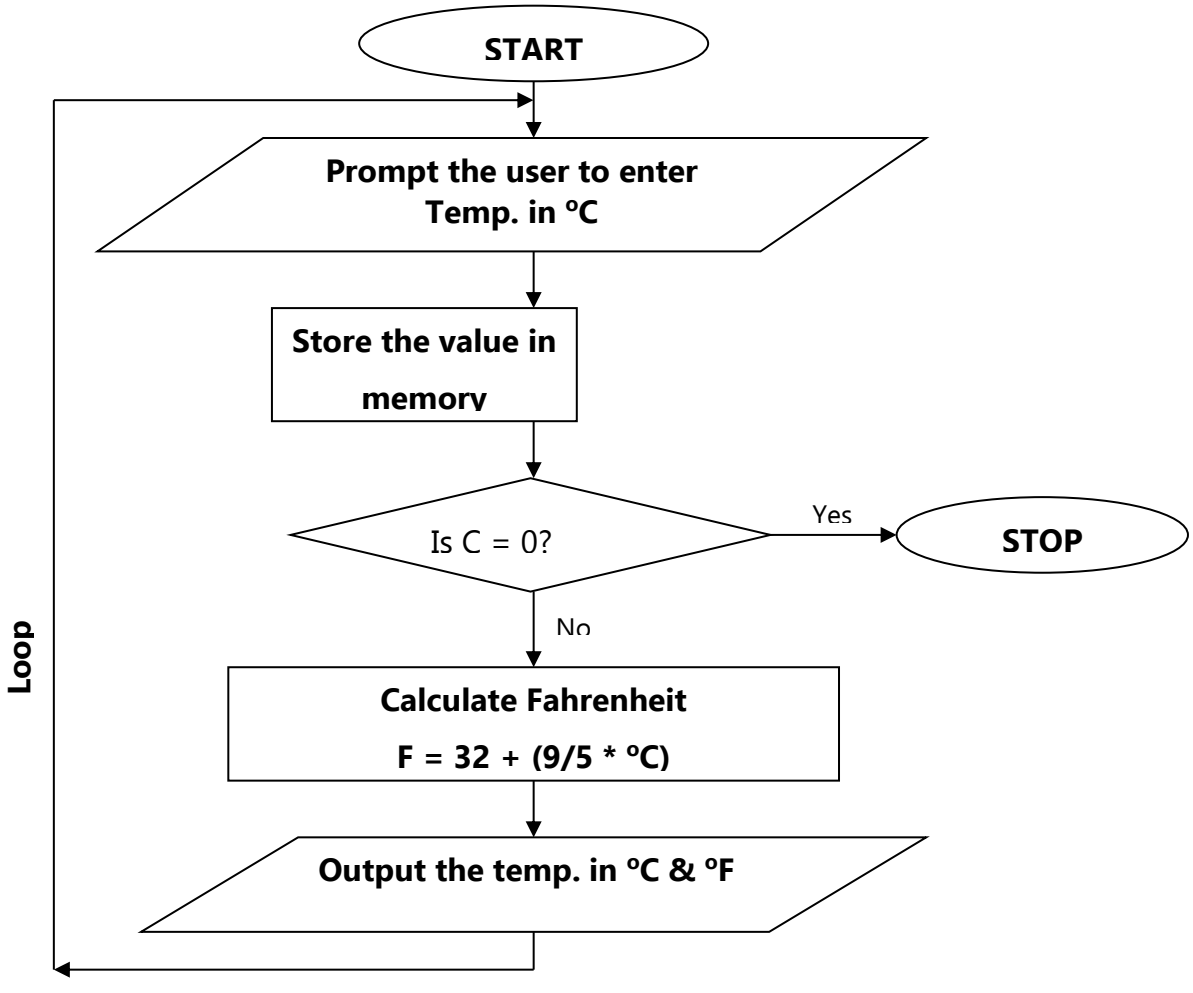
Types of loops:

(a). ***Conditional loop***. - This is where the required number of repetitions is not known in advance.

Pseudocode

STEP 1: [Prompt the user for temperature in °C]
STEP 2: [Store the value in memory]
STEP 3: **IF** C = 0 **THEN** Stop
STEP 4: [Calculate temperature in °F]
F: = 32 + (°C * 9/5)
STEP 5: [Output temperature in °C & °F]
STEP 6: [GOTO Step 1]

Flowchart



This algorithm illustrates **Conditional execution**. Conditional execution is a situation that requires that a logical test be carried out, and then a particular action be taken depending on the outcome of that test.
In this case, going to Step 4 will depend on whether the condition is True or False. E.g., If C = 10 then the condition 'C = 0' is False, and the program goes to Step 4. But if C = 0, then the condition is True, and the program stops.

(b). ***Unconditional loop***: - This is where the execution of the instructions is repeated some specified number of times.

(c). ***Continuous (infinite/unending) loop***: - This is where the computer repeats a process again and again, without ending.

Example:

STEP 1: [Prompt the user for temperature in °C]
STEP 2: [Store the value in memory]
STEP 3: [Calculate temperature in °F]
F: = 32 + (°C * 9/5)
STEP 4: [Output temperature in °C & °F]
STEP 5: [GOTO Step 1]

As long as a number is entered for °C, the algorithm does not stop when it reaches STEP 5 but rather transfers control to STEP 1, causing the algorithm/process to be repeated.
However, a zero (0) can be used to stop the program because; the program cannot give the Fahrenheit equivalent to 0 °C.

Requirements for loops:

1. *Control variable* (*Counter*): - it tells/instructs the program to execute a set of statements a number of times.
2. *Initialization*: - allocating memory space, which will be occupied by the output.
3. *Incrementing*: - increasing the control variable by a certain number before the next loop.

Generally, there are 3 main looping controls:

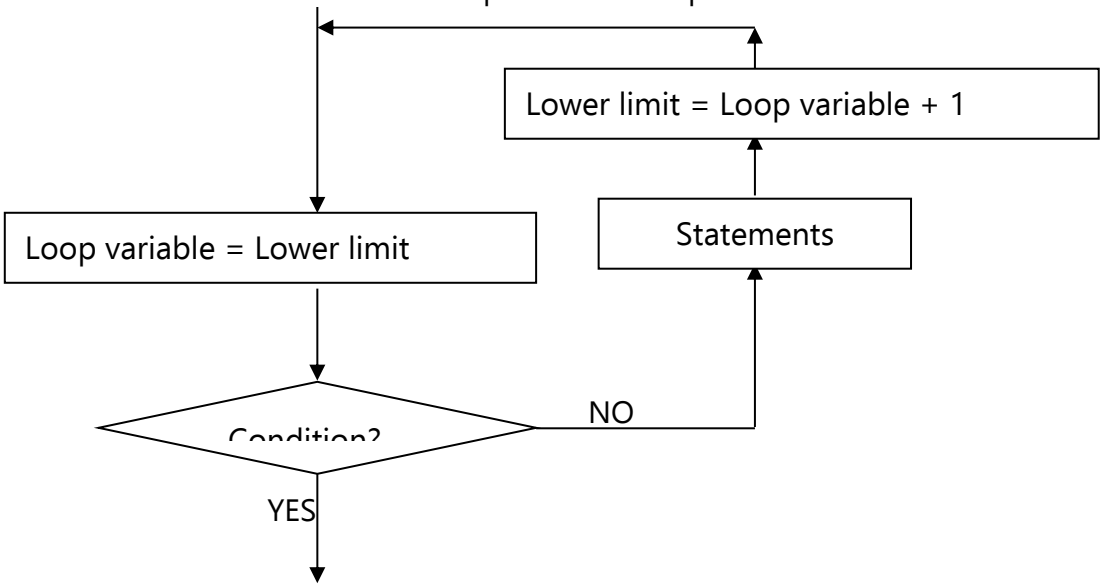
1. The WHILE loop
2. The REPEAT…UNTIL loop.
3. The FOR loop.

The FOR loop

The FOR loop is used in situations where execution of the chosen statements has to be repeated a predetermined number of times.
The general format of the FOR loop is:

FOR *loop variable* = *Lower limit* TO *Upper limit* DO
    Statements;
END FOR

The flowchart extract for a FOR loop that counts upwards is:



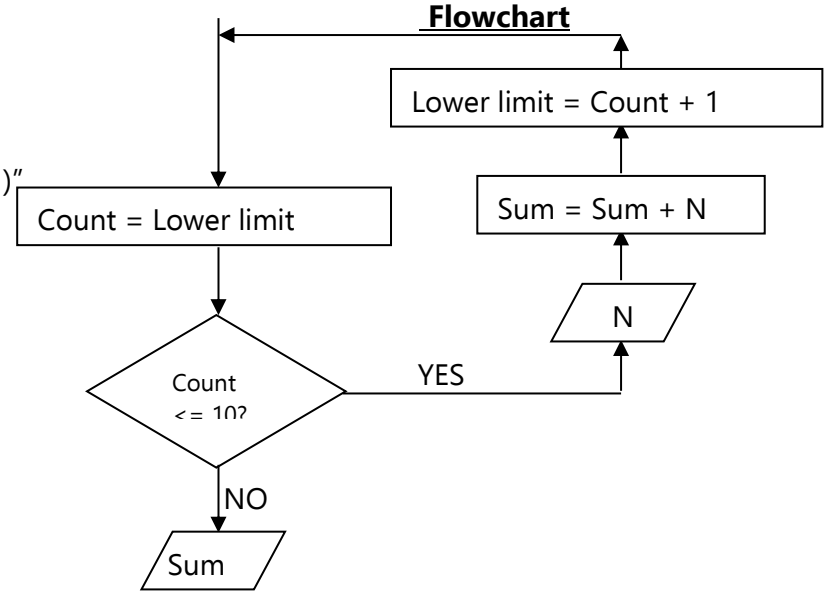
Example;

Consider a program that can be used to calculate the sum of ten numbers provided by the user. The 'FOR' loop can be used to prompt the user to enter the ten numbers at most 10 times. Once the numbers have been entered, the program calculates and displays the accumulated sum.

Pseudocode

```
FOR count = 1 TO 10 DO
        PRINT "Enter a number (N)"
        Sum = Sum + N
END FOR
Display SUM
```

Flowchart



Explanation

1. The *loop variable* (Count) is first initialized/set to the *Lower limit* whose value is 1.
2. The lower limit is then tested against the Upper limit whose value is set at 10.
3. If the lower limit is less than or equal to 10, the program will prompt the user to enter a number N, otherwise the computer will exit the loop.
4. After the last statement in the loop has been executed, the loop variable (count) is incremented by a 1 and stored in the lower limit, i.e., *Lower limit = Count + 1.*
5. The lower limit is again tested, and if it is less than or equal to 10, the loop is repeated until the time the lower limit will equal the upper limit.

NOTE:

The FOR loop can also be used to count downwards from the upper limit to the lower limit.

E.g., FOR count = 10 DOWN TO 1DO. In this case, the upper limit 10 is tested against the lower limit 1.

The WHILE loop

The 'WHILE' loop is used if a condition has to be met before the statements within the loop are executed.

E.g., to withdrawal money using an ATM, a customer must have a balance in his/her account.

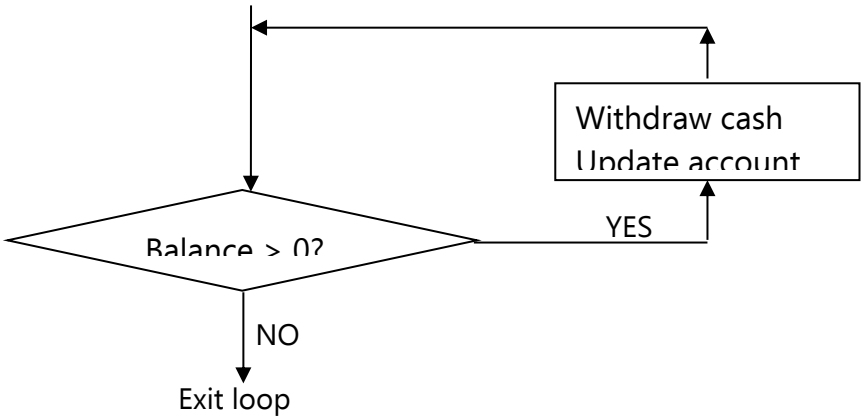
Therefore, it allows the statements to be executed *zero* or *many* times.

Pseudocode

```
WHILE Balance > 0 DO
        Withdraw cash

        Update account
ENDWHILE
```

Flowchart



Explanation

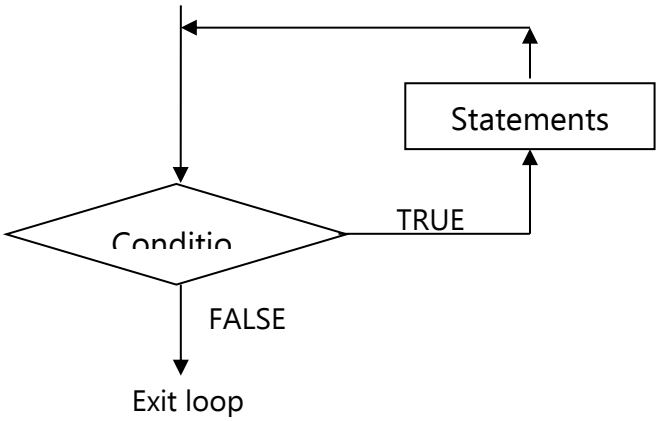
1. The condition *balance > 0* is first tested.
2. If it is TRUE, the account holder is allowed to withdraw cash.
3. The program exits the loop once the balance falls to zero.

The general representation of the WHILE loop is:

Pseudocode segment

```
WHILE Condition DO
        Statements;
ENDWHILE
```

Flowchart extract



The REPEAT…UNTIL loop

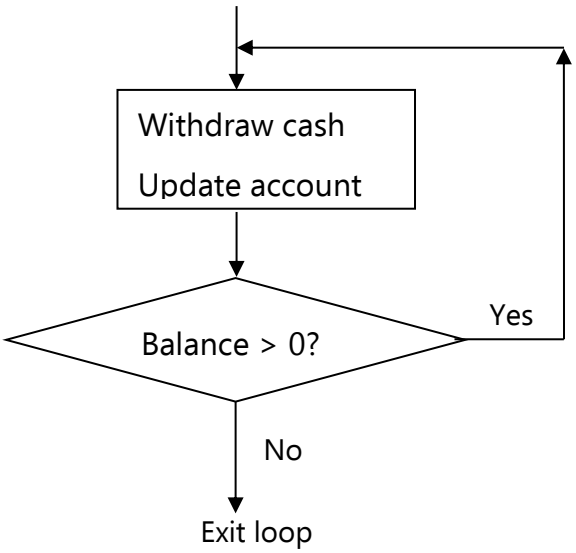
In REPEAT…UNTIL, the condition is tested at the end of the loop. Therefore, it allows statements within it to be executed at least once.

E.g., if REPEAT…UNTIL is used in case of the ATM cash withdrawal, the customer will be able to withdraw the cash at least once since availability of balance is tested at the end of the loop.

Pseudocode **Flowchart**

```
REPEAT
        Withdraw cash

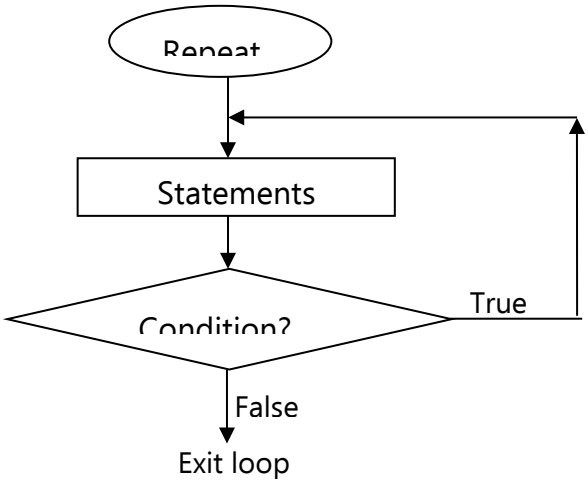
        Update account
UNTIL balance <= 0;
```



The general format of the REPEAT...UNTIL loop is:

Pseudocode segment **Flowchart extract**

```
REPEAT
        Statements;
UNTIL Condition;
```



WORKED OUT EXERCISES

Exercise 1:

With aid of a pseudocode and a flowchart, design an algorithm that:

a). Prompt the user to enter two numbers X and Y.

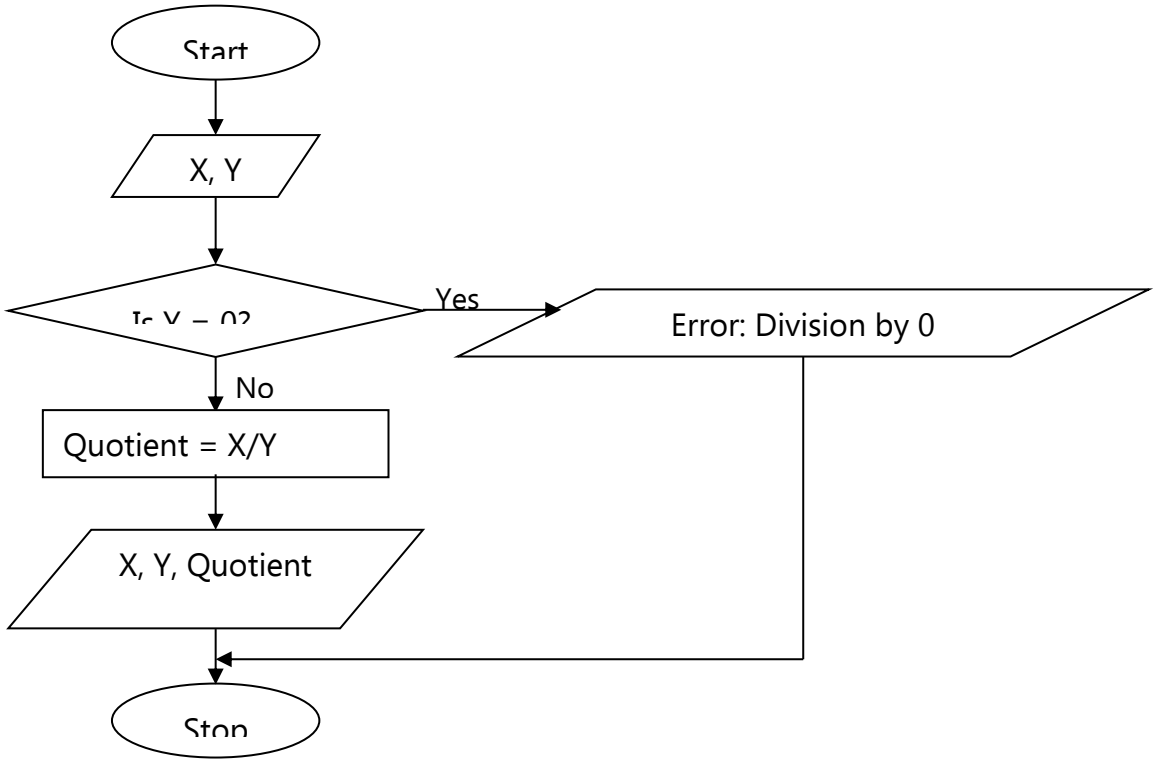
b). Divide X by Y. However, if the value of Y is 0, the program should display an error message "Error: Division by zero".

Pseudocode

```
START
    PRINT "Enter two numbers X and Y"
    INPUT X, Y
    IF Y = 0 THEN
        PRINT "Error: Division by zero"
    ELSE
     Quotient = X/Y
    PRINT X, Y, Quotient
```

```
    ENDIF
STOP
```

Flowchart



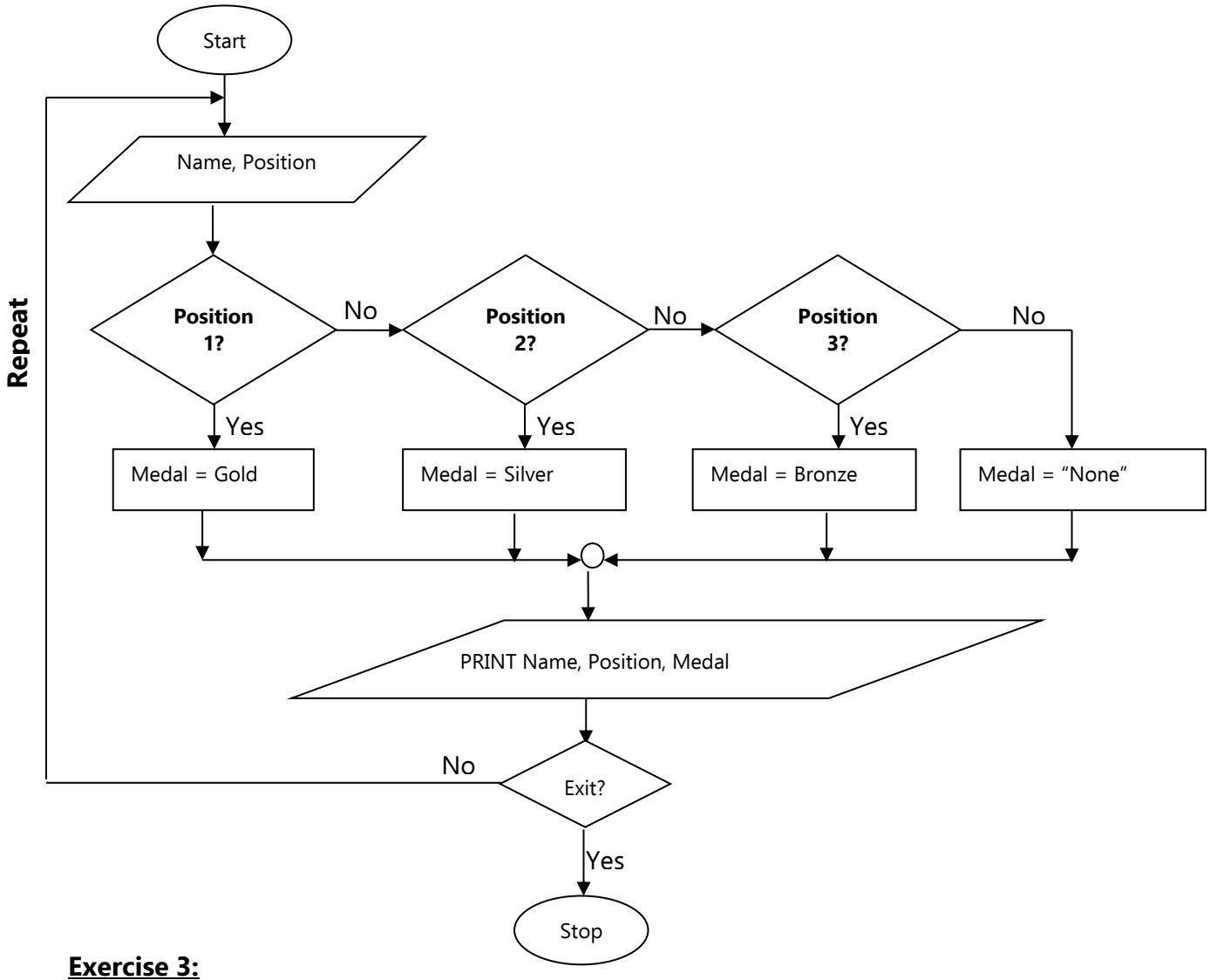
Exercise 2:

In an athletics competition, an athlete is rewarded as follows:
1st position: Gold
2nd position: Silver
3rd position: Bronze
Draw a pseudocode and a flowchart for a program that would be used to determine the type of medal to be rewarded to each athlete.

Pseudocode

```
START
    PRINT "Enter athlete Name and Position"
    INPUT Name, Position
    IF Position = 1 THEN
            Medal = "Gold"
    ELSE
        IF Position = 2 THEN
            Medal = "Silver"
        ELSE
            IF Position = 3 THEN
            Medal = "Bronze"
                ELSE
            Medal = "None"
            ENDIF
        ENDIF
    ENDIF
```

Flowchart



Exercise 3:

A lady deposits 2,000 shillings in a Microfinance company at an interest rate of 20% per annum. At the end of each year, the interest earned is added to the deposit and the new amount becomes the deposit for that year.

Write a pseudocode for a program that would track the growth of the deposits over a period of seven years.

```
START
    INPUT Initial Deposit
    INPUT Interest Rate
    SET Deposit to Initial deposit (i.e., 2000)
    SET Year to 0
    WHILE Year <= 7 DO
    Interest = Deposit x Interest rate
    Total = Deposit + Interest
    Deposit = Total                    {the new deposit}
    Year = Year + 1
    ENDWHILE
    PRINT Deposit, Year
STOP
```

Exercise 4:

The class teacher of Form 3S in a secondary school requested a programmer to design for her a simple program that would help her do the following:

(a) Enter the names of students and marks obtained in 8 subjects – Mathematics, English, Kiswahili, Biology, Chemistry, Business studies, Computer studies, and History.

(b) After entering the mark for each subject, the program should calculate the total and average marks for each student.

(c) Depending on the Average mark obtained, the program should assign grade as follows:

(i) Between 80 and 100 – A
(ii) Between 70 and 79 – B
(iii) Between 60 and 69 – C
(iv) Between 50 and 59 – D
(v) Below 50 – E

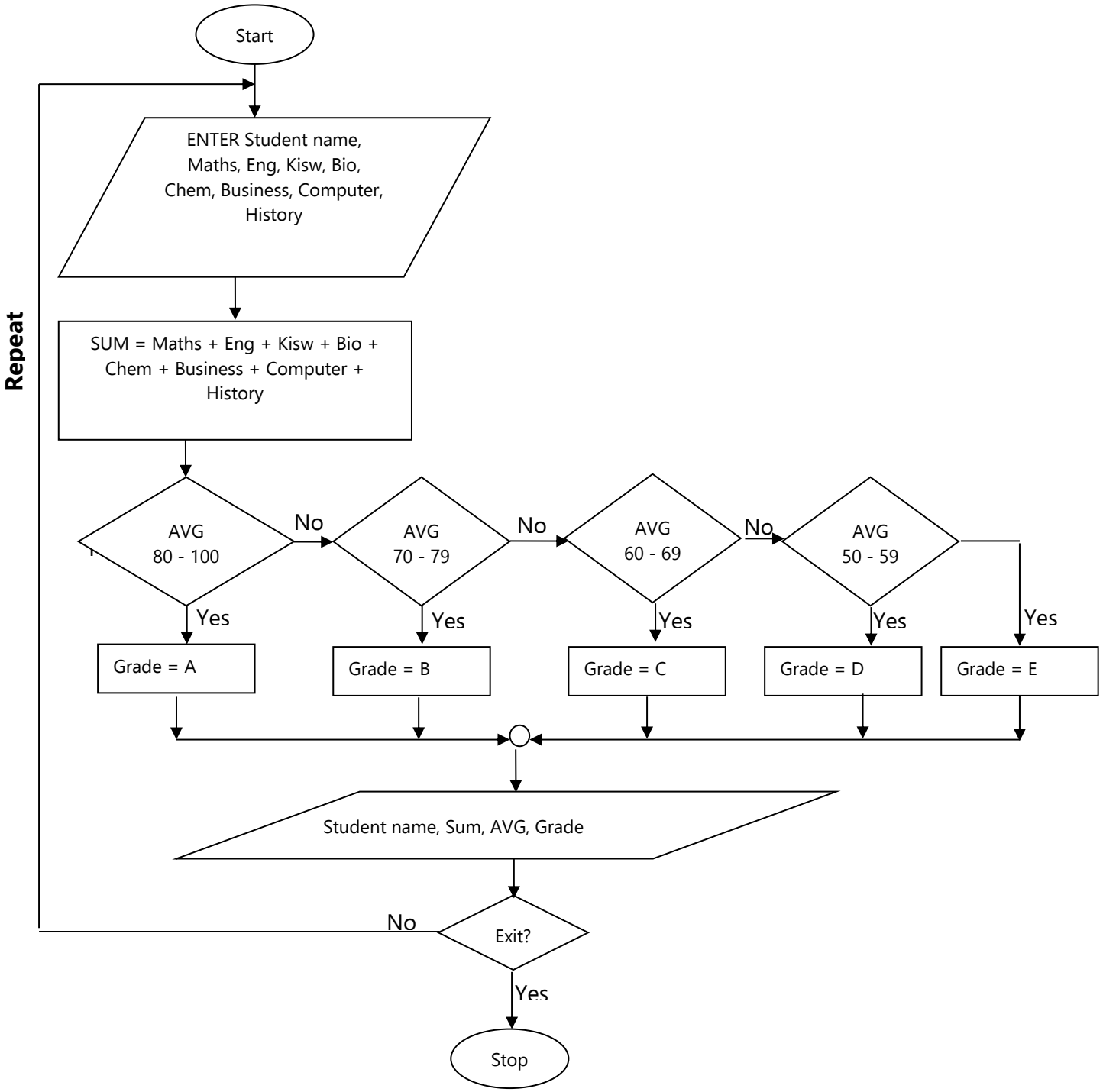
(d) The program should then display each student's Name, Total marks and the Average grade.

Using a pseudocode and a flowchart, write an algorithm that shows the design of the program.

Pseudocode

```
START
    REPEAT
    PRINT "Enter student Name and subject marks"
    INPUT Student name, Maths, Eng, Kisw, Bio, Chem, Business, Computer, History
    SUM = Maths + Eng + Kisw + Bio + Chem + Business + Computer + History
    AVG = SUM/8
    IF (AVG => 80) AND (AVG <= 100) THEN
            Grade = "A"
    ELSE
        IF (AVG => 70) AND (AVG <= 79) THEN
                Grade = "B"
        ELSE
            IF (AVG => 60) AND (AVG <= 69) THEN
                    Grade = "C"
            ELSE
                IF (AVG => 50) AND (AVG <= 59) THEN
                        Grade = "D"
                ELSE
                    Grade = "E"
            ENDIF
        ENDIF
      ENDIF
    ENDIF
    PRINT Student name, Sum, AVG, Grade
    UNTIL Count = Number of students
    STOP
```

Flowchart



Exercise 5:

Mutuku took a loan of Ksh. 400,000 from a local bank at an interest rate of 10% payable in four years. Assuming you wish to develop a computer program that will keep track of monthly repayments:

(a) Identify the input, processing and output requirements for such a program.

(b) Design the algorithm for the program using a simple flowchart and pseudocode.

(a). Requirements:

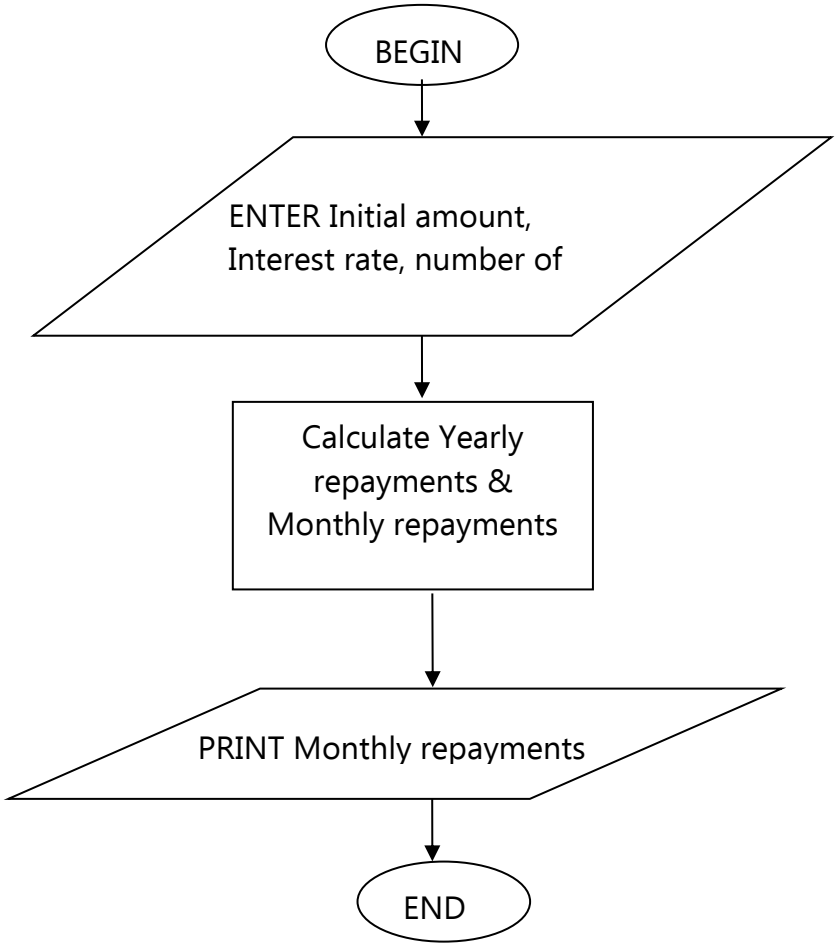
Input - Initial amount borrowed
- Interest rate
- Number of years

Processing - equation to calculate Yearly repayments and Monthly repayments.
Output - Monthly repayments calculated by the process

(b). Pseudocode:

START
  INPUT Initial amount borrowed
  INPUT Interest rate
  INPUT Number of years
  Calculate Yearly repayments
  Monthly repayments = (Yearly repayments / 12)
  OUTPUT Monthly repayments
STOP

Flowchart:



ELEMENTARY PROGRAMING USING C

YOUR FIRST C PROGRAM

You're probably eager to try your first program in C. To help you become familiar with your compiler, here's a quick program for you to work through. You might not understand everything at this point, but you should get a feel for the process of writing, compiling, and running a real C program.

This demonstration uses a program named HELLO.C, which does nothing more than display the words Hello, World! on-screen. This program, a traditional introduction to C programming, is a good one for you to learn. The source code for HELLO.C is given below;

```
1: #include <stdio.h>
2:
3: main()
4: {
5:     printf("Hello, World!\n");
6:     return 0;
7: }
```

Note that you do not have to include the lines and colons in the above code.

ENTERING AND COMPILING HELLO.C

To enter and compile the HELLO.C program, follow these steps:

1. Start your editor. As mentioned previously, any text editor can be used, but most C compilers (such as Borland's Turbo C++ , Code Blocks and Microsoft's Visual C/C++) come with an integrated development environment (IDE) that lets you enter, compile, and link your programs in one convenient setting. If you don't have an editor/comp*iler, use a search engine to find and download any of the above and install it to your computer.*

2. Use the keyboard to type the HELLO.C source code exactly as shown above Press Enter at the end of each line.

3. Save the source code. You should name the file HELLO.C.

4. Compile and link HELLO.C. Execute the appropriate command specified for compiler. You should get a message stating that there were no errors or warnings.

5. Check the compiler messages. If you receive no errors or warnings, everything should be okay.

If you made an error typing the program, the compiler will catch it and display an error message. For example, if you misspelled the word printf as prntf, you would see a message similar to the following:

Error: undefined symbols: _prntf in hello.c (hello. OBJ)

6. Go back to step 2 if this or any other error message is displayed. Open the HELLO.C file in your editor. Check your codes, make any necessary corrections, and continue with step 3.

7. Your first C program should now be compiled and ready to run. If you display a directory listing of all files named HELLO (with any extension), you should see the following:

HELLO.C, the source code file you created with your editor

HELLO.OBJ or HELLO.O, which contains the object code for HELLO.C

HELLO.EXE, the executable program created when you compiled and linked HELLO.C
9. To *execute,* or run, HELLO.EXE, simply enter hello. The message Hello, World! is displayed on-screen.
Congratulations! You have just entered, compiled, and run your first C program. Admittedly, HELLO.C is a simple program that doesn't do anything useful, but it's a start. In fact, most of today's expert C programmers started learning C in this same way--by compiling HELLO.C--so you're in good company.

COMPILATION ERRORS

A compilation error occurs when the compiler finds something in the source code that it can't compile. A misspelling, typographical error, or any of a dozen other things can cause the compiler to choke. Fortunately, modern compilers don't just choke; they tell you what they're choking on and where it is! This makes it easier to find and correct errors in your source code.
This point can be illustrated by introducing a deliberate error into HELLO.C. If you worked through that example (and you should have), you now have a copy of HELLO.C on your disk. For example, erase the terminating semicolon on the line that contains the printf() and then try to compile. The compiler displays a message similar to the following:
hello.c(6) : Error: `;' expected
Looking at this line, you can see that it has three parts:
hello.c The name of the file where the error was found
(6) : The line number where the error was found

LINKER ERROR MESSAGES

Linker errors are relatively rare and usually result from misspelling the name of a C library function. In this case, you get an Error: undefined symbols: error message, followed by the misspelled name (preceded by an underscore). Once you correct the spelling, the problem should go away.

A SHORT C PROGRAM

The listing below presents the source code for MULTIPLY.C. This is a very simple program. All it does is input two numbers from the keyboard and calculate their product. At this stage, don't worry about understanding the details of the program's workings. The point is to gain some familiarity with the parts of a C program.
Before looking at the sample program, you need to know what a function is, because functions are central to C programming. A *function* is an independent section of program code that performs a certain task and has been assigned a name. By referencing a function's name, your program can execute the code in the function. The program also can send information, called *arguments,* to the function, and the function can return information to the main part of the program. The two types of C functions are *library functions,* which are a part of the C compiler package, and *user-defined functions,* which you, the programmer, create. You will learn about both types of functions as we proceed.

SOURCE CODE FOR MULTIPLY.C.

```
1:  /* Program to calculate the product of two numbers. */
2:  #include <stdio.h>
3:
4:  int a,b,c;
```

```
5:
6:  int product(int x, int y);
7:
8:  main()
9:  {
10:     /* Input the first number */
11:     printf("Enter a number between 1 and 100: ");
12:     scanf("%d", &a);
13:
14:     /* Input the second number */
15:     printf("Enter another number between 1 and 100: ");
16:     scanf("%d", &b);
17:
18:     /* Calculate and display the product */
19:     c = product(a, b);
20:     printf ("%d times %d = %d\n", a, b, c);
21:
22:     return 0;
23: }
24:
25: /* Function returns the product of its two arguments */
26: int product(int x, int y)
27: {
28:     return (x * y);
29: }
```

Enter a number between 1 and 100: **35**
Enter another number between 1 and 100: **23**
35 times 23 = 805

THE PROGRAM'S COMPONENTS

The following sections describe the various components of the preceding sample program. Line numbers are included so that you can easily identify the program parts being discussed.

The main() Function (Lines 8 Through 23)

The only component that is required in every C program is the main() function. In its simplest form, the main() function consists of the name main followed by a pair of empty parentheses (()) and a pair of braces ({}). Within the braces are statements that make up the main body of the program. Under normal circumstances, program execution starts at the first statement in main() and terminates at the last statement in main().

The #include Directive (Line 2)

The #include directive instructs the C compiler to add the contents of an include file into your program during compilation. **An *include file* is a separate disk file that contains information needed by your program or the compiler.** Several of these files (sometimes called *header files*) are supplied with your compiler. You never need to modify the information in these files; that's why they're kept separate from your source code. Include files should all have an .H extension (for example, STDIO.H).

You use the #include directive to instruct the compiler to add a specific include file to your program during compilation. The #include directive in this sample program means "Add the contents of the file STDIO.H." Most C programs require one or more include files.

The Variable Definition (Line 4)

A *variable* is a name assigned to a data storage location. Your program uses variables to store various kinds of data during program execution. In C, a variable must be defined before it can be used. A variable definition informs the compiler of the variable's name and the type of data it is to hold. In the sample program, the definition on line 4, int a,b,c;, defines three variables--named a, b, and c--that will each hold an integer value. We will discuss about variables when we look at "Storing Data: Variables and Constants."

The Function Prototype (Line 6)

A *function prototype* provides the C compiler with the name and arguments of the functions contained in the program. It must appear before the function is used. A function prototype is distinct from a *function definition,* which contains the actual statements that make up the function.

Program Statements (Lines 11, 12, 15, 16, 19, 20, 22, and 28)

The real work of a C program is done by its statements. C statements display information on-screen, read keyboard input, perform mathematical operations, call functions, read disk files, and carry out all the other operations that a program needs to perform. For now, remember that in your source code, C statements are generally written one per line and always end with a semicolon. The statements in MULTIPLY.C are explained briefly in the following sections.

printf()

The printf() statement (lines 11, 15, and 20) is a library function that displays information on-screen. The printf() statement can display a simple text message (as in lines 11 and 15) or a message and the value of one or more program variables (as in line 20).

scanf()

The scanf() statement (lines 12 and 16) is another library function. It reads data from the keyboard and assigns that data to one or more program variables.

The program statement on line 19 calls the function named product(). In other words, it executes the program statements contained in the function product(). It also sends the arguments a and b to the function. After the statements in product() are completed, product() returns a value to the program. This value is stored in the variable named c.

return

Lines 22 and 28 contain return statements. The return statement on line 28 is part of the function product(). It calculates the product of the variables x and y and returns the result to the program statement that called product(). The return statement on line 22 returns a value of 0 to the operating system just before the program ends.

The Function Definition (Lines 26 Through 29)

A function is an independent, self-contained section of code that is written to perform a certain task. Every function has a name, and the code in each function is executed by including that function's name in a program statement. This is known as *calling* the function.

The function named product(), in lines 26 through 29, is a user-defined function. As the name implies, user-defined functions are written by the programmer during program

development. This function is simple. All it does is multiply two values and return the answer to the program that called it.

Program Comments (Lines 1, 10, 14, 18, and 25)

Any part of your program that starts with /* and ends with */ is called a *comment*. The compiler ignores all comments, so they have absolutely no effect on how a program works. You can put anything you want into a comment, and it won't modify the way your program operates. A comment can span part of a line, an entire line, or multiple lines. Here are three examples:

```
/* A single-line comment */
int a,b,c; /* A partial-line comment */
/* a comment
spanning
multiple lines */
```

However, you shouldn't use *nested* comments (in other words, you shouldn't put one comment within another). Most compilers would not accept the following:

```
/*
/* Nested comment */
*/
```

Some compilers do allow nested comments. Although this feature might be tempting to use, you should avoid doing so. Because one of the benefits of C is portability, using a feature such as nested comments might limit the portability of your code. Nested comments also might lead to hard-to-find problems.

NOTE: Many people have started using a newer style of comments in their C programs. Within C++ and Java, you can use double forward slashes to signal a comment. Here are two examples:

```
// This entire line is a comment
int x;  // Comment starts with slashes.
```

The two forward slashes signal that the rest of the line is a comment. Although many C compilers support this form of comment, you should avoid it if you're interested in portability.

Braces (Lines 9, 23, 27, and 29)

You use braces ({}) to enclose the program lines that make up every C function--including the *main()* function. A group of one or more statements enclosed within braces is called a *block*.

A NOTE ON ACCURACY

A computer is fast and accurate, but it also is completely literal. It doesn't know enough to correct your simplest mistake; it takes everything you enter exactly as you entered it, not as you meant it!

This goes for your C source code as well. A simple typographical error in your program can cause the C compiler to choke, gag, and collapse. Fortunately, although the compiler isn't smart enough to correct your errors (and you'll make errors--everyone does!), it *is* smart enough to recognize them as errors and report them to you.

Storing Data in C Programs: Variables and Constants

VARIABLES

A *variable* is a named data storage location in your computer's memory. By using a variable's name in your program, you are, in effect, referring to the data stored there.

VARIABLE NAMES

To use variables in your C programs, you must know how to create variable names. In C, variable names must adhere to the following rules:

- The name can contain letters, digits, and the underscore character (_).
- The first character of the name must be a letter. The underscore is also a legal first character, but its use is not recommended.
- Case matters (that is, upper- and lowercase letters). Thus, the names "count" and "COUNT" refer to two different variables.
- C keywords can't be used as variable names. A keyword is a word that is part of the C language.

The following list contains some examples of legal and illegal C variable names:

Variable Name	*Legality*
Percent	Legal
y2x5__fg7h	Legal
annual_profit	Legal
_1990_tax	Legal but not advised
savings#account	Illegal: Contains the illegal character #
Double	Illegal: Is a C keyword
9winter	Illegal: First character is a digit

Because C is case-sensitive, the names percent, PERCENT, and Percent would be considered three different variables. C programmers commonly use only lowercase letters in variable names, although this isn't required. Using all-uppercase letters is usually reserved for the names of constants.

For many compilers, a C variable name can be up to 31 characters long. (It can actually be longer than that, but the compiler looks at only the first 31 characters of the name.) With this flexibility, you can create variable names that reflect the data being stored. For example, a program that calculates loan payments could store the value of the prime interest rate in a variable named interest_rate. The variable name helps make its usage clear. Many naming conventions are used for variable names created from multiple words. You've seen one style: interest_rate. Using an underscore to separate words in a variable name makes it easy to interpret.

The second style is called *camel notation*. Instead of using spaces, the first letter of each word is capitalized. Instead of interest_rate, the variable would be named InterestRate. Camel notation is gaining popularity, because it's easier to type a capital letter than an underscore.

NOTE

DO use variable names that are descriptive.
DO adopt and stick with a style for naming your variables.
DON'T start your variable names with an underscore unnecessarily.
DON'T name your variables with all capital letters unnecessarily.

NUMERIC VARIABLE TYPES

C provides several different types of numeric variables. You need different types of variables because different numeric values have varying memory storage requirements and differ in the ease with which certain mathematical operations can be performed on them. Small integers (for example, 1, 199, and -8) require less memory to store, and your computer can perform mathematical operations (addition, multiplication, and so on) with such numbers very quickly. In contrast, large integers and floating-point values (123,000,000 or 0.000000871256, for

example) require more storage space and more time for mathematical operations. By using the appropriate variable types, you ensure that your program runs as efficiently as possible.
C's numeric variables fall into the following two main categories:

- Integer variables hold values that have no fractional part (that is, whole numbers only). Integer variables come in two flavors: signed integer variables can hold positive or negative values, whereas unsigned integer variables can hold only positive values (and 0).
- Floating-point variables hold values that have a fractional part (that is, real numbers).

Within each of these categories are two or more specific variable types. These are summarized in the table below which also shows the amount of memory, in bytes, required to hold a single variable of each type when you use a microcomputer with 16-bit architecture.

TABLE SHOWING C'S NUMERIC DATA TYPES.

Variable Type	Keyword	Bytes	Range
Character	Char	1	-128 to 127
Integer	Int	2	-32768 to 32767
Short integer	Short	2	-32768 to 32767
Long integer	Long	4	-2,147,483,648 to 2,147,438,647
Unsigned character	Unsigned char	1	0 to 255
Unsigned integer	Unsigned int	2	0 to 65535
Unsigned short integer	Unsigned short	2	0 to 65535
Unsigned long integer	Unsigned long	4	0 to 4,294,967,295
Single-precision floating-point	Float	4	1.2E-38 to 3.4E38[1]
Double-precision floating-point	Double	8	2.2E-308 to 1.8E308[2]

Approximate range means the highest and lowest values a given variable can hold. (Space limitations prohibit listing exact ranges for the values of these variables.) *Precision* means the accuracy with which the variable is stored. (For example, if you evaluate 1/3, the answer is 0.33333... with 3s going to infinity. A variable with a precision of 7 stores seven 3s.)
Looking at the above table, you might notice that the variable types int and short are identical. Why are two different types necessary? The int and short variable types are indeed identical on 16-bit IBM PC-compatible systems, but they might be different on other types of hardware. On a VAX system, a short and an int aren't the same size. Instead, a short is 2 bytes, whereas an int is 4. Remember that C is a flexible, portable language, so it provides different keywords for the two types. If you're working on a PC, you can use int and short interchangeably.
No special keyword is needed to make an integer variable signed; integer variables are signed by default. You can, however, include the signed keyword if you wish. The keywords shown in the table are used in variable declarations.
Although we have said the size of the data types can vary depending on your computer platform, C does make some guarantees, thanks to the ANSI Standard. There are five things you can count on:

- The size of a char is one byte.
- The size of a short is less than or equal to the size of an int.
- The size of an int is less than or equal to the size of a long.
- The size of an unsigned is equal to the size of an int.
- The size of a float is less than or equal to the size of a double

VARIABLE DECLARATIONS

Before you can use a variable in a C program, it must be declared. A variable declaration tells the compiler the name and type of a variable and optionally initializes the variable to a specific value. If your program attempts to use a variable that hasn't been declared, the compiler generates an error message. A variable declaration has the following form:

typename varname;

typename specifies the variable type and must be one of the keywords listed in the above table. *varname* is the variable name, which must follow the rules mentioned earlier. You can declare multiple variables of the same type on one line by separating the variable names with commas:

```
int count, number, start;    /* three integer variables */
float percent, total;        /* two float variables */
```

Later, you'll learn that the location of variable declarations in the source code is important, because it affects the ways in which your program can use the variables. For now, you can place all the variable declarations together just before the start of the main() function.

INITIALIZING NUMERIC VARIABLES

When you declare a variable, you instruct the compiler to set aside storage space for the variable. However, the value stored in that space--the value of the variable--isn't defined. It might be zero, or it might be some random "garbage" value. Before using a variable, you should always initialize it to a known value. You can do this independently of the variable declaration by using an assignment statement, as in this example:

```
int count;   /* Set aside storage space for count */
count = 0;   /* Store 0 in count */
```

Note that this statement uses the equal sign (=), which is C's assignment operator. We shall discuss this sign when look at Statements, Expressions, and Operators. For now, you need to be aware that the equal sign in programming is not the same as the equal sign in algebra. If you write

```
x = 12
```

in an algebraic statement, you are stating a fact: "x equals 12." In C, however, it means something quite different: "Assign the value 12 to the variable named x."

You can also initialize a variable when it's declared. To do so, follow the variable name in the declaration statement with an equal sign and the desired initial value:

```
int count = 0;
double percent = 0.01, taxrate = 28.5;
```

Be careful not to initialize a variable with a value outside the allowed range. Here are two examples of out-of-range initializations:

```
int weight = 100000;
unsigned int value = -2500;
```

The C compiler doesn't catch such errors. Your program might compile and link, but you might get unexpected results when the program is run.

DO understand the number of bytes that variable types take for your computer.
DO use typedef to make your programs more readable.
DO initialize variables when you declare them whenever possible.
DON'T use a variable that hasn't been initialized. Results can be unpredictable.

DON'T use a float or double variable if you're only storing integers. Although they will work, using them is inefficient.
DON'T try to put numbers into variable types that are too small to hold them.
DON'T put negative numbers into variables with an unsigned type.

C PROGRAMMING PRACTICE EXERCISES:

Use an editor and compiler program to type the following programs and run them they should compile and run without errors:

POEM.C: PROGRAM TO DISPLAY A POEM ABOUT HIV/AIDS

This program demonstrates the use of escape sequences (\t and \n).

```
1:  #include <stdio.h>
2:  int a;
3:  int main(){
4:  puts(" \t\tHIV\\AIDS, HIV\AIDS, HIV/AIDS! \a");
5:  printf("\n");
6:  printf("\t\tU've killed our loved %ds,\n",1) ;
7:  puts("\t\tU've kept our souls in misery\b");
8:  printf("U've were here yesterday,\n");
9:  printf("\t\tU r here  %d day,\n",2);
10:printf("\t\tU r here %d stay.\n",2);
11:printf("\n");
12:printf("\t\tWhere are you' \n");
13:printf("\t\tIn the whole of East africa U r there,\n");
14:printf("\t\tU've travelled the whole African continent,\n");
15:printf("\t\tEven in America, Asia & Australia, U r
   there,\n");
16:printf("\t\tBehold U've spread %d the whole world.\n\n\n",2);
17:return 0;
18: }
```

A PROGRAM THAT DOES A SUM AND PRINTS THE RESULT TO THE SCREEN

```
1:   /* Add.c: Calculate an addition and print out the result */
2:   #include <stdio.h>
3:   /* This function adds two integers and returns the result */
4:   int integer_add( int x, int y ) {
5:   int result;
6:   result = x + y;
7:   return result;
8:   }
9:   int main() {
10:  int sum;
11:  sum = integer_add( 5, 12);
12:  printf("The addition of 5 and 12 is %d.\n", sum);
13:  return 0;
14:  }
```

WRITE A C PROGRAM TO CONVERT A GIVEN INTEGER (IN SECONDS) TO HOURS, MINUTES AND SECONDS.

```
1:  #include <stdio.h>
2:  int main() {
3:      int sec, h, m, s;
4:      printf("Input seconds: ");
5:      scanf("%d", &sec);
6:      h = (sec/3600);
```

```
7:     m = (sec -(3600*h))/60;
8:     s = (sec -(3600*h)-(m*60));
9:     printf("H:M:S - %d:%d:%d\n",h,m,s);
10:    return 0;
11:}
```

CONVERTS A TEMPERATURE FROM CENTIGRADE TO FAHRENHEIT

Fahrenheit and centigrade are two temperature scales in use today. In the Fahrenheit scale, water freezes at 32 degrees and boils at 212 degrees. The formular used to convert is C = (5/9) * (F - 32) , where F is the Fahrenheit temperature.

```
1: #include <stdio.h>
2: float temp_f;      /* degrees fahrenheit */
3: float temp_c;      /* degrees centigrade */
4: char line_text[50];         /* a line of input */
5: int main() {
6:    printf("Input a temperature (in Centigrade): ");
7:    fgets(line_text, sizeof(line_text), stdin);
8:    sscanf(line_text, "%f", &temp_c);
9:    temp_f = ((9.0 / 5.0) * temp_c) + 32.0;
10:        printf("%f degrees Fahrenheit.\n", temp_f);
11:        return(0);
12:   }
```

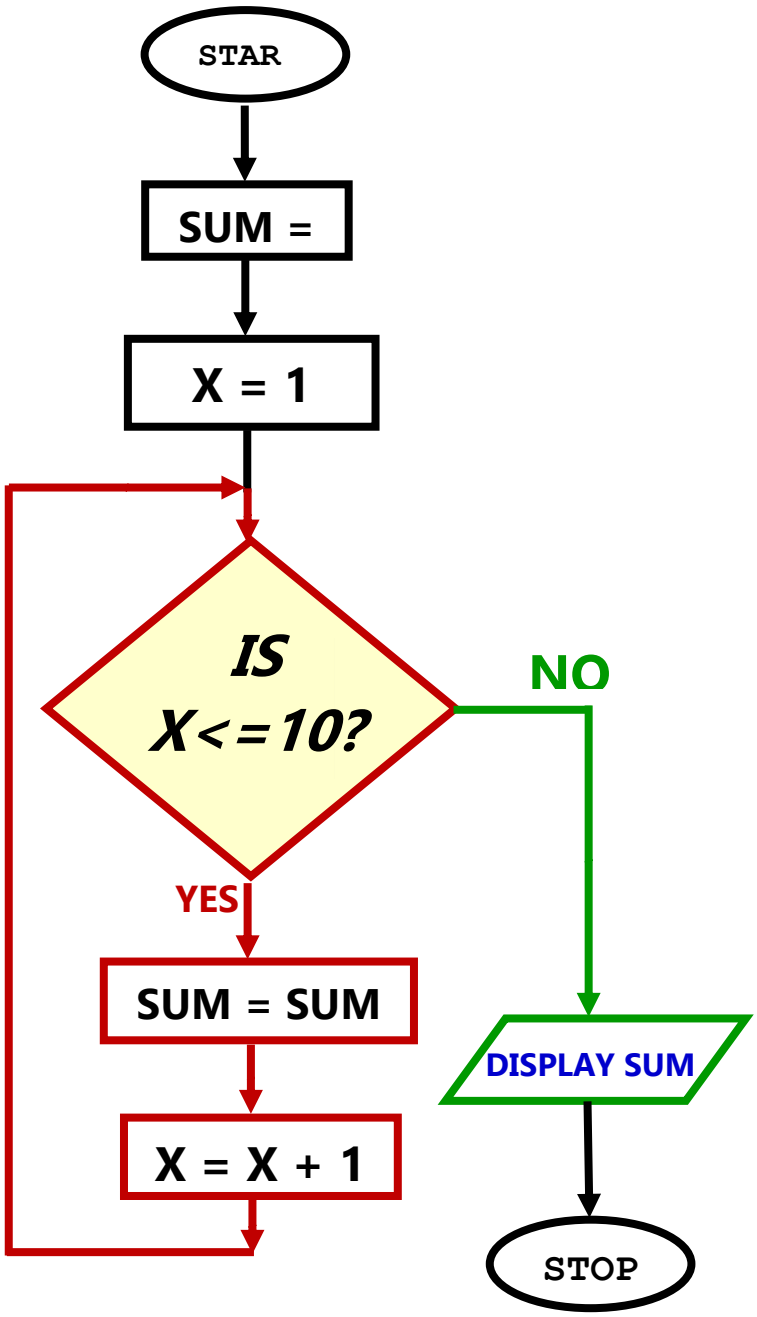
CAPTURES YOUR NAME AND YEAR OF BIRTH AND DISPLAYS YOUR AGE AND NAME.

```
1: #include <stdio.h>
2: int main(){
3:     char firstname[20], lastname[20];
4:     int bir_year, current_year, age;
5:     printf("Input your firstname: ");
6:     scanf("%s", firstname);
7:     printf("Input your lastname: ");
8:  scanf("%s", lastname);
9:  printf("Input your year of birth: ");
10:    scanf("%d", &bir_year);
11:    printf("Input current year: ");
12:    scanf("%d", &current_year);
13:    age = current_year - bir_year;
14:    printf("\n%s %s you're %d years old.",firstname,lastname,age);
15:       return 0;
16:   }
```

QUAD.C: PROGRAM TO DISPLAY THE ROOTS X1 AND X2 OF A QUADRATIC EQUATION $AX^2 + BX + C$

```
1: #include<stdio.h>
2:  #include<math.h>
3:  int a,b,c,x1,x2;
4:  main(){
5:  printf("QUADRATIC EQUATION SOLVER FOR ax^2 + bx + c = 0\n");
6:  printf("Please enter the coeficients a,b and c,\n separated
    by spaces:\n");
7:  scanf("%d%d%d",&a,&b,&c);
8:  x1=(-b+sqrt(b*b-4*a*c))/(2*a);
9:  x2=(-b-sqrt(b*b-4*a*c))/(2*a);
10:printf("\nThe roots are are %d and %d",x1,x2);
11:return 0;
12:}
```

PROGRAM THAT SUMS UP INTEGERS FROM 1 TO 10



FLOW CHART DRY RUN

X	IS X<=10?	SUM=SUM+X
1	YES	0+1=1
1+1=2	YES	1+2=3
2+1=3	YES	3+3=6
3+1=4	YES	6+4=10
4+1=5	YES	10+5=15
5+1=6	YES	15+6=21
6+1=7	YES	21+7=28
7+1=8	YES	28+8=36
8+1=9	YES	36+9=45
9+1=10	YES	45+10=55
10+1=11	NO	SUM=55

The equivalent **pseudo code** is:

```
START
    SUM=0;
    X =1;
  REPEAT
    IF X<=10
    THEN
    SUM=SUM+X;
    X=X+1;
    UNTIL X>10
  DISPLAY SUM
STOP
```

The equivalent **c code** is:

```
#include <stdio.h>
main() {
 int sum=0;
 int x=1;

 while(x<=10){
 sum=sum+x;
 x=x+1;        //Or x++;
 }
 printf("Sum is %d.\n",sum);
 return(0);
}
```

PRACTICE ASSIGNMENT:

Use C programming language to write source code for all the programs which have been designed using pseudo code and flow charts in the section on developing algorithms in this Topic.
Use a suitable editor such as Dev C++ or CodeBlocks to create the programs on computer, debug and run.

ELEMENTARY PROGRAMING USING VISUAL BASIC

Visual Basic is a third-generation event-driven programming language and integrated development environment (IDE) from Microsoft. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC, a user-friendly programming language designed for beginners, and it enables the rapid application development (RAD) of graphical user interface (GUI) applications.

Microsoft launched VB.NET in 2002 as the successor to its original Visual Basic language. Although the ".NET" portion of the name was dropped in 2005.

Visual Studio

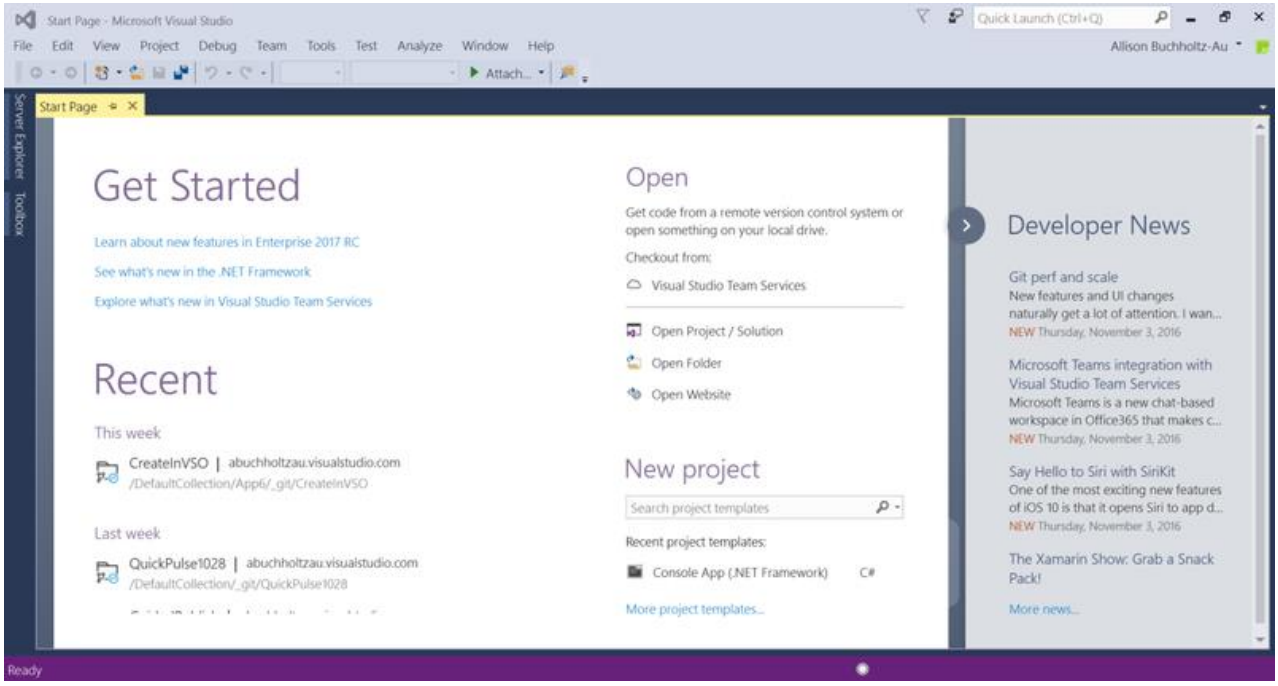
Microsoft's integrated development environment (IDE) for developing in Visual Basic .NET language is Visual Studio. Most of Visual Studio editions are commercial; the only exceptions are Visual Studio Express and Visual Studio Community, which are freeware.

Visual Studio Community 2017 is the current Free, fully-featured IDE for students, open-source and individual developers. Visual Basic 2017 is the latest version of Visual Basic launched by Microsoft in 2017. Visual Basic 2017 is bundled together with other Microsoft Programming languages C# C++, F#, JavaScript, Python and more in a package called Visual Studio Community 2017 Release Candidate. Microsoft has added many new features in Visual Studio 2017 particularly those features for building mobile applications.

Downloading Visio Studio

Visual Studio Community 2017 RC can be downloaded from https://www.visualstudio.com/downloads/ . You need to have a Microsoft account to download the package.

When you first launch Visual Studio Community 2017, the following start Page appears, as shown below:

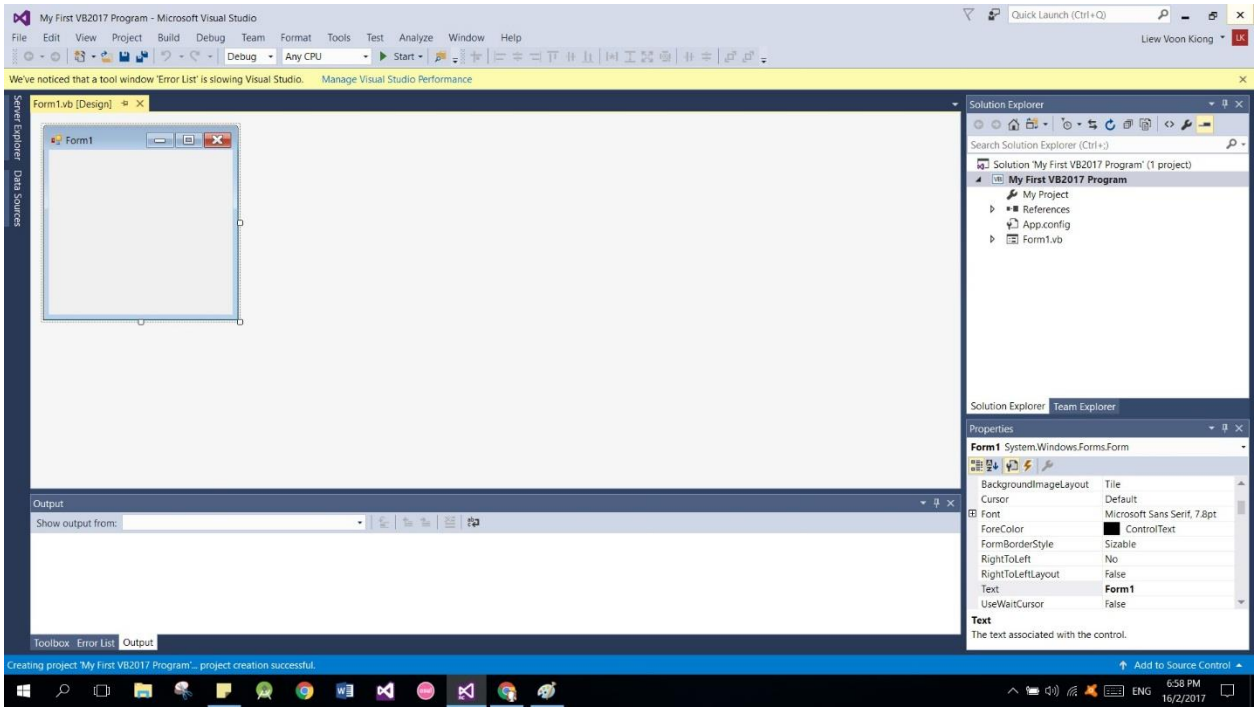


Now click on New Project under Start to launch the New Project window, In the New Project window, you can build many kinds of applications using different programming languages. They are Visual Basic, Visual C#, Visual C++, Visual F#, JavaScript, Python and more. As we are only dealing with Visual Basic, we shall click on Visual Basic Windows Form APP(.NET Framework). Before you continue, enter the application name

at the bottom. Change the default name WindowsApplication1 to My First VB2017 project.

Visual Basic Community 2017 Integrated Development Environment

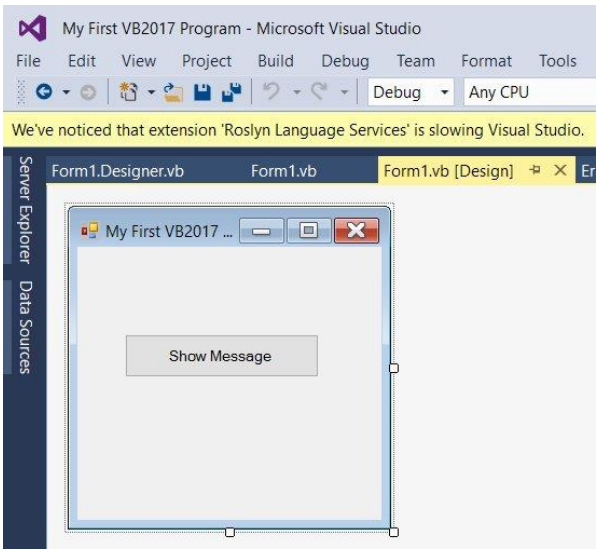
Upon clicking on the Windows Form Application, the Visual Basic Community 2017 Integrated Development Environment appears, as shown in Figure below. You can see that the name of the project you entered earlier appears on the top right corner of the IDE.



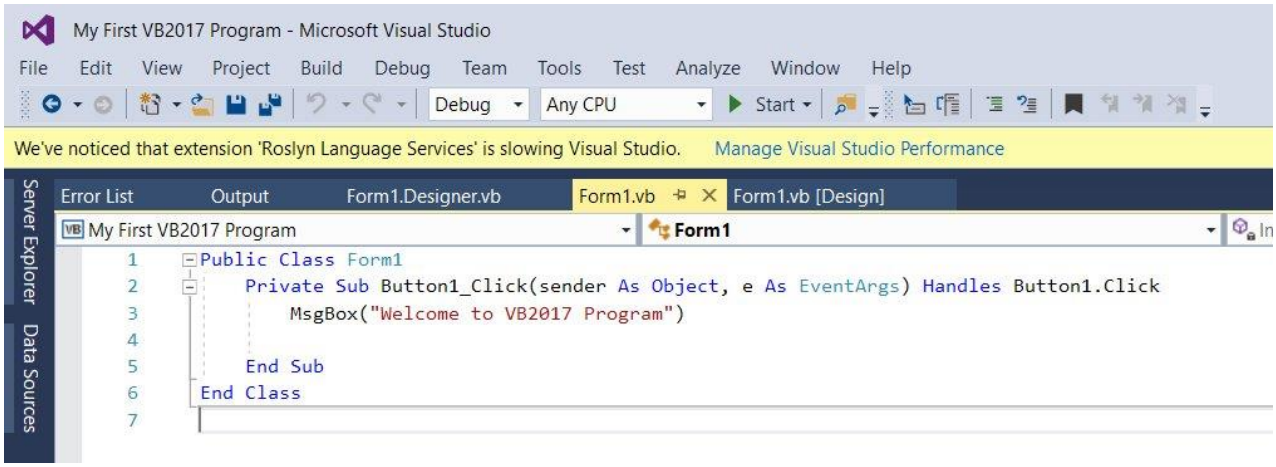
Visual Basic Community 2017 IDE comprises a few windows, the Form window, the Solution Explorer window and the Properties window. It also consists of a toolbox which contains many useful controls that allow a programmer to develop his or her Visual Basic 2017 programs. The toolbox can be hidden or dragged to the bottom or side of the window.

YOUR FIRST VISUAL BASIC PROGRAM

Now, we shall proceed to show you how to create your first program in Visual Basic 2017. First, change the text of the form to *My First VB2017 Program* in the properties window, it will appear as the title of the program. Next, insert a button (drag it from the toolbox) and change its text to *Show Message*. The design interface is shown below:



Click on the Show Message button to bring up the code window and enter the statement `MsgBox("Welcome to VB2017 Program")` between Private Sub and End Sub procedure, as shown below:



When you run this program and click on the show Message button, you should get the following popup message box.



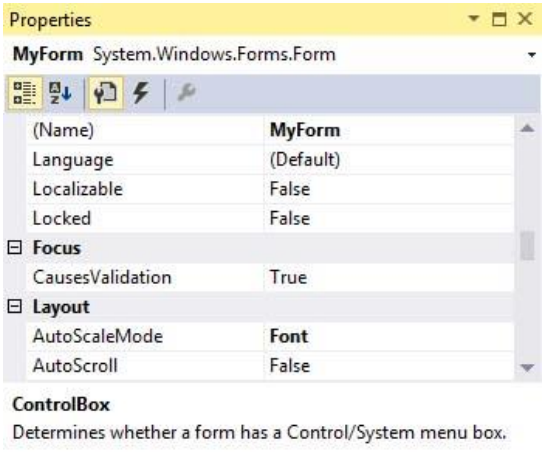
The function MsgBox is a built-in function of Visual Basic 2017 and it will display the text enclosed within the brackets.

Now you have created your first program in Visual Basic 2017!

DESIGNING THE INTERFACE

The first step in developing a Visual Basic 2017 application is to build a graphical user interface. To build a graphical user interface, add controls from the toolbox to the form and then customize their properties. Note that the default form is also a control by itself and you can change its properties first before adding additional controls. After adding controls to the form, you then need to write code for all the controls so that they can response to events triggered by the user's actions such as clicking the mouse. Therefore, Visual Basic 2017 is also an event-driven programming language.

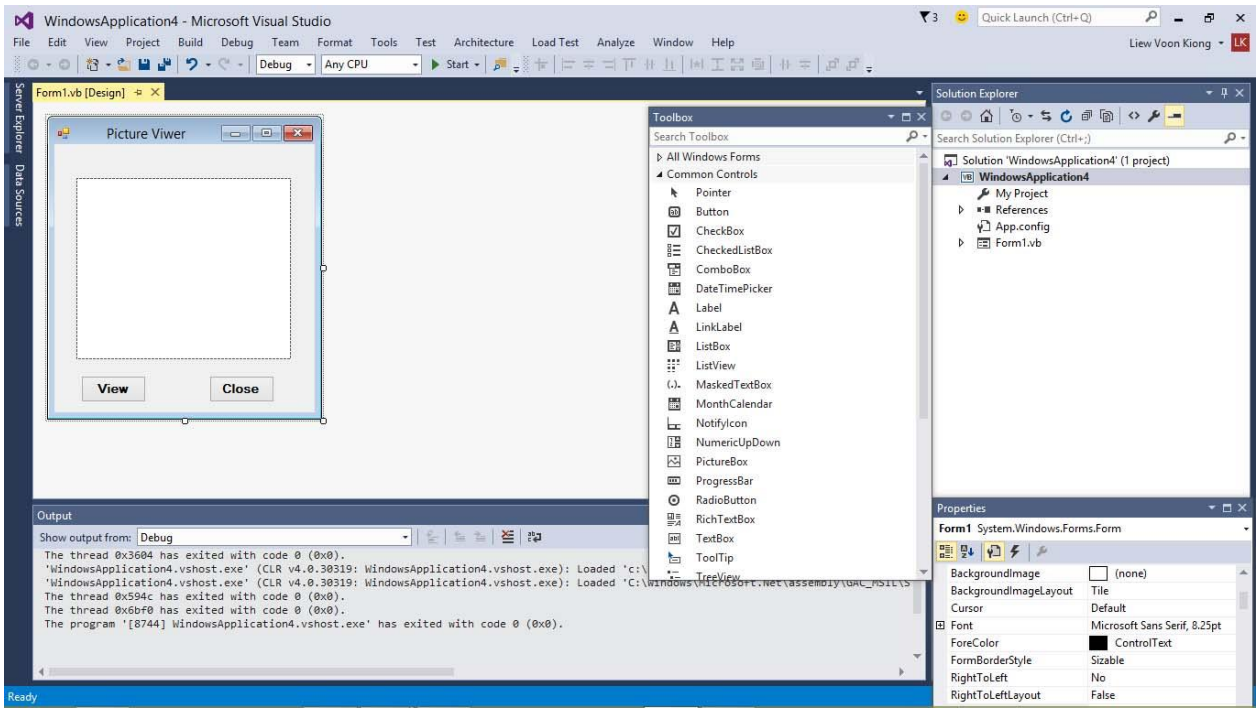
When you start a new Visual Basic 2017 project, the IDE will display the default form along with the Solution Explorer window and the **Properties window** on the far right. The properties window comprises an object drop-down list, a list of properties and the bottom section that shows a description of the selected property. As the only object on the IDE is the default form by the name of Form1, the properties window displays all properties related to Form1 and their corresponding attributes or values, as shown in Figure. You can change the name of the form, the title of the form, the background color, the foreground color, the size and more.



Properties can be changed by typing a value or select a value from a drop-down list. For the color setting, you just need to select a color rectangle or from a color palette.

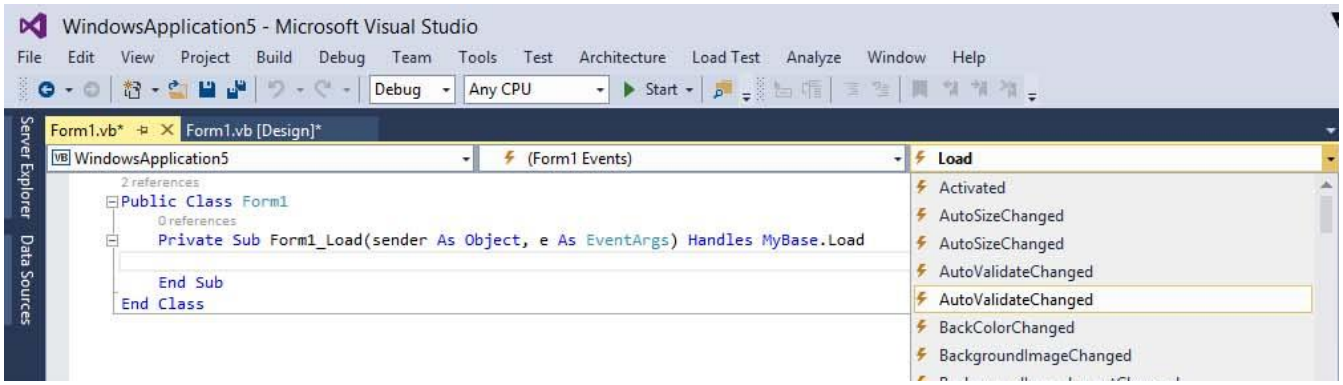
ADDING CONTROLS TO THE FORM

Among the controls, the most common ones are button, label, text box, list box, combo box, picture box, check box, radio and more.The controls can be made visible or invisible at runtime. However, some controls will only run in the background and invisible at runtime, one such control is the timer.Adding controls to the form is an easy task, what you need to do is drag a control from the tool box and drop it onto the form or draw it on the form. You can drag the control around the form and you can also resize it easily. The Toolbox is usually is hidden when you start Visual Basic 2017, you can click View on the menu bar and then select Toolbox to reveal the tool box. You can also use shortcut keys Ctrl+Alt+x to bring out the toolbox. You can drag and dock the Toolbox around the IDE.



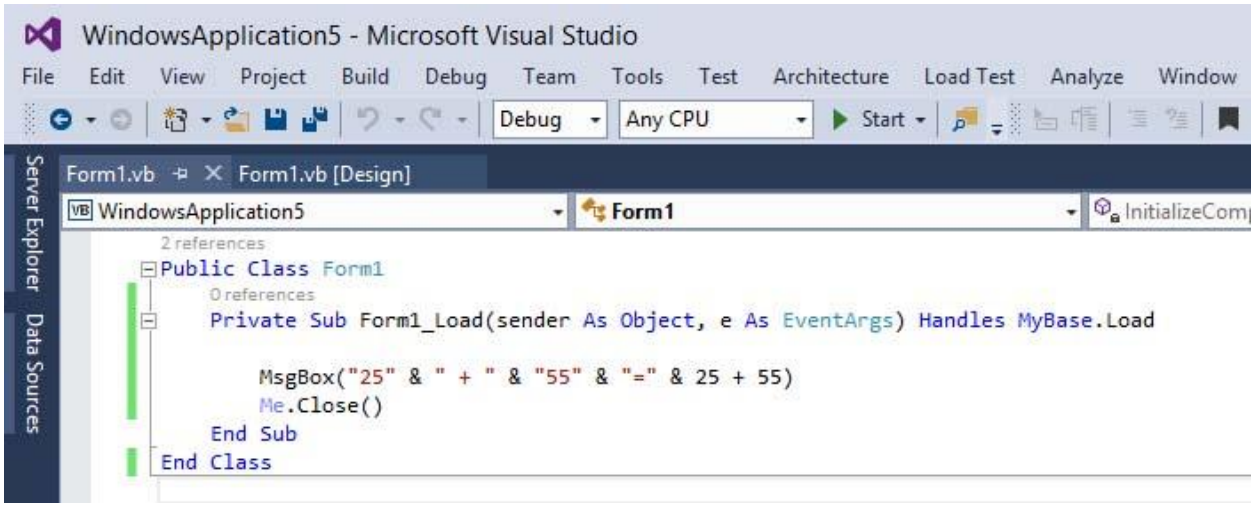
WRITING THE CODE

Visual Basic 2017 is an **event driven programming** language, which means that the code is executed in response to events. We have learned how to design the interface by putting controls (objects) on the form, but they do nothing unless we write code for the objects to respond to events triggered by the user. Every control you place on the form has a set of events related to them. The events usually comprise but not limited to the user's inputs. Among the events are load, click, double click, drag, and drop, pressing the keys and more. To view the events, double-click the control on the form to enter the code window. The default event will appear at the top part on the right side of the code window. You need to click on the default event to view other events associated with the control. The code appears on the left side is the event procedure associated with the load event.

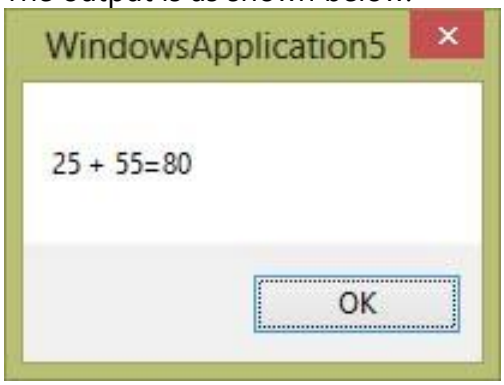


EXAMPLE 1: A SIMPLE PROGRAM TO ADD AND DISPLAY THE SUM OF TWO NUMBERS

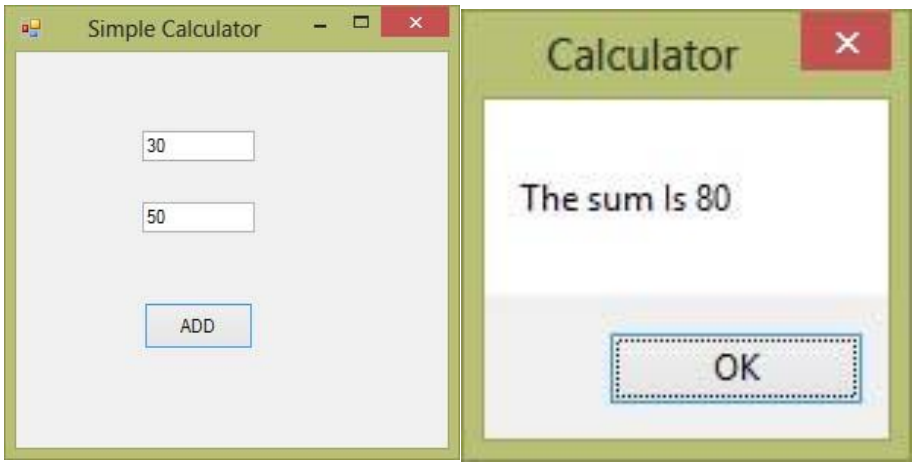
You can use the MsgBox and the arithmetic operator plus to perform an addition of two numbers, as shown below:



*The symbol & (*ampersand)* is to perform string concatenation. The statement **Me.Close()** is to close the program after clicking the OK button.
The output is as shown below:



Example 1 (b): The following program will add the value in textbox 1 and value in textbox 2 and displays the sum in a message box.




```
Private Sub Button1_Click(sender As Object, e As EventArgs)
Handles Button1.Click
MsgBox("The sum is "& Val(TextBox1.Text) + Val(TextBox2.Text))
End Sub
```

EXAMPLE 2 SIMPLE CALCULATOR PROGRAM THAT CAN CALCULATE THE SUM OF TWO NUMBERS ENTERED BY THE USER

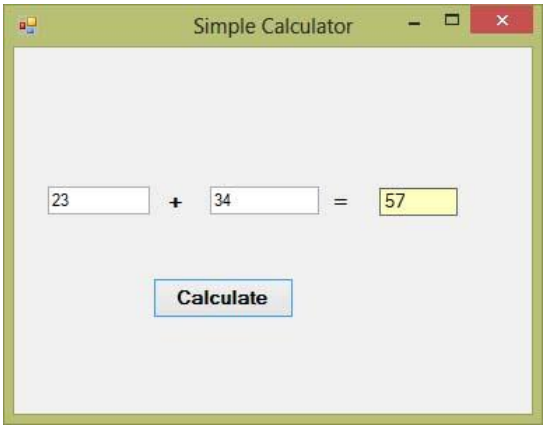
In this visual basic program, instead of showing the sum in a message box, we want to display the sum in a texbox. This is a simple calculator program that can calculate the sum of two numbers entered by the user. To design the interface, you add three text boxes, two labels and a button on the form. Under the respective properties windows change the text of the first label to +, the text of the second label to =. For the button, change its text to Calculate. The two text boxes are used to accept inputs from the user. The button is programmed to calculate the sum of the two numbers using the plus operator. Double click on the button and add the code below between the Private Sub and End Sub Statements.

The Code:

```
Private Sub CommandButton1_Click(sender As Object, e As
EventArgs) Handles CommandButton1_Click
      Dim num1 As Integer
      Dim num2 As Integer
      Dim Sum As Integer

      num1 = TextBox1.Value
      num2 = TextBox2.Value
      Sum = num1 + num2

      TextBox3.Value = Sum
End Sub
```



The output of the program is shown in the figure.

VISUAL BASIC 2017 DATA TYPES

Visual Basic 2017 classifies information into two major data types, the numeric data types, and the non-numeric data type. **Numeric data types** are types of data comprises numbers that can be calculated using various standard arithmetic operators, such as the Byte, Integer, Long, Single, Double, Currency and Decimal data types. The non-numeric data comprises text or string data types, the Date data types, the Boolean data types that store only two values (true or false), Object data type and Variant data type.

DECLARING VARIABLES

In Visual Basic 2017, you have to declare the variables before using them. To declare a variable, you need to assign a name to the variable and state its data type. If you fail to do so, the program

will run into an error. Variables are usually declared in the general section of the code windows using the **Dim** statement.
The syntax to declare a variable in Visual Basic 2017 is as follows:
Dim VariableName As DataType
If you want to declare more variables, you can declare them in separate lines or you may also combine more in one line, separating each variable with a comma, as follows:
Dim VariableName1 As DataType1, VariableName2 As DataType2, VariableName3 As DataType3

EXAMPLE 3: PROGRAM TO CALCULATE AREA OF A CIRCLE

```
Private Sub Button1_Click(sender As Object, e As EventArgs)
Handles Button1.Click
      Const Pi As Single = 3.142
      Dim R As Single
      R = 10
      Dim AreaCircle As Single
      AreaCircle = Pi * R ^ 2
      MsgBox("Area of circle with " & "radius" & R & "=" &
      AreaCircle)
End Sub
```

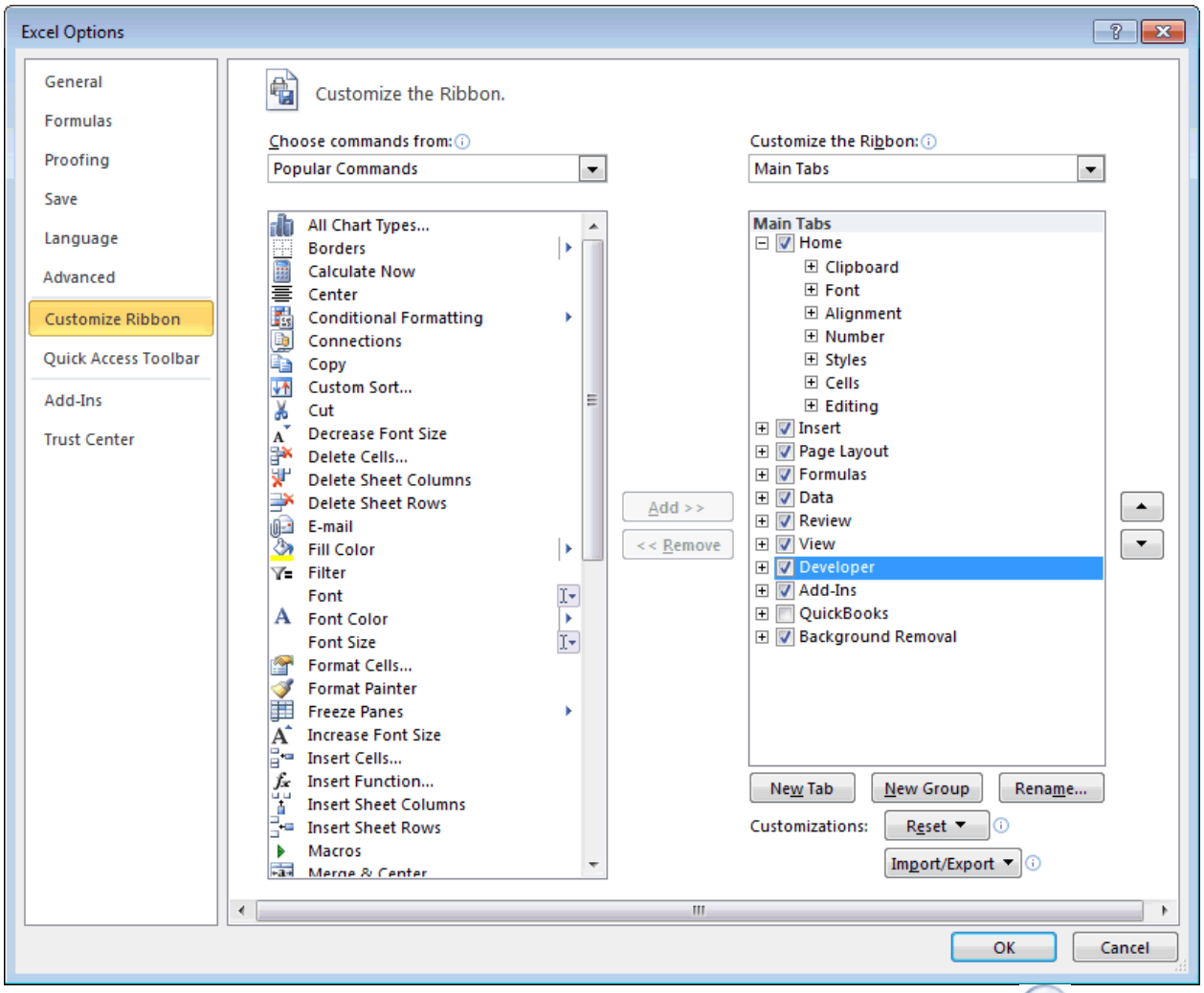
PROGRAMMING WITH VISUAL BASIC FOR APPLICATIONS (VBA)

Installing Visual Studio IDE is troublesome because of the hardware and software requirements / dependencies which many of our schools don't have. However, teachers and students can use VBA to create simple Visual Basic programs even when they can't install the Fully Fledged Visual Studio IDE.
VBA is the acronym for **Visual Basic for Applications**. It is similar to the Microsoft programming language Visual Basic except that it is embedded within the MS Office applications such as MS Excel, MS Words, MS Access, MS PowerPoint and more. VBA allows you to create customized programs using the built-in Visual Basic Editor in MS applications.

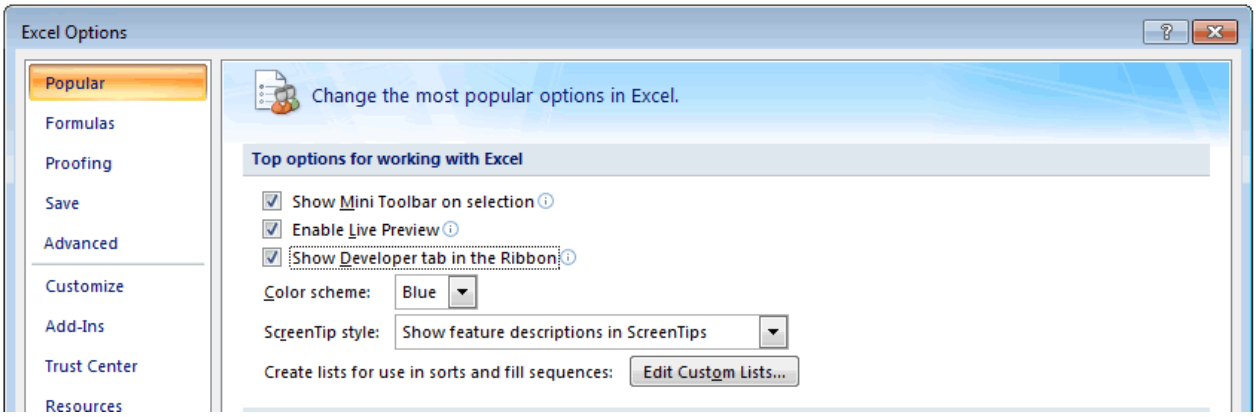
Launching the Visual Basic Editor in Microsoft Excel

You can access the VBA environment in Excel by opening the Microsoft Visual Basic for Applications window.

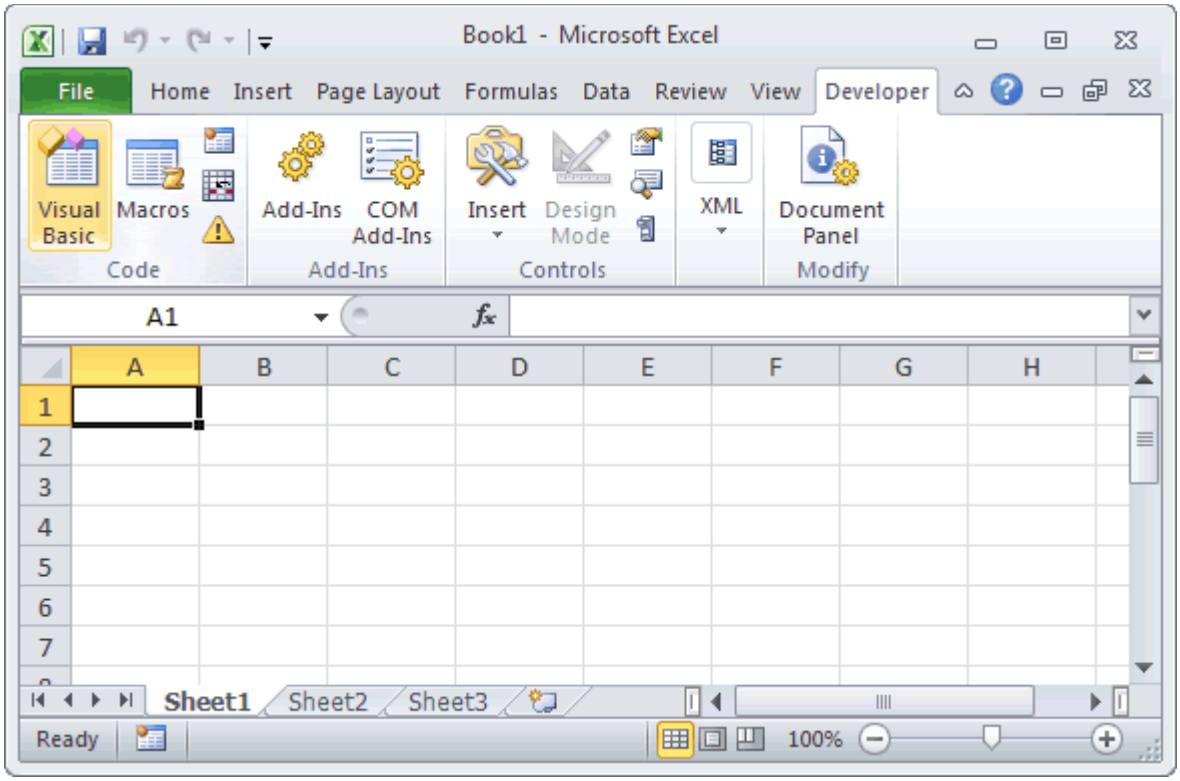
First, be sure that the Developer tab is visible in the toolbar in Excel. To display the Developer tab in Excel 2010-2016, click on **File** in the menu bar and select **Options** from the drop down menu.
When the Excel Options window appears, click on the **Customize Ribbon** option on the left. Click on the **Developer** checkbox under the list of Main Tabs on the right. Then click on the OK button.



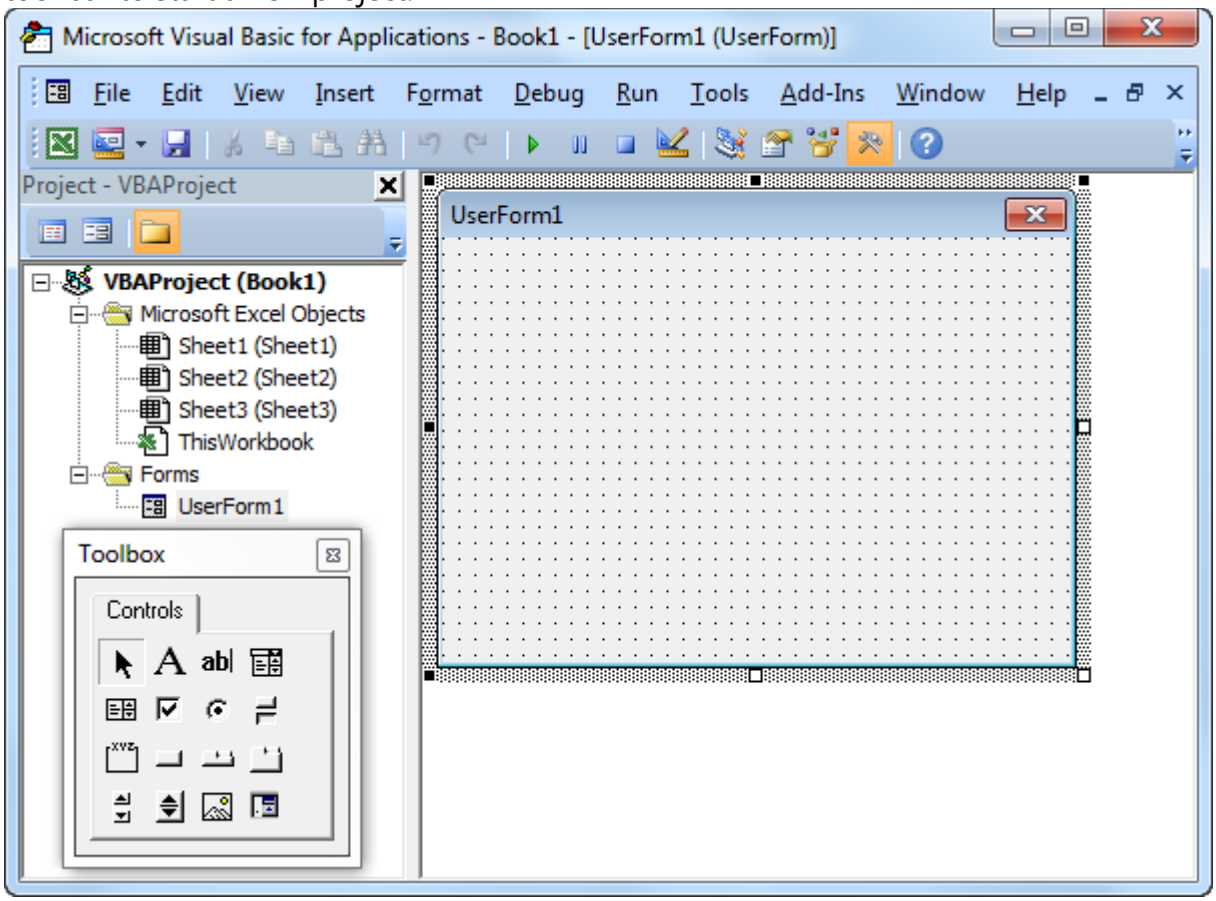
Excel 2007: To display the Developer tab, click on the Microsoft Office button in the top left of the Excel window and then click on the Excel Options button. When the Excel Options window appears, click on the Popular option on the left. Select the option called "Show Developer tab in the Ribbon". Then click on the OK button.



The Developer Tab should appear.



Select the **Developer tab** from the toolbar at the top of the screen. Then click on the **Visual Basic** option in the **Code group.** Now the Microsoft Visual Basic editor should appear and you can view your VBA code. Click on the New UserForm Button on the tool bar to start a new project.



The Visual Basic Editor is similar to Visual Studio IDE that we looked at earlier. You can now try out the examples we did with Visual Studio and Run them using VBA. Add

controls to the form and double click on them to add the code between the Private Sub and End Sub Statements, then click the green run button to test the programs. Save your Excel file as a macro-enabled work.

WORKED OUT EXERCISES

1a. Using C or VB write a code that can output a phrase "I Love My School"
b. Write down the steps you went through to have you the phrase "I Love My School".
2. Using any programming language write a code / program that can be used to multiply two numbers.
3. Using C or VB programming platform write a code that can calculate for the radius of a circle given the area.
4. Using C or VB programming platform write a code that can calculate the parameter or area of a rectangular object.
5. Define the following terms
a. Computer software
b. Computer program
c. Programming
d. Programming language
e. Variable
f. Psuedocode
g. Flowchart
h. Constant

Solutions to the Exercise using VB

1 (a) Program GUI consists of one user form and one 'Run' button which when clicked displays the message "I love My School"

THE VB CODE

```
Private Sub CommandButton1_Click()
  MsgBox ("I love My School")
End Sub
```

1(b) Steps:

- Open Visual Basic Editor
- Create New UserForm
- Add One Button
- Double Click on Button to open Code Editor
- Between the Private Sub and End Sub Statements, Write the Statement:
- MsgBox ("I love My School")
- Save and Run.

2. VB program to multiply two numbers

Program GUI consists of 1 user form with three text boxes, two labels and one command button

THE VB CODE

```
Private Sub CommandButton1_Click()
Dim num1 As Integer
Dim num2 As Integer
Dim Sum As Integer
num1 = TextBox1.Value
```

```
num2 = TextBox2.Value
Sum = num1 * num2
TextBox3.Value = Sum
End Sub
```

3. Program to calculate radius given area

Program GUI consists of a userform with one lable, one textbox and one command button.

THE VB CODE

```
Private Sub CommandButton1_Click()
Const Pi As Single = 3.142
Dim CircleArea As Single
Dim R As Single
CircleArea = TextBox1.Value
R = Sqr(CircleArea / Pi)
MsgBox ("Radius of circle with area" & CircleArea & " is " & R)
End Sub
```

4. Program for calculating perimeter of rectangle

Program GUI consists of Two text boxes, two lables and one command button.

THE VB CODE

```
Private Sub CommandButton1_Click()
Dim length As Single
Dim width As Single
Dim perimenter As Single
length = TextBox1.Value
width = TextBox2.Value
perimeter = 2 * (length + width)
MsgBox ("The area of the rectangle is " & perimeter)
End Sub
```

5. Definition of Terminologies

a) Computer Software is a generic term for programs that tell the computer how to perform tasks.
b) A computer program is a set of coded instructions given to the computer, and represents a logical solution to a problem. It directs a computer in performing various operations/tasks on the data supplied to it.
c) Programming is the process of designing a set of instructions (computer programs) which can be used to perform a particular task or solve a specific problem.
d) A programming language is a set of symbols (a language) which a computer programmer uses to solve a given problem using a computer.
e) A variable is a named data storage location in your computer's memory. By using a variable's name in your program, you are, in effect, referring to the data stored there.
f) A pseudocode is a method of documenting a program logic in which English-like statements are used to describe the processing steps.
g) A Flowchart is a diagrammatic or pictorial representation of a program's algorithm.

h) A constant is a value that cannot be altered by the program during normal execution.

CODING EXAMPLES IN C AND VISUAL BASIC SIDE BY SIDE

C CODE

//HELLO WORLD PROGRAM in C

```
#include <stdio.h>
main() {
 printf("Hello, World!\n");
return 0;
 }
```

PROCEDURES 1. Start your IDE that lets you enter, compile, and link your programs. **2.** Use the keyboard to type the source code exactly as shown above Press Enter at the end of each line. **3.** Save the source code. You should name the file HELLO.C. **4.** Compile and link HELLO.C. Execute the appropriate command specified for compiler. You should get a message stating that there were no errors or warnings. **5.** Check the compiler messages. If you receive no errors or warnings, everything should be okay. **6.** Go back to step 2 if any error message is displayed. Check your codes, debug and continue with step 3. **7.** Your first C program should now be compiled and ready to run. If you display a directory listing of all files named HELLO (with any extension), you should see the following:

HELLO.C, the source code file you created with your editor,

HELLO.OBJ or HELLO.O, which contains the object code for HELLO.C, HELLO.EXE, the executable program created when you compiled and linked HELLO.C. **8.** To *execute,* or run HELLO.EXE, The message Hello, World! is displayed on-screen.

//C PROGRAM TO SUM AND AVERAGE TWO INPUT NUMBERS

```
#include <stdio.h> //Preprocessor directive
int main(){                    //Starting main function
int X, Y, Sum, Average;        //Declaring variables
printf("Enter X and Y\n"); //Display instruction to user
scanf("%d%d", &X,&Y);  //Read data input and save in X and Y
Sum = X+Y;             //Add X and Y and store in Sum variable
Average = Sum/2;       //Divide Sum by 2 and store in Average
printf("Sum is:%d Average is:%d",Sum, Average);
                       //Output Sum and Average
    return 0;    //Marks end of program execution
}                          //close main function
```

//C PROGRAM TO CLASSIFY ADULTS OR CHILDREN ACCORDING TO AGE>18

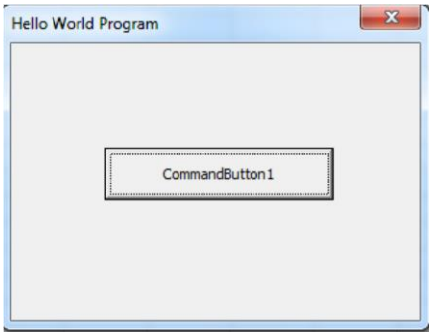
```
#include <stdio.h> //Preprocessor Directive for including standard library int main(){                    //starting main function     int age;                    //Declaring age variable
    printf("Enter the age\n"); //Prompting user to enter age on new line      scanf( "%d", &age);  //Read age from keyboard and input      if(age > 18){        //Decision with condition [age greater than 18]      printf(" Adult ");  //Print 'Adult' if condition is true
    }
    else {     //Print 'Child' if condition is false
     printf(" Child ");
    }
    return 0;                          //End program
}                                      //close main function
```

VISUAL BASIC CODE

'HELLO WORLD PROGRAM in Visual Basic(VB)

```
Private Sub CommandButton1_Click()
   MsgBox ("Hello World!")
End Sub
```

PROCEDURES: **1.** Open your Visual Basic Editor. **2.** Click on the New UserForm Button on the tool bar to start a new project. **3.** Change the text of the form to Hello World Program in the properties window, it will appear as the title of the program. **4**, Insert a command button (drag it from the toolbox – you can also modify its properties) and **5**.



Double Click on it to bring up the code window. **6**.Enter the code `MsgBox ("Hello World!")` between Private Sub and End Sub procedure. **7.** When you run this program and click on the command button, you should get a popup message box with the message, Hello World! **8.** In case of any syntax or runtime error, the debugger will show you its location in the visual basic editor. Debug and run again.

'VB PROGRAM TO SUM AND AVERAGE TWO INPUT NUMBERS

```
Private Sub CommandButton1_Click()
    Dim X, Y, Sum, Average As Integer 'Declaring variables
X = Val(InputBox("Enter value for X")) 'Prompting user to input X
Y = Val(InputBox("Enter value for Y")) 'Prompting user to input Y
    Sum = X + Y                    'Add X and Y and store in Sum variable
    Average = Sum / 2 'Divide Sum by 2 and store in Average variable
    MsgBox ("Sum is:" & Sum & " Average is: " & Average)
            'Display Sum and Average with other text End Sub 'End Program
```

'NB: an Apostrophe (') is used to start inline comments in as compared to two slashes in C (//)

//VB PROGRAM TO CLASSIFY ADULTS OR CHILDREN ACCORDING TO AGE>18

```
Private Sub CommandButton1_Click()
Dim age As Integer 'Declaring age variable
age = Val(InputBox("Enter the age"))
                'Prompt User to input age and store in variable
    If age > 18 Then      'Decision with condition [age greater than 18]
        MsgBox ("Adult") 'Print 'Adult' if condition is true      Else
        MsgBox ("Child")  'Print 'Child' if condition is false      End If
End Sub                   'End sub routine/ program
```

UNEB 2018 UCE 840/1 COMPUTER STUDIES SECTION C QN 29

29. (a) Explain **three** reasons why a flowchart would be used instead of a pseudocode to solve a problem. *(06 marks)*

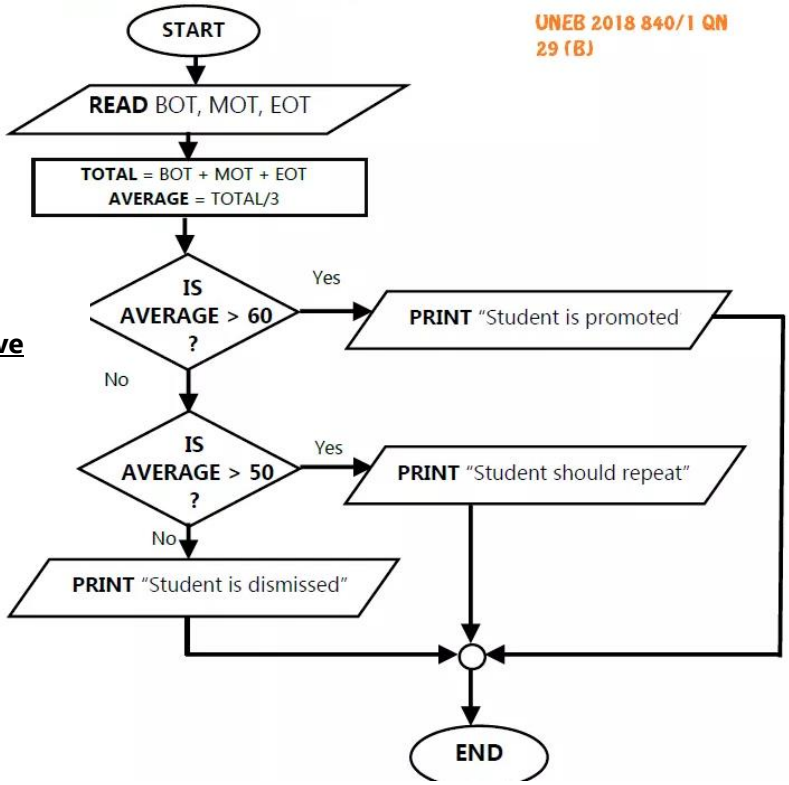
(b) A school uses a simple computerised system to manage students' results. The school administers three examinations namely; beginning of term (BOT), middle of term (MOT) and end of term (EOT). The systems administrator has set the system to get the total of the three examinations and find the average which is used to promote the students to the next class. If the average mark is greater than 60, the student is promoted. If the average mark is from 50 to 60, the student repeats. If the average is below 50 the student is dismissed.
Write a suitable algorithm that will manage the students' results.
(14 marks)

29 (b) This question required an algorithm which can be written using Pseudocode or a flowchart.

Pseudocode Alternative Attempt

```
START
    PRINT "Enter BOT, MOT and EOT marks"
    READ BOT, MOT, EOT
    COMPUTE TOTAL = BOT + MOT + EOT
    COMPUTE AVERAGE = TOTAL/3
    IF AVERAGE > 60 THEN
        PRINT "Student is promoted"
    ELSE
        IF AVERAGE >= 50 THEN
            PRINT "Student should repeat"
        ELSE
            PRINT "Student is dismissed"
        ENDIF
    ENDIF
END
```

Pseudo Code Alternative Attempt



UNEB UCE 840/1 2018 Qn 29(b) Program in C

(NB code wasn't required by UNEB, this program has been written for learning purposes only.

```
/* UNEB UCE 840/1 2018 Qn 29(b) Program Corresponding C Code*/
#include <stdio.h>                          //Preprocessor Directive for including library
int main(){                                 //starting main function
double BOT, MOT, EOT, TOTAL, AVERAGE;       //Declaring variables
printf("Enter BOT, MOT & EOT marks 1 by 1\n"); //Asking user to enter marks
scanf("%lf",&BOT);                          //Read keyboard input and save BOT mark
scanf("%lf",&MOT);                          //Read keyboard input and save MOT mark
scanf("%lf",&EOT);                          //Read keyboard input and save EOT mark
TOTAL = BOT+MOT+EOT;                        //Computing the TOTAL
AVERAGE = TOTAL/3;                          //Computing the AVERAGE
printf("The  Average  is  %.1lf  :",AVERAGE);  //Displaying the AVERAGE, (wasn't required)
if(AVERAGE > 60)                            //Decision with condition [AVERAGE > 60]
       printf(" Student is promoted.");     //Print 'Promoted' if condition is true
else                                        //If above condition is false...
     if(AVERAGE>=50)                        //Decision with condition [AVERAGE > 50]
      printf(" Student should repeat.");    //Print 'Repeat' if condition is true
else                                //Else part executed  only if above condition is false...
       printf(" Student is dismissed.");
return 0;                                   //End program
}                                           //closing the main function
```

UNEB UCE 840/1 2018 Qn 29(b) Program in Visual Basic

(NB code wasn't required by UNEB, this program has been written for learning purposes only.

```
' UNEB UCE 840/1 2018 Qn 29(b) Program Corresponding VB Code*
Private Sub CommandButton1_Click()              'Opening Sub routine statement
    Dim BOT, MOT, EOT, TOTAL, AVERAGE As Double 'Declaring variables
    BOT = Val(InputBox("Enter BOT mark")) 'Prompt User to input age and store in variable
    MOT = Val(InputBox("Enter MOT mark")) 'Prompt User to input age and store in variable
    EOT = Val(InputBox("Enter EOT mark")) 'Prompt User to input age and store in variable
    TOTAL = BOT + MOT + EOT             'Computing the TOTAL
    AVERAGE = TOTAL / 3                 'Computing the AVERAGE
    MsgBox ("The Average is " & AVERAGE) 'DISPLAYING Printing the AVE, (wasn't required)
    If AVERAGE > 60 Then                    'Decision with condition [AVERAGE > 60]
          MsgBox ("Student is promoted.") 'Print 'Promoted' if condition is true
    Else                                    'If above condition is false...
        If AVERAGE >= 50 Then           'Decision with condition [AVERAGE > 60]
                MsgBox ("Student should repeat.") 'Print 'Promoted' if condition is true
    Else
            MsgBox ("Student is dismissed.") 'Print 'Child' if condition is false
        End If                                'End First If
    End If                                   'End Second If
End Sub                                      'Closing Sub statement
```

NB: Words in **bold** are keywords or reserved words

Teachers: Find some more resources on programming on the ictteachersug.net website, search for 'programming'

S4 - TOPIC 12: TRENDS IN COMPUTING

GENERAL OBJECTIVE: To enable the learner to understand and appreciate contemporary issues and developments in computing.

Teaching and Learning Strategies: Teacher should guide learners to discover on their own; Learning should be through observations by learners; Teacher should demonstrate to the learners to achieve learning; Learners should engage in self-study; ***a resource person can be used in this topic to supplement the teacher's input.***

COMPUTER INTEGRITY AND SECURITY

Definitions

Data Security *refers to protective measures that are applied to ensure integrity, availability and confidentiality of computer data or information.*

- **Integrity** means prevention of unauthorized modification of data and data corruption. ***Data corruption*** *refers to errors in data that may occur during reading, writing, processing, storage or transmission of said data which may introduce unintended/unwanted changes to the original data.*
- **Availability** means prevention of unauthorized withholding of data access (Intended users can access whenever they need to access).
- **Confidentiality** means to avoid unauthorized disclosure of data third parties.

Physical Security refers to the measures put in place by protect computer systems from physical damage and mitigate physical security risks. Physical security includes:

- Locked doors.
- Burglar proofs.
- Parameter fences.
- Security guards.
- Server room environmental protection, optimization.
- Concrete walls.
- Lightening conductors.
- Fire extinguishers.
- Strategic server and storage placement, etc.

HARDWARE INTEGRITY

- A computer security risk is an Action that causes loss of or damage to computer system.
- Security threats to hardware include:
  1. System Failure
  2. Hardware Theft
  3. Malicious Destruction of hardware, software, data or network resources, as well as sabotage.

System failure

Some of the causes of computerized information system failure include

- Hardware failure due to improper use.
- Unstable power supply as result of brownout or blackout and vandalism. Network breakdown.

- Natural disaster
- Program failure

Control measures against hardware failure

- Protect computers against brownout or blackout which may cause physical damages or data loss by using surge protectors and Uninterruptible power supply (UPS).
- For critical systems, most organizations have put into place fault tolerant systems. A **fault tolerant system** has redundant or duplicate storage, peripherals devices and software that provide a fail-over capability to backup components in the event of system failure.
- **Disaster recovery plans.** Disaster recovery plan involves establishing offsite storage of an organization's databases so that in case of disaster or fire accidents, the company would have backup copies to reconstruct lost data.



Hardware theft and hardware vandalism

- **Hardware theft is act of stealing computer equipment**
  - Cables sometimes used to lock equipment
  - Some notebook computers use passwords, possessed objects, and biometrics as security methods
  - For PDAs, you can password-protect the device
- **Hardware vandalism** is the act of defacing or destroying computer equipment

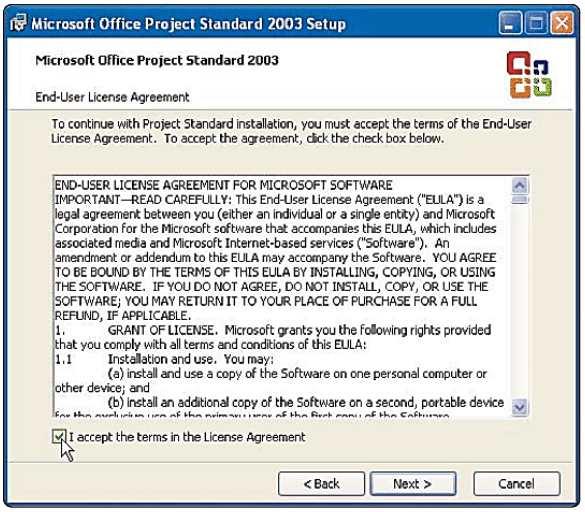
SOFTWARE INTEGRITY

- Security threats to computer software and data include:
  1. Information Theft
  2. Software Theft
  3. Internet And Network Attacks Such Us Hackers
  4. Malicious Programs (Computer Viruses, Worms And Trojan Horses)
  5. Unauthorised Access and Use
  6. Unauthorized Alteration.

Software theft is the act of stealing or illegally copying software or intentionally erasing programs.

- **Software piracy** is illegal duplication of copyrighted software.
- To guard against software theft and piracy, product activation is used.

- **Product activation** allows user to input product identification number online or by phone and receive unique installation identification number.
- A **license agreement** gives the right to use software. Single-user license agreement allows user to install software on one computer, make backup copy, and sell software after removing from computer.



Information theft

- Information theft is yet another type of computer security risk. **Information theft** occurs when someone steals personal or confidential information. An unethical company executive may steal or buy stolen information to learn about a competitor. A corrupt individual may steal credit card numbers to make fraudulent purchases.
- **Safeguards against Information Theft:** Most companies attempt to prevent information theft by implementing the user identification and authentication controls.
- To protect information on the Internet and networks, companies and individuals use a variety of encryption techniques.

COMPUTER INTRUSION

This refers to compromising a **computer** system by breaking the security of such a system or causing it to enter into an insecure state. The act of intruding—or gaining unauthorized access to a system—typically leaves traces that can be discovered by **intrusion** detection systems

Unauthorized access and Use

- **Unauthorized access** is the use of a computer or network without permission. **Unauthorized use** is the use of a computer or its data for unapproved or possibly illegal activities.
- Unauthorized use includes a variety of activities: an employee using an organization's computer to send personal e-mail messages, or someone gaining access to a bank computer and performing an unauthorized transfer.

- **Intrusion detection software** automatically analyzes all network traffic, assesses system vulnerabilities, identifies any unauthorized access (intrusions), and notifies network administrators of suspicious behavior patterns or system breaches.

To utilize intrusion detection software requires the expertise of a network administrator because the programs are complex and difficult to use and interpret. These programs also are quite expensive

NETWORK INTRUSION AND ATTACKS

Information transmitted over networks has a higher degree of security risk than information kept on an organization's premises. In an organization, network administrators usually take measures to protect a network from security risks. On the Internet, where no central administrator is present, the security risk is greater. Internet and network attacks that jeopardize security include computer viruses, worms, Trojan horses, and rootkits; botnets; denial of service attacks; hackers, back doors; and spoofing.

Hacking

- The term hacker refers to someone who accesses a computer or network illegally. Originally it was a complimentary word for a computer enthusiast.
- A **cracker** also is someone who accesses a computer or network illegally but has the intent of destroying data, stealing information, or other malicious action.
- Both hackers and crackers have advanced computer and network skills.
- Some hackers claim the intent of their security breaches is to improve security, and may be hired by software companies to test the security of new software systems.
- A **script kiddie** has the same intent as a cracker but does not have the technical skills and knowledge. Script kiddies often use prewritten hacking and cracking programs to break into computers.
- A **cyberextortionist** is someone who uses e-mail as a vehicle for extortion.
- A **cyberterrorist** is someone who uses the Internet or network to destroy or damage computers for political reasons. The cyberterrorist might target the nation's air traffic control system, electricity-generating companies, or a telecommunications infrastructure.

Explaining how denial of service attacks, backdoors, spoofing are carried out.

- A **denial of service attack**, or **DoS attack**, is an assault whose purpose is to disrupt computer access to a network service.
- The attackers may use an unsuspecting computer to send an influx of confusing data messages or useless traffic to a computer network. The victim computer network slows down considerably and eventually becomes unresponsive or unavailable, blocking legitimate visitors from accessing the network.
- Perpetrators have a variety of motives for carrying out a DoS attack. Those who disagree with the beliefs or actions of a particular organization claim political anger motivates their attacks. Some perpetrators use the attack as a vehicle for extortion. Others simply want the recognition.

- A **botnet** is a group of compromised computers connected to a network such as the Internet that are used as part of a network that attacks other networks, usually for nefarious purposes.
- A compromised computer, known as a **zombie**, is one whose owner is unaware the computer is being controlled remotely by an outsider. Cybercriminals use botnets to send spam via e-mail, spread viruses and other malware, or commit a denial of service attack.
- A **back door** is a program or set of instructions in a program that allow users to bypass security controls when accessing a program, computer, or network.
- Once perpetrators gain access to unsecure computers, they often install a back door or modify an existing program to include a back door, which allows them to continue to access the computer remotely without the user's knowledge.
- **Spoofing** is a technique intruders use to make their network or Internet transmission appear legitimate to a victim computer or network.
- E-mail spoofing occurs when the sender's address or other components of the e-mail header are altered so that it appears the e-mail originated from a different sender. E-mail spoofing commonly is used for virus hoaxes, spam, and phishing scams.
- IP spoofing occurs when an intruder computer fools a network into believing its IP address is associated with a trusted source. Perpetrators of IP spoofing trick their victims into interacting with a deceptive Web site.

COMPUTER CRIMES

Identifying types of computer crimes

Physical theft - The physical theft of computer hardware and software is the most widespread related crime especially in developing countries.

- The most common issues now, we here cases of people breaking into an office or firm and stealing computers, hard disks and other valuable computer accessories. In most cases such theft can be done by untrustworthy employees of firm or by outsiders. The reason behind an act may be commercial, destruction to sensitive information or sabotage.

Control measures against theft

- Employ security agents to keep watch over information centers and restricted backup sites.
- Reinforce weak access points like windows, door and roofing with metallic grills and strong padlocks.
- Motivate workers so that they feel a sense of belonging in order to make them proud and trusted custodians of the company resources.
- Insure the hardware resources with a reputable insurance firm.

Piracy - illegal copying of software, information or data.

Fraud - Fraud is stealing by false pretense. Fraudsters can be either employees in a company, non-existent company that purports to offer internet services such as selling vehicles etc. other form of fraud may also involve computerized production and use of counterfeit documents. This is due to the dynamic growth of internet and mobile computing, sophisticated cybercrimes.

Sabotage - Sabotage refers to illegal destruction of data and information with the aim of crippling services delivery, or causing great loss to an organization. Sabotage is usually carried out by disgruntled employees or competitors with the intention of causing harm to an organization.

Eavesdropping - Eavesdropping refers to tapping into communication channels to get information. Hackers mainly use eavesdropping to access private or confidential information from internet users or from poorly secured information system.

Surveillance (monitoring) - Surveillance refers to monitoring use of computer system and networks using background programs such as spyware and cookies. The information gathered may be used for one reason or the other e.g. spreading sabotage.

Industrial espionage - Industrial espionage involves spying on a competitor to get information that can be used to cripple the competitor.

Accidental access - Threats to data and information come from peoples unknowingly giving out information to strangers is or unauthorized persons.

Alteration - Alteration is the illegal modification of private or confidential data and information with the aim of misinforming users. Alteration is usually done by people who wish to cancel the truth or sabotage certain operations.

- Alteration comprises the integrity of data and information making it unreliable.

COMPUTER PROTECTION

Appropriate ways of protecting data in computer systems

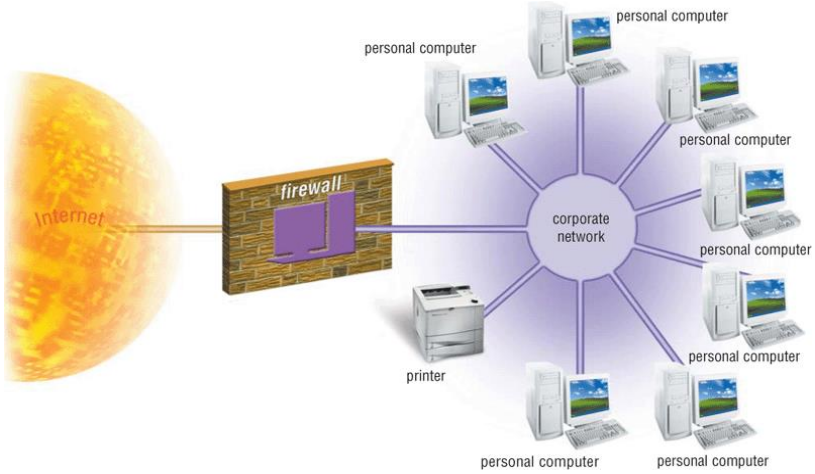
1. Data Encryption. Data on transit over the network faces many dangers of being tapped, listened to or copied to unauthorized destinations. Such data can be protected by mixing up into a form that only the sender and receiver is able to understand. This is by reconstructing the original message from the mix which is called data encryption.

   What is Data encryption?

   - Process of converting plaintext (readable data) into ciphertext (unreadable characters)
   - Safeguards against information theft
   - Encryption key (formula) often uses more than one method
   - To read the data, the recipient must decrypt, or decipher, the data
2. Surge protectors: Protect computers and equipment from electrical power disturbances. Uninterruptible power supply (UPS) is surge protector that provides power during power loss.



3. Backups - the ultimate safeguard. Backups - the ultimate safeguard
   - Full backup - all files in computer
   - Selective backup select which files to back up
   - Three-generation backup preserves three copies of important files
   - In case of system failure or corrupted files, restore files by copying to original location.
4. Firewall
   - **Firewall is a security system consisting of hardware and/or software that prevents unauthorized network access**
   - A firewall is a device or software system that filters the data and information exchanged between different networks by enforcing the host networks access control policy. The main aim of a firewall is to monitor and control access to or from protected networks. People who do not have permission (remote requests) cannot access firewall restricted sites outside their network.



5. **Use of acceptable use policy (AUP)**

- The AUP outlines the computer activities for which the computer and network may and may not be used.
- An organization's AUP should specify the acceptable use of computers by employees for personal reasons.
- Some organizations prohibit such use entirely. Others allow personal use on the employee's own time such as a lunch hour.

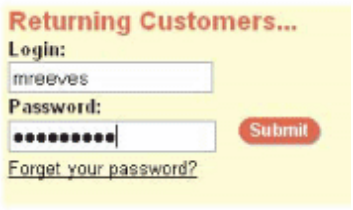
6. **Use of Intrusion Detection Software**

- To provide extra protection against hackers and other intruders, large organizations sometimes use intrusion detection software to identify possible security breaches.

7. **Identifying and Authenticating Users**

- Many organizations use access controls to minimize the chance that a perpetrator intentionally may access or an employee accidentally may access confidential information on a computer.
- An **access control** is a security measure that defines who can access a computer, when they can access it, and what actions they can take while accessing the computer. In addition, the computer should maintain an **audit trail** that records in a file both successful and unsuccessful access attempts.
- An unsuccessful access attempt could result from a user mistyping his or her password, or it could result from a hacker trying thousands of passwords. Organizations should investigate unsuccessful access attempts immediately to ensure they are not intentional breaches of security

8. **User Names and Passwords**
   a. A username is Unique combination of characters that identifies user
   b. Password is private combination of characters associated with the user name that allows access to computer resources.



How can you make your password more secure?

How can you make your password more secure?

PASSWORD PROTECTION

		AVERAGE TIME TO DISCOVER	
Number of Characters	Possible Combinations	Human	Computer
1	36	3 minutes	.000018 second
2	1,300	2 hours	.00065 second
3	47,000	3 days	.02 second
4	1,700,000	3 months	1 second
5	60,000,000	10 years	30 seconds
10	3,700,000,000,000,000	580 million years	59 years

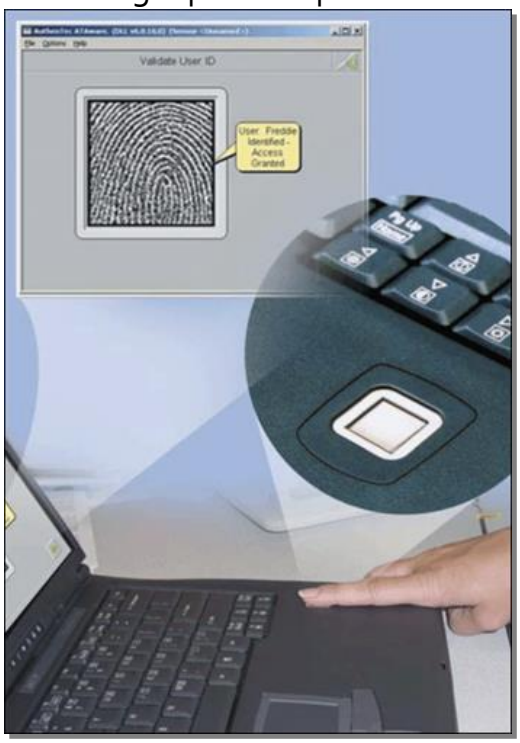
- *Possible characters include the letters A–Z and numbers 0–9*
- *Human discovery assumes 1 try every 10 seconds*
- *Computer discovery assumes 1 million tries per second*
- *Average time assumes the password would be discovered in approximately half the time it would take to try all possible combinations*

9. **Possessed objects**

— **Items that you must carry to gain access to computer or facility, e.g badges, cards, smart cards, and keys. Often used with numeric password called personal identification number (PIN) e.g ATM pin**.

— Access control can be enhanced by implementing multilevel authentication policies such as assigning users log on accounts, use of smart cards and a personal identification number (PIN).

10. **Security monitors** are programs that monitor and keep a log file or record of computer systems and protect them from unauthorized access.
11. Biometric devices
    - **Authenticate people's identity using a human characteristic** like Fingerprint, hand geometry, voice, signature, or iris.
    - Biometric security is a growing form of unauthorized control measure that takes the user's attributes such as voice, fingerprints and facial recognition. For example, you can log on swap a finger on a finger print swap windows.
12. Callback systems
    - User connects to computer only after the computer calls that user back at a previously established telephone number.
    - Some networks utilize callback systems as an access control method to authenticate remote or mobile users.
    - Callback systems work best for users who regularly work at the same remote location, such as at home or branch office.
13. **Secure web data transmission using HTTPS.** Users apply for SSL certificate from a certificate authority (CA). A CA is an Authorized person or company that issues and verifies SSL certificates.





The following are some examples of crimes perpetuated by use of computers.

COMPUTER ETHICS

- Ethics is knowing and understanding what is right and what is wrong, and then doing the right thing right. In simple terms, ethics are standards of moral conduct.
- Quite often, people in society do the wrong things either out of ignorance or deliberately to achieve selfish interests.
- In today's society, computers are involved to some extent in almost every aspect of life and sometimes they often perform life-critical tasks.
- This makes it very important to carefully consider the issues of ethics in use of computers and software.

- Ethical principles are important because they help us navigate through difficult situations and reflect the way to relate with our friends and community.

Three useful ethical principles:

- An act is ethical if society benefits from the act.
- An act is ethical if people are treated as an end and not as a means to an end.
- An act is ethical if it is fair to all parties involved.

Computer ethics involves use of computers & software in morally acceptable way.

ICT ethics are the moral guidelines that govern use of computers and information systems.

- Standards or guidelines are important in this industry, because technology changes are outstripping the legal system's ability to keep up.

Computer Ethics for Computer Professionals

- According to the Association for Computing Machinery (ACM) code, a computing professional:
- Contributes to society and human well-being.
- Always avoids harm to others.
- Should be honest and trustworthy.
- Should exercise fairness and takes action not to discriminate.
- Honors property rights, including copyrights and patents
- Gives proper credit when using the intellectual property of others.
- Respects other individuals' rights to privacy.
- Honors confidentiality.

IT CODE OF CONDUCT

1. Computers may not be used to harm other people.
2. Employees may not interfere with others' computer work.
3. Employees may not meddle in others' computer files.
4. Computers may not be used to steal.
5. Computers may not be used to bear false witness.
6. Employees may not copy or use software illegally.
7. Employees may not use others' computer resources without authorization.
8. Employees may not use others' intellectual property as their own.
9. Employees shall consider the social impact of programs and systems they design.
10. Employees always should use computers in a way that demonstrates consideration and respect for fellow humans.

CODE OF CONDUCT

- A **code of conduct** is a written guideline that helps determine whether a specific action is ethical or unethical.

COMPUTER PIRACY

Piracy is a form of intellectual property theft which means illegal copying of software, information or data. Software, information and data are protected by copyright and patent laws.

Control measures against piracy - There are several ways of reducing piracy

- Enforce laws that protect the owners of data and information against piracy.
- Make software cheap enough to increase affordability.
- Use licenses and certificates to identify original software.
- Set installation passwords that deter illegal installation of software.

COPYRIGHT LAW IN UGANDA

Copyright law in Uganda is currently is governed by;

- the Copyright and Neighbouring Act, 2006 and the
- Copyright and Neighbouring Rights Regulations, 2010.

The Act provides that NO person of any kind shall produce, reproduce, distribute, broadcast, make available to the public, sale or offer for sale, lease or rent out or make public performances or import for distribution …audio visual recordings in Uganda except under a licence issued by the owner of the neighbouring rights or a **Collecting society**.

In Uganda, collecting society are catered for under Part VII of the Copyright and neighbouring Act, 2006. Also known as a copyright collecting agency or copyright collective management, the body is created by copyright law which engages in collective rights management. Collecting societies have the authority to license copyrighted works and collect royalties as part of compulsory licensing or individual licenses negotiated on behalf of its members. Collecting societies collect royalty payments from users of copyrighted works and distribute royalties to copyright owners.

In Uganda, the Uganda Federation of Movie Industry (UFMI) is one of the registered and certified Copyright Collecting Society that manages the rights of all the Audiovisual works.

What can be protected by Copyright law?

- Literary works (e.g. articles, novels, pamphlets, books)
- Dramatic works (e.g. scripts for films and dramas)
- Musical works (e.g. melodies)
- Artistic works (e.g. paintings, photographs, drawings, architecture, sculpture)
- Sound recordings
- Films
- Television and radio broadcasts
- Cable programmes
- Performances
- Computer programs
- What works are not protected by Copyright law?
- Ideas, concepts, procedures, methods, public benefit works or other things of a similar nature are not protected by Copyright law.

How is Copyright acquired?

Copyright is recognized and protected at creation.
A created work is automatically protected by copyright as soon as it exists.

However the work must be original (it must have been developed independently by its creator) and it must be expressed in material form. Works are protected irrespective of their quality. The Copyright law of Uganda however, further provides that the owner of a copyright and neighboring right may register the right with the registrar for the purposes of keeping evidence of ownership of right, identification of works and authors and maintenance of record of the rights.

What is the procedure for registering a copyright?

- An application for registration must be made to the Registrar of copyright at Uganda Registration Services Bureau (URSB) and an application fee paid.
- The application for must be published in the Uganda Gazette for 60 days.
- If no objection is made to the registration of the said right, a certificate of registration will be issued to the applicant.
- How long does copyright protection last?
- Copyright protection generally lasts for the life of the creator and 50 years after the creator's death. This means that it is not only the creators that benefit from their works, but also their heirs.

COMPUTERS AND SOCIETY

Computers have had a lot of impact in various aspects of society as discussed below.

POSITIVE IMPLICATIONS OF USING COMPUTERS TO SOCIETY

- Created and widened employment opportunities e.g.; software engineers, computer teachers, technicians, etc.
- Improved education and research by simplifying teaching and learning. E.g. abstract content can be made real through cyber science technology – others are computer aided teaching and computer aided learning, presentations software, etc.
- Improved entertainment and leisure through computer games, music, etc for people to refresh and make-up.
- Improved communication and collaboration through computer networks.
- Improved health services where computers facilitate recording, monitoring, and diagnosis for patients.
- Improved security through computer managed gates and monitoring of commercial and domestic premises, detecting and controlling crime by police.
- Reduced production time and manufacturing processes through computer aided manufacturing and computer aided designing which have greatly improved the quantity and quality of life.
- Improved customer services delivery and care eg networked computers provide 24/7 on-line services like credit cards Improved business and investment opportunities.

- Improved data and document production, storage and manipulation.

NEGATIVE IMPLICATIONS OF USING COMPUTERS TO SOCIETY

- **Violation of Privacy:** In many instances, where personal and confidential records stored on computers were not protected properly, individuals have found their privacy violated and identities stolen.
- **Public Safety:** Adults, teens, and children around the world are using computers to share publicly their photos, videos, journals, music, and other personal information. Some of these unsuspecting, innocent computer users have fallen victim to crimes committed by dangerous strangers.
- **Impact on Labor Force**: Although computers have improved productivity and created an entire industry with hundreds of thousands of new jobs, the skills of millions of employees have been replaced by computers. Thus, it is crucial that workers keep their education up-to-date. A separate impact on the labor force is that some companies are outsourcing jobs to foreign countries instead of keeping their homeland labor force employed.
- **Health Risks:** Prolonged or improper computer use can lead to health injuries or disorders.
- **Impact on Environment:** Computer manufacturing processes and computer waste are depleting natural resources and polluting the environment.
- Computer related crime e.g. forgeries, cyberbullying, Piracy etc.
- Increased cost of production as computers are very expensive to buy and maintain. Computer experts can as well be expensive to hire.
- They are many health hazards e.g. can cause eye defects, Tendonitis, RSI, etc.
- Electronic fraud: Stealing money electronically through practices like Credit card cloning and illegal money transfers.
- Hacking: Unauthorized access into computers possibly to access information, compromising privacy. e.g. Wikileaks
- Virus threats which has made data storage and safety very unreliable.
- Loss of employment as they take over job assignments for semi and less skilled job functions.
- Deaths and accidents due to computer malfunctioning or explosion.
- Erosion of human integrity and creativity as even the smallest calculation is assigned to the computer. Other cases are Forgeries, GMFs, test tube children, etc.
- Loss of man-hours as some workers go for unproductive computer based leisure at the expense of their work. Cyber terrorism.
- Moral Decay: The internet has websites with content such as pornography, which have a bad impact on the users especially the young children.
- In politics, ICTs are being used for running new forms of political activism, for example mobilizing masses against to rebel against governments using social media channels like twitter.

HEALTH CONCERNS OF COMPUTER USE

Users are a key component in any information system. Thus, protecting users is just as important as protecting hardware, software, and data. The widespread use of computers has led to some important user health concerns.
A repetitive strain injury (RSI) is an injury or disorder of the muscles, nerves, tendons, ligaments, and joints. Computer-related RSIs include tendonitis and carpal tunnel syndrome.
Tendonitis is inflammation of a tendon due to some repeated motion or stress on that tendon.
Carpal tunnel syndrome (CTS) is inflammation of the nerve that connects the forearm to the palm of the wrist.
Repeated or forceful bending of the wrist can cause CTS or tendonitis of the wrist. Symptoms of tendonitis of the wrist include extreme pain that extends from the forearm to the hand, along with tingling in the fingers. Symptoms of CTS include burning pain when the nerve is compressed, along with numbness and tingling in the thumb and first two fingers.
Long-term computer work can lead to tendonitis or CTS. Factors that cause these disorders include prolonged typing, prolonged mouse usage, or continual shifting between the mouse and the keyboard. ***If untreated, these disorders can lead to permanent physical damage***.

You can take many precautions to prevent these types of injuries. Take frequent breaks during the computer session to exercise your hands and arms. To prevent injury due to typing, place a wrist rest between the keyboard and the edge of your desk. To prevent injury while using a mouse, place the mouse at least six inches from the edge of the desk. In this position, your wrist is flat on the desk. Finally, minimize the number of times you switch between the mouse and the keyboard, and avoid using the heel of your hand as a pivot point while typing or using the mouse.



Another type of health-related condition due to computer usage is computer vision syndrome (CVS). You may have CVS if you have sore, tired, burning, itching, or dry eyes; blurred or double vision; distance blurred vision after prolonged staring at a display device; headache or sore neck; difficulty shifting focus between a display device and documents; difficulty focusing on the screen image; color fringes or after-images when you look away from the display device; and increased sensitivity to light. Eyestrain associated with CVS is not thought to have serious or long-term consequences.

Techniques to Ease Eyestrain





- Every 10 to 15 minutes, take an eye break.
  - Look into the distance and focus on an object for 20 to 30 seconds.
  - Roll your eyes in a complete circle.
  - Close your eyes and rest them for at least one minute.
- Blink your eyes every five seconds.
- Place your display device about an arm's length away from your eyes with the top of the screen at eye level or below.
- Use large fonts.
- If you wear glasses, ask your doctor about computer glasses.
- Adjust the lighting.

People who spend their workday using the computer sometimes complain of lower back pain, muscle fatigue, and emotional fatigue. Lower back pain sometimes is caused from poor posture. Computer users can protect themselves from health risks through proper workplace design, good posture while at the computer, and appropriately spaced work breaks.

Ergonomics and Workplace Design

Ergonomics is an applied science devoted to incorporating comfort, efficiency, and safety into the design of items in the workplace. Ergonomic studies have shown that using the correct type and configuration of chair, keyboard, display device, and work surface helps users work comfortably and efficiently and helps protect their health. For the computer work space, experts recommend



an area of at least two feet by four feet. Figure below illustrates additional guidelines for setting up the work area.

Computer Addiction

Computers can provide entertainment and enjoyment. Some computer users, however, become obsessed with the computer and the Internet. Computer addiction occurs when the computer consumes someone's entire social life. Computer addiction is a growing health problem but can be treated through therapy and support groups.

Symptoms of a user with computer addiction include the following:

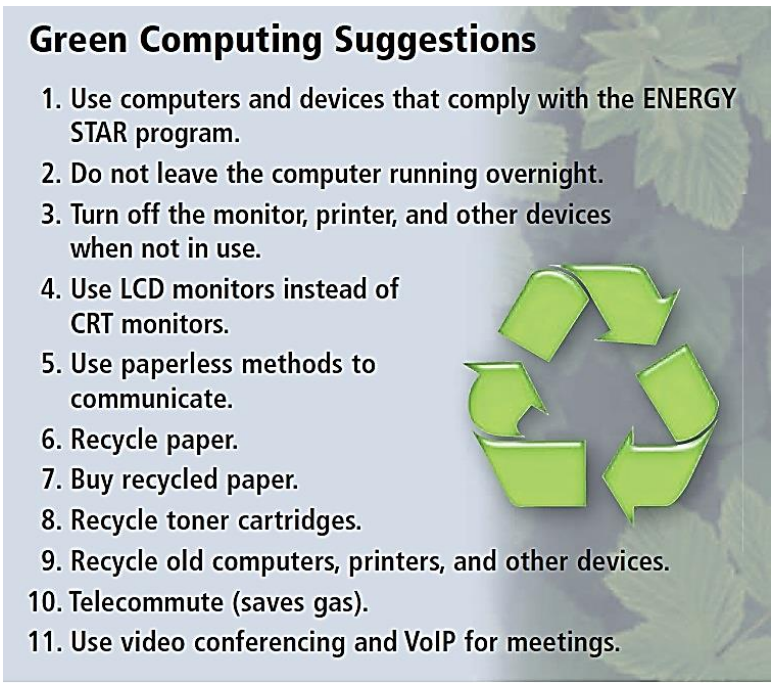
- Craves computer time
- Irritable when not at the computer
- Overjoyed when at the computer
- Unable to stop computer activity
- Neglects family and friends
- Problems at work or school

GREEN COMPUTING

Green computing involves reducing the electricity and environmental waste while using a computer. People use, and often waste, resources such as electricity and paper while using a computer.

The United States government developed the ENERGY STAR program to help reduce the amount of electricity used by computers and related devices. This program encourages manufacturers to create energy-efficient devices that require little power when they are not in use. Computers and devices that meet the ENERGY STAR guidelines display an ENERGY STAR label.

Users should not store obsolete computers and devices in their basement, storage room, attic, warehouse, or any other location. Computers, monitors, and other equipment contain toxic materials and potentially dangerous elements including lead, mercury, and flame retardants. In a landfill, these materials release into the environment. Recycling and refurbishing old equipment are much safer alternatives for the environment.



Definition: **Emerging technologies** are those that are currently being developed or will be developed in the next 5 to 10 years, and which will alter the business and social environment.

ICT is always improving and changing and new technologies are being developed all of the time.

These are many Developments in Hardware, Developments in Software and Developments in Application of computers. The Developments in technology will, by nature, impact on our everyday lives and these include:

a) **Artificial Intelligence (AI)**
b) **Digital forensics**
c) **Biometrics**
d) **Robotics**
e) **Quantum Cryptography**
f) **Computer Assisted Translation (CAT)**
g) **3D and Holographic Imaging (aka holograms)**
h) **Virtual Reality**

Artificial Intelligence (AI)

This is a computer science that is focused on creating computer systems that simulate human intelligence. The term was first used in 1956 by a computer scientist at the Massachusetts Institute of Technology (MIT) who was focused on trying to make computers behave like humans.

AI is being developed in the following application areas:

- **Expert Systems** - These are computers that have been programmed to make decisions based on information they are given. For example: Medical expert systems can diagnose patient's illnesses based on symptoms entered.
- **Languages** - This type of AI involves computers that can understand different human languages as they are spoken to them.
- **Robotics** - Robotic artificial intelligence is where machines are programmed to imitate a human.
- **Game Playing** - Computers developed to play games against human players. For example: In 1997 a computer named 'Deep-Blue' defeated a world champion in the game of chess.

Impacts of AI on everyday life:

Some of the impacts that artificial intelligence can have on everyday life are discussed in the table below:

- **Accurate prediction of weather** - AI software will soon be used to sift through weather data more accurately that humans can and will be used to predict approaching storms and automatically issue warnings.
- **Increased leisure time** - Robotic vacuum cleaners are becoming more and more popular. These can detect walls and other objects in order to vacuum around them. People can leave them running whilst they enjoy extra spare time.

- **Safer transport** – Self driving cars already exist will drastically reduce road accidents. Driverless trains too already exist in some countries!
- **Increased Personal safety** - Modern home alarm systems use artificial intelligence software that can tell the difference between the home owners and intruders. The software automatically alerts the police when intruders are detected.
- **Improved medical care** - Robotic surgery assistants are being used to quickly and accurately pass the correct surgical tools to doctors. The few seconds saved in getting the correct tool to the doctor can save patient's lives.

Digital forensics

Digital forensics, also called computer forensics, network forensics, or cyberforensics, is the discovery, collection, and analysis of evidence found on computers and networks. Digital forensics involves the examination of computer media, programs, data and log files on computers, servers, and networks.

Many areas use digital forensics, including

- law enforcement,
- criminal prosecutors,
- military intelligence,
- insurance agencies,
- Tax investigations and
- information security departments in the private sector.

A digital forensics examiner must have knowledge of the law, technical experience with many types of hardware and software products, superior communication skills, familiarity with corporate structures and policies, a willingness to learn and update skills, and a knack for problem solving.

Impact of Digital Forensics on everyday life:

Forensics is changing in the digital age, and the legal system is still catching up when it comes to properly employing digital evidence.

- Forensics has led to increased legal use of digital evidence. Digital evidence is information found on a wide range of electronic devices that is useful in court because of its probative value.
- Technology changes evidence. There is still a vigorous debate in the legal world over the usage and reliability of DNA evidence, for example. This is now being mirrored in more recent court challenges over the use of digital evidence.
- Digital evidence tendered in court often fails to meet the same high standards expected of more established forensics practices, particularly in ensuring the evidence is what it purports to be. It is increasingly common for criminal trials to rely on digital evidence. And, regrettably, it is common for

innocents to be convicted and guilty people acquitted because of digital evidence.

Biometrics

Biometrics is where parts of a person's body are used for identification purposes. Examples include:

- **Fingerprints** - These are impressions embedded at the end of human fingers and thumbs. Fingerprints kept in a database can be matched to those left at crime-scenes to help identify the culprit.
- **Eye recognition** - Eye scans analyse the iris which is the coloured ring that surrounds the pupil.
- **Face recognition** - This is where the shapes of individual's faces are analysed.
- **Voice recognition** - Pitch, tone and frequency of voices are unique and can be analysed to identify people.

All of these parts of the human body are unique from person to person and can be used to authenticate identity.

Note: Even identical twins have slightly different fingerprints and voices etc.

- Before biometric methods can be useful, people have to perform a process known as 'biometric enrolment'.
- This is where body-part data such as fingerprints or voice patterns are captured and stored within the system so that they can be used to identify the person later on.
- Biometrics are beginning to be used in place of passwords and physical locks as a means of security.
- Biometrics have advantages over these older methods as body parts cannot be lost, forgotten or stolen as can be the case with passwords and keys.

Impacts of Biometrics on everyday life:

Some impacts of biometrics are discussed below:

- **Better airport security** Iris recognition is already in use in some airports.
- Travellers have their eyes and iris scanned into a system and this data is later matched up when the person is performing airport checks.
- **Increased building security** Fingerprint access to buildings have been replacing the older methods of locks and keys. This method ensures that only authorised people can enter restricted buildings or rooms.
- **Reduced car theft** Cars already exist that use fingerprints to only unlock their doors or start the engine for the fingerprint that is registered. This means that the doors will not unlock for a print that is not recognised and makes the car harder to steal.
- **More secure mobile phones** Mobile phones contain our lives. We used our phones for everything from social media to shopping online.

They need to be as secure as possible in order to protect the valuable data that they contain. Apple recently released an iPhone model that uses a fingerprint reader to identify the true owner of the phone. It will not unlock for a fingerprint that it does not recognise.

Robotics

Robots are used to perform a wide range of physical tasks.

They are either automated (controlled by a computer chip) or manually controlled by a human.

There are 4 different types of robots:

- Manufacturing robots (used to perform repetitive tasks such as welding)
- Carrier robots (used by the military to carry heavy loads over dangerous terrain)
- Domestic robots (used in homes to perform cleaning tasks such as vacuuming)
- Exploration robots (used to visit and send images from places such as Mars)

Some more typical tasks that robots can be used for are described in the table below:

- **Dangerous jobs -** E.g. disposing of bombs, spray painting or cleaning up nuclear waste. Note: these are all jobs that could harm or kill a human.
- **Exploring extreme environments-** E.g. inside volcanoes, planets or the depths of the ocean. Note: humans cannot visit these environments due to lack of oxygen and high pressure / heat levels.
- **Repetitive manufacturing jobs -** E.g. production lines, packing and welding etc.
- Note: these jobs can also be performed by humans but robots can do them much faster and more efficiently.
- **Moving heavy objects -** E.g. installing large engines, moving pallets of items etc.

Robots are increasingly being used in manufacturing due to their proven increase in productivity. Think about it! Robots can work 24/7 and never need to take breaks. They also do not require wages like humans do. This means that robots can produce more at a lower cost.

Impacts of Robotics on everyday life:

Some impacts of robotics are discussed below:

- **Increased personal time** - If robots can carry out domestic chores, this frees up more time for us to spend as we wish.
- This could mean more time spent at work or for more enjoyable activities such as socialising.
- **More efficient manufacturing** Robots can manufacturer products such as cars much faster and cheaper than humans can. This means that companies can make more products at less cost and this means greater business profits.

- **Loss of jobs** Due to higher and cheaper productivity, robots are taking over the manufacturing jobs that used to be carried out by humans. This means that humans are missing out on employment on assembly lines and factory work.
- **Safer working environments** - Robots can safely carry out tasks that are too dangerous for humans. For example: spraying cars with toxic paint, defusing bombs on battlefields and search and rescue operations in buildings destroyed by earthquakes.

Quantum Cryptography

Quantum cryptography (encryption) is an emerging technology that allows messages and data to be sent with complete privacy.

Note: Encryption is where digital data and files are scrambled so that only authorised people are allowed to read it.

Unauthorised people attempting to read the data would see illegible nonsense instead of the real information. Older methods of encryption were based around mathematics but quantum cryptography uses physics instead.

This makes the encryption impossible to break.

In quantum cryptography, messages are encrypted using photons.

These are tiny packets of light.

Impacts of Quantum Encryption on everyday life:

Some impacts of quantum cryptography are discussed below:

- **Completely secure voting** Citizens of countries have the right to vote-in new governments but history is littered with examples of where these votes have been tampered with in order to influence election outcomes. Securing votes with quantum encryption methods ensures that they cannot be tampered with or changed.
- **Completely secure communication** - Messages sent by the military often include the locations of squadrons or special op's teams. If enemy forces intercepted these messages it could have severe consequences. Using quantum cryptography to secure the messages would eliminate the risk of them being read or heard by unauthorised ears.
- **Completely secure bank transfers** - Any electronic transfer of money, such as at ATM's or buying goods online, will be completely secure. Some banks are already using quantum cryptography for the purposes of securing money transfers.
- **Completely secure personal information** - Health records, bank details and other types of personal information will be absolutely secure from hackers and other people wishing to commit identity theft crimes.

Computer Assisted Translation (CAT)

CAT is where a human translator uses computer software to help in the translation process. CAT software can reduce the amount of time that the translation takes. Current CAT tools are not always 100% accurate. They need a human to check for errors.

Examples of different types of CAT tools include:

- **Spell checkers** - These are usually built-into word processing software and can automatically flag-up spelling errors and suggest translations of miss-spelt words.
- NOTE: Most word-processors allow the user to select the language in which to spell-check.
- **Translation memory software** - Translation memory software are databases which store translated text as the human translator works through it in order to be reused in the future. Translated text is built-up in the database's memory and can be accessed by other translators in order to speed up their translation jobs.
- **Language search-engine software** - These are Internet based systems which allow translators to enter any text that they want translating and also to select which language they want the text translating into. The software will then search through a large collection of translation memory databases to try and find a match with the text entered into the search engine.

If a match is found, translated text will be shown on-screen.

Impacts of Computer Aided Translation on everyday life:

Some impacts of CAT are discussed below:

- **More accurate documents** Spell checkers can quickly scan your word processed documents and automatically find spelling errors. Miss-spelt words can be quickly corrected to produce an error-free document.
- **A more multilingual society** Anyone with an Internet connection can access tools such as Google Translate and the vast collection of language databases that the tools can search through. This makes accessing other languages much easier than in the past and makes it easier for people to learn these new languages.
- NOTE: Google's new 'Voice Search' facility allows users to actually speak into a tablet or mobile phone and Google will automatically translate (and speak) the words or phrase in almost any language.
- **Quicker and more efficient translations** Foreign visitors to countries can be communicated with much easier through these CAT tools. They are especially useful in places like embassies where a wide-range of foreign visitors may need to communicate with local officials about problems or ask for advice etc.

3D and Holographic Imaging (aka holograms)

This is a technique where images are made to appear three-dimensional and to actually have depth. Holograms work by taking two regular two-dimensional images of the same object and laying one on top of the other. The two-dimentional images need to have been shot at different angles. Two different types of laser beams are used to record the two-dimensional images onto a single photographic plate. This creates one single image that

incorporates the angles of the original two-dimensional images. This produces a 3D effect. When viewing the image, human eyes see it from slightly different angles. The brain combines them into a three-dimensional image.

Impacts of 3D imaging on everyday life:

Some impacts of 3D imaging are discussed below:

- **Improved security** - Credit cards, ID cards, software and some bank notes include holograms as a way of trying to prevent forged duplicates being created. NOTE: Forgeries don't usually include a hologram as they are difficult and expensive to reproduce.
- **Better movie experiences** -Hollywood have been using 3D imaging within the production of movies for many years. These provide the viewer with a much more immersive experience. NOTE: 3D movies require the viewer to wear special glasses for the effect to take place. The glasses project two images shot at different angles (one in each eye) and your brain puts them together as one 3D image.
- **Greater data storage** - It is thought that the technology behind holograms will eventually be used to provide the means to store large amounts of data. Companies have already produced discs that use holographic layers that each have the potential to hold a massive 3.9 terabytes. NOTE: This is the equivalent of over 150 standard Blu-ray discs.

Virtual Reality

Virtual reality is where computers are used to create an artificial environment that users can interact with as if it were real. Virtual reality is not really meant for gaming purposes. It is used for more serious purposes such as:

- Allowing architects to walk around a virtual version of their design (this gives a better idea of what the finished building will look like)
- Training soldiers in combat (flight simulation, battlefield simulation)
- Training surgeons (virtual patients can be operated on to provide experience to trainee surgeons).

As they walk around the virtual environment users will experience things in a similar way to the real world. For example:

- Objects get smaller as you walk away from them (and bigger as you move closer)
- The direction of sounds change as you move around
- Objects in the virtual world appear the same dimensions as they would in the real world (for example dogs are smaller than us but elephants are bigger).

Equipment needed to create the virtual reality experience includes the following:

- **Eye Goggles -** These produce the 3D images that make up the artificial world.
- The goggles project slightly different views into each eye and this fools your brain into thinking that the scene is 3D. Virtual chairs look solid and so on.

- **Special Gloves -** The gloves detect your hand and finger movements which are input into a computer and processed. As users touch or use items in the virtual world, the computer can carry out these commands and make them happen. This allows the user to interact with the virtual world and perform tasks such as moving objects or switching on lights etc.
- **Headphones** - These control what users hear in the virtual world. For example: Distant sounds will be quieter than sounds that are close by.
- **Powerful Computer -** A very powerful computer is needed to create the virtual environment and to process/output data sent into the system by the user's actions. For example: The computer produces graphics that appear as walls, outdoor scenes and objects such as trees.

Impacts of Virtual Reality on everyday life:

Some impacts of virtual reality are discussed below:

- **Improved medical surgeons** - Surgeons can be trained using virtual patients. This allows them to practice over and over until they have perfected a particular surgery without risk to a real patient. For example: Imagine a new surgeon performing surgery on you and accidentally cutting off your leg!!.
- **Larger and stronger buildings** - Virtual buildings allow architects to walk around to experience what the building would look like when completed and check for potential errors before the actual building is constructed. Virtual buildings will also be able to be tested against factors such as earthquakes to see what effects they would have on the current design. This allows architects to modify designs quickly and cheaply and will, potentially, allow for the development of much larger and safer buildings than we currently have.
- **More effective treatment of phobias** - VR is being used to help patients overcome phobias and anxieties. People can experience a tame, controlled version of what they are afraid of. Slowly the person becomes used to the situation and can relax. For example: Someone might be terrified of spiders and so they could be gradually introduced to larger and larger virtual spiders (the virtual spiders would be controlled by the therapy team as well).
- **Training in dangerous situations** - VR can be used for training in dangerous situations where it is impossible to practice the real thing. For example: A large fire in an office building could never be set up in reality, but it could in a virtual environment. This will allow workers to practice emergency evacuation in a safe environment.
- **More realistic education -** VR can give students the opportunity to learn in a much more interactive way. For example: Astronomy students can learn about the solar system by engaging with the objects in the virtual environment. They could look around stars, move planets and track the

orbits of comets. This approach is likely to allow students to retain knowledge much better than reading text out of a book.

Review Questions:

1. List 5 technologies that are currently being developed or are emerging.

2a. Describe 3 areas where artificial intelligence is being developed.

2b. Describe 3 impacts that artificial intelligence can have on everyday life.

3a. Explain what 'Biometrics' is

3b. Describe 3 areas where biometric technology is being used.

3c. Describe 3 impacts that biometrics can have on everyday life.

4a. State 3 different types of robot

4b. Describe 3 areas where robots are being used.

4c. Describe 3 impacts that robots can have on everyday life.

5a. Explain what 'Quantum Cryptography' is.

5b. Describe 3 impacts that quantum cryptography can have on everyday life.

6a. Explain what 'Computer Aided Translation' is.

6b. Describe 3 different examples of computer aided translation tools.

6c. Describe 3 impacts that computer aided translation can have on everyday life.

7a. Explain what '3D Imaging' is.

7b. Describe 3 impacts that 3D imaging can have on everyday life.

8a. Explain what 'Virtual Reality' is:

8b. Describe 3 purposes for which virtual reality is being used.

8c. Describe 3 impacts that virtual reality can have on everyday life.

9a. Discuss the reliability of digital forensic evidence in courts of law.

SYSTEMS ANALYSIS

INTRODUCTION

- **What is systems analysis?**

Systems analysis is the separation of a substance into parts for detailed study, examination and interpretation (oxford dictionary). (Substance = business system).

- System analysis is the study of an organization's problem or situation and the specification of business requirements for an improved system.

- **What is systems design?**

Systems design is the detailed specification of a computer based solution to the business requirements. The design includes the programming specifications.

What is systems analysis and design?

- Systems Analysis and Design covers the entire systems development process from: Planning to implementation, maintenance, and evolution. It includes all activities performed to produce an automated IS.

IMPORTANCE OF SYSTEMS ANALYSIS

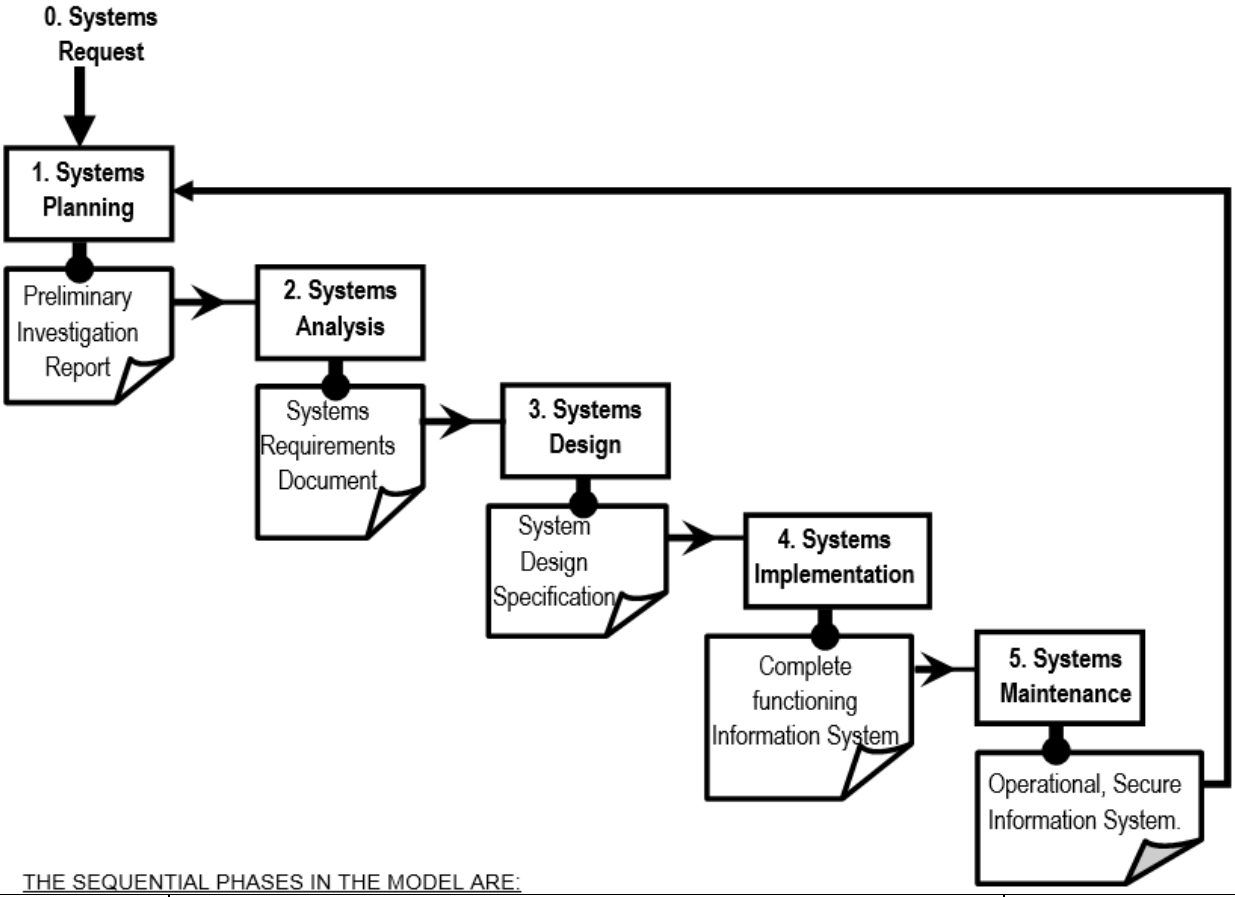
Why Systems analysis?

Projects do not succeed by chance. Successful IT projects follow a systematic "analysis and design" process in order to improve chances of success. Many people would think that software applications development is the actual programming of an application, and that the programming involves programmers writing codes and compiling them to make an application. Few people or users are quite aware that prior to these programmers doing the codes, a systems analysis and design is very critical. Here are the following reasons:

- A systems analysis process involves studying the actual business processes, understand where data is coming from, how it should be processed and what results are required.
- This is to find the bottlenecks in data or in processing that results in performance degradation of an application software.
- To sub-divide a more complex application system so that it can easily be managed.
- Participation of Users: The strategic purpose of the analysis of the system is to seek the acceptance of the people to a new development. System analysis process provides a sense of participation to the people. This helps in breaking the resistance to the new development and it also ensure the commitment to the new system.
- Understanding of Resource Needs: The analysis of the system helps in defining the resource requirements in terms of hardware and software. Hence, if any additional resources are required, this would mean an investment. The management likes to evaluate the investment form the point of view of return on such investment. If the return on the investment is not attractive, the management may drop the project.
- Assessment of Feasibility: The analysis of the system helps to establish its feasibility / viability from different angles. The system should satisfy the technical, economic and operational feasibility.
- System Boundaries: It is necessary to establish the system boundaries which would define the scope and the coverage of the system. This helps to sort out and understand the functional boundaries of the system, the department boundaries in the system, and the people involved in the system. It also helps to identify the inputs and the outputs of the various sub-systems covering the entire system.
- System Importance: It is necessary to understand the importance of the system in the organization. This would throw more light on its utility and would help the designer to decide the design features of the system. It would be possible then to position the system in relation to the other systems for deciding the design strategy and development.
- Nature of The System: The analysis of the system will help the system designer to conclude whether the system is the closed type or open. Such an understanding of the system is necessary, prior to design the process to ensure the necessary design architecture.

PHASES OF SYSTEMS ANALYSIS

The following are the core phases of system analysis basing on the traditional Systems Development Process



THE SEQUENTIAL PHASES IN THE MODEL ARE:

Phase	Explanation	Outputs
Systems Planning Phase	Begins with a formal request to the IT department, called a Systems request. The purpose of this phase is to perform a preliminary investigation to evaluate an IT-related business opportunity or problem. Feasibility study key at this phase and a course of action based on operational, technical, economic, and time factors is recommend after the study.	Preliminary Investigation Report Feasibility Study Recommendations
Systems Analysis Phase	The purpose of the systems analysis phase is to build a logical model of the new system. To understand the system, fact-finding techniques such as interviews, are used to collect facts necessary to build the model. Requirements modeling help to get the systems requirements of the system.	Systems Requirements Document
System Design Phase	The purpose of this phase is to create a physical model that will satisfy all documented requirements for the system. At this stage, you design the user interface and identify necessary outputs, inputs, and processes, plus the internal and external controls.	System Design Specification
Systems Implementation Phase	During the systems implementation phase, the new system is constructed - programs are written, tested, and documented, and the system is installed. This phase also includes an assessment, called a systems evaluation, to determine whether the system operates properly and if costs and benefits are within expectations.	Complete functioning information system
Systems Maintenance Phase	In this phase IT staff maintain, enhance, and protect the system. Maintenance changes correct errors and adapt to changes in the environment, such as new tax rates. Enhancements provide new features and benefits. Security controls safeguard the system from both external and internal threats.	Operational, Secure information system

	A scalable design can expand to meet new business requirements and volumes.	

THE SYSTEM ANALYST



- She or he performs Systems Analysis
- Usually employed in the Information Systems department
- Has Wide ranging skills
- A *system analyst* studies the problems and needs of an Organisation. To determine how people, methods, and computer technology can best accomplish improvements for the business.

ROLE OF A SYSTEMS ANALYST

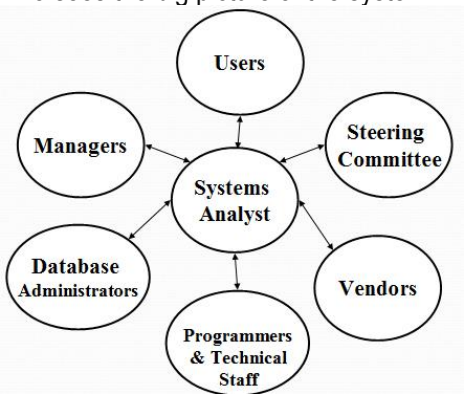
1. Investigate how information is used, handled and manipulated in an organization.
2. Identify inefficiencies and ineffectiveness in the current system used by the organization e.g. delays, high operating costs, huge clerical effort and health hazards.
3. Analyze the results of the investigation that will lead to designing the new system.
4. Design a specification of a new system which overcomes the inefficiencies and meets the organization objectives.
5. Oversees the process of testing during the testing of the system.
6. The analyst acts as a *facilitator*.

- He/She interfaces among many different types of people and facilitates the development of computer applications through these people.

STAKEHOLDERS OF AN INFORMATION SYSTEM

NB. These teams in the diagram will be created and disbanded as projects are started and completed or cancelled.

- The analyst may well be the only individual who sees the big picture of the system.



TASKS OF A SYSTEMS ANALYST

Systems analyst tasks include

- Investigation
- Planning
- Understanding
- Communication
- Documentation

QUALITIES OF A SYSTEMS ANALYST

1. Working knowledge of IS Techniques and Technology.
2. Computer Programming Knowledge
3. Problem-solving skills (creativity)
4. Interpersonal Relations skills (confidence, persistent, patience)
5. Interpersonal communication skills
6. Ongoing interest in updating one's knowledge in IT.

SYSTEMS ANALYST SKILLS - BEHAVIOURAL &TECHNICAL

Diplomacy	Being able to say "no" without being " blunt; displaying tact in dealing with others.
Interviewing	Asking the right questions in order to obtain the information needed.
Directing	Giving instructions and communicating user requirements to programming and support staff.
Patience	Continually refining user requirements by requesting - feedback; tolerating lack of computer literacy and specificity.
Assertiveness	Insisting on a course of action or what one believes in, even though it may be unpopular.
Leadership	Getting work done while keeping the team satisfied, effectively giving rewards and punishment.
Programming	Converting system specifications into effective and efficient computer code.
Speaking	Presenting your ideas in a manner easily understood by your audience, both in group meetings and person to person.

Writing	Preparing written documents that accurately communicate ideas in a manner that is easily understood by intended readers.
Listening	Paying attention to and concentrating on what is being said, and asking questions that refine points about which one is uncertain.
Empathy	Being able to understand how others feel; accurately determining what someone else thinks about an issue.
Sales	Promoting the system you advocate; persuading others to accept your viewpoint.
Politics	Understanding what motivates individuals; determining sources of power and influence in an organisation.
Management	Planning, organising and controlling projects so that they get done on schedule and within budget.
Training	Educating users and other non-technical groups on the capabilities of computers and systems.
Cooperation	Working with others productively; resolving conflict in an effective manner.

COMPUTER PROFESSIONS

Information and communication technology (ICT) has created new job titles such as computer operators, computer technicians, system analyst, computer programmers, software engineer, information systems manager, data base administrator, computer trainer, web administrator, computer graphics designers, system administrators and network administrator, as detailed below:

System analyst

- This a person who is responsible for analyzing a company's needs or problems then designs and develops a computer based information system.

Some of the responsibilities of a system analyst include:

- Reviewing the current manual or redundant information system and making recommendations on how to replace it with a more efficient one.
- Working with programmers to construct and test the system.
- Coordinating training for users of the new system.

A good system analyst is one who has at least the following attributes;

- Good problem solving skills and creativity, ie. Must have wide experience in solving problems.
- Good communication skills: The analyst must be able to communicate clearly and precisely both in writing and in speech. He/she must be able to talk to different groups of people e.g managers, operators, attendant and general public.
- Must have business knowledge: the analyst must clearly understand the environment for which the system is being developed.
- Technical knowledge: A system analyst must be well trained in relevant areas of computer science such as hardware, software programing knowledge.

Computer operator

- Some of the responsibilities of a computer operator include;
- Entering data into the computer for processing.
- Keeping up-to-date records (log files) of all information processing activities.

Computer technician

- Given that computers require regular maintenance, upgrading as well as emergency repairs, demand for computer technicians continues to grow as more people computerize their workplaces and homes.

- Some of the responsibilities of a computer technician are;
    - Troubleshooting computer hardware and software related problems.
    - Assembling and upgrading computers and their components.
    - Ensuring that all computer related accessories such as printers modems, storage media devices are in good working condition.

Computer engineer

- Computer and electronic engineers are coming up with new and more efficient technologies in information and communication technology almost daily. Since computers are electronic devices, hardware designers must be good in electronic engineering in order to be able to:
- Design and develop computer components such as storage devices, motherboards and other electronic components.
- Determine the electrical power requirement of each component.
- Re-engineer computer components to enhance its functionality and efficiency.
- Design and develop engineering and manufacturing computer controlled devices such as robots.

Computer programmer

- Large organizations such as insurance companies, banks, manufacturing firms and government agents hire programmers to work together with system analysts in order to:
- Develop in house application programs or system programs.
- Customize commercial application packages to suite the organization needs.
- Install, test, debug, and maintain programs developed or customized for the organization.

Web administrator/webmaster

- **A web administrator is responsible for:**
- Developing and testing websites.
- Maintaining, updating and modifying information on the website to meet new demands by the users.
- **Software engineers:** Most Software engineers analyses user needs and create application software. Software engineers usually have experience in programming, but focus on the design and development of programs using the principles of mathematics and engineering.
- **Computer Trainers:** Computer trainers typically teach new users how to use the computer software and hardware.

Network administrator

- A network administrator is a specialist whose responsibilities are to:
- Set-up a computer network.
- Maintain and enforce security measures on the network.
- Monitor the use of network resources.
- Maintain and troubleshoot network related problems.

Graphic designers: A graphic designer is a professional within the graphic design and graphic arts industry who assembles together images, typography, or motion graphics to create a piece of design.

System Administrators

- *A system administrator, or sysadmin, is a person who is responsible for the upkeep, configuration, and reliable operation of computer systems; especially multi-user computers, such as servers.*
  Other responsibilities of an information system administrator include; The system administrator seeks to ensure that the uptime, performance, resources, and security of the computers he or she manages meet the needs of the users, without exceeding the budget.
- A system administrator may acquire, install, or upgrade computer components and software; provide routine automation; maintain security policies; troubleshoot; train or supervise staff; or offer technical support for projects.

ANSWERS TO OBJECTIVE TYPE REVIEW QUESTIONS**

Topic One: Introduction to Computer Studies

1. C	**2.** C	**3.** B	**4.** B	**5.** B
6. D	**7.** C	**8.** B	**9.** C	**10.** B
11. D	**12.** A	**13.** A	**14.** C	**15.** A
16. C	**17.** D	**18.** D	**19.** C	**20.** C

Topic Two: Computer Hardware

1. C	**2.** A	**3.** C	**4.** A	**5.** D
6. B	**7.** D	**8.** A	**9.** C	**10.**D
11. A	**12.** A	**13.** B	**14.** A	**15.** A
16. D	**17.** D	**18.** C	**19.** C	**20.** D

Topic Three: Computer Software

1. B	**2.** C	**3.** B	**4.** C	**5.** A
6. A	**7.** A	**8.** C	**9.** D	**10.** B
11. B	**12.** D	**13.** D	**14.** B	**15.** B
16. B	**17.** D	**18.** C	**19.** A	**20.** D

Topic Four: Word Processing

1. B	**2.** D	**3.** C	**4.** C	**5.** A
6. C	**7.** D	**8.** A	**9.** B	**10.**C
11. D	**12.** B	**13.** C	**14.** A	**15.** C
16. B	**17.** C	**18.** C	**19.** A	**20.** D

Topic Five: Presentation Software

1. D	**2.** C	**3.** C	**4.** B	**5.** A
6. C	**7.** A	**8.** B	**9.** C	**10.**A
11. A	**12.** C	**13.** B	**14.** D	**15.** D
16. A	**17.** B	**18.** C	**19.** B	**20.** C

Topic Six: Spreadsheets

1. C	**2.** D	**3.** C	**4.** A	**5.** A
6. A	**7.** D	**8.** D	**9.** B	**10.**C
11. D	**12.** C	**13.** C	**14.** B	**15.** B
16. A	**17.** D	**18.** C	**19.** A	**20.** A

Topic Eight: Computer Communication And Networking

1. B	**2.** D	**3.** B	**4.** B	**5.** D
6. A	**7.** C	**8.** B	**9.** B	**10.**A
11. B	**12.** B	**13.** D	**14.** D	**15.** A
16.	**17.**	**18.**	**19.**	**20.**
21. C	**22.** C	**23.** A	**24.** C	**25.** C

Topic Nine: Web Design

1. A	**2.** C	**3.** B	**4.** B	**5.** C
6. B	**7.** B	**8.** A	**9.** B	**10.**B
11. D	**12.** D	**13.** A	**14.** A	**15.** D
16. D	**17.** C	**18.** A	**19.** B	**20.** A

Topic Ten: Databases

1. A	**2.** C	**3.** B	**4.** B	**5.** C
6. B	**7.** B	**8.** A	**9.** B	**10.**B
11. D	**12.** D	**13.** A	**14.** A	**15.** D
16. D	**17.** C	**18.** A	**19.** B	**20.** A

**FOOTNOTE: For inquiries, comments, corrections and clarifications, please visit www.mukalele.net

GLOSSARY OF ICT TERMINOLOGY

A

Absolute Reference: An absolute cell reference is a cell address that does not change when it is copied to other cells in a spreadsheet. Absolute references always refer to cells in a specific location. To make a cell address absolute, we insert the dollar symbol $ before the letter that identifies the column and before the number that identifies the row, example B1 becomes $B$1.

Acceptable Use Policy (AUP): An AUP is a set of rules that define the ways in which ICT facilities can and cannot be used in a business or educational institution, including a description of the possible sanctions that can be applied if a user breaks the rules. Two of the most important topics covered by an AUP are (i) **e-safety** and (ii) **awareness of and compliance with copyright**.

Active Matrix: A term used to describe the newer type of computer Display Screen that makes use of Thin Film Transistor (TFT) technology:.

Address Book: Usually supplied as part of your Email software. An *address book* in this sense is used to keep a record of all the email addresses of people whom you may wish to contact by email.

ADSL: Abbreviation for Asymmetric Digital Subscriber Line. A high-speed digital telephone connection that operates over an existing copper telephone line, allowing the same line to be used for voice calls. ADSL lines offer transmission speed that are usually in the range 2Mbps to 8Mbps, and are used mainly for Internet access. The term *asymmetric* is used because the data flows more quickly from the telephone exchange to the user than from the user to the exchange - because most Web users are more interested in receiving data quickly from websites rather than uploading it to websites. The term *symmetric* is used for connections where the data flows at the same speed in both directions, which is essential for accessing websites where there is a high degree of interactivity.

Adware is software that may have been installed on your computer by a remote computer, i.e. via the Web. Many free utilities that you download from the Internet will install hidden software that sends details of the websites you visit and other information from your computer (which can include your email address) to advertisers so they can target you with popup ads and spam.

Analogue: A wave form of electronic information transmission that is accomplished using signals of varying frequency or amplitude. Voice and radio have traditionally been analog forms of communication. Modems are devices used to convert analog information into digital form for transfer over computer networks.

Anchor: A term used in connection with HTML, the coding system used for creating Web pages. An anchor is the target of a Hyperlink, i.e. a point in a Web document to which you jump when you click on a hyperlink.

Animation: The display of a sequence of images in a computer program or on a Web page to give the impression of movement.

ANSI: Abbreviation for American National Standards Institute. This is a system that specifies code numbers for all the characters that appear on a computer Keyboard, plus the extended character set used in *Microsoft Windows*. It includes all the ASCII codes plus many others. Each character on the keyboard of a computer is assigned a unique ANSI code number, e.g. A = ANSI 065. Characters that don't appear on the keyboard can be typed by holding down the *Alt key*, pressing a series of digits on the number pad, e.g. ALT + 0233, and then releasing the *Alt key*. 0233 is the ANSI code for é.

Apache: The most popular Web Server software on the World Wide Web. Apache runs mainly on Unix systems, although there is also a *Microsoft Windows* version. The Apache Project website is at http://www.apache.org

API: Abbreviation for Application Programming Interface. API is a so-called protocol of communication that enables different computer programs to communicate with one another. A good API makes it easier to develop a program by providing all the building blocks that the programmer needs. Although APIs are designed for programmers, they are also good for program users insofar as they guarantee that all programs using a common API will have similar interfaces. This makes it easier for users to learn new programs.

Applet: A small program written in the Java programming language and embedded in a Web page. When you use your Browser to access a Web page, an applet may run "inside" the Web page, as it were, to perform an interactive animation, make a calculation or carry out another simple task.

Application: A computer program or a suite of computer programs that performs a particular function for the user, such as a word-processor, e.g. *Microsoft Word*, or a range of functions, such as *Microsoft Windows* or Microsoft Office.

Android: Google's smartphone and tablet's operating system. Unlike Apple's iOS operating system (used on the iPad, iPhone, iPod touch) they are many different manufacturers who produce Google Android compatible devices.

Archive: An **archive file** is a file that is composed of one or more files along with metadata. Archive files are used to collect multiple

data files together into a single file for easier portability and storage, or simply to compress files to use less storage space. Archive files often store arbitrary comments, and sometimes use built-in encryption. A file archiver is a computer utility program that combines a number of files together into one archive file, or a series of archive files.

Artificial Intelligence (AI): The ability of a computer to mimic human attributes in finding a solution to a problem. *Artificial Intelligence* techniques are applied in various ways in computer applications in the language world, e.g. in Machine Translation (MT) programs and in grammar and style checkers.

ASCII: Abbreviation for American Standard Code for Information Interchange. This is a system that specifies code numbers for all the characters that appear on a computer Keyboard, plus other specialized characters. Each character on the keyboard of a computer is assigned a unique ASCII code number. The ANSI character set includes many more characters, Unicode includes even more and is becoming a standard coding system.

ASF: Abbreviation for Advanced Streaming Format. This is Microsoft's own file format that stores both audio and video information and is specially designed to run over the Internet. ASF enables content to be delivered as a continuous stream of *streaming audio* or *streaming video* data with little wait time before playback begins. This means that you no longer have to wait for your audio and video files to fully download before starting to view them.

Assistive Technology: This term describes computer software or devices used by people with special needs to enable them to access the services provided by ICT, e.g. computer programs, Email and the World Wide Web. Technologies under this heading include Text To Speech (TTS) screen readers for the unsighted or partially sighted, alternative keyboards and mice for people who have problems in hand-eye coordination, head-pointing devices, speech recognition software, and screen magnification software.

Asynchronous: "Not at the same time".

Attachment: A term used in connection with Email. An attachment can be a File of almost any kind - a document file, an image file, a sound file or a video clip - that you can add, i.e. *attach*, to an email.

Attribute: A specification that defines a property of an object, element, or file. It may also refer to or set the specific value for a given instance of such. For example, in computer graphics, line objects can have attributes such as thickness (with real values), color (with descriptive values such as brown or green or values defined in a certain color model, such as RGB), dashing attributes, etc.

AVI: Abbreviation for Audio Video Interleave (or Interleaved). A file format for storing video recordings on a computer..

B

Backup or Back Up: Used as a verb, *to back up* means to copy a File or Folder from your computer to another Storage Device, e.g. a CD-ROM, as a precaution in case your Hard Drive fails or is infected by a Virus. A *backup*, used as a noun, or a *backup copy* describes a copy that you have made in this way. It is essential to back up new files and folders at regular intervals.

Bandwidth: The amount of data that can be sent from one computer to another through a particular connection in a certain amount of time, e.g. via a computer to the Internet and vice versa. The more bandwidth available, the faster you are able to access information. Bandwidth is usually measured in *kilobits per second* (Kbps) or *megabits per second* (Mbps).

Baud: A unit of measurement at which data can be transferred (i.e. the *baud rate*), for example over a telephone line via a Modem or from a computer to an external device such as a Printer. Rarely used nowadays, as transfer rates are normally expressed in kilobits per second (Kbps) or megabits per second (Mbps).

Binary: A number system using base 2 instead of the usual (human) base 10, which is normally referred to as the decimal system. Computers use base 2 because they can only recognize two values, 1 or 0. This is simulated electronically by using a device, such as a switch, which is either on (1) or off (0). All numbers are represented by combinations of ones and zeroes, thus the number 9 is represented as 1001, the right-most column being the units column and the other columns, moving from right to left, being 2, 4, 8

Binary File: Strictly speaking all computer files are Binary, consisting of a string of ones and zeroes, but the term *binary file* is often used to differentiate program files and data files from *text files*, which contain only unformatted printable ASCII characters.

BIOS: Acronym for Basic Input/Output System. This is a built-in ROM Chip on the Motherboard containing essential programs to manage the computer's input and output, which are loaded into memory during the boot process.

Bit: Contraction of *binary digit*. A bit is the smallest measurement unit of computer memory.

Bitmap: A computer graphic or image composed of thousands of individual dots or *pixels*, each pixel

being stored as a number. The image is displayed by specifying the colour of each pixel. Bit-mapped graphics can be imported into other applications, e.g. a word-processor, but they cannot be edited within these applications. When bit-mapped graphics are resized they usually suffer a loss of sharpness, whereas *vector graphics* can be resized without such loss

Blended Learning: This term normally refers to combining Internet-based *distance learning* with face-to-face tuition but it may also be used to describe combining offline ICT-based materials with more traditional materials, such as books, audiocassettes and videocassettes.

Blog: Contraction of the term Weblog. A *blog* is essentially a website that contains discrete pieces of information posted by different users. New items of information are usually entered by contributors via a simple form, following the introduction of each new theme by a person who initiates the blog, and then submitted to the site, where they may be filtered by an administrator before being posted. A blog can contain news items, short essays, annotated links, documents, graphics, and multimedia. These posts are usually in reverse chronological order and often take the form of a journal or diary.

Blogger: Normally used to refer to someone who *blogs*, i.e. who regularly writes *blogs*. Also used to describe a service that provides Web-based tools used by individuals to create a Blog or Weblog

Bluetooth: *Bluetooth* is a technical industry standard for radio technology which facilitates the transmission of signals over short distances (up to around 10 metres) between telephones, computers and other devices without the use of wires. For example, a Bluetooth-enabled mobile phone can communicate with a Desktop Computer or Laptop Computer for the purpose of synchronizing data, such as an appointments diary.

BMP: Abbreviation for Bitmap, a file format for storing images. This is the standard format used, for example, by *Windows Paint*. BMP image files occupy quite a lot of space compared to other formats.

Bookmark: A *bookmark* is a facility within a Browser that enables you to keep a record of Web pages that you have visited and may wish to visit again. Bookmarks are stored in a subdirectory of the Windows directory on your computer. *Internet Explorer* bookmarks are known as Favorites .Bookmarks are also used to mark positions in a *Word* document, i.e. positions to which you can jump from other points in the document by clicking on them with the Mouse.

Boot: (verb) To start up a computer by loading the operating system into memory. The computer is regarded as *bootstrapping* itself into operation, i.e. picking itself up by its own bootstraps. The adjective *bootable* is often used to describe a backup disc that can be used to start a computer, e.g. when the hard disc fails or becomes corrupted for some reason.

Bot: Short for *Robot*.

bps: Abbreviation for *bits per second*. Computer people normally measure data transmission speeds in *Kbps*, meaning *kilobits per second*, or *Mbps*, meaning *megabits per second*. If you have a 56Kbps modem (which is slow by today's standards) it means that your modem can transmit at speeds up to 56,000 bits of information per second. Se

Broadband: A general term used to describe a high-speed connection to the Internet.

Browser: A software package installed on the hard disc of your computer that enables you to access and to navigate the World Wide Web - to "browse" or "surf" the Web .

Bug: Not a nasty insect, but a logical fault in a computer program which causes it to malfunction. Many computer programs contain bugs, some of which take years to come to light.

Burn: When data is written to a CD, for example using a CD-Read/Write drive, a pattern of microscopic dots is etched with a laser beam in a spiraling track on the CD surface. This is a process often referred to as "burning a CD".

Bus: This is basically a set of parallel wires for connecting the Central Processing Unit (CPU) of a computer to other hardware devices. Data can be transmitted in two directions, from and to the CPU.

Byte: A measurement of computer memory or disc capacity. A byte comprises 8 *bits*.

C

CAA: Abbreviation for Computer Aided Assessment

Cache: is a component that transparently stores data so that future requests for that data can be served faster. The data that is stored within a cache might be values that have been computed earlier or duplicates of original values that are stored elsewhere. If requested data is contained in the cache (**cache hit**), this request can be served by simply reading the cache, which is comparatively faster.

CAD Abbreviation for Camputer Aided Design.. CAD enables the user to manipulate drawings, including 3D drawings, and viewing them from a variety of angles.

CAI: Abbreviation for Computer Assisted Instruction.

CAM Abbreviation for Computer Aided Manufacturing. CAM is a general term for computer support during the manufacturing process.

Camcorder: A portable video camera, capable of recording live motion video for later replay through a computer. Videos produced by a camcorder can be *uploaded* to a computer via a USB or Firewire cable.

Card: In computer jargon, a *card* is an electronic circuit board, usually one which can be slotted into your computer in order to fulfill a specialized function.

Cascading Style Sheets (CSS): Cascading Style Sheets are a feature of HTML that enables a range of styles for headers, body text, bullet points, links etc., to be specified for hypertext documents. This makes it possible to set up CSS file containing a library of styles that are used throughout a website, thereby facilitating consistency. If a style needs to be changed throughout a website it only needs to be changed once in the CSS file and then it will be applied automatically. CSS have a good deal in common with the *Styles and Formatting* feature in Microsoft Word.

Case Sensitivity: Used to describe how a computer program, e.g. a Browser, interprets upper and lower case letters, e.g. in the name of a program, the name of a folder stored on your computer, or the name of a website. Some computer programs may be *case sensitive*, in other words they make a distinction between capital letters and lower case letters so that, for instance, Uganda is perceived as different from *uganda*.

Cathode Ray Tube (CRT): An older type of computer Display Screen or Monitor, in which beams of high-voltage electrons are fired at a screen causing thousands of Red, Green and Blue (RGB) dots to glow in different combinations and intensities, thus producing the full-colour image displayed on the screen. Cathode Ray Tubes are also used in older domestic TV sets. Newer types of display screens are of the LCD or TFT flat panel type - like many modern TV sets. They are much lighter, use less electricity and take up less room on your desk.

CBT: Abbreviation for Computer Based Training.

.**Cell:** A box at the intercession of a row and a column in a table or a spreadsheet.

Central Processing Unit (CPU): Also known as the Central Processor. In a modern computer the CPU is a single microprocessor Chip or Microchip, an integrated circuit which carries out information processing and calculations. In essence, the CPU is the computer's "brain".

Chat Room: A *synchronous*, mainly text-based communication facility, offering a Web-based environment where people either drop into or arrange to meet and *chat* at specific times. You type in your text online, it is seen almost immediately by others online at the same time who respond online in real time.

Client: A computer that receives services from another computer. The computer on your desk which you use to browse the Web is a *client*, and the computers from which World Wide Web files are downloaded to your computer are *servers*. Similarly, a computer (also known as a workstation) connected to a Local Area Network (LAN) is a *client* that can receive information from and send information to the *server* that controls the LAN.

Clipart or **Clip Art:** A collection of image files that can be embedded or inserted into Web pages, word-processed documents, *PowerPoint* presentations, etc. Some clipart images are copyright-free or in the public domain but others may be subject to a license fee.

Clipboard: A temporary storage area in a computer's memory used to hold items such as text that has been copied or cut from one section of a document before pasting it to another section in the same document or to another document.

Clock Speed: The speed of a computer's Central Processing Unit (CPU), which is normally expressed in Hertz. The Hertz represents the number of instruction cycles the processor carries out each second. In simple terms this indicates how fast the computer runs - how powerful it is.Modern computers now run at over one GigaHertz (1GHz).

CMY: Abbreviation for Cyan Magenta Yellow. The scheme used in colour printing, where inks of the subtractive primary colours Cyan, Magenta and Yellow are combined to produce millions of other colours. Most colour printers also have a black ink cartridge, both for monochrome printing and to produce a true black in colour printing.

CODEC: Short for **COmpressor / DECompressor** or **COder / DECoder**. A CODEC is software that is used to compress or decompress a digital audio or video file. CODECs are additional pieces of software that operate in conjunction with different media players, and certain types of audio and video recordings will only play back if the relevant CODEC is running in conjunction with the media player that you are using. A CODEC can consists of two components, an encoder and a decoder. The encoder compresses the file during creation, and the decoder decompresses the file when it is played back. Some CODECs include both components, while other CODECs include only one. CODECs are used because a compressed file takes up less storage space on your computer or on the Web. When you play an audio or video file in your media player it will use a CODEC to decompress the file

Collaborative Writing: A process that involves the creation and editing documents using Web tools designed for use by multiple authors, e.g. Google Docs. Such tools look, act and feel like normal word processors, but simplify the process of sharing and viewing documents.

Colour Depth: The number of colors that can be displayed at any one time on a computer Display Screen. Modern computers can display a range of millions of colours, producing very high quality images.

Command Line Interface (CLI): A *User Interface* in which a computer user communicates with a computer by entering commands as *text*, i.e. in order to run programs and to carry out other operations such as copying information from one Folder to another, deleting files, etc. Contrasted with a Graphical User Interface (GUI), e.g. *Microsoft Windows*, which allows the user to carry out such operations by clicking on *icons*, opening and shutting *windows* and dragging and dropping with a *mouse*. MS DOS and Unix are examples of CLIs.

Combination Drive: A Disc Drive that is capable of reading and writing to CD-ROMs, audio CDs and DVDs.

Compatibility: Pieces of hardware and/or software which are capable of being used together are described as *compatible*.

Compiler: A program which converts programs written in a high-level *programming language*, i.e. as used by professional human programmers, into Machine Code, a language that can be "understood" by a computer. A *compiler* produces a *binary executable* program file after the programmer has completed the programming.

Compression: A technique which reduces the amount of space required to store data, e.g. as used to reduce the amount of space needed to store an image, an audio recording, or a video recording.

Computer Aided Assessment (CAA): A term that covers all forms of assessment, whether Summative (i.e. tests that will contribute to formal qualifications) or Formative (i.e. tests that promote learning but are not part of a course's marking), delivered with the help of computers.

Computer Assisted Instruction (CAI): A term used mainly in the business world. Implies a top-down, instructor-centered approach to teaching with computers and is closely associated with Programmed Learning.

Computer Based Training (CBT): A term used mainly in the business world. Implies a top-down, trainer-centered approach to teaching with computers and is closely associated with Programmed Learning.

Computer Program: A set of instructions that the computer carries out in sequence to perform a given task. Programs are written in programming languages (e.g. C, Pascal), and are then converted into binary machine instructions via a compiler or an interpreter.

Concept Keyboard: A specialized overlay keyboard with no pre-set keys. Each key can be programmed with a wide range of different functions. Concept keyboards are useful for small children or learners with special needs: for example, offering pictures or symbols as an alternative to the alphabetic keyboard.

Cookie: A small piece of data sent from a website and stored in a user's web browser while a user is browsing a website. When the user browses the same website in the future, the data stored in the cookie can be retrieved by the website to notify the website of the user's previous activity

Copyright: Copyright is a set of exclusive rights granted to the author or creator of an original work, including the right to copy, distribute and adapt the work. Software copyright is used by proprietary software companies to prevent the unauthorized copying of their software. Piracy is considered to be the illegitimate use of materials held by copyright. Once the term of a copyright has expired, the formerly copyrighted work enters the public domain and may be freely used or exploited by anyone.

Courseware: A set of computerized lessons, exercises, tests and reference material.

Crash: A term describing what happens to hardware or software when it suddenly fails to work properly. The commonest symptom of a crash is the "frozen screen", i.e. when the keyboard and/or mouse goes dead with the result that nothing can be typed and the Cursor cannot be moved around the screen. Modern computers typically crash several times a day. Most crashes are not serious and are simply the result of faulty programming

Crawler: A *crawler* is a program that searches the Web for new links, new content and changes in order to keep Search Engine results up to date. A crawler may also be called a *bot* (short for *robot*) or *spider*. Crawlers within search engines perform a useful indexing function, but there are also crawlers or bots that have more sinister motives, such as gathering addresses to be targeted by spammers.

Cursor: The pointer which appears on screen and is controlled by a *pointing device*, such as a *mouse*. The *cursor* usually has the shape of an arrow, but can also take other shapes: e.g. an *I-beam* in a document, an hourglass whilst an operation is under way, or the graphic image of a hand over a Hyperlink.

Cyberspace: Cyberspace is the electronic medium of computer

networks, in which online communication takes place. Used to describe the non-physical electronic universe of information available through the Global Computer Networks. The term was coined by William Gibson.

D

Data: Raw facts and figures in a form which can be processed by a computer. Data can be text or sets of figures on which a computer program operates. Data is the plural of "datum", but now usually considered as a collective noun in the singular.

Database: A structured collection of related data that can easily be retrieved and used for a variety of purposes. A database may contain data relating to staff employed by a company or to students at an educational institution. In order to set up and manage a database you need a database program such as Microsoft Access.

Data Projector: A device that enables the image displayed on a computer screen to be projected onto a wall screen.

DBMS: Abbreviation for Database Management System. An Application enabling the storage, modification, retrieval, and querying of data in a Database.

Debugging: Process of testing, finding and reducing the number of bugs, or defects, in a computer program or a piece of electronic hardware, thus making it behave as expected.

Default: A setting or value automatically assigned to a computer program or device in the absence of a choice made by the user. When you use a program for the first time, e.g. a Browser or Word-processor, all the settings will be preset to their *default values* - many of which can be changed to settings that you prefer, e.g. the *default* font type and size.

Defrag: Short for *defragment*. A process whereby parts of individual data files scattered around different segments of a computer hard disc are gathered together into continuous file segments. This makes applications run more efficiently and also frees up disc space.

Desktop: The main workspace in Windows OS, which is displayed on the screen that you see after booting. This electronic desktop is a metaphor for the top of a real desktop, where jobs to be done are laid out in different folders symbolized by Icons, i.e. small images. Users open and work with programs by clicking on the icons on the desktop, and they can also store shortcuts to documents or websites there.

Desktop Computer: A desktop computer is one that is designed to sit permanently on a desk, as opposed to a portable computer, e.g. Laptop Computer, Netbook, Notebook Computer and Tablet Computer, all of which can easily be carried around.

Desktop Publishing (DTP): An Application for laying out text, graphics and pictures in order to produce a professional-looking publication. Examples of DTP applications are *Microsoft Publisher* and Adobe *PageMaker*.

Device Driver: Software that enables a computer to communicate with a hardware device such as a Printer or Scanner. Hardware devices must each have the proper *device driver* installed in order to enable them to run. Most hardware devices are supplied with CDROMs with programs that are installed onto your hard drive when you use the device for the first time. The drivers tell the computer how to communicate with that specific device.

Digital: A digital system is a data technology that uses discrete (discontinuous) values. By contrast, non-digital (or analog) systems represent information using a continuous function. Although digital representations are discrete, the information represented can be either discrete, such as numbers and letters or continuous, such as sounds, images, and other measurements. The word digital comes from the same source as the words digit and digitus (the Latin word for finger), as fingers are used for discrete counting.

Digital Camera: A camera used for taking still photographs - but some digital cameras can also record short sequences of moving images. A digital camera looks much the same as an ordinary camera but stores photographs in electronic format on memory chips so that they can be *uploaded* computer via a USB cable to a computer.

Digital Video Disc or **Digital Versatile Disc (DVD):** A *Digital Video Disc* or *Digital Versatile Disc* is an Optical Disc that is capable of storing high-quality video as well as other forms of data files, e.g. programs, text, still pictures and graphics. Most DVDs have a storage capacity of about 4.7GB. It is possible that DVDs will completely replace CD-ROMs. DVDs can be read or written to on multimedia computers equipped with a DVD drive.

Digitise / Digitize: To translate into a digital form, i.e. numbers. For example, scanners *digitize* images by translating them into discrete *bitmaps*, i.e. thousands of individual dots or *pixels*.

Directory: A location on a disc containing a group of *files* and *subdirectories* grouped together for organizational purposes. The term is used synonymously with Folder, which has become a more common term since the introduction of Windows. Subdirectories are sometimes

referred to as "child directories" of the "parent directory". The topmost directory on a computer, which is the parent of all directories on the disc, is known as the *root directory* such as the *pathname* C:\.

Disc Drive: A device within or connected to a computer that enables data to be read from and written onto a disc.

Display Screen: The screen on which output from a computer is displayed. Also referred to as a Monitor. Older computers used a Cathode Ray Tube, which is essentially the same as that used in older domestic TV sets. Newer types of display screens are of the LCD or TFT flat panel type - like many modern TV sets. They are much lighter, use less electricity and take up less room on your desk.

Distance Learning: A form of learning that takes place where the teachers and the students are in physically separate locations. Original distance learning included the mailing of printed materials, correspondence between teachers and students in writing, contact by telephone, and radio and television broadcasts. More recently, distance learning has included E-learning and/or Online Learning, where technologies of video conferencing, email and social networking have set in.

DOC: The standard three-letter Extension to a document file produced by *Microsoft Word*. Documents created by Word 2007, 2010 and 2013 have a four letter .DOCX file extension, but can be converted to the compatibility mode which bears the .DOC file extension.

Domain Name: A unique name that identifies a Website. A domain name can be purchased from and registered by a *domain name* registration company. Such companies also provide a service that will check if a required name is available for purchase. Domain names always have two or more parts, separated by dots.

DOS: Short for MS DOS.

Dot Matrix Printer: An older type of printer that works by firing sets of pins in different combinations at an ink ribbon located against a sheet of paper. Such printers produce text that looks "ragged". Laser printers and ink-jet printers are now much more common..

Download: To transfer a copy of data, from one computer to another computer. This is the main means of obtaining data and programs from the World Wide Web.

dpi: Abbreviation for **Dots Per Inch**. A measure of the of the quality of output, i.e. the number of dots per square inch produced by a *printer* or *scanner*, also referred to as its *resolution*. A resolution of at least 300 dpi is considered reasonable for the production of high-quality output by a printer.

E

E-learning: *E-learning* (electronic learning)

If someone is learning in a way that uses Information and Communications Technologies (ICTs), they are using e-learning. They could be a pre-school child playing an interactive game; they could be a group of pupils collaborating on a history project with pupils in another country via the Internet; they could be geography students watching an animated diagram of a volcanic eruption their lecturer has just downloaded; they could be a nurse taking her driving theory test online with a reading aid to help her dyslexia - it all counts as e-learning.

Electronic Whiteboard: More commonly referred to as an Interactive Whiteboard these days.

Email: Short for Electronic Mail. A system for creating, sending and receiving messages via computer networks such as the Internet. In order to send and receive email messages globally, you have to register with an Internet Service Provider (ISP) that provides an *email service* and have *email software* such as Outlook or Eudora installed on your computer. Alternatively, Many ISPs also offer a Webmail facility, which provides simpler means of creating, sending and receiving email messages such as Gmail and yahoo mail.

Encryption: A system of coding that helps prevent access to private information on computer networks or on the Web.

End user: The final user of a piece of Software or Hardware, i.e. the individual person for whom the product is created, as distinct from the people who produce and market the product.

European Computer Driving License (ECDL): An internationally recognized qualification in ICT which is designed specifically to help teachers, support staff and ICT coordinators develop practical computing skills for teaching and learning in the classroom and leads to an internationally recognized level of certification.

Executable: This describes a program which has been converted (compiled) into binary machine code. If you double-click on an executable program name in *Windows Explorer*, it will immediately *execute* itself - i.e. run. Executables usually have the Extension **.exe** or **.com**.

Expansion Slot: A long, multi-pin socket on the computer's Motherboard into which an add-on card (such as a Sound Card) can be inserted to enhance the computer's capabilities.

Extension: In computer jargon an *extension* is an optional addition, usually consisting of a dot plus three or four letters, to the name of a File. The extension to the filename helps the computer (and the user) recognise what type of file it is and what it may contain,

e.g. **.doc** is a *Word* document file, **.exe** is a computer program, **.jpg** or **.jpeg** is a picture file, and **.htm** or **.html** is a Web page file

F

Facebook: A popular social networking website. www.facebook.com.

FAQ: Abbreviation for Frequently Asked Question. The ICT4LT project's list of FAQs is located here.

Favorites: A facility within the *Internet Explorer* Browser that enables you to keep a record of Web pages that you have visited and may wish to visit again. Also known as *bookmarks*:

Feedback: Feedback is an automatic response from a computer, which may take the form of text, image, audio, video or any combination of these, to a learner's input. Input from the learner may take various forms, e.g. (i) clicking with the mouse to select an answer in a multiple-choice exercise, (ii) typing an answer at the computer keyboard, or (iii) speaking an answer into a microphone. Feedback in interactive language learning materials should go beyond a "boing" (wrong) or "applause" (right) or "try again" message and attempt to mimic the "live" situation when using the language results in either a response from the other person or an action showing that the language used was appropriate.

File: A *file* in computer jargon can be used to describe many different things. It may be a Computer Program, a document file created with a Word-processor, an image file, an audio file, a video file, etc. Think of it in the same way as you would think of a file in a filing cabinet. A file has a name that describes what it is, and the file is stored in a place where you can easily find it. Files are usually grouped together on a computer's Hard Disc in *directories* or *folders* and, as well as their names, they usually have a three-letter Extension that tell you what their function is or what they contain, e.g. **fwtt.exe** is a program, **mystory.doc** is a *Word* document, **sally.jpg** is a picture, and **mydog.mpg** is a video file. Files may also be stored on CD-ROMs, DVDs and Flash Drives.

Filename: The name of a File on a computer.

File Permissions: Files stored on a computer usually have *permissions* governing which users are allowed to read, amend or execute them. This is particularly important in a a school, college or university network environment, where teachers and lecturers may have the permission to amend certain files, e.g. documents that they have created, but students are only allowed to read them. File permissions are usually determined by network managers.

File Transfer Protocol: (FTP) This is the method, i.e. a software standard, used for transferring files from one computer to another via the Internet. FTP is also used as a verb in the sense "to transfer" (a file).

Firewall: A *firewall* is a software package that sits between your computer and your Internet connection, keeping an eye on the traffic going to and fro. If anything suspicious appears, such as an unauthorized attempt from a remote computer to write information to your hard disc or to send information from your computer to a remote computer, it will block it and warn you. Firewalls have become essential these days because of the frequent attempts being made by *hackers* to grab confidential information from computers all around the world, e.g. your bank or credit card details, which may be stored in a file somewhere on your computer. Any computer is vulnerable while it is connected to the Internet.

Firewire: A *firewire* is in essence a facility that allows you to transfer video recordings very quickly from one device to another, e.g. from a Camcorder to a computer, using a special cable that connects to the computer's fireware socket. Many modern computers already have a firewire socket built in. If your computer does not have a firewire socket then you have to buy a firewire card and slot it in.

Firmware: Software that has been written to a ROM chip with in a device by its manufacturers.

Flash Drive: A portable Storage Device. Flash drives look like a small flat pen, around 3cm to 5cm long, and are easily carried in your pocket. Their storage capacity is impressive; 4GB to 8GB is not unusual these days. They are used to store data that you wish to carry around, e.g. a *PowerPoint* presentation, and they can be plugged into any computer with a USB socket. Flash drives are also commonly referred to as *pen drives* or *memory sticks*.

Flash Player: Software produced by Adobe for the development and viewing of animated and interactive sequences on the Web.

FLV: Abbreviation for Flash Video, a proprietary file format used to deliver video over the Web using the Adobe Flash Player.

Floppy Disc: A plastic disc covered in magnet sable material, enclosed in a case, on which data is stored magnetically. A typical 3.5-inch floppy disc can store up to 1.44MB of data. Floppy discs are used for carrying small amounts of data around from one location to another, e.g. a *Word* document or a *PowerPoint* presentation,, but they are now virtually obsolete and have been replaced by CD-ROMs, DVDs and Flash Drives.

Folder: An alternative word for a *directory* and which has become more common since the introduction of Windows. It describes a location on a disc which contains a set of related files. A folder can be divided into sub-folders.

Font: The terms *font* (also spelt *fount*) and *typeface* are often confused or interchanged. *Font* refers to a complete collection of letters, numerals, symbols and punctuation marks that have common characteristics, including their style and size. The two commonest fonts are Times New Roman, a Serif font, which is characterized by cross-lines that finish off the stroke of each letter, and Arial, a Sans Serif font that has no cross-lines. *Typeface* is the name given to the style of a particular set of letters, numerals, symbols and punctuation marks.

Formatting: The process of preparing a writeable disc for use. Formatting creates a structure on the disc which enables it to hold data.

Forum: Often used synonymously with Discussion List. An electronic forum on the Internet or an intranet enables users to post messages by email or via the Web for other users to read and respond to.

Fourth Generation Language (4GL): A programming language of a higher level than 3GLs such as C or Pascal - that is, the program code is closer to English, and a 4GL function might be the equivalent of many 3GL functions. 4GLs are used for writing software for specialized tasks, such as querying databases.

Frame: An area in a Web page that scrolls independently of the rest of the Web page. A Web page can be divided into multiple frames. For example, a frame can include a navigation bar that always stays on the screen as the user moves around the other pages of the site.

Freeware: Software that can be copied and used without payment to the author(s), although there may be some restrictions on distribution.

G

Geek: A colloquial term describing someone who is obsessed with computers and uses them at every opportunity in their free time, mainly for "social" purposes, e.g. communication via social networks, email, blogs, playing multi-user games, etc.

Generic Software / Generic Application: This term normally refers to general-purpose software applications that are not designed for use in a specific subject area, e.g. a word-processor (e.g. *Word*), spreadsheet package (e.g. *Excel*), presentation software (e.g. *PowerPoint*) or database package (e.g. *Access*).

GIF: Abbreviation for Graphic Interchange Format. A file format used for storing simple graphics. GIF files use a palette of 256 colours, which makes them practical for almost all graphics except photographs. Generally, GIF files should be used for logos, line drawings, icons, etc, i.e. images that don't contain a rich range of colours. A GIF file containing a small number of colours tends to be quite small, but it will be big if the image has a wide range of colours, e.g. a photograph.GIF files are commonly used for storing images on the Web. GIF files are also suitable for storing animated (i.e. moving) images.

Gigabyte: Usually abbreviated to *GB*, or *gig* in common computer parlance. A unit of measurement of computer memory or disc capacity equal to 1,073,741,824 bytes.

Giga Hertz: Usually abbreviated to *GHz*. A unit of measurement relating to the Clock Speed of a computer or, put simply, a measurement of how fast its Central Processing Unit (CPU) runs. Typical clock speeds of modern computers range from 500 Mega Hertz (500MHz) upwards. Faster clock speeds are normally expressed in Giga Hertz (= 1000MHz).

Google: A popular Search Engine. Probably the most widely used search engine on the Web. You can also use Google to find definitions of words. Call up Google at http://www.google.co.ug/ and in the search box: type **define:** immediately in front of the word you would like to be defined. Google will then locate definitions of that word on the Web, e.g. try **define:computer**. If your term consists of two or more elements, encase it in inverted commas, eg: **define:"Information and Communication Technology"**. "To Google" is even used as a verb in the sense "to carry out a search on the Web". As well as offering a search facility, Google offers much more: gmail, maps, news, shopping, translation services, document sharing, etc.

Gopher: a TCP/IP Application layer protocol designed for distributing, searching, and retrieving documents over the Internet. Strongly oriented towards a menu-document design, the Gopher protocol was a predecessor of (and later, an alternative to) the World Wide Web. The spectacular rise of the World Wide Web is driving the gopher into extinction.

Graphical User Interface (GUI): A type of interface that enables users to communicate with a program by manipulating graphical features, rather than by entering commands. Typically, a GUI includes a combination of graphics, pointing devices, menu bars and other menus, overlapping windows, and icons. Contrasted with Command Line Interface (CLI), in which the user controls the computer by typing commands at the Keyboard.

Graphics Card: An alternative name for a Video Card.

H

Hacker: A person who spends their time trying to gain access to information stored on other people's computers all around the world. Some hackers are just harmless browsing types, but other have more invidious aims such as grabbing details of your credit cards or bank account, which may be stored in a file somewhere on your computer. If you access the Internet regularly you should consider installing a Firewall to protect yourself against hackers.

Hardcopy or **Hard Copy:** Printed output from a computer, that physically exists in a more permanent and tangible form as opposed to a softcopy output on a display device.

Hard Disc: A *hard disc* consists of a set of rigid circular magnetic discs enclosed within a metal case, i.e. a *hard disc drive*, which is mounted internally in your computer and is used for storing the computer programs and data that it needs in order to work. External hard disc drives can also be obtained for additional storage capacity or backup storage. Hard discs can contain vast amounts of data, usually measured in *gigabytes*.

Hardware: The physical elements of a computer system - the bits you can see, touch, drop, kick or fall over. Contrasted with Software, which consists of electronic instructions that tell a computer how to perform tasks.

Hertz: Usually abbreviated to *Hz*. A unit of measurement relating to the number of times something is repeated per second. In computer jargon this normally refers to the Clock Speed of a computer, i.e. in simple terms how fast the computer runs. One Hertz is one cycle per second. Computer clock speeds are normally expressed in MegaHertz (*MHz*) or GigaHertz (*GHz*). Named after the physicist and mathematician Heinrich Hertz (1857-1894), the discoverer of radio waves. The frequency of radio waves is also expressed in Hertz.

Hexadecimal: A number system used in computers in which numbers are composed of combinations of 16 digits, using 0-9 then the letters A-F to represent 10-15. Hex allows binary numbers to be expressed in a more compact and comprehensible form. For example, 100110101111 (binary) = 9AF (hex).

Homepage or **Home Page:** This is the main Web page of a website. From this page links are made to other pages on the same site and to external sites. Also used to refer to the page a Browser displays first whenever it starts up.

Host: Short for *host computer*. Any computer that provides services to other computers that are linked to it, via a local network or via the Internet.

HTML: Abbreviation for Hypertext Markup Language. The coding system used for creating pages on the World Wide Web. HTML enables the author to control how the page appears and to insert Hypertext links within one Web page or to other pages anywhere on the Web. Nowadays most Web authors and designers use an Authoring Tool such as *Dreamweaver* to create World Wide Web pages. Web page files end with the Extensions **.htm**. or **.html**.

HTTP: Abbreviation for Hypertext Transfer Protocol. The transfer method (*protocol*) used by the World Wide Web to transmit and receive Web pages. This abbreviation normally precedes the name of a website, e.g. **http://www.google.com.**.

Hub: A device that provides a common connection point for networked computers and other devices. Hubs are used to connect devices in a Local Area Network (LAN).

Hyperlink: Digital pointers that help a user to jump from one resource such as a webpage or document to another by simply pointing or clicking with the computer mouse. Hyperlinks from one page to another spot within the same site are called "internal" links; hyperlinks to other web sites are called "external" links. Hyperlinks are usually indicated by blue-underlined text or by buttons.

Hypertext: The text displayed on a computer or other electronic device with references (hyperlinks) to other text that the reader can immediately access, usually by a mouse click..

I

I-Beam: The form or shape that the Cursor takes up when editing text in any text entry area such as a document or dialog box text box, It looks a bit like a large letter I.

Icon: A small symbol or graphic on computer screen used in a Graphical User Interface (GUI) to represent programs or files, e.g. Double clicking a button with the mouse then causes the program that the icon represents to run or a file to be displayed.

ICT: Abbreviation for Information and Communications Technology and refers to all the digital devices (computers, Radios, Televisions, cell phones, PDAS, iPods, etc.) that play a role in the creation of new media modes of interaction between people.

Impact Printer: A printer that uses a print head mechanism that physically hits the surface of an ink ribbon, thereby pressing the ink ribbon against the paper (similar to the action of a typewriter). Contrasted with a nonimpact printer which forms characters and graphics on a piece of paper by using technologies such as ink spray, heat or pressure to create

images without actually striking the paper.

Ink Jet Printer: A type of Printer that fires little jets of ink at the page in order to form the characters and graphics. One of the commonest forms of printers currently in use and capable of producing high-quality output in black and white and in full colour.

Input: Anything that goes into a computer in order to be processed and/or stored. Also used as a verb.

Input Device: Any device that is capable of entering information into a computer system, e.g. a Keyboard, Microphone, Mouse o r Scanner e.t.c.

Input Validation: a program routines which prevents the user from making mistakes while entering data at the keyboard, by ensuring that only the expected format of data is entered correctly in the right section.

Install: A verb used to describe the process of *setting up* a computer program or suite of computer programs on the computer's hard disc for first-time use. Programs are normally supplied on CD-ROM from which they are copied to the computer's hard disk during installation.

Integrated Circuit: An electronic circuit fixed onto a small piece of silicon to act like electronic components such as diodes, capacitors and resistors.

Integrated Learning System (ILS): A computer-driven system of learning in which the content is presented in tutorial format and which monitors and records the progress of the learner.

Intel: The name of a manufacturer of *microprocessors* used in personal computers.

Interactive Whiteboard (IWB): Often abbreviated to IWB. A touch-sensitive projection screen that allows the teacher to control a computer directly by touching the screen, i.e. the whiteboard, rather than using a Keyboard or Mouse. A Data Projector has to be connected to the teacher's computer in order to project the image onto the interactive whiteboard and special software has to be installed on the computer in order for the whiteboard to become active and sensitive to touch - which may require the use of an "electronic pen" or it may work in reaction to one's finger or hand.

Interface: An *interface* in computer jargon is a connection between two systems. It can be Hardware or Software. It may take the form of a plug, cable or socket, or all three, for example where a Printer or Scanner is connected to a computer, and then it's a hardware interface. The term *interface*, also known as *user interface*, also describes the software that is used to enable human beings to communicate with a computer, for example *Microsoft Windows* uses a Graphical User Interface (GUI)

Internet: The *Internet*, or simply "the Net", is a global connection of computer networks connecting millions of computers all over the world. It provides communications to governments, businesses, universities, schools and homes. Any modern computer can be connected to the Internet using existing communications systems. The Internet dates back to the group of interconnected networks that evolved from the ARPANET of the late 60's. It has grown from a handful of interconnected networks into a huge network of millions of computers. The main Internet services on the internet are Email and World Wide Web. The World Wide Web is only part of the Internet, but many people treat both terms as synonyms.

Internet Explorer: A Browser produced by the Microsoft Corporation and supplied together with the Windows operating system.

Internet Service Provider (ISP): A company that provides a subscription service to enable you to access the Internet. An ISP has a network of computers permanently linked to the Internet. When you take out a subscription with an ISP they link your computer to their network, usually via an existing telephone line, but dedicated lines are also provided by some ISPs. ISPs also give you an Email address and space on the World Wide Web for setting up your own website.

Interpreter: Software which converts the human-readable Source Code of a program which has been written in a high-level programming language such as BASIC, **one statement at a time,** into machine instructions as the application is run.

Intranet: A private network inside a company or educational organization and used over its LAN (Local Area Network). A sort of local Internet used only within the organization.

I/O: Abbreviation for Input/Output. Commonly used in connection with devices which can do both computer data input and output such as disk drives, modems and touch screens.

IP Address: Short for Internet Protocol Address. The unique numerical address of a computer on the Internet, expressed as four sets of numbers (maximum 3 digits each) separated by dots: e.g. 173.194.47.63 is the IP Adress for www.google.co.ug. NB: if you want to find the IP address for any URL, then all you need to do is: Start Menu > All Programs > Accessories > Command prompt > enter "ping" followed by the URL (e.g. ping www.google.com) > [Enter]. Your computer will ping (i.e. send a request to the URL) and will retrieve the URL's IP address.

iPod: The name of a portable (mobile) Media Player designed and marketed by Apple. The **iPod** first appeared in 2001. As well as being capable of storing and playing back audio recordings, newer models can also record and

play back video. The iPod has become popular for storing recordings, mainly music, downloaded from the Web or transferred from audio CD to a computer and then moved across to an iPod using a software package known as iTunes.

ISDN: Abbreviation for Integrated Services Digital Network. A type of digital telephone service, used for transferring large chunks of data to and from the Internet without a Modem. Gradually falling out of use these days with the introduction of ADSL broadband services. ISDN lines normally operate at 128 Kbps, which is faster than a standard 56Kbps Dial-up Modem but slower than an ADSL connection, which runs at a speed of at least 1Mbps.

ISBN: Abbreviation for International standard book number, a 10-13-digit machine readable number assigned to every book before publication, recording such details as language, provenance, and publisher. The ISBN is usually converted into a unique Barcode image containing all the data about the book.

IT: Abbreviation for Information Technology, Essentially used to describe the use of computers and telecommunications equipment in business, education and everyday life to store, retrieve, transmit and manipulate data.

J

Java: A programming language, invented by Sun Microsystems, that is specifically designed for writing programs that can be downloaded to your computer through the Internet and immediately executed. Using small Java programs, called *applets*, Web pages can include functions such as animations, interactive sequences, etc. You need to set up your browser to enable it to interpret and run the Java applets. Java is similar to a programming language known as C++ but it has been considerably simplified. Not to be confused with Javascript.

Javascript: *Javascript* is a script language, a system of programming codes that can be embedded into the HTML code of a Web page to add functionality, e.g. interactive sequences, questionnaires, etc. Although it shares many of the features and structures of the full Java language, Javascript is essentially quite different and was developed independently.

Joystick: A device that looks a bit like a gear lever in a car. This is connected to a computer and is used mainly for controlling the Cursor in fast action games.

JPEG or **JPG:** Abbreviation for Joint Photographic Expert Group. Pronounced "Jaypeg". A file format used for storing images. The JPEG/JPG format uses a palette of millions of colours and is primarily intended for photographic images.

Top

K

KB: Abbreviation for Kilobyte. The single letter *K* is also used.

Kbps: Abbreviation for *kilobits per second*. A unit of measurement of data transmission speed, e.g. via a Modem.

Keyboard: a typewriter-style device, which uses an arrangement of buttons or keys, to act as mechanical levers or electronic switches. Following the decline of punch cards and paper tape, keyboards became the main input device for computers.

A keyboard typically has characters engraved or printed on buttons called keys, and each press of a key typically corresponds to a single written symbol. However, to produce some symbols requires pressing and holding several keys simultaneously or in sequence. While most keyboard keys produce letters, numbers or signs (characters), other keys or simultaneous key presses can produce actions or computer commands.

Kilobit: Usually abbreviated to *Kb*. A unit of measurement consisting of 1,024 *bits*, mainly relating to data transmission speed.

Kilobyte: Usually abbreviated to *K or KB*. A unit of measurement of computer memory or disc capacity = 1,024 *bytes*.

L

LAN: Abbreviation for Local Area Network. A Network of computers at one site that provides services to other computers connected to it. A *LAN* is usually limited to an immediate area, for example the floor of a building, a single building or a campus.

Laptop Computer: A **laptop computer** is a personal computer for mobile use. A laptop has most of the same components as a desktop computer, including a display, a keyboard, a pointing device such as a touchpad and/or a pointing stick, and speakers all manufactured as a single unit. A laptop is powered by mains electricity via an AC adapter, but be used away from an outlet using a rechargeable battery. Laptops are also sometimes called, **notebooks**, **ultra books** or **netbooks**.

Laser Printer: A non-impact Printer that works by firing a laser at a rotating drum, and uses powdered toner to produce images on paper. Laser printers produce high-quality output at a reasonable speed.

LCD: Abbreviation for Liquid Crystal Display. A technology used for producing a type of flat panel computer Display Screen, which is replacing the older type of Cathode Ray Tube display screen. A more advanced form of technology for producing flat panel display screens is known as TFT (Thin Film

Transistor). LCD and TFT screens are also used in *digital cameras* and *camcorders*.

Linux: A Unix-type Operating System, similar to Windows and the Apple Mac operating system. Linux was originally created by Linus Torvalds with the assistance of developers around the world. The Source Code for Linux is freely available to everyone.

M

Machine Assisted Translation (MAT): The use of computers to assist human beings in the process of translating natural language. MAT systems are normally used as only aids for human translators who have to intervene in the process of translation by machine, making corrections and amendments as necessary.

Machine Code: The machine-readable form of a computer program, produced by conversion of the human-written program (source code) into binary code by a *compiler* or *interpreter*.

Macro: A macro is a series of commands and instructions that you group together as a single command to accomplish a task automatically. Instead of manually performing a series of time-consuming, repetitive actions, you can create and run a single macro - in effect, a custom command that carries out the task for you. A macro can be saved and called up whenever you need it. A degree of caution needs to be exercised if you are given or sent a file, e.g. a *Word* DOC file, containing a macro, as data destructive macros can be designed. Make sure you know where the file comes from.

Mail Merge: A feature of word processing software which combines a master document with a secondary file containing variable data such as names and addresses, to produce multiple documents each of which contains the same master information but is addressed and sent to multiple recipients automatically. The process uses a store / database of user inputted addresses, which are then automatically inserted into the right place on each of the printed letters.

Mainframe Computer: (also referred to as "big iron") are very large computers which can serve many users at remote terminals. Mainframes are used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and transaction processing.

MAN: Abbreviation for Metropolitan Area Network. A network of computers located at different sites within a large fixed area, such as a city.

Mbps: Abbreviation for *megabits per second*. A unit of measurement of data transmission speed, e.g. via a Modem. A typical Broadband connection to the Internet transmits data at 1 Mbps to 8 Mbps.

Measurement Units: There is still a good deal of confusion about what the terms Kilobyte, Megabyte, Gigabyte, etc. mean. Traditionally, the terms *kilobyte*, *megabyte* and *gigabyte* are used to express the binary multiples of 1,024, 1,048,576 and 1,073,741,824 bytes but, because people are used to thinking decimal rather than binary, the International Electro technical Commission (IEC: http://www.iec.ch) approved in December 1998 a new standard for names and symbols for use in the fields of data processing and data transmission. Thus *kilobyte*, *megabyte* and *gigabyte* should now be used to express the decimal multiples 1,000, 1,000,000 and 1,000,000,000 bytes. New terms, *kibibyte*, *mebibyte* and *gibibyte*, were approved to be used to express the binary multiples 1,024, 1,048,576 and 1,073,741,824 bytes, but these still have not caught on among the general public.

Malware: Malware, short for malicious (or malevolent) software, is software used or created by attackers to disrupt computer operation, gather sensitive information, or gain access to private computer systems. It can appear in the form of code, scripts, active content, and other software. 'Malware' is a general term used to refer to a variety of forms of hostile or intrusive software. Malware includes computer viruses, worms, trojan horses, spyware, adware, and other malicious programs.

Media Player: Used in two main senses: (1) a program that enables your computer to record, store and play back audio and video recordings; (2) a device such as the portable iPod *media player* that is also used to record, store and play back recordings.

Megabyte: Usually abbreviated to *MB*. 1,024 *kilobytes* or 1,048,576 *bytes*. A unit of measurement of computer memory or disc capacity. Roughly 180,000 words of text - an average-sized novel.

MegaHertz: Usually abbreviated to *MHz*. A unit of measurement relating to the Clock Speed of a computer or, put simply, a measurement of how fast its Central Processing Unit (CPU) runs. Typical clock speeds of modern computers range from 500MHz upwards. Faster clock speeds are normally expressed in Giga Hertz

Memory: Most people use this term to refer to a computer's temporary internal main memory or RAM. Memory may also refer to ROM (Read Only Memory), which is permanent and part of a computer system as supplied by the manufacturer.

Memory Stick: A small electronic card, also known as a *memory card*, which is inserted into a Digital

Camera or Camcorder for storing photographs or movie files that can then uploaded to a computer. This term is also used as an alternative to Flash Drive.

Menu: A list of options from which a computer user makes a selection in order to determine the course of events in a program. This usually involves keying in a single letter or number, or selecting text or an Icon with a Mouse.

Menu Bar: Most computer programs display a *menu bar* or set of menu bars at the top of the screen, from which choices can be made by the user to carry out certain operations, e.g. saving a File, printing a document, or setting up the program in different ways.

MHz: Abbreviation for Mega Hertz.

Microchip: An electronic circuit etched on to a small piece of silicon which has been subjected, using photo-masking processes, to controlled "doping" with certain impurities. Particular areas of the chip can then be made to act like electronic components such as diodes, capacitors and resistors.

Microcomputer: Also known as a personal computer: generic name for a class of computers small size digital computers based on a microprocessor and designed to be used by one person at a time. Modern Desktop
Computers and Laptop Computers fall into this class.

Microprocessor: The *microproce ssor* is the Central Processing Unit (CPU) of a computer, where all the data processing and calculations are carried out. It's a single silicon chip containing millions of transistors etched on to its surface, connected to the Motherboard by an array of pins at its base.

Microsoft Office: A suite of programs produced by Microsoft Corporation, comprising a Word-processor (*Word*),
a Spreadsheet (*Excel*),
a Presentation Program (*PowerPoint*), an Email package (*Outlook*), a Database program (*Access*), and a Desktop Publishing package (*Publisher*).

MIDI: Abbreviation for Musical Instrument Digital Interface. A digital system for connecting computers and musical instruments such as keyboards, guitars, etc. and for transmitting musical signals between them. A MIDI is an industry-standard protocol that enables electronic musical instruments (synthesizers, drum machines), computers and other electronic equipment (MIDI controllers, sound cards, and samplers) to communicate and synchronize with each other.

Millennium Bug: A fault in computer programs which was thought likely to cause a breakdown in computer systems worldwide following the commencement of the Year 2000 - or Y2K in computer jargon. The Millennium Bug arose as a result of year dates having been stored in older computer programs as two digits, e.g. 89 instead of 1989. The bug was most likely to arise when one year date was compared with another, when 00 (instead of 2000) was perceived as older than 99 (instead of 1999). The Millennium Bug proved to be far less of a problem than was anticipated, but it did manifest itself in computerized stock control systems, resulting in batches of canned food with sell-by dates after 2000 being accidentally scrapped before their time..

Minicomputer: Smaller than a Mainframe Computer and bigger than a Microcomputer. Small businesses often rely on minis. Minis can handle many users at once.

Modem: Short for modulator/demodulator. A device which converts computer digital data to a analog signals that can be transmitted over a standard telephone line. It can also reconvert a an analog signal coming into a computer via a telephone line so that it can be understood by the computer. Modems are mainly used to connect computers to the Internet.

Monitor: The screen on which output from a computer is displayed. Also referred to as Display Screen.

Motherboard: The main electronic circuit board of a microcomputer, to which internal components, external peripherals and other circuit boards (also known as adapter *cards*) can be connected. Typically, the motherboard contains expansion slots,
the BIOS, CPU, RAM, ROM and all the controllers required to control standard peripheral devices, such as the Display Screen, Keyboard and disc drives.

Mouse: A *pointing device* that is used by moving it around on your desk and pressing (clicking) a button. Most mice have two buttons (left and right) but some have a third scroll button. Apple Mac computers use a mouse with just one button. Moving the mouse causes a pointer or Cursor to move around the screen, and clicking a mouse button once or twice when the pointer is hovering over an icon or word activates a command, e.g. starts a computer program or initiates an action inside another program such as *Microsoft Word*. A mouse is used with computers that use a Graphical User Interface (GUI).

MOV: The format for storing and playing back audio and video files using the QuickTime media player on the Apple Macintosh, but also available for the multimedia PC. Economical in terms of storage space.

MP3: Abbreviation for MPEG Layer 3: MP3 is a file format for storing high-quality audio files that can be played back on computers and portable *media players* such as

the iPod. MP3 has the advantage of taking up far less storage space than the WAV format without loss of quality.

MP4: Abbreviation for the MPEG-4 file format. The MP4 file format is used to store video files in a more manageable size without affecting the quality. It is also increasingly being used for storing video on iPods and similar portable devices.

MPEG or **MPG:** Abbreviation for Motion Picture Expert Group. A standard file format for storing movies in digital format. Video files stored MPEG format can be recognized by the file Extension **.mpg**

MS DOS: Abbreviation for Microsoft Disc Operating System. An *operating system* for the personal computer, written by Microsoft Corporation, but now superseded by *Microsoft Windows*. MS DOS has a command line interface, whereby the user has to type commands at a prompt using only a keyboard.

Multimedia: The integration of two or more types of information (text, images, audio, video, animation, etc.) in a single application.

Multitasking: The execution of more than one program, apparently at the same time, on a computer. In reality, however, the computer rapidly switches its attention from one program to another, thus dividing its time. *Multitasking* makes it possible, for example, to print one word-processed document while playing music using a media player.. Another form of multitasking allows you to open several different *windows* in which different programs can be run, but only one window is the *active window*.

N

Navigation: This describes the process of finding your way, i.e. *navigating*, around a series of menus within a computer program or finding your way around the World Wide Web by means of a Browser.

Netbook: A netbook is a small, lightweight computer, smaller than a Laptop Computer, with a long battery life and ideal for travelling. Netbook computers have built in Wifi and are optimized for browsing the Web.

Netiquette: Etiquette on the Internet. An code of behaviour for people browsing the web and communicating by email or social networks via the Internet.

Netizen: Derived from the term citizen, referring to a citizen of the Internet, or someone who uses networked resources. The term implies civic responsibility and participation.

Netscape: An early Web Browser, which first appeared in 1994, shortly after the World Wide Web went public.

Network: A group of computers connected together, either by physical connections such as cables, or by wireless connections (Wifi) to communicate and share resources.

Newsgroup: A type of public online *forum* which anyone can read and contribute to. All users of a *newsgroup* can post messages, and every user can read all the messages that have been posted. Many newsgroups are distributed worldwide by the Usenet system.

Notebook Computer: A type of Laptop Computer, but lighter and thinner - and therefore easy to carry around. A Netbook, is even smaller and lighter computer.

O

Offline: Not connected to a computer or network of computers. Often used in the sense of working with software stored on a stand-alone computer. For example, if you use a package such as *Microsoft Word* you are working with *offline* software, and if you use learning materials stored on CD-ROM you are also working *offline*. Contrasted with Online.

Online: Connected to a computer or network of computers, especially the World Wide Web. Often used in the sense of working with software stored at a remote location. For example, if you use learning materials stored at a website you are working *online*.

Online Learning: The use of the Internet to follow a course that usually results in the award of a diploma or certificate. E-learning, i.e. electronic learning, is a broader term, embracing the use of ICT in general in teaching and learning as well as online learning.

Open Source: Used to describe Software that is provided free of charge, along with the original Source Code used to create it so that anyone modify it to improve it and work in ways that reflect their own preferences. Mozilla Firefox, Linux and Moodle are typical examples of open source software.

Operating System (OS): A suite of programs that starts up when you switch on your computer and manages and coordinates all the other programs installed and hardware on the computer. *Windows* is the *operating system* developed and produced by the Microsoft Corporation.

Optical Character Recognition (OCR): OCR software is used conjunction with a *scanner* to convert printed text into digital format. For example, a page from a printed book can be placed on the scanner and the OCR software will be used by the scanner to detect the individual words from which it is made up and then convert them into a form that can be stored on a computer, e.g. a *Word* document, instead of retyping the entire age. A great time-saver!

Optical Disc: The generic name for a type of computer disc which uses a laser to read and write data.

CD-ROM, and Digital Video Discs are examples of *optical discs*.

Outlook: A popular Email management software, part of the *Microsoft Office* suite of programs.

Output: Anything that comes out of a computer after being processed. Also used as a verb.

P

Packet:
A block of data sent over a computer network. A packet contains the identities of the sending and receiving stations, error-control information, synchronizing information and a payload (the information to be transmitted). The entire message to be sent is broken down and logically grouped into smaller packets since if an error occurs in transmission, only the packet with the error needs to be retransmitted. The idea with packets is to transmit them over a network so each individual packet can be sent along the most optimal route to its destination.

Packet switching: A mode of data transmission in which a message is broken into a number of parts that are sent independently, over whatever route is optimum for each packet, and reassembled at the destination.

Pathname: The pathname of a File on a computer specifies exactly its position on disc, and consists of at least three parts: (i) drive letter, (ii) directory, and (iii) filename,
e.g. **d:\classwork\notes.doc**. One or more subdirectories may also be included in a pathname, e.g. **d:\classwork\biology\notes.doc**. biology is the sub directory/folder.

PDA: Abbreviation for Personal Digital Assistant. A handheld device that combines computing, audio communication, browsing and networking features and serves as an organizer for personal information.

PDF: An abbreviation for Portable Document Format. This is a file type that allows fully formatted, documents to be transmitted across the Internet and viewed on any computer that has Adobe *Acrobat Reader* software. Media houses and educational institutions often use PDF-formatted files to display the original look of their publications in electronic format in a high-quality piece of work which preserves the look of the original, complete with fonts, colours, images, and formatting. Documents in PDF format can be published on the Web without having to be converted into HTML. PDF files can contain *hyperlinks*, QuickTime mov ies and sound clips.

Pentium: A generic name for a faster type of Personal Computer microprocessors that superseded the earlier 486 range of slower microprocessors. Essential for running modern multimedia software and accessing the Internet.

Peripheral Device: External hardware devices which can be connected to a computer. This term includes keyboards, modems, printers, scanners, flash disks, interactive whiteboards, etc.

Pixel: Short for Picture Element. The smallest discrete component of a printed image or picture on a display screen. "the greater the number of pixels per inch the greater the resolution or image quality" A pixel is tiny dot of illumination on a display screen, one of many from which an image is composed.

Platform: A platform is a hardware and/or software architecture that serves as a foundation or base on which other hardware or software can work. The terms "platform" and "environment" are used interchangeably. Operating systems are always "software platforms" because applications must interface with them. An application can also be a platform if it is a base for other programs. For example, Web browsers accept third-party plug-ins, which are small software components that add functionality. The browser becomes a platform to contain those components.

Plug-in: In computing, a plug-in is a set of software components that adds specific abilities to a larger software application. If supported, plug-ins enable customizing the functionality of an application. Add-on (or add-in) in computing is often considered the general term comprising snap-ins, plug-ins, extensions, and themes for software applications.
Specific examples of applications and why they use plug-ins: (1) Media players use plug-ins to support file formats and apply filters (2) Microsoft Office uses add-ins to extend the abilities of its application by adding custom commands and specialized features. Web browsers use plug-ins to play/download YouTube videos, scan for viruses, and display new file types. Well-known plug-ins examples include Adobe Flash Player, QuickTime, and Java Applets.

Pointing Device: A device which allows the user to control the position of the Cursor on a computer screen by physical manipulation of the device in different directions. Joystick, Mouse, Trackball, are pointing devices.

Pop-up: A small Window that appears within a program or over the top of a Web page to deliver additional information. Pop-ups on the Web can be annoying as they are often used for unwanted advertising material.

Portal: A Web page, website or service that acts as link or entrance to other websites on the Internet. Typically, a portal includes an

annotated catalogue of websites and may also include a Search Engine, Email facilities, a Forum and other services. Also known as a Gateway.

PowerPoint: The name of a Presentation Program forming part of the Microsoft Office suite of programs.

PPM: Abbreviation for Pages Per Minute. A measure of the output speed of printers.

Presentation Program / Presentation Software: *Presentation Software* is used in conjunction with a Data Projector and a wall screen or Interactive Whiteboard in order to display a series of slides relating to a speech presentation, a slideshow or lecture. PowerPoint is a popular presentation software.

Printer: A peripheral device attached to a computer for producing hardcopy output.

Printout: Anything produced on a printer after being processed by a computer program.

Programming Language: A formal, structured, software tool used to create sets of special instructional statements that can be performed by a computer. Programming languages are used by software developers to create applications, including those for the web, for mobile phones, and for desktop operating systems.

Protocol: A set of rules that define an exact format for communication between systems. For example the Hyper Text Transfer Protocol (HTTP) defines the format for communication between Web *browsers* and Web *servers* on the internet.

Public Domain: Material that is copyright free, whose copyright has expired, or which cannot be copyrighted.

Q

QR Code: Short for Quick Response Code. A QR Code is a two-dimensional barcode that can store a variety of different types of information, e.g. text, a website URL, a telephone number, an SMS message, an email address, an email message, contact details, information about an event, a Google Maps location, your social media profile (Facebook, Twitter, etc), an iTunes link, a YouTube link, etc. QR Codes can be read by barcode readers and Smartphone cameras. Instead of writing down the information relating to a website URL or map location etc, you just take a photo of the QR Code.

QuickTime: Software used for viewing movies and listening to audio recordings: **QuickTime** is often needed as a Plug-in, when you are accessing audio or video materials on the Web.

QWERTY keyboard: Alternatively referred to as the Sholes keyboard, the QWERTY keyboard was invented by Christopher Sholes who was issued a patent for a typewriter on July 14, 1868. The QWERTY keyboard is named after the five letter keys located at the top left side of the keyboard and is now the official standard of computer keyboards

R

RAM: An acronym for Random Access Memory, referring to the dynamic memory in the silicon chips in a computer. RAM chips are the memory chips used as the temporary working area for running and developing programs. Data in RAM can be read and written to (i.e. changed) in microseconds, as opposed to the much slower data access times for discs, but RAM's contents disappear the moment the computer is switched off. The more RAM a computer has, the more flexibility the user has. RAM used to be measured in *kilobytes (KB)* but now it is usually expressed in *megabytes* (*MB*) and even *gigabytes (GB)*. The amount of RAM a PC has could crudely be thought of as its "mental capacity"

RGB: Abbreviation for Red Green Blue. The name given to the Additive Colour system that is used to display colours on computer screens, where red, green and blue light of varying intensities is combined to produce millions of other colours.

Resolution: A measure of the number of *pixels* or small dots displayed on a computer *display screen*, *printer* or *scanner*. One normally talks in terms of the quality of resolution, using the expression *low-resolution*, *medium-resolution* and *high-resolution*. The resolution of a computer *display screen* is normally expressed as two numbers representing the horizontal and vertical resolution, i.e. dots across each line of the screen and down each line of the screen: e.g. 640 x 480, 1024 x 768, etc. The resolution of a Printer is normally referred to by the number of *dots per inch (dpi)* - i.e. square inch.

ROM: Acronym for Read Only Memory. ROM chips in a computer contain data and programs as supplied by the manufacturer that can be accessed but not changed, i.e. they are *read-only*. ROM is also used to describe CD-ROMs. Originally CD-ROMs contained data and programs that could not be changed or erased, and new data and programs could not be stored on them, but modern CD-ROM and DVD drives allow certain types of CDs and DVDs to be *written to* as well as *read*.

Root Directory: The topmost directory in the directory hierarchy, from which all other directories are

descended. On a PC's hard disc this has the pathname C:\.

Router: A hardware device that connects computers to a Network or that connects one network with another network. *Routers* are now available at low prices and can be used for connecting two or more computers together in home networks, so that data can be exchanged between the computers on the network and so that all the computers in the network can access the Internet.

RSS (Really Simple Syndication) / Rich Site Summary: *RSS* is a development in Internet technology that enables users to subscribe to websites that change or add content regularly, for example news sites (such as the BBC) and sites containing Blogs, Nings, Podcasts and Wikis. RSS makes use of software that presents new additions to a website as list of subject headings or the first line or two of a news item, with a clickable link to the full article, blog posting or podcast. Thus, instead of the user having to browse websites for new information in which s/he is interested, an update of what is available is made available directly to the user, an *RSS feed* or *news feed.* An application known as an *aggregator* or *feed reader* (e.g. Google Reader) can check RSS-enabled websites and display any updated information that it finds.

RTF: Abbreviation for Rich Text Format, an alternative way of storing a document created with a Word-processor. RTF-formatted files can be moved relatively easily between different computer systems. RTF format is also recommended when transmitting an Attachment by Email as it is much safer than the *Microsoft Word* DOC format, which can harbor *Word* Macro viruses. RTF files preserve most of the formatting contained in DOC-formatted files.

S

Sans Serif: A type of Font, e.g. Arial, that is characterized by an absence of cross-lines on the ends of its letters and symbols.

Scanner: A device used to convert hard copy, e.g. a printed page, photograph or photographic negative, into a form that can be stored on a computer..

Scroll: To move up and down or from side to side through a document or a Window to view or access all of its contents

Search Engine: A search facility provided at a number of sites on the *World Wide Web*. Search engines enable the user to search the whole of the Web for key words and phrases and to locate related websites. This is a useful facility for locating information. **Serif:** A type of Font, e.g. Times News Roman, that is characterized by the presence of cross-lines (twiddle bits) on the ends of its letters and symbols.

Server: A computer which provides services to other computers, which are known as *clients*. For example, when you click on a link in a Web page your Browser sends a request to a remote computer, known as a Web Server, that *serves* the requested page to your browser, which then displays it on your computer screen. A Local Area Network (LAN) has a *server* that delivers software to the computers (also known as workstations) that are connected to it. It is usually the most powerful computer in the network Users connected to a LAN can access their own files remotely and exchange information with the server and other users connected to the network.

Setup Program: A program that enables the user to set up a program or suite of programs on the computer's hard disc. Also known as Install Program or Installation Program.

Shareware: Try before you buy software. A Shareware application can be freely copied and used without payment to the author(s), but you are encouraged to pay a registration fee if you use it regularly. Shareware is often a cut-down copy of the fully-featured application, which can only be obtained by paying the registration fee.

Shockwave Player: Software developed by Adobe that enables Web pages containing interactive multimedia materials to be played on the Web. Such materials may contain games, product demonstrations and online learning applications.

Silicon Chip: An encased piece of extremely pure silicon on to which electronic circuits are etched. The circuitry of modern computers is based on silicon chips that perform a vast range of different tasks.

Simulation: A type of program that simulates a real-life situation, allowing the user to carry out experiments which could have dangerous consequences or which are impractical in a normal learning environment. An early example of a simulation for language purposes was *Granville*, a program dating back to the 1980s in which the learner was asked to imagine that he/she had won a holiday in Granville, France, and had to survive for a number of days on a limited budget. The border line between simulations and *adventure games* is rather fuzzy. The latter tend to be set in fantasy worlds, whereas the former are more down-to-earth.

Smartphone: A *smartphone* is an advanced mobile phone that offers a wide range of applications. In addition to functioning as a mobile phone smartphones can be used as a media player, a camera, a GPS navigation device and a Web browser - and in many other ways.

Apple's **iPhone** is a typical example of a smartphone, using a touchscreen for typing and to run applications.

Social Media: Term used to describe a variety of Web 2.0 applications that enable people to share images, audio recordings and video recordings via the Web and to initiate discussions about them.

Social Networking: A term applied to a type of website where people can seek other people who share their interests, find out what's going on in their areas of interest, and share information one another.

Software: A generic term describing all kinds of computer programs, applications and operating systems. Software is not tangible, being a set of instructions written in a Programming Language comprising a set of instructions that the computer executes.

Sound Card or **Soundcard:** A *card*, i.e. an electronic circuit board, inside a computer that controls output to speakers or headphones and sound input from a Microphone or other source. A sound card is essential for multimedia applications. Also known as Audio Card. **Source Code:** The human-readable form of a *computer program*, which is converted into binary computer instructions by a *compiler* or *interpreter*.

Spam: Unsolicited email advertisements, the Internet equivalent of junk mail. A *spammer* is someone who sends out spam. A spammer can email an advertisement to millions of email addresses, newsgroups, and discussion lists at very little cost in terms of money or time.

Spambot: A *spambot* is a program designed to collect email addresses from the Internet in order to build mailing lists for sending Spam. A spambot is a type of Web Crawler that can gather email addresses from websites, discussion list and forum postings, and chat-room conversations.

Speech Recognition: A branch of Human Language Technologies (HLT) devoted to developing programs and devices that enable computers to recognize, analyze and transcribe human speech.

Spellchecker or **Spell-checker:** An electronic dictionary, usually part of a Word-processor, which scans the text entered by the user and highlights any word that it does not recognize. The author of the text is then given the option to correct, ignore or add any highlighted word to the dictionary. Spellcheckers can be set to accommodate different varieties of a language, e.g. British or American English, and many other languages. Many email packages also include a spellchecker.

Spreadsheet: Essentially an accounting program, e.g. *Excel*, which forms part of the Microsoft Office suite of programs. Such programs might, at first sight, not appear to have a great deal to offer the language teacher, but bear in mind that they can also be used for organizing vocab lists and for maintaining students' marks or grades.

Spyware is a term that may be used synonymously with *adware* but it implies more sinister motives on the part of the person who has dumped it onto your computer, e.g. with a view to stealing private information such as bank account numbers, credit card numbers, passwords, etc.

Storage Device: A Storage Device is a hardware device that reads and writes data to and from a storage medium. All equipment used for accessing and recording (i.e. *storing*) computer programs, texts, images, audio recordings and video recordings, such as disk drives are storage devices.

Storage Medium / Storage Media. A storage medium is the physical material on which a computer keeps data. There is a variety of storage media available, such as Hard Disks, Optical Disks, Flash disks, e.t.c.

Streaming: Playing audio or video in real time from a website. In order to play streaming multimedia files you need a specific Plug-in program that links in with your Browser and plays the file as it is transmitted rather than downloading it to your computer first. Streaming requires a Broadband connection to the Internet since multimedia files are not stored on your computer but played in a continuous stream direct from the computer where they are stored.

Synchronous: "At the same time". Often used to refer to communication in a Chat Room or via Videoconferencing, where the participants have to be present at their computers at the same time.

T

Tablet Computer: A *tablet computer* is compact portable computer that makes use of a Touchscreen instead of a keyboard for typing and running applications. Apple's **iPad** is a typical example of a tablet computer.

Tag: *Tagging* has become more common in recent years as a result of the widespread use of Social Media for sharing images, audio recordings, video recordings, website references, etc. *Tags* are labels that briefly describe the what the media or references are all about and help other people find them quickly. Tags are also used in HTML, to define how the onscreen text is rendered by the browser: for example the tag <b> makes the text bold.

TCP/IP: Abbreviation for Transfer Control Protocol / Internet Protocol. The main data transfer protocol used on the Internet.

Telnet: A program which allows you to log in to a remote Host computer and carry

out the same commands as if you were using a terminal at the host site.

Text File: A data file consisting entirely of printable ASCII characters, i.e. plain unformatted text. Text files often have a **.txt** Extension after the filename (e.g. **readme.txt**) and their contents can be viewed using programs such as *Windows Notepad*. The term *text file* is also used to describe files, i.e. texts, created by authoring packages such as *Fun with Texts*, which then *manipulates* the texts into a set of activities for completion by the learner.

Text to Speech (TTS): TTS software enables text to be read out loud from a computer screen by a synthetic voice. TTS software falls into the category of Assistive Technology, which has a vital role in improving Accessibility for a wide range of computer users with special needs.

TFT: Abbreviation for Thin Film Transistor. A new technology used in manufacturing computer display screens of the flat panel type, which is replacing the older Cathode Ray Tube type of display screen. In TFT screens each pixel is controlled by one to four transistors. TFT screens produce high-quality resolution and better, brighter colours than LCD screens. TFT screens are sometimes referred to as Active Matrix screens.

TIFF or **TIF:** Abbreviation for Tag Image File Format. A file format for storing images on a computer. TIFF files can store very high-quality images with millions of colours, but they are very demanding in terms of storage space.

Toolbar: A *toolbar* is a type of Menu Bar, normally located at the top of a computer screen, that contains *icons* for the most commonly-used commands in an application, e.g. in a word-processor or Browser. Typically, a toolbar appears under the Main Menu Bar, which normally consists of set of names of drop-down menus.

Touchscreen: A Display Screen which enables a computer to react to the touch of a finger. Touchscreens are commonly used in devices such as Smartphones and Tablet Computers.

Trackball or **Tracker Ball:** A Pointing Device. A sort of upside-down Mouse, with the ball facing upwards. The user manipulates the track of the Cursor on the screen by moving the ball with the palm of the hand or fingers.

Trojan: Trojans are programs - usually malicious - that install themselves or run surreptitiously on a victim's machine. They do not install or run automatically but may entice users into installing another program. e.g. a game, that actually installs a hostile piece of software and causes considerable damage to your computer. The name derives from Trojan Horse, the hollow wooden horse in which, according to legend, Greeks hid and gained entrance to Troy, later opening the gates to their army.

Troll: A *troll* is someone who intentionally posts derogatory or provocative messages in an online community such as a Discussion List or Forum or Blog to bait other users into responding.

Twitter: A Microblogging facility that allows users to post very short texts (maximum 140 characters) containing snippets of information about what they are doing at a given moment, news items, links to websites or comments on events, e.g. conferences and courses.

U

Unicode: The Unicode Worldwide Character Standard is a character coding system designed to support the interchange, processing, and display of the written texts of the diverse languages of the modern world. In addition, it supports classical and historical texts of many written languages:

Uninstall: A verb used to describe the process of removing an unwanted application from your computer's hard disc.

Universal Serial Bus (USB): A means of connecting a wide range of devices, e.g. Digital Cameras, Camcorders, iPods, mobile phones, Scanners and Printers, via a cable to a computer. *USB ports*, to which the cables are connected, are found on all modern computers A USB Port takes the form of a socket into which a plug at one end of the cable can be inserted. The plug at the other end varies according to the device that you are using. USB ports can also deliver power to devices that need it, so that separate power cables are not necessary.

Unix: An Operating System widely used on large computer systems in corporations and universities, on which many *Web servers* are hosted. A PC version of *Unix*, called *Linux*, is becoming increasingly popular as an alternative to *Windows*.

Upload: To transfer a copy of a computer program, a text file, an image file, a sound file or a video file from one computer to another computer. This term can also be used to describe the process of transferring a photograph from a digital camera to a computer,

URL: Abbreviation for Uniform Resource Locator. Also known as a Web Address. A URL contains the location of a resource on the Internet. A URL specifies the address of the computer where the resource is located, which may be the homepage of a website, e.g. http://www.newvision.co.ug, or a sub-page, e.g. http://www.newvision.co.ug/news/international.htm.

User-friendly: Mainly used to describe Software. Software that is easy to use and offers guidance if the user does meaningless things is described as user-friendly. This term may also be applied to certain types of Hardware.

V

Vector Graphic: A method of creating graphic images on a computer by telling it to draw lines in particular positions. An advantage of a *vector graphic* is that it can be enlarged or reduced in size without loss of sharpness or distortion. Most modern image creation and edtiting packages can save images in vector graphic format. Vector graphics can be contrasted with *bit-mapped graphics*, which are made of a fixed number of pixels (small dots), and therefore sharpness may be lost when the image is resized.

VGA: Abbreviation for Video Graphics Adaptor. An older type of Video Card or circuit board used to control the output on a computer Display Screen. VGA cards were superseded by SVGA cards.

Video Card: An electronic circuit board inside a computer, which controls the display on the Monitor, i.e. the computer screen. Video cards are usually add-on cards inserted into expansion slots, although sometimes video circuitry is incorporated into the Motherboard. Usually referred to as a *graphics card* these days.

Videoconferencing or **Video Conferencing:** A computer-based communications system that allows a group of computer users at different locations to conduct a "virtual conference" in which the participants can see and hear one another as if they were in the same room participating in a real conference.

Video Memory: The dynamic memory available for the computer's Display Screen. The greater the amount of memory, the greater the possible colour depth and resolution of the display. Also known as Video RAM (VRAM).

Virtual Learning Environment (VLE): A VLE is a Web-based package designed to help teachers create online courses, together with facilities for teacher-learner communication and peer-to-peer communication. VLEs can be used to deliver learning materials within an institution or within a local education authority. They may even address a wider constituency, and can even be used on a worldwide basis. VLEs have certain advantages in terms of ease of delivery and management of learning materials.

Virtual Reality: The simulation of an environment by presentation of 3D moving images and associated sounds, giving the user the impression of being able to move around with the simulated environment. Users wear helmets and visors that convey the images and sound and gloves that give them the experience of touching objects.

Virus: A virus is a nasty program devised by a clever programmer, usually with malicious intent. Viruses can be highly contagious, finding their way onto your computer's hard drive without your being aware of it and causing considerable damage to the software and data stored on it. Viruses can be contracted from files attached to email messages, e.g. Microsoft Word files, or direct from the Web. Be very wary of opening an email attachment of unknown origin, as this is the commonest way of spreading viruses. Software used to protect your computer against the invasion of computer viruses is known as *anti-virus software*.

Visual Display Unit (VDU): a hardware output device that visually conveys text and graphics to one or more people. Also simply known as a display device. Examples include monitors, LED displays, projectors, e.t.c.

VoIP: Abbreviation for Voice over Internet Protocol, i.e. audio communication using the Internet instead of telephones. Skype and Ventrilo ar e examples of VoIP.

Volatile Memory: Used to describe the internal main Memory of a computer that loses its contents when power is switched off. RAM is *volatile memory* as the information is stored in memory chips as an electric charge.

W

WAN: Abbreviation for Wide Area Network. A network of computers located at geographically separate sites.

WAV: Short for Waveform Audio Format. A format for storing high-quality audio files. Somewhat hungry in terms of storage space compared to the MP3 and WMA audio file formats.

Webcam: A camera connected to a computer that enables it to transmit images and videos to the Internet. For example, *webcams* can be set to transmit a live picture every few minutes from a location to a website, displaying a live view of a landscape, cityscape or interior of a building. Webcams are essential for Videoconferencing. Many laptop computers have an integrated webcam - which appears as a small "eye" in the top of the frame of the Display Screen.

Webmail: A facility for creating, sending and and receiving messages via the Internet. *Webmail* offers an alternative to using email software such as Outlook or Eudora.

Web Server or **Webserver:** A computer or a software package running on a computer that delivers, i.e. *serves*, Web pages to its *clients*. Every *Web server* has

an IP Address and possibly a Domain Name. For example, if you enter the URL **http://www.ict4lt.org/index.htm** in your Browser, this sends a request to the Server whose domain name is **ict4lt.org**. The server then fetches the page named **index.htm** and sends a copy of it to your browser. Any computer can be turned into a Web server by installing Web server software and connecting the machine to the Internet.

Website: An area on the World Wide Web where an organization or individual stores a collection of pages of material - **Web pages**. The pages are usually interlinked with one another and with other websites. Every website has a unique Web Address or URL.

Wifi: Wireless Fidelity, also known as *wireless networking*, a way of transmitting information without cables that is reasonably fast and is often used for laptop computers within a business or a university or school campus instead of a Local Area Network (LAN) that uses cable connections. *Wifi* systems use high frequency radio signals to transmit and receive data over distances of several hundred feet. Many hotels and airports now offer wifi access to people travelling with laptop computers.

Wiki: A website or similar online resource which allows anyone to set up a resource in which content can be created collectively. It's important feature is that it allows anyone who views the wiki to add to or edit the existing content as if they were adding to or editing, for example, someone else's *Word* document. Wiki also refers to the software used to create such a website. The word "wiki" derives from the Hawaiian "wiki-wiki", meaning "quick". **Wikipedia** is the best known example of a wiki. It's a collaboratively written encyclopedia.

Wild Card or **Wildcard:** In a question-answer dialogue which aims not to be over-sensitive about spelling, the teacher may decide to allow for aberrations by declaring certain characters "wild". For example, the answer "relitivaty" would match with 'r?l?t?v?t?', the question marks representing wild card characters: i.e. whatever the learner types in place of them is accepted. Conventionally, a question mark is used for a single character and an asterisk for a string of characters. A technique also used in programs that help you cheat at crossword puzzles! *Wildcards* can also be used in search engines such as Google when you are not sure of the spelling of the item you are searching for.

Window: An rectangular area of a computer screen set aside for a special purpose. Modern computers, such as the Macintosh and most personal computers, divide the screen into discrete sections, known as *windows*, within which different pieces of software can be run at the same time - although not necessarily strictly at the same time, as normally only one window is active: The user can control the size, shape and positioning of each window. Data, e.g. a piece of text, a picture or numerical data, can be moved or copied and pasted from one window to another.

Windows: The name of a range of several different Graphical User Interface (GUI) operating systems produced by the Microsoft Corporation. *Microsoft Windows* is currently the most widely used GUI for personal computers. It exists in various versions, e.g. Windows 2000 and XP, Vista, 7 and 8.

Windows Explorer: Microsoft's tool, provided as part of *Windows*, that enables you to inspect and manage *folders* and *files* stored on your computer.

Wireless Mouse (Cordless Mouse): A Mouse that does not require a cable connection to a computer, but which operates via infrared or radio signals.

Wizard: Software that guides the user step-by-step through a complex task, such as setting up software on a network or configuring a printer to output data in a special format, e.g. for printing labels from a database program.

WMA: Abbreviation for Windows Media Audio. Microsoft's audio encoding format which offers high-quality output with lower file sizes.

Word processor: Probably the most widely used computer Application. Modern word-processors allow the user to create fine-looking documents including images, tables, photographs, and even sound and video recordings if they are to be viewed on screen rather than from the printed page. In many respects they are similar to Desktop Publishing applications. Word-processors normally include a spellchecker, a grammar checker, a style checker and a thesaurus, as well as tools for writing in HTML, the coding language used for producing Web pages.

Workstation: Any computer that forms part of a Network. Formerly, this term was applied to a particular type of powerful computer used for scientific and engineering calculations, e.g. the *Sun Workstation*.

World Wide Web: Usually referred to simply as **the Web**. This is the most powerful and fastest growing Internet service. The World Wide Web was the brainchild of Tim Berners-Lee, who in 1989 invented the HTML coding language that is the basis of the Web. The Web became a public service in 1993. It is a huge collection of resources of information, including learning materials, which is accessed by means of a computer program

known as a Browser. The World Wide Web is only part of the Internet, but many people treat both terms as synonyms.

Worm: A computer worm is a self-replicating hostile computer program, similar to a computer Virus. A virus attaches itself to and becomes part of another program, but a worm is self-contained and does not need to be part of another program to propagate itself. Worms can cause considerable damage to computers.

Write Protect: To protect a Storage Device, File or Folder so that its contents cannot normally by altered or erased. This may be done physically, e.g. by moving a notch on a floppy disc's casing, or - more commonly these days - through software that designates the device, file or folder as read-only.

WWW: Abbreviation for World Wide Web.

WYSIWYG: Acronym for What You See Is What You Get. Dating back to the MC-DOS, when what you saw on the screen, e.g. in a *Word* document, was not necessarily what appeared on your Printer - something we now take for granted.

X

x64 (64-bit): Replacement for the older x86 or 32-bit platform, 64-bit is a computer or software program that is capable of transferring 64-bits at a time. When referring to 64-bit, this is referring to a computer's microprocessor or the computer bus and is also often referred to as WOW64 and x64.

x86 (32-bit): Platform and Microprocessor architecture that originated from the Intel 8086. This number is used to help identify the Intel platform processor computers that are 32-bit. This term is also often used as another way to describe IBM compatible computers, which means even if the IBM compatible computer is not using an Intel processor, it still is an x86 compliant computer. Today, the x86 platform is beginning to be replaced with the faster 64-bit or x64 architecture (also known as WOW64).

Xbox: The Xbox and Xbox 360 are game consoles developed by Microsoft that connect to a TV or other digital display.

Xeon: A high end Intel processor for enterprise servers and workstations. The Xeon processor requires a compatible motherboard and will not work with motherboards designed for the consumer Intel Pentium processors.

XML: Abbreviation for eXtensible Markup Language. XML is a specification emanating from the World Wide Web Consortium (W3C) that allows Web designers to create their own language for displaying documents on the Web. XML is an extension to the standard language for creating Web pages, HTML, and makes it possible to create websites containing more complex interactivity.

Y

Yahoo: A popular Search Engine and webmail service provider.

Y2K: Year 2000. See Millennium Bug.

YouTube: A website to which you can upload your own video clips and view video clips uploaded by others: http://www.youtube.com.

Z

Zip Disc: A portable type of disc used to store around 100Mb of data. Zip discs have become obsolete since the arrival of smaller and more convenient storage devices with much greater storage capacity, e.g. the increasingly popular Flash Drive or Memory Stick.

Zip: Used as a verb to describe the process of compacting files or programs in order to cut down the amount of storage space they require by compressing them into one tightly-packed file and thus to make it easier for them to be transported on floppy discs or transmitted electronically to other locations, e.g. via the Internet. Proprietary programs, such as **WinZip** or **WinRAR**, can be used to zip data and files. Zipped files are recognized by the Extension **.zip** or **.rar** (for files created with WinRAR) and have to be unzipped before they can be used, again using proprietary programs.

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