456/1

MATHEMATICS

Paper 1

July / Aug. 2022

2 ½ hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **ALL** *questions in section A and any* **five** *questions from section* ***B.***

Any additional question(s) answered will **not** *be marked.*

ALL *necessary calculations* ***MUST*** *be done on the answer booklet provided.*

Therefore, no paper should be given for rough work.

Graph paper should be provided

Only silent non-programmable scientific calculators may be used.

Mathematical tables, squared papers are provided.

State the degree of accuracy at the end of each answer attempted using a calculator or tables; and indicate ***Cal*** *for calculator,* ***Tab*** *for mathematical table.*

SECTION A (40 MARKS)

Answer **ALL** *the questions in this section*

1. Find two consecutive even numbers that are seven times the smaller number subtracted from nine times the greater number makes 46. *(04 marks)*

2. The top 11 students in a class got the following marks in a mathematics test. 63, 60, 64, 68, 62, 69, 59, 58, 62, 54, 74.
   Find the mode and mean mark. *(04 marks)*

3. Without using mathematical tables or a calculator, evaluate;
   (a) $Cos\ 600^o$
   (b) $Sin\ 405^o$ *(04 marks)*

4. Factorize completely;
   $18x^2 - 2(b - 3)^2$ *(04 marks)*

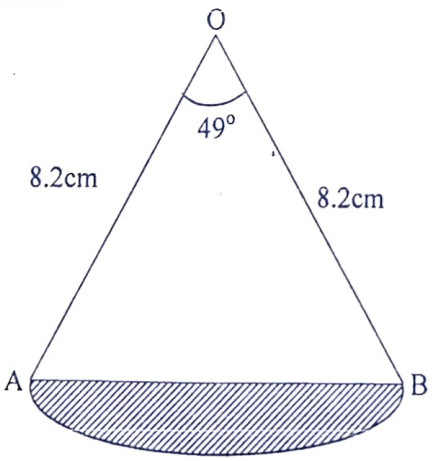
5. Find the value of $\frac{x}{y}$ when $4^x - 256^y = 0$ *(04 marks)*

6. Solve the simultaneous equations;
   $2x + 5y = 12$
   $x + 2y = 5$ *(04 marks)*

7. If $\begin{pmatrix} -1 & -2 \\ 3 & a \end{pmatrix}\begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} b \\ 7 \end{pmatrix}$, find the values of a *and* b. *(04 marks)*

8. Amega's present age is $\frac{1}{3}$ of his father's age. In ten years time, he will be ½ of his father's age then. How old is his father? *(04 marks)*

9. The figure below shows a sector of radii 8.2cm and subtends a minor angle of 49° at the centre.



Calculate the;

(a) Length of a chord AB *(02 marks)*

(b) Height of triangle ABO above the chord AB. *(02 marks)*

10. Under an enlargement of scale factor $+2$, the image of point $X(3,1)$ is $X^1(2,-1)$. Calculate the coordinates of the centre of enlargement. *(04 marks)*

SECTION B (60 MARKS)

Answer any **FIVE** *questions from this section*

All questions carry equal marks

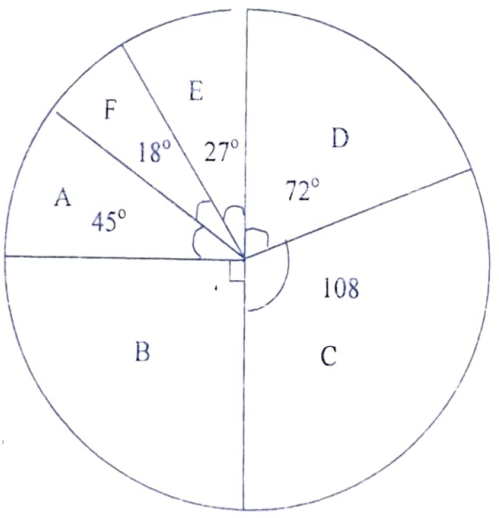
11. B *and* C are two points on a straight road, the bearing of C *from* B being $060°$. B *and* C are 200 metres apart. From B a tree is sighted on a bearing of $040°$ and from C the same tree is on a bearing of $290°$.

Calculate the;

(a) Distance of the tree from B. *(07 marks)*

(b) Shortest distane from the tree to the road. *(05 marks)*

12. The pie – chart below shows the distribution of marks scored by 200 students in a test.



A	B	C	D	E	F
31 – 40	41 – 50	51 – 60	61 – 70	71 – 80	81 - 90

(a) How many students scored;

(i) Between 41 and 50 *(02 marks)*

(ii) Above 60 marks *(04 marks)*

(b) What fraction of the students scored at most 50 marks? *(04 marks)*

(c) What is the modal class? *(02 marks)*

13. (a) Given that $A = \begin{pmatrix} 3 & -4 \\ 2 & 1 \end{pmatrix}$ and $AB = \begin{pmatrix} -10 & -12 \\ -3 & 3 \end{pmatrix}$. Find matrix B. *(06 marks)*

(b) Three friends went shopping and purchased fish, beef and chicken;

Amega purchased 1 fish, 1kg of beef and 2 chicken, Naleera purchased 1 fish, 3kgs of beef and 2 chickens and Kuluse purchased 1 fish, 3 kgs of beef and 6 chicken.

(i) Represent the above information as a 3×3 matrix.

(ii) One fish costs shs. 12,000, a kilogram of beef cost shs. 15,000 and one chicken costs 25,000/=. Using matrix multiplication, obtain the money spent by each of the friends alone, determine the total amount of money spent by the three friends. *(06 marks)*

14. A quadrilateral $ABCD$ has vertices $A(1,1)$, $B(4,1)$, $C(4,3)$ and $D(3,2)$ is mapped on to quadrilateral $A^1B^1C^1D^1$ with vertices at $A^1(-1,1)$, $B^1(-1,4)$, $C^1(-3,4)$ and $D^1(-2,3)$ under a rotation. $A^1B^1C^1D^1$ is then mapped onto $A^{11}B^{11}C^{11}D^{11}$ by a matrix $M = \begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$. Find the;

(a) (i) Centre of rotation by construction.

(ii) Angle of rotation. *(08 marks)*

(b) Coordinates of $A^{11}B^{11}C^{11}$ and D^{11}. *(04 marks)*

15. Two dice are thrown and the number on each dice recorded. The event M is "the sum of the two numbers is divisible by three" while the event N is "the sum of the two numbers is odd."

(a) Draw a table to show the possibility space. *(06 marks)*

(b) Calculate the probability of;

(i) M *(01 mark)*

(ii) N *(01 mark)*

(iii) M and N *(04 marks)*

16. (a) Copy and complete the table below for the function $y = 3x^2 + 5x - 7$ for $-3 \leq x \leq 2$.

x	-3	-2	-1	0	1	2
$3x^2$	27					12
$5x$	-15					10
-7	-7	-7	-7	-7	-7	-7
y	5					15

(b) On the same axes, draw the graphs of $y = 3x^2 + 5x - 7$ and $y = 2x + 3$. Use a scale of 2cm to 1 unit on the $x-axis$ and 1cm to 2 units on the $y-axis$. ***(05 marks)***

(c) Use your graphs to find the solutions of the simultaneous equations $y = 3x^2 + 5x - 7$ *and* $y = 2x + 3$. ***(04 marks)***

17. A club has x regular members and y Gold members. Regular membership costs shs. 25,000 per year and God membership costs shs. 75,000 per year.
The club needs to collect at least shs. 1,500,000 in membership fees each year. The club has a maximum of 50 members, and must have at least 15 regular members.

(a) Write down **four** inequalities which the club must satisfy. ***(04 marks)***

(b) Represent the inequalities on the graph paper by shading the unwanted regions. (Use the scale of 1cm to 5 units on both axes). ***(04 marks)***

(c) Find the maximum amount the club can expect to receive in membership fees each year, and the number of regular and gold members that are needed to achieve this amount. ***(04 marks)***

END