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# P.7 MATHEMATICS SELF-STUDY LESSONS SET 4 11.6.2020

## LESSON 1

**TOPIC : NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC : FINDING FACTORS AND COMMON FACTORS OF NUMBERS**

**Learning outcomes**

**By the end of this lesson, you should be able to:-**

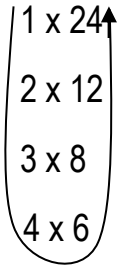
- Define factors.
- List factors of the given numbers.
- Identify greatest common factors.

## Content: Factors of Numbers

- **Factors** are numbers that are multiplied to get a multiple.
- One is a factor of every number and the number itself is a factor of its own.
- The lowest factor of all numbers is 1.

**Examples**

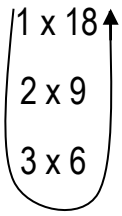
1. List all the factors of 24




$F_{24}$ = {1, 2, 3, 4, 6, 8, 12, 24}

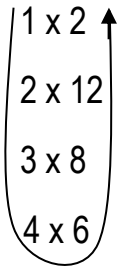
2. Find the greatest common factor (G.C.F) of 18 and 24.

**Factors of 18**




$F_{18} = \{1, 2, 3, 6, 9, 18\}$

**Factors of 24**




$F_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\}$

C.F = {1, 2, 3, 6}

L.F= 1

GCF = 6

**Activity**

1. List all the factors of;
   a) 12
   b) 36
   c) 48

2. Find the lowest common factor of 12 and 18.

3. Given that M={factors of 24}. Find n(M).

4. Find the sum of all factors of 18?

5. Find the product of all factors of 6?

6. Find the greatest common factor of 18 and 24

7. Find the greatest common divisor (G.C.D) of;
   a) 15 and 12
   b) 30 and 36
8. Find the Lowest Common factor of;
   a) 12 and 18
   b) 20 and 24

**LESSON 2**

**TOPIC : NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC : PRIME FACTORIZATION**

**Learning outcomes**

**By the end of this lesson, you should be able to:-**

- Define prime factorization.
- Identify the methods used in prime factorization
- Prime factorize given numbers.
- Write prime factors in different ways ;set notation/subscript ,power form, multiplication

**Content: Prime Factorization**

- Prime factorization is a way of dividing numbers using its prime factors.
- There are two methods used
  - Ladder method
  - Factor tree method
- There are three ways / forms of presenting(writing) prime factors

  -Set notation/ subscript form

-Power /exponent/index form

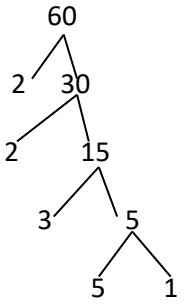
-Multiplication form

**Examples 1**

Find the prime factors of 60 ( write your answer in three different forms)

| | |
|---|---|
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

**Or**




- **Divide 60 by 2 to get 30**
- **Then 30 by 2 to get 15**
- **Then 15 by 3 to get 5**
- **Then 5 by 5 to get 1**

**The moment you get 1 , then stop and write the prime factors as instructed.**

- Set notation.

$F60=\{2_1,2_2,2_1,5_1\}$

- Multiplication form
  F60={2 X 2 X 3 X 5}

- Power form
  $F60=2^2 \times 3^1 \times 5^1$

**Activity**

Prime factorize each of the following numbers and show your answer in power form.

1. 18
2. 30
3. 24
4. 36

**Prime factorize and use set notation method to show your answer**

5. 45
6. 60
7. 54
8. 42

**Prime factorize the following numbers and write your answer in multiplication form**

9. 16
10. 120
11. 225
12. 66

**LESSON 3**

**TOPIC : NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC : FINDING THE PRIME FACTORIZED NUMBER AND THE UNKNOWN PRIME FACTOR.**

**Learning outcomes**

**By the end of this lesson, you should be able to:-**

- Identify the form used to present a prime factorized number.
- Expand numbers presented in power.
- Find the prime factorized number.
- Find the value of unknown prime factors.

**Content: Finding the prime factorized number and the unknown prime factor**

**Examples**

1.Find the number whose prime factorization is $2^2x3^2x5^1$

$2^2x3^2x\ 5^1$

(2x2)**x**(3x3)**x** 5

4 **x** 9 **x** 5

36 **x** 5

180

- You must understand the form in which the prime factorized number has been presented that is (**powerform, multiplication and set notation/subscript**.
- $2^2$ means multiply **2 twice**
- $3^2$ means multiply **3 twice.**
- $5^1$ means write **5 once**
- After multiplying all of the together then note the answer which was prime factorized.

2.The prime factors of 90 are : 2 **x** 3 **x** 3 **x** y. Find the value of y.

2x 3 x 3 x y = 90

18 **x** y = 90

$\frac{18y}{18} = \frac{90}{18}$

y = 5

**Activity**

1. Find the numbers whose prime factorization are given below
   a) $\{2^1 \times 3^1 \times 5^3\}$
   b) $2^1 \times 3^3 \times 5^2$
   c) $2^5 \times 3^1$
   d) $2^1 \times 5^1 \times 11^1$
   e) $\{3_1, 5_1, 7_1\}$
2. Given that:
   a) The prime factorization of 30 is 2 x p x 5. Find the value of p
   b) The prime factorization of 70 is 2 x 5 x n. Find the value of n.
3. The prime factors of 144 are $2_1$, $2_2$, $2_3$, $2_4$, $3_1$ and k. Find the value of k.

**LESSON 4**

**TOPIC : NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC : VALUE OF NUMBERS EXPRESSED IN POWER FORM**

**Learning outcomes**

**By the end of this lesson, you should be able to:-**

- Identify prime factors
- Find the value of numbers expressed in power.
- Express numbers in powers form

- Find the product of numbers with their exponents.
- Substitute for the unknown values.

**Examples**

1. What is the value of $7^3$?

$7^3 = 7 \times 7 \times 7$

$= 49 \times 7$

$= 343$

2. Express 64 in powers of 4

| | |
|---|---|
| 4 | 64 |
| 4 | 16 |
| 4 | 4 |
| | 1 |

$64 = 4 \times 4 \times 4$

$4^3$

3. What is the value of $2p^2 + p$ if $p=4$.

$2p^2 = 2 \times p \times p + p$

$= 2 \times 4 \times 4 + 4$

$= 2 \times 16 + 4$

$= 32 + 4$

$= 36$

**Work to do**

1. Find the value of each of the following:-
   a) $2^3$
   b) $11^3$
   c) $6^2$
2. Express 125 in powers of 5.
3. Write 49 in powers of 7.
4. Change 512 in powers of 8.
5. Express 216 in powers of 6

6. Express 256 in powers of 4
7. Find the value of $2x^2$ if $x = 3$
8. If $t = 9$, what is the value of $3t^2$?

**LESSON 5**

**TOPIC : NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC : ADDITION AND SUBTRACTION OF NUMBERS IN POWER FORM**

**Learning outcomes**
**By the end of this lesson, you should be able to:-**

- Identify powers / exponents
- Expand numbers given in powers
- Find products of powers
- Add or subtract values of powers.

**Content: Addition and subtraction of numbers in power form**
**Note:**Any number to the power zero is one except zero.eg $4^0=1$, $34^0=1$, $0^0=0$

Any number to power one is that same number. Eg $5^1=5$, $10^1=10$, $6^1=6$

**Examples**

1. Find the values of : $4^3 + 3^2$

   $(4 \times 4 \times 4) + (3 \times 3)$

   $64 + 9$

   $73$

2. Work out : $2^3 + 3^2 + 5^0$

   $(2 \times 2 \times 2) + (3 \times 3) + 1$

   $8 + 9 + 1$

   $18$

- ✓ $\mathbf{4^3}$ means multiply 4 three times.
- ✓ $\mathbf{3^2}$means multiply 3 two times.
- ✓ Get the value of $\mathbf{4^3}$ which is **64** plus the value of $\mathbf{3^2}$ which is **9**.
- ✓ Their sum which is 73 is the answer.

**Work to do**

Find the values of;

1. $2^2 + 3^2$
2. $4^2 + 3^2$

3. $6^2 + 6^3$
4. $7^0 + 3^0$
5. $4^2 + 6^3 - 8^0$
6. $3^4 + 4^2 + 2$
7. $8^1 – 3^0$
8. $2^2 + 3^2 + 2^3$
9. $2^4 + 3^4$
10. $5^3 - 4^3$

**LESSON 6**

**TOPIC: NUMBER PATTERNS AND SEQUENCES**

**SUB TOPIC: FINDING THE NEXT NUMBER IN THE SEQUENCE**

Competences; By the end of this lesson, you should be able to:-

- Identify the type of number used in the sequence
- Identify the type of sequence depending on the progression.
- Identify the operation used in the progression.

**Note;**

1. Sequences are in three groups. Namely,

- Increasing sequences
- Decreasing sequences
- Irregular sequences

2. Before finding the pattern used to find the given numbers, you need to study the sequence in order to identify the type of number used.
3. Some numbers such as prime numbers and composite numbers don't have a pattern and hence he next number is found by stating the type of number used in the sequence.

4. Addition and multiplication are use in a sequence that is increasing in value.

5. Subtraction and division are used in a sequence that is decreasing in value.

6. For irregular sequences, two or more operations can be used in the sequence.

**Examples**

1. Find the next number in sequence below
   1, 4, 9, 16, 25, -----

   Solution.

   1, 4, 9, 16, 25, **36** (Square numbers)

   1x1=1, 2x2=4 , 3x3=9, 4x4=16, 5x5=25, 6x6=36

2. Find the next number in the sequence.
   81, 27, 9, 3, ____

   Solution
   81, 27, 9, 3, ____ this kind of sequence is decreasing and hence u need to compare subtraction or division to guide u in finding the next number in the sequence.

   The common divisor that can be used is 3. How? 81÷27 = 3

   81, 27, 9, 3, **1**

   ÷3 ÷3 ÷3 ÷3

3. Write the next number in the sequence in Roman numerals.

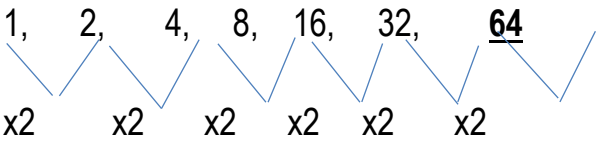
1, 2, 4, 8, 16, 32, ____

Solution

- The key points in this question are two ie, finding the next number in the sequence and then, expressing it in Roman numerals.

- Secondly, the sequence given is increasing and hence 2 operations should be considered ie, multiplication and addition.

- In this case, multiplication can be used since the increase is big and the common progressive factor used is 2.




**Roman numerals**

64 = 60 + 4
= LX IV
= LXIV

Work to do.

1. Find the next number in the sequence.
   a) 2, 3, 5, 7, ___
   b) 1, 3, 6, 10,___
   c) 81, 49, 36, 25, ___
   d) 1, 8, 27, 64, 125,___
   e) 1, 3, 6, 11, 17, ____
   f) 3, 6,4,7,5,8,6,____
   g) 32, 16, 8, 4, 2, ___
   h) -14, -11, -8, - 5,____
2. Find the square of the next number in the sequence. 1, 3, 5, 7, 9, 11, ___
3. Find the sum of the next two numbers in the sequence. 3,5,9,15,23,___, ____

**LESSON 7**

**TOPIC :** **NUMBER PATTERNS AND SEQUENCES**

**SUBTOPIC**: **FINDING SQUARE NUMBERS**

Competences;

By the end of the lesson, learners should be able to

- Define a square number.
- Find squares of
  - ✓ whole numbers,
  - ✓ common fractions
  - ✓ decimal fractions

Note;

- A square number is a result obtained by multiplying any given number by itself two times.

- When given a common fraction, the result must remain a common fraction and when given a decimal, the answer must be presented as a decimal

Examples

1. Find the square of 4.

   Solution.

   To find the square of 4 means multiply 4 by self two times.

   4 x 4 = 16

a) Find the square of $\frac{1}{4}$ .

   Solution

   To find the square of $\frac{1}{4}$ means multiply it by self 2 times.

$\frac{1}{4}$ x $\frac{1}{4}$ = $\frac{1 \text{ x } 1}{4 \text{ x } 4}$

= $\frac{1}{16}$

2. Find the square of 0.6.
   Solution

- When given a decimal number, first change it to a common fraction and then multiply it by self 2 times.
- However, your answer must again be converted back to a decimal fraction.

$\frac{6}{10}$ x $\frac{6}{10}$

$(0.6)^2$=0.6 x 0. 6

=$\frac{6}{10}$ x $\frac{6}{10}$

=$\frac{36}{100}$

= 0.36

Work to do.

1. Find the square of the following.
   a) 16
   b) 6
   c) 16
   d) 0.4
   e) 0.12
   f) 0.14
   g) $\frac{3}{4}$
   h) $\frac{2}{3}$
   i) $\frac{4}{5}$
2. Calculate the area of the square whose sides are:
   a) 7cm
   b) 13cm
   d)$\frac{4}{5}$ cm

c) 1.2dm