P.6 MATHEMATICS

TERM ONE

THEME: **SETS**

❖ SET CONCEPTS.....6
- Meaning of a set and symbols used
- Types of sets
- Describing parts of a venn diagram
- Difference of sets
- Complement of sets
- Listing elements from a venn diagram
- Representing sets on venn diagrams
- Listing subsets and proper subsets
- Finding number of subsets using the formulae
- Finding number of elements when given subsets and proper subsets
- Number of elements in a venn diagram
- Solving problems using a venn diagram
- Application of sets
- Revision questions

THEME: **NUMERACY**

❖ WHOLE NUMBERS.....25
- Forming numerals from digits
- Place values and values of numbers up to millions
- Writing in words
- Writing in figures
- Expanded form
- Rounding off
- Roman numerals

❖ OPERATION ON WHOLE NUMBERS.....32
- Addition of big numbers
- Subtraction of big numbers
- Multiplication of big numbers
- Division of big numbers
- Properties of numbers

❖ NUMBER PATTERNS AND SEQUENCES.....36
- Divisibility tests
- Types of numbers

P.6 Mathematics

- Finding sum of consecutive counting numbers using the formula
- Factors and multiples
- Prime factorization
- Finding unknown factors
- LCM and HCF
- Application of LCM and HCF
- Consecutive numbers
- Squares
- square roots
- Cube roots

TERM TWO

- **FRACTIONS**.....48
- Addition and subtraction of fractions
- Multiplication of fractions
- Finding reciprocal/multiplicative inverse
- Division of fractions
- Mixed operation on fractions (using BODMAS)
- Application of fractions

DECIMALS

- Changing vulgar fractions to decimals
- Changing non recurring decimals to vulgar fractions
- Changing recurring decimals to vulgar fractions
- Addition and subtraction of decimals
- Multiplication of decimals
- Division of decimals
- Mixed operations
- Multiplication and division of decimals
- Application of decimals

- **RATIOS AND PROPORTIONS**.....58
- Meaning of ratios
- Expressing quantities as ratios
- Sharing in ratios
- Solving problems on ratios
- Increase and decrease in ratios
- Finding ratio of increase and decrease
- Finding numbers increased in ratio
- Finding numbers decreased in ratios
- Direct proportions
- Inverse proportions

- **PERCENTAGES**.....64
- Meaning of percentages
- Expressing percentages as fractions
- Expressing fractions as percentages

P.6 Mathematics

- Expressing percentages as ratios
- Expressing ratios as percentages
- Expressing percentages as decimals
- Expressing decimals as percentages
- Expressing quantities as percentages
- Expressing one quantity as a percentage of another
- Finding quantities equivalent to percentage
- Sharing quantities using percentages
- Forming and solving equations
- Increasing or decreasing quantities using percentages
- Finding percentage of increase and decrease
- Percentage increase and decrease
- Percentage profit and loss
- Finding (SP) when cost price (CP) percentage profit or loss are given
- Finding cost price(CP) when given selling price (SP) and percentage profit.
- Finding cost price(CP) when given selling price (SP) and percentage loss.
- Percentage discount
- Finding simple interest
- Finding rate
- Finding time
- Finding principal
- More about simple interest

THEME:**INTERPRETATION OF GRAPHS AND DATA**

❖ DATA HANDLING.....87

- Revision about graphs
- pie charts involving degrees
- pie charts involving percentages
- pie charts involving fractions
- solving problems on pie charts
- Construction of pie charts
- Measures of central tendency and range (statistics)
- Complex mean / average
- Probability

THEME:**MEASUREMENTS**

❖ MONEY..... 106

- Shopping lists
- Table bills
- Exchange rates
- Buying and selling of money
- Bank notes

P.6 Mathematics

❖ DISTANCE,SPEED AND TIME.....112

- Revision about conversion of time
- Converting from 12 hr clock to 24 hr clock
- Converting from 24 hr clock to 12 hr clock
- Duration
- Finding distance,
- Finding speed
- Finding time
- Changing from km/hr to m/sec and vice versa
- Average speed
- Time tables
- Travel graphs
- Drawing travel graphs

TERM THREE

❖ LENGTH, MASS AND CAPACITY.....126

- Conversion of length, mass and capacity. (review)
- Finding perimeter. (review)
- Finding area of simple shapes. (review)
- Finding area of square, rhombus and kite using diagonals.
- Finding perimeter and area of parallelogram
- Comparing sides of polygons
- Circle properties
- Finding circumference of a circle and parts of a circle
- Finding perimeter of a circle and parts of a circle
- Finding radius or diameter when given circumference
- More about perimeter (irregular figures)
- Finding area of a circle and parts of a circle
- Finding radius or diameter when given area
- Finding area of combined shapes
- Finding shaded area
- Finding missing sides using Pythagoras' theorem
- Application of Pythagoras' theorem in an isosceles triangle, trapezium and a rhombus

• VOLUME AND SURFACE AREA

- Solid figures their properties and their nets
- Converting from (cm^2) to (cm^2) and viceversa
- Converting from square (km^2) to (m^2) and viceversa
- Converting from (m^3) to (cm^3) and viceversa
- Volume and capacity of a cube
- Volume and capacity of a cuboid
- Finding missing sides when given volume of a cuboid

P.6 Mathematics

- Volume and capacity of cylinders
- Finding missing sides when given volume of a cylinder
- Volume and capacity of triangular prisms
- Finding missing sides when given volume of a triangular prism
- TSA of cubes and cuboids
- Find missing sides when given TSA of cubes and cuboids

THEME:GEOMETRY

LINES, ANGLES AND GEOMETRIC FIGURES.....156

- Names of polygons
- Interior and exterior angles
- Finding number of sides of a polygon
- Finding number of triangles
- Finding number of right angles
- Finding number of sides when given right angles and triangles
- Finding interior angle sum
- Finding number of sides when given interior angle sum
- Interior angles of a triangle
- Interior and exterior angles of a triangle
- Angles of an isosceles triangle
- Exterior angles of polygons
- Angles on parallel lines
- More about angles on parallel lines
- Properties of quadrilaterals
- Complementary angles
- Supplementary angles

CONSTRUCTION

- Constructing special angles
- Constructing other angles
- Constructing perpendicular bisectors
- Constructing perpendicular lines from a point
- Construction of parallel lines
- Construction of a pentagon when given side
- Construction of polygons using a centre angle
- Construction of a square when given a side
- Construction of a square in a circle
- Construction of a square using diagonals
- Construction of a rectangle when given sides
- Construction of a triangle when given sides(SSS)
- Construction of a triangle when given two sides and one angle(SAS)
- Construction of a triangle when given two angles and one side(ASA)
- Construction of a rhombus when given side and angle

THEME: NUMERACY

❖ **INTEGERS**.....188

- Arranging and ordering integers using a number line
- Addition and subtraction of integers with and without a number line
- Subtraction of integers with and without a number line.
- Multiplication of integers with and without a number line.
- Division of integers with and without a number line.
- Application of integers

• **FINITE / MODULAR SYSTEM**

- Writing numbers in finite system
- Equivalences in finite system
- Addition in finite system
- Subtraction in finite system
- Multiplication in finite system
- Division in finite system
- Application of finite system in days of the week.
- Application of finite system in 12 and 24 hour time.
- Application of finite system in months of the year.
- Applying more than one finite in solving problems
- Solving equations

THEME: ALGEBRA

❖ **ALGEBRA**.....202

- Algebraic phrases and expressions
- Substitution
- Collecting like terms
- Addition and subtraction of fractional algebraic terms
- Multiplication and division of fractional algebraic terms
- Removing brackets
- Removing brackets in fractional algebraic terms
- Powers or Indices
- Solving simple equations
- Solving equations involving squares and square roots
- Solving equations involving brackets
- Solving equations involving fractions
- Forming and solving equations
- Application of algebra in ages
- Finding solution sets
- Solving and writing solution sets
- Finding solution sets with compound inequalities
- Solving and writing solution sets with compound inequalities

TERM ONE: SET CONCEPTS

Key words: *universal, complement, subsets, union, intersection, empty, finite, infinite, probability*

SUB TOPIC: MEANING OF A SET AND SYMBOLS USED

A set is a group of defined elements

Symbols used in sets

$=$	*Equal sets*
$\neq$	*un equal sets*
$\cup$	*Union sets*
$\cap$	*Intersection sets*
$\emptyset$	*Empty set*
$\longleftrightarrow$	*Equivalent sets*
$\not\longleftrightarrow$	*Non equivalent*
ε	*Universal sets*
$\subset$	*Is a subset of*
$\not\subset$	*Is not a subset of*
$\supset$	*Is a superset of*
$\not\supset$	*Is not a superset of*
$\in$	*Is a member of*
$\notin$	*Is not a member of*
$'$	*Complement of sets*

SUB TOPIC: TYPES OF SETS(equal sets, equivalent sets and un-equal sets)

1. Equal sets

Equal sets are sets with the same number of elements which are similar.

Compare set A and B below



Set A is equal to set B

Mathematics is the Key

2. Equivalent sets

Equivalent sets are sets with the same number of elements

Compare the sets below

X

1, 2, 3, 4,

Y

a, b, c, d,

Set X and set Y are equivalent sets

3. Non equivalent sets

Non equivalent sets are sets whose elements are not equal in number.

Compare the sets below

P

a,e,i

Z

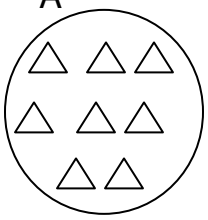
1,2,3,4

Set P and set Z are non equivalent sets

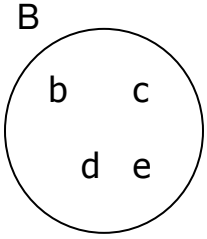
EXERCISE

1. Study the sets below and answer questions that follow:

A



B



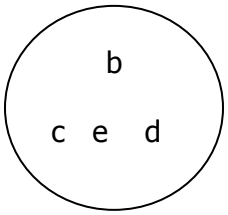
C



D



E



Write true or false.

(a) A and B are unequal.

(b) A and C are equivalent

(c) B and E are equal

(d) B and D are equivalent

(e) A and E are non - equivalent

2. State whether the sets given are equal, equivalent, unequal or non – equivalent.

(i) A = { a, b, c, d}
B = { T, W, K, Y, L }

(ii) K = { b, a, t}
L = { t, a, b}

iii) M = { 3, 6, 10, 12}
N = { 15, 8, 6, 5}

iv) Q = { Even numbers between 0 and 14}
R = { Multiples of 2 less than 14}

Mathematics is the Key

(a) Intersecting sets (∩)

A set of common members from two or more sets.

(b) Union sets (∪)

A set of all elements in the two or more sets.

(c) Universal set (ε)

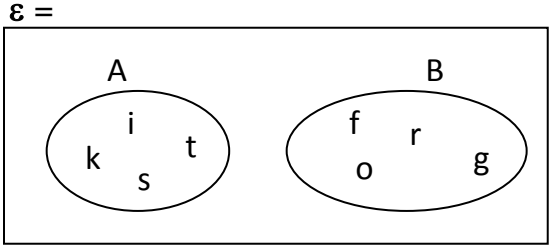
The biggest set from which other smaller sets are got.

(d) Disjoint Sets

These are sets without common members.

A = {s, k, i, t} B = {f, r, o, g}

ε =

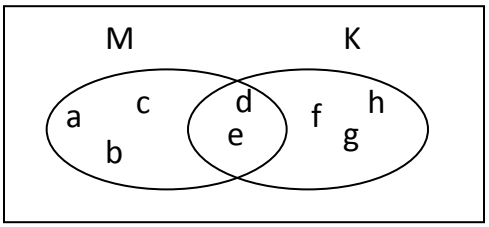


Examples

Sets M = {a, b, c, d, e, }

K = {d, e, f, g, h, }

ε =



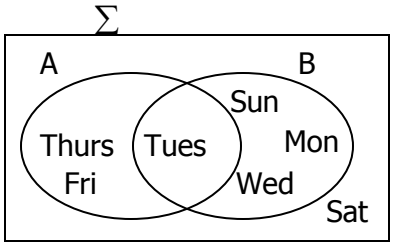
(i) M ∩ K = ***{e, d}***

(ii) K ∪ M = ***{a, b, c, d, e, f, g, h}***

(iii) Universal set (ε) = ***{a, b, c, e, d, f, g, h}***

EXERCISE

Study the venn diagram below and answer the questions given.



List the members of

(a) ∑

(b) A

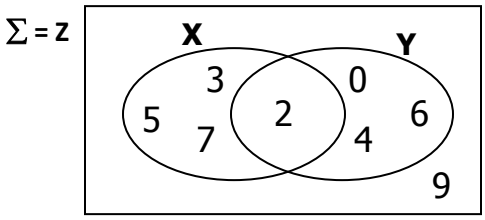
(c) B

(d) A ∪ B

(e) **A ∩ B**

Mathematics is the Key

2. Study the venn diagram below:-

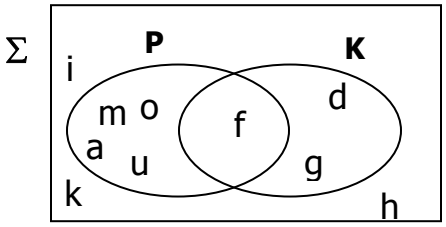


Find

(a) X∩Y
(b) X∪Y
(c) X
(d) Y
(e) ε

3. List the members of the sets:

(i) Σ (ii) P (iii) K



SUBTOPIC: TYPES OF SETS (finite and infinite sets)

A ***finite*** set is a set whose members can be listed down and has an end.
e.g set T = {even numbers between 4 and 12}
T = {6, 8, 10}

An ***infinite*** set is a set whose members are endless.
e.g. a set of odd numbers, a set of all stars in the sky, a set of all integers.
Set K= {all prime numbers}
K= {2, 3, 5, 7, 11, 13…..}

Activity

1. State whether the following sets are finite or infinite:

G = {girls in your class}
B = {boys in your class}
W= {days of the week}
K = {square numbers}
P= {pupils who like football}
T = {multiples of three}
H = {all alphabetical letters}

Mathematics is the Key

F = {months of the yea}

SUBTOPIC:DIFFERENCE OF SETS

This is a set showing the elements in one set only.

1. Given the sets

M={a, b, c, d, e, f}

N={b, e, a, n, s}

Find;

(a) M – N (M only)

$\underline{\boldsymbol{M - N = \{c, d, f\}}}$

(b) N – M (N only)

$\underline{N - M = \{n, s\}}$

2. Study the sets below

A = {m, a, n, g, o, e, s}

B = {p, e, n, c, i, l}

Find;

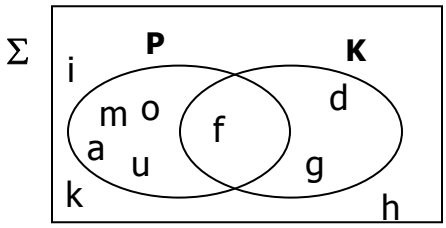
(a) A – B

$A - B = \{m, a, g, o, s\}$

(b) B – A

$B - A = \{p, c, i, l\}$

3. Study the venn diagram below

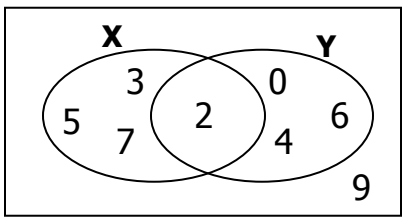


Find;

(a) P – K

(b) K – P

4. Study the venn diagram below.



Find;

Mathematics is the Key

(a) X – Y

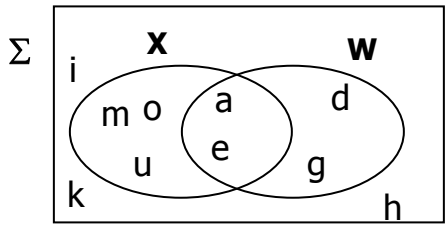
(b) Y – Z

SUBTOPIC:COMPLEMENT OF SETS

Complement of a set is a set of elements outside the given set.

Examples

1. Study the venn diagram below



Find;

(a) Set X complement

$\boldsymbol{X^I = \{d, g, h, i, k\}}$

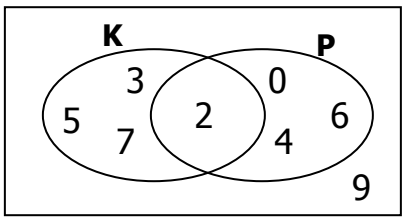
(b) Set W complement

$\boldsymbol{W^I = \{m, o, u, i, k\}}$

(c) The complement of $\boldsymbol{X \cap W}$

$\boldsymbol{X \cap W = \{m, o, u, d, g, h, i, k\}}$

2. Study the venn diagram below.



Find;

(a) $The\ complement\ of\ P$

(b) $The\ complement\ of\ K$

(c) $The\ complement\ of\ K \cap P$

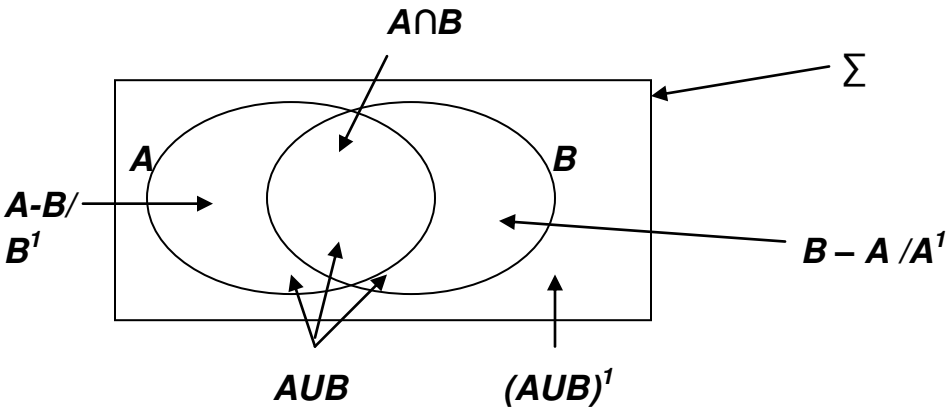
(d) $(K \cup P)^I$

(e) $The\ complement\ of\ K - P$

(f) $The\ complement\ of\ P\ only$

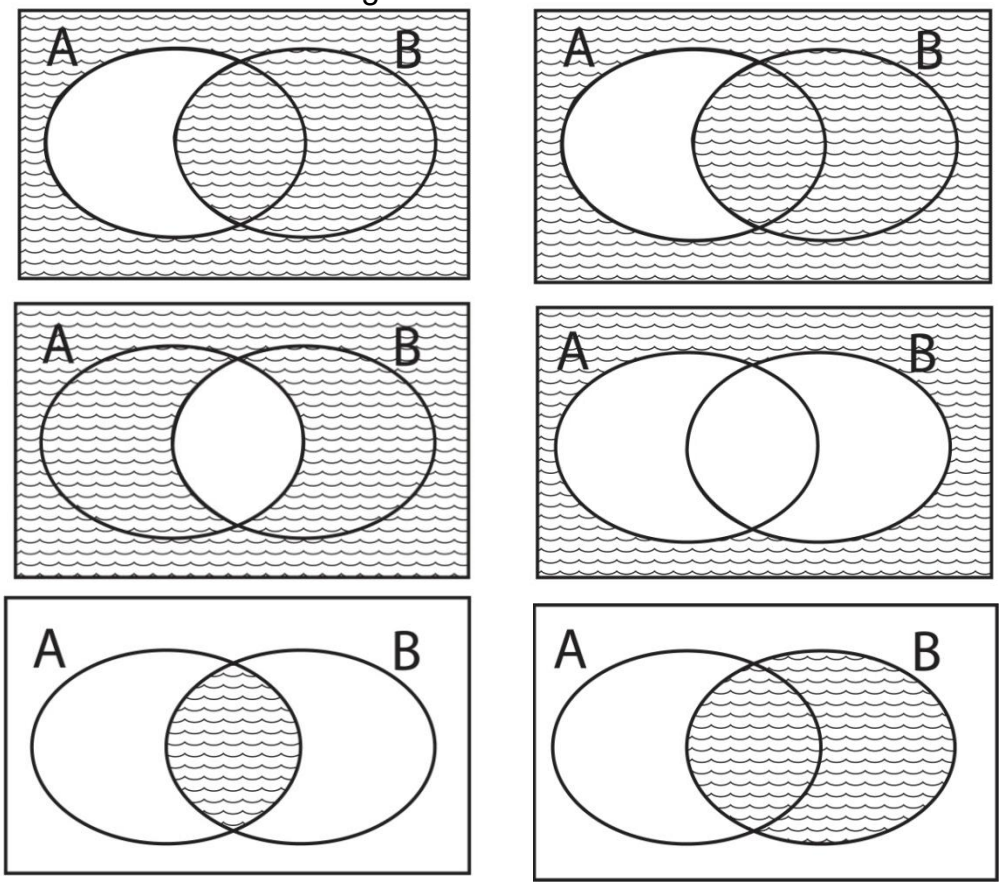
Mathematics is the Key

SUBTOPIC:Regions/describing points of Venn diagram



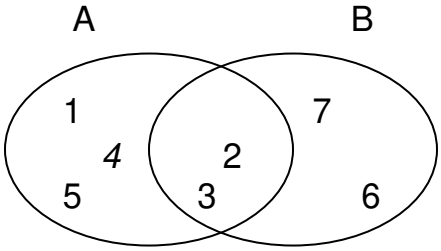
Activity

Describe the shaded regions



SUBTOPIC:LISTING ELEMENTS FROM A VENN ADIAGRAM

1. Given the venn diagram below:



Mathematics is the key

List members of the following using the above venn diagram:

(i) Set B
(ii) Set A^1
(iii) (B∩A)
(iv) (AUB)
(v) A – B
(vi) The complement of (AUB)

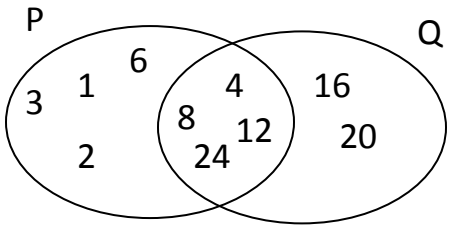
SUBTOPIC:REPRESENTING SETS ON VENN DIAGRAMS

Example:

If P = {Factors of 24}
Q= {Multiples of 4 less than 25}

(i) List elements of P and Q : P = {1, 2, 3, 4, 6, 8, 12, 24, }
Q = {4, 8, 12, 16, 20, 24}

(ii) Represent the above sets on a venn diagram below:



(iii) What is: (a) P ∩ Q (b) n(P∪Q)

Activity:

1. Given that set A = {Even numbers less than 15}
B = {Composite numbers less than 15}
(a) List down the members of the above sets.
(b) Represent the above sets on a venn diagram

2. Given that ε = {whole numbers less than 15}
Set P = {4, 6, 14, 8, 0, 12, 3, 7}
Set Q = {1, 3, 5, 7, 9, 11, 13}
(a).Write down the numbers of P∩Q
(b).Represent the above sets on a venn diagram

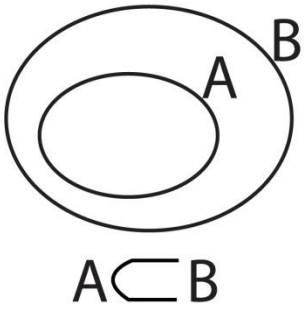
Mathematics is the Key

SUB TOPIC : SUBSETS

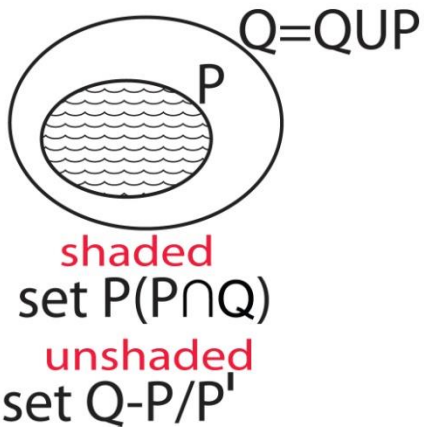
A subset is a set that can be got from another set.

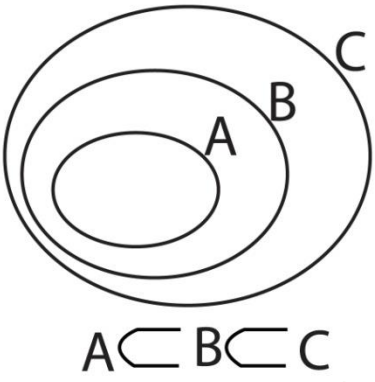
The symbol for **"is a subset of"** is $\subset$

Subsets on venn diagram



$A \subset B$





$A \subset B \subset C$

Activity

1. Draw a venn diagram to show that;
(a). all dogs(D) are animals (A)
(b) all girls(G) are females(F)
(c) teachers(T) and pupils(P) are found in a school(S)

SUBTOPIC: LISTING SUBSETS AND PROPER SUBSETS

1. Given that set A= { a, b}

a) List all subsets of set A

{ }, { a }, { b }, { a, b }

b) Write down all proper subsetsof set A

{ }, { a }, { b }

2. List the subsets for each of the following sets:

B = {p, q } b) C= {x, y, z} c) D= { t } d) E={ p, q, r, s}

3. List all possible proper subsets of the sets below.

M={1, 3, 4} P={a, g, o} K={6, 9, 0, 8}

Mathematics is the Key

SUBTOPIC: FINDING THE NUMBER OF SUBSETS AND PROPER SUBSETS

1. Given that set A= { a, b}.

a) Find the number of subsets in set A

By listing: { }, { a }, { b }, { a, b }

No. of subsets in (A) = 4 subsets

Using: ***No. of subsets = 2^n*** *(Where 'n' = number of elements)*

$= 2^2$

$= 2 \times 2$

= 4 subsets

b) Find the number of proper subsets in set A

By listing: { }, { a }, { b }

No. of proper subsets in set A = 3 subsets

Using : ***No. of proper subsets = $(2^n) - 1$***

$= 2^2$

$= 2 \times 2 - 1$

$= 4 - 1$

=3 proper subsets

2. How many subsets are in each of the sets below?

B = {p, q} ***C= {x, y, z}*** ***D= { t }*** ***n(E)=4***

3. Find the number of proper subsets in each of the following sets.

M={1, 3, 4} ***P={a, g, o}*** ***K={6, 9, 0, 8}***

SUBTOPIC: Finding number of elements when given subsets and proper subsets.

1. Set A has 8 subsets. Find the number of elements in set A.

Using 2^n = no. of subsets

2^n = 8

$2^n = 2^3$

n= 3

n (A)= 3

2	8
2	4
2	2
	1

$8=2^3$

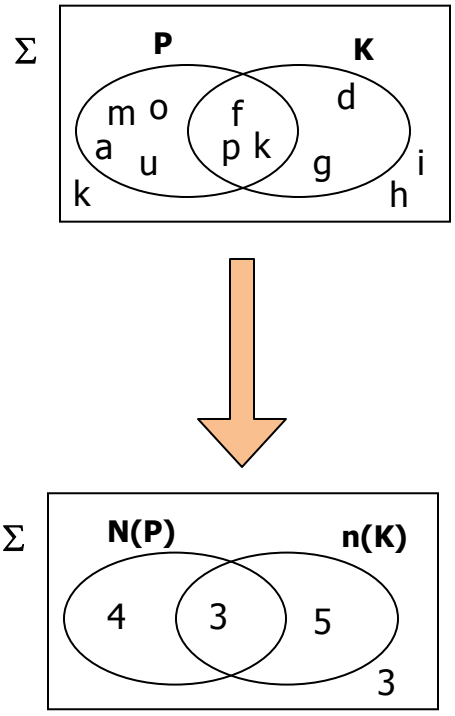
2. ***Find the number of elements in a set with 16 subsets***
3. ***Set P has 15 proper subsets. How many elements are in set P?***
4. ***Find the number of elements in a set with the following number of subsets***

a) 4 subsets ***b) 32 subsets*** ***c) 64 subsets***

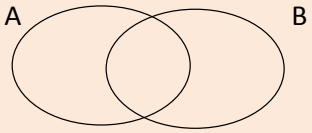
Mathematics is the Key

SUB TOPIC: NUMBER OF ELEMENTS ON VENN DIAGRAMS

The diagrams below show the relationship between a venn diagram with elements and number of elements.



REMEMBER



$(AUB)=A^1 + A\cap B + B^1$

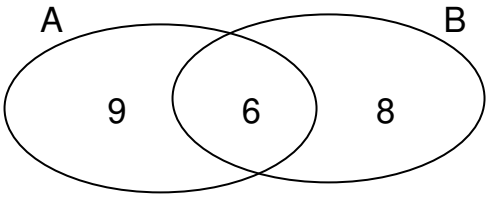
$A = A\ only + A\cap B$

$B = B\ only + A\cap B$

$\sum = A\ only + A\cap B + B\ only + (AUB)^1$

Example

1. The diagram below shows the number of pupils who eat apples (A) and beans (B). Use it to answer questions that follow:



(i) How many pupils eat both apples and beans?
6 pupils

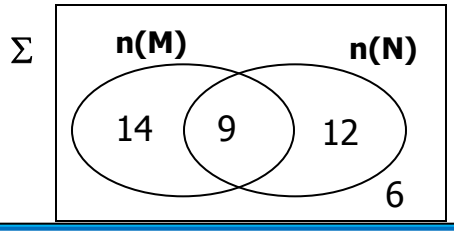
(ii) How many pupils eat beans?
n(B) = 6 + 8 = 14

(iii) How many pupils eat apples?
9 + 6 = 15 pupils

(iv) How many pupils eat only one type of food?
9 + 8 = 17 pupils

(v) Find the number of pupils in the whole class.
9 + 6 + 8 = 23 pupils

2. Study the venn diagram below and use it to answer the questions that follow



Mathematics is the Key

Find

(a) n(M)
(b) n(N)
(c) n($M \cup N$)
(d) n($M \cap N$)^{I}
(e) n(Σ)

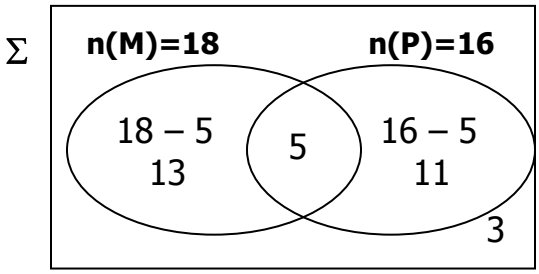
REFERENCE

A New MK Maths Revised Edition Bk 7 Pg 9

SUB TOPIC: SOLVING PROBLEMS USING VENN DIAGRAMS

1. Given that n(M)=18, n(P)=16, n(M∩P)=5 and n($P \cup M^{I}$)=3

(a) Complete the venn diagram below

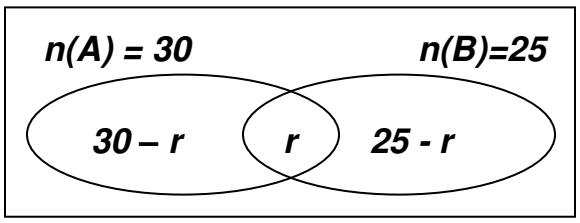


(b) Find n($\mathcal{E}$)

$$n(\mathcal{E}) = 13 + 5 + 11 + 3$$
$$= 18 + 14$$
$$= 32$$

2. Given that n(A) = 30, n(B) = 25 and n(AUB) = 45.

(a) Draw a venn diagram to show the above information.



n(AUB)=n(∑)= 45

(b) Find n(A∩B)

Let the number in (A∩B) be r.

$$30 - r + r + 25 - r = 45$$
$$30 + 25 + r - r - r = 45$$
$$55 - r = 45$$
$$55 - 55 - r = 45 - 55$$
$$-r = -10$$
$$\frac{-r}{-1} = \frac{-10}{-1}$$

Mathematics is the Key

r = 10

(ii) n(A only)

n(A only) = 30 – r

= 30 – 10

= 20

(c).If a member is picked at random, find the probability of selecting a member in $(A \cap B)^{I}$

$n(A \cap B)^{I} = (30 - r) + (25 - r)$

$= (30 - 10) + (25 - 10)$

$= 20 + 15$

$= 35$

$n(E) = 35$

$SS = 45$ $\quad$ $Probability = \frac{35}{45}$

REFERENCE

A New MK Primary Maths ppls Bk 7 Pg 10 – 11

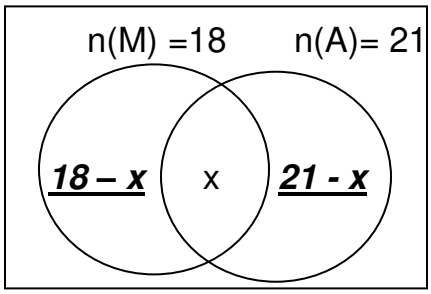
SUB TOPIC: APPLICATION OF SETS

Examples

1. In a class of 30 pupils 18 like music (M), 21 like Art (A) and some like both.

a) Represent the above information on a Venn diagram.

$n(\sum) = 30$



b) How many pupils like both subjects?

$18 - x + x + 21 - x = 30$

$18 + 21 - x = 30$

$39 - x = 30$

$39 - 39 - x = 30 - 39$

$-x = -9$

$\frac{-x}{-1} = \frac{-9}{-1}$

$x = 9$

:. 9 Pupils like both subjects

(c).How many pupils like one subject ?

$18 - x + 21 - x$

$18 - 9 + 21 - 9$

$9 + 12$

21pupils

(d).What is the probability of selecting a pupil who likes one subject?

$n(E) = 21$

$SS = 30$

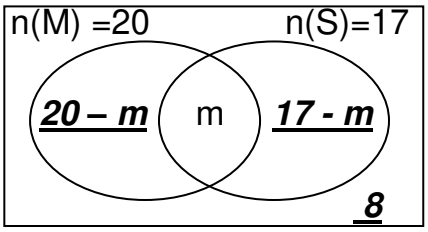
Mathematics is the key

Probablity = $\frac{21}{30}$

2. In a class of 40 pupils, 20 like mathematics (M), 17 like science (S), m like both subjects while 8 do not like any of the subjects.

a) Represent the above information on a Venn diagram.

n(∑)=40



b) How many pupils like both subjects?

$8 + 20 - m + m + 17 - m = 40$

$28 + 17 - m = 40$

$45 - m = 40$

$45 - 45 - m = 40 - 45$

$-m = -5$

$\frac{-m}{-1} = \frac{-5}{-1}$

$m = 5$

:. 5 Pupils like both subjects

c) What is the probability of selecting a pupil who likes only one subject?

(20 –x) + (17 – x)

(20 - 5) + (17 - 5) ***Prob (only one subject) =*** $\frac{27}{40}$

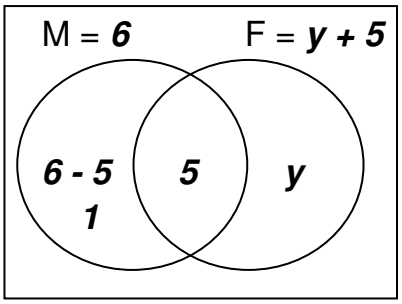
15 +12

27 pupils

3. In a family of 10 members, 6 members eat meat (M), 5 members eat both meat and fish (F) while 'y' members eat only fish.

i) Represent the above information on a Venn diagram

n(∑)=***10***



ii) How many members eat only fish?

$y + 5 + 1 = 10$

$y + 6 = 10$

$y + 6 - 6 = 10 - 6$

Mathematics is the Key

y = 4

iii) Find the number of pupils who eat fish.

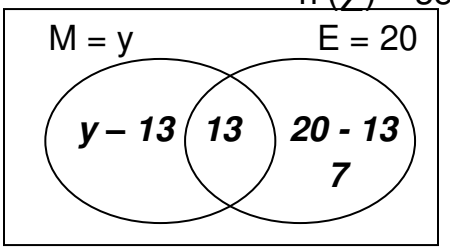
(y + 5) Pupils

4 + 5

9 Pupils

4. In a class of 35 pupils, y like mathematics (M), 20 like English (E) while 13 like both subjects.

a) Using a Venn diagram, show the above information



b) Find the number of pupils who like mathematics.

y – 13 + 13 + 20 – 13 = 35

y + 7 = 35

y + 7 - 7 = 35 – 7

y = 28

OR

y + 20 – 13 = 35

y + 7 = 35

y + 7 – 7 = 35 – 7

y = 28

OR

y – 13 + 20 = 35

y + 7 = 35

y + 7 – 7 = 35 -7

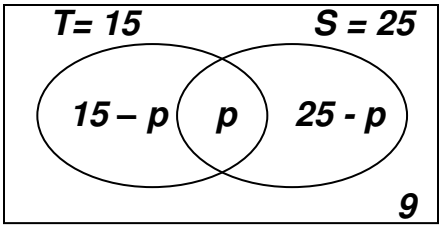
y = 28

∴ 28 Pupils like mathematics

5. In a group of 40 people, they all play football(F), 9 play football only, 15 play tennis(T) and football, 25 swim(S) and play football and some enjoy all the three games.

a. Draw a Venn diagram to represent the above information

n (ε) = n(F)= 40



Mathematics is the Key

b. How many people participate in all the three activities?

$$15 - p + p + 25 - p + 9 = 40$$
$$15 + 25 - p + 9 = 40$$
$$49 - p = 40$$
$$49 - 49 - p = 40 - 49$$
$$-p = -9$$
$$\frac{-p}{-1} = \frac{-9}{-1}$$
$$p = 9$$

TOPICAL QUESTIONS ON SET CONCEPTS

1. Given that:

Set P = {1, 2, 3, 4, 5, 6, 7}
K = {0, 2, 4, 8, 9, 10}
Find (i) P∩K
(ii) n(PUK)
(iii) P – K
(iv) K^1
(v) $(P \cap K)^1$

2. Draw a venn diagram to show that all dogs (D) are animals (A)

3. Given that Set A = {all pri me numbers less than 20} B = {all factors of 16}

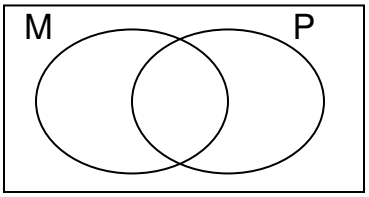
4. Given that a set has 32 subsets. How many elements has it?

5. In a class of 30 pupils, 10 pupils Like History (H) 14 like Geography(G) and 12 do not like either of the subjects.

(i) Draw a venn diagram to represent this information.
(ii) How many pupils like both subjects?
(iii) How many pupils like History?
(iv) How many pupils like one subject?

6. Seventy children were taken to a clinic for immunization,
45 children were immunized against Measles (M)
X children were immunized against Polio (P)
6 children were immunized against measles and Polio.
1 child was not immunized at all.

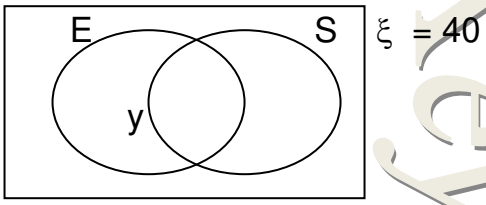
(a) Represent the information in the venn diagram



(b) Find the number of children who were immunized against Polio only.

7. In a class of 40 pupils, 25 like English (E),15 like Science (S) Y pupils like both English and Science and 8 do not like any of the 2 subjects.

(a) Complete the venn diagram.



(b) Find the value of y.

Mathematics is the key

(c) What is the probability of picking a pupil who likes only one subject?

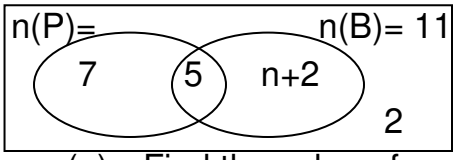
8. In a class of 20 pupils where two languages are spoken, 14 speak Luganda (L), 15 speak Kiswahili (K).

(a) .Draw a venn diagram and show the information given.

(b) Find the number of pupils who speak both Luganda and Kiswahili.

(c) Find the number of pupils who speak only one language.

9. Use the venn diagram below.



n (ξ) =

(a) Find the value of

(i) n

(ii) Universal set

(iii) $n(P \cap B)^1$

10. In a class of 60 pupils, all enjoy eating beans, 33 enjoy eating meat (M), 35 enjoy eating fish (F), If P pupils enjoy all the three while 2 enjoy eating beans only.

(a) Represent the information on a venn diagram.

(b) Find the value of P.

(c) How many pupils enjoy only fish?

11. Given that Set X = {a, d, c, d}
Find the number of:

(i) Sub sets

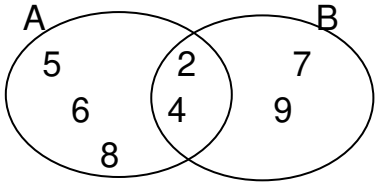
(ii) Proper subsets

12. Write two examples of empty sets

13.Draw a symbol for equivalent set

14.Given that K= {a,b,c,d,e,f }
KUL={ a,b,c,d,e,f,g,h,i,j }. Find n(L)

15.In the figure below find A'B

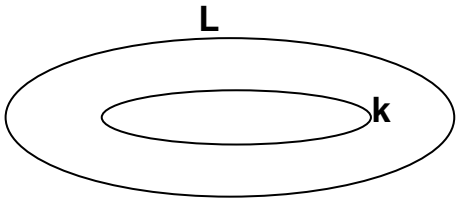


16.Set k = {a,b,c }. List all subsets of set k

17. Given that M = {all prime numbers less than 15 }.Find n(M)

18. Given that A= {1,2,3,4,5} and B = {1,3,5,7,9}. Find the number of subsets in A∩B.

19. Describe the shaded part on the venn diagram

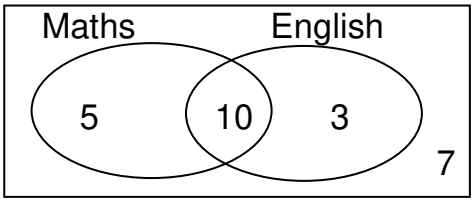


20. Draw a venn diagram to show that all cows are animals

21. Given that.
Set A={all counting numbers less than 10}
B = {all odd numbers from 1 to 10}.
Find n(AUB)

22.Set T has 16 subsets. How many elements has set T?

23.Study the venn diagram below and use it to answer the questions



(a).How many pupils study mathematics?

(b)How many pupils do not study mathematics?

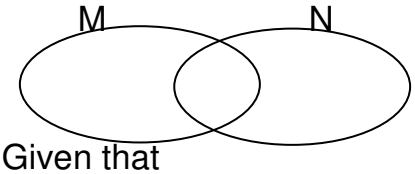
(c).Find the probability of selecting a pupil who studies either Mathematics or English.

Mathematics is the key

24.Express the number of pupils who study one subject as a percentage of the whole class

25.Set K has 31 proper subsets. How many elements are in set K?

17.Shade M'∩N



18. Given that

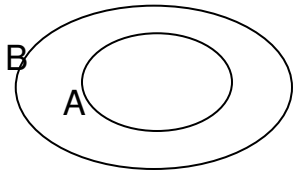
X={p, q, r, s, t}

Y={o, p, a, q, u, e}

Find n(X-Y)

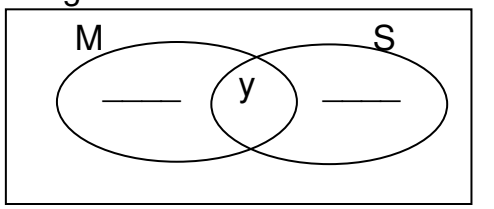
19. How many subsets are in a set with six elements?

20. What is the relationship between A and B as shown in the venn diagram below?



21. In a class of **50 boys**, **40** like mathematics **(M)** and **25** like science **(S)**.some boys **y** like both subjects and **2** do not like any of the **two** subjects.

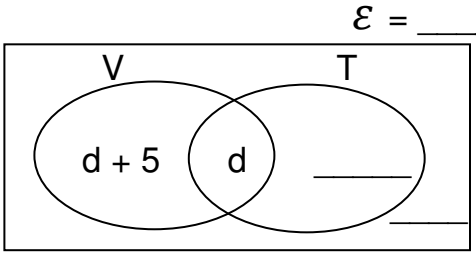
(a) Show the information in the venn diagram below. $\mathcal{E}$ = 50



(b).How many boys like mathematics only?

22. In a class, **31**pupils play tennis **(T)** and **(d+5)** play volley ball **(V)** only. **d** pupils play both games while **3** play neither of the games.

(a).Complete the venn diagram.



23.Given than n(Ɛ) = 25, n (A) = 15, n(B) = 18 and n (AUB)' = 2

(a) Draw a venn diagram to show the above information.

(b)Find n(A∩B)

Mathematics is the Key

WHOLE NUMBERS

SUBTOPIC: FORMING NUMERALS USING GIVEN DIGITS

CONTENT: Using digits to form smallest and largest numbers.
Finding the sum of/product/difference/quotient between the smallest and largest numbers formed from the given digits.

Examples:

- Write down all 3-digit numerals that can be formed using the digits; 4, 6, 7
  476 467 647 674 746 764
- Find the difference between the smallest and highest numerals formed.
  Smallest = 467
  Biggest = 764
  Difference = 7 6 4
  - 4 6 7
  2 9 7

Activity:

- ✓ Using digits **3, 0, 6 ,**form all 3 - digit numerals that can be formed.
- ✓ Find the product of the smallest and the biggest numerals formed.

- ❖ Write down all three digit even numerals that can be formed from ***8, 3, 4.***
- ❖ Find the sum of all 3-digit odd numbers that can be formed

SUBTOPIC: PLACE VALUES AND VALUES OF DIGITS UP TO MILLIONS

The place value chart

Million			Thousands			Units		
H	T	O	H	T	O	H	T	O
		7	6	5	4	3	2	9

The table below shows the place values and values of the numeral above

Digit	***Place value in words***	***Place value in figures***	***Value (digit × P.V)***
9	Ones	1	$9 \times 1 = 9$
2	Tens	10	$2 \times 10 = 20$
3	Hundreds	100	$3 \times 100 = 300$
4	Thousands	1,000	$4 \times 1{,}000 = 4{,}000$
5	Ten thousands	10,000	$5 \times 10{,}000 = 50{,}000$
6	Hundred thousands	100,000	$6 \times 100{,}00 = 600{,}000$
7	Millions	1,000,000	$7 \times 1{,}000{,}000 = 7{,}000{,}000$

Mathematics is the key

Example: Find the value of 6 in the number 2602

2 6 0 2
- 2 → Thousands (1000)
- 6 → Hundreds (100)
- 0 → Tens (10)
- 2 → One (1)

Value of 6 = 6 x 100 = 600

Activity:

1. Write the place value and value of 9 in
   (a). 345987
   (b).26490321
   (c).689458345
2. Find the sum of the value of seven and the place value of 9 in 23745893

SUB TOPIC: WRITING IN WORDS (UP TO MILLION)

Examples:

(i) Write 20,480 in words.

Thousand	Units
20	480

Twenty thousand, four hundred eighty.

(ii) 6,808,040

Million	Thousand	Units
6	808	040

Six million, eight hundred eight thousand forty.

Activity:

Write the following in words.

- 34567
- 9999999
- 3,230,203
- 67,045
- 2,999,087

Mathematics is the Key

SUB TOPIC: WRITING NUMERALS IN FIGURES

Examples:

Write in figures:

(i) seven million, four hundred twenty one thousand, nine hundred five.

7 million = 7,000,000

421 thousand + 421,000

905 905

7,421,905

(ii) A quarter of a million

A million = 1,000,0000

$\frac{1}{4}$ *of* $1,000,000$

$\frac{1}{4} \times 1,000,000$

$= 250,000$

(iii) Write " six hundred thirty nine thousand, seven" in figures

(iv) Write " three million, thirty nine thousand, eight" in figures

(v) Write " nine million, four hundred thirty nine thousand, six" in figures

(vi) Write "thirty nine thousand, fifty seven" in figures

SUB TOPIC: EXPANDED NOTATION

CONTENT: Expanding numerals using:

- **Place values**
- **Values**
- **Powers of ten/exponents**

Examples:

Expand: 5624 using:

Place values: **5624 = (5 x 1000) + (6 x 100) + (2 x 10) + (4 x 1)**

Values: **5624 = 5000 + 600 + 20 + 4**

Powers:

10^3	10^2	10^1	10^0
5	6	2	4

5624 = (5 x 10^3) + (6 x 10^2) + (2 x 10^1) + (4 x 10^0)

Mathematics is the Key

Activity:

Expand the following as instructed

a) 2,354 (place values)
b) 40,369 (place values)
c) 45,689 (values)
d) 29,542(values)
e) 890765 (exponents)
f) 2354 (powers)

SUB TOPIC: FINDING THE EXPANDED NUMBERS (SHORT FORM)

Examples:

Write as a single number.

(i) (6 x 10,000 + (4 x 10) + (5 x 1)

(6 x 10000) + (4 x 100) + (5 x 1)

= 60,000 + 400 + 5

= 60000

400

\+ 5

60405

(ii) 9000000 + 700 00 + 50000 + 1000 + 30 + 8

= 9 000 000

700 000

50 000

1 000

30

\+ 8

9 750 038

(iii) $(2 \times 10^5) + (4 \times 10^3) + (6 \times 10^0) + (7 \times 10^2)$

(2 x 10 x 10 x 10 x 10 x 10) + (4 x 10 x 10 x 10) + (6 x 1) + (7 x 10 x 10)

200,000 + 4000 + 6 + 700

200 000

4000

700

\+ 6

204706

Mathematics is the Key

Activity

What number has been expanded to give?

a) $3000 + 200 + 3$

b) $(5 \times 1000) + (9 \times 100) + (2 \times 10) + (8 \times 1)$

c) $(9 \times 10^4) + (9 \times 10^2) + (2 \times 10^1) + (8 \times 10^0)$

SUB TOPIC: ROUNDING OFF WHOLE NUMBERS

Examples:

Round off the following as instructed.

(i) 3864 to the nearest hundreds.

TH	H	T	0
3	8	~~6~~	~~4~~
+	1		
3	9	0	0

(ii) 214 (nearest tens

H	T	O
2	1	~~4~~
+	0	
2	1	0

(iii) 4.78516 to the nearest thousandths.

0	T^{th}	H^{th}	TH^{th}	T/TH^{th}
4	. 7	8	5	~~1~~
+ 0	. 0	0	0	
4.	7	8	5	

(i) 75.634 to the nearest whole number nearest whole number

T	0	Tth	Hth	THth
7	5 .	~~6~~	~~3~~	~~4~~
+	1			
7	6 .			

Activity:

1. **Round off the following as instructed in brackets**
   a) **45637 (nearest hundreds)**
   b) **99999 (nearest thousands)**
   c) **780937887 (nearest millions)**
   d) **89.58(nearest tenths)**
   e) **23.786(nearest hundredths)**
   f) **7.239(nearest two d.p)**

Mathematics is the Key

SUB TOPIC: ROMAN NUMERALS (converting Hindu Arabic numerals to roman numerals)

BASIC ROMAN NUMERALS

1	***=I***
5	***=V***
10	***= X***
50	***=L***
100	***=C***
500	***=D***

NOTE:
All other numerals are got from basic roman numerals by adding or subtracting .

Example

1. Write the following in roman numerals

1 2 4

100 + 20 + 4

100 = C

20 = XX

4 = IV

∴ 124 = ***CXXIV***

ii) 1962

1000 + 900 + 60 +2

1000 = M

900 = CM

60 = LX

2 = II

∴ 1962= ***MCMLXII***

Activity

Write the following in roman numerals

a) 49
b) 235
c) 333
d) 78
e) 140
f) 999
g) 1449

SUBTOPIC: ROMAN NUMERALS (conversion of Roman numerals to Hindu Arabic)

Write the following numbers in Hindu Arabic numerals

(i) MXLV

M + XL + V

M = 1000

XL = 40

V = 5

MXLV = 1045

(ii) CD XCIV

Mathematics is the Key

CD + XC + IV

CD = 400

XC = 90

IV = 4

CDXCIV = 494

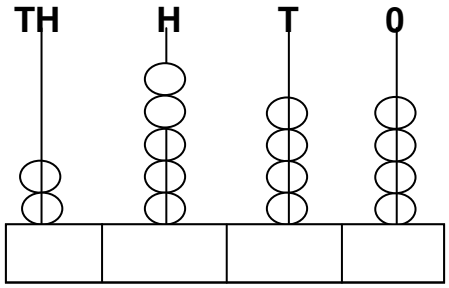
(iii) Write the following in Hindu Arabic numerals

- *XLIV*
- *CVIII*
- *XCIX*
- *CDXCIV*
- *MXCIV*

(iv) A church was built in MDCCLXIV. Which year is this in Hindu Arabic?

END OF TOPIC EXERCISE

1. Show 2843 on the abacus.
2. Write the number shown on the abacus in roman numerals.



3. Write the place value of each digit in 486349334.
4. Workout the sum of the value of 6, 8 and 7 in 4638047.
5. Workout the difference between that value of 7 and the place value of 9 in 49834734.
6. Write the product of the value of 6 and 3 in 8469 in roman numerals.
7. Write 4009009 in words.
8. Write "Two hundred thirty six thousand forty nine" in expanded form using exponents.
9. Expand 963.07 using values.
10. Which number was expanded to give $(6x10^{4}) + (8 \times 10^{2}) + (3 \times 10^{-1}) + (7x10^{-2})$
11. Round off 9999 to the nearest thousands.
12. Round off 67.987 to the nearest hundredths.
13. Round off 99.999 to the nearest hundredth.
14. Round off 16.873 to the nearest whole number.
15. Expand 635.057 using exponents.
16. St. Mary's college was constructed in MCMLXXXVII. In which year was it constructed?
17. Write 18.487 in words.
18. Find the sum of the value of 7 and the value of 3 in 3.467.
19. Write forty six and eighty seven thousandths in figures.

Mathematics is the Key

OPERATION ON NUMBERS

SUB TOPIC: ADDITION OF LARGE NUMBERS

Examples:

Add correctly:

(i)

$$\begin{array}{r} 5\ 146\ 144 \\ +\ 0\ 005\ 614 \\ \hline 5\ 151\ 758 \end{array}$$

(ii) The population in four countries of a district shows that county A is 23,467, county B is 21 602, county C is 19466 and county D is 25 102. What is the total population in the district?

County A	***23 467***
County B	***21 602***
County C	***19 466***
County D	***+25 012***
	89 547

Emphasis on place value arrangement and re-grouping.

(iii) Add correctly

- $23,456 + 89,045$
- $668,433 + 998,765$
- $4,677 + 78,890$

(iv) In a certain country, 467,883 patients contracted COVID-19 in March and 349,277 patients in April and 89,898 patients in May. How many patients contracted COVID-19 in the three months of the year 2020?

SUB TOPIC: SUBTRACTION OF LARGE NUMBERS

CONTENT: Examples:

Subtract correctly:

(i)

$$\begin{array}{r} 596\ 148\ 320 \\ -\ 239\ 610\ 510 \\ \hline 356\ 537\ 810 \end{array}$$

(ii) What is the difference between 3060 and 186?

$$\begin{array}{r} 3\ 060 \\ -\ 186 \\ \hline 2\ 874 \end{array}$$

Emphasis on place value arrangement and regrouping.

(iii) Subtract correctly

- $4657 - 2379$
- $100{,}000 - 46{,}575$
- $87{,}565 - 7{,}389$

Mathematics is the Key

(iv) 78,377 patients contracted COVID-19 in April 2020 in a certain country. If 2,567 died and 45,671 recovered. How many patients remained with Corona Virus Disease 2019 (COVID-19)

SUB TOPIC: MULTIPLICATION OF LARGE NUMBERS

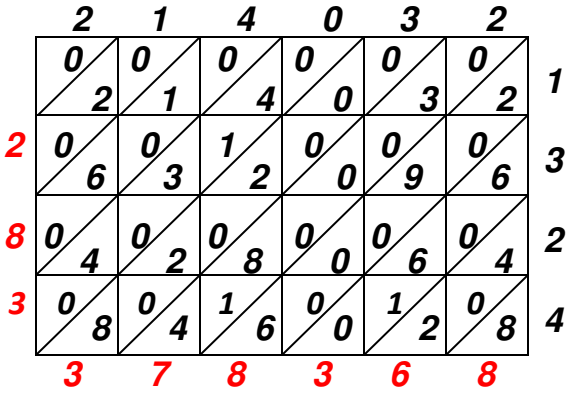
Examples:

Multiply:

(i) 214 032 x 1324

214 032
X 1 324
856 128
4 280 640
64 209 600
+ 214 032 000
283 378 368

Lattice method(Napier's rod method)



∴214,032 x 1,324 = 283 378 368

(ii) A store can hold 1973 boxes each containing 34 pairs of shoes. How many pairs of shoes are in the store?

1 973
X 34
7 892
+59 190
67 082 pairs

(iii) Multiply the following

- 458×234
- 24307×45

Mathematics is the Key

(iv) 134 MPs contributed 9,570 kilograms of posho each on average during the time COVID-19. How many kilograms of posho did they contribute altogether?

SUB TOPIC: DIVISION OF LARGE NUMBERS

Examples:

(i) Divide 3816648 by 132

```
        2 8 9 1 4
   ┌──────────────
132 | 3 8 1 6 6 4 8
    -2 6 4
      1 1 7 6
     -1 0 5 6
        1 2 0 6
       -1 1 8 8
           1 8 4
         - 1 3 2
             5 2 8
           - 5 2 8
```

3816648 ÷ 132= 28914

(ii) There are 6315 books to be packed in 15 boxes. How many books should be packed in each box?

```
      4  2 1 books
   ┌──────────
15 | 6 3 1 5
     6 0
       3 1
     - 3 0
         1 5
        -1 5
```

(iii) Divide the following

- $650075 \div 5$
- $5868 \div 12$

(iv) The RDC of a certain district shared sh.982,500 amongst 15 members on the COVID-19 task force in 2020. How much did each member get?

SUB TOPIC: PROPERTIES OF NUMBERS

DISTRIBUTIVE PROPERTY

Examples:

Use the distributive property to work out:

(i) (379 x 27) + (27 x 21)

Re-arrange(27 x 379) + (27 x 21)
= 27 x (379 + 21)
= 27 x (400)
= 27 x 400
= 10800

(ii) (137 x 42) – (37 x 42)

(137 x 42) – (37 x 42)
= (42 x 137) – (42 x 37)
= 42 x (137 – 37)
= 42 x 100
= 4200

Mathematics is the Key

Workout the following;

1. $(2 \times 17) + (2 \times 13)$
2. $(75 \times 29) - (75 \times 19)$
3. $(129 \times 37) - (129 \times 27)$
4. $(290 \div 70) - (10 \div 70)$
5. $(179 \div 13) - (10 \div 13)$

ASSOCIATIVE PROPERTY

Example

The alteration of the position of the brackets does not change the result.

Use the associative property to workout

(5+8)+2 = 5+(8+2) = (5+2)+8

13+2 = 5+10 = 7 +8

15 = 15 = 15

The alteration of the position of the brackets does not change the result.

(5x8) x 2 = 5x(8x2) = (5x2)+8

40x2 = 5x16 = 10x8

80 = 80 = 80

Conclusion : *Associative property works with both addition and multiplication only.*

COMMUTATIVE PROPERTY

Example

4+3 = 3+4 (What you start with does not affect the result)

7 7

4x3 = 3x4 (What you start with does not affect the result)

12 = 12

Conclusion: *Commutative property works with both addition and multiplication*

END OF TOPIC EXERCISE

1. A wire of length 161 metres was shared by some boys the average length of wire each boy got was 23 metres. Find the number of boys which shared the wire.
2. In a village there are 680 males, 328 females and 462 children. How many people are in that village altogether?
3. Workout 23 – 48 + 37
4. In a league tournament, **3** points were awarded for a win, **1** point for a draw and **0** points for a loss. Five tournaments and the results were recorded as shown below.

Team	P	W	D	L	PTS
BURAMA FC	6	3	2	1	
BURUMA FC	6	4	0	2	

Mathematics is the Key

GADAMA FC	6	5	1	0	
ENDAKO FC	6	2	2	2	
PHILIPS FC	6	4	2	0	

P = played **W**= win **D**= Draw **L**= loss

Complete the table with the points for each team.

5. Musa's farm produces 1500 eggs everyday. If a tray of eggs is sold at sh.12000 and it holds 30 eggs.

(a) How many trays does he get everyday?

(b) How much money does he get every day?

(c) A trader bought ten trays of eggs from the farm and sold each at sh. 450.

(i)Calculate the profit made.

(ii) A trader bought other ten trays and 75 eggs got broken. If he sold the remaining eggs at sh. 500 each. Calculate the loss he made.

6. Write 0.0867 in standard form.
7. Write 187000 in standard form
8. Use distributive property to workout the following. (81 x 17) + (19 x 17)
9. Workout. (3.6 x 5) + (6.4 x 5)
10. Workout using distributive property.
    (65 ÷ 5) – (20 ÷ 5)

PATTERNS AND SEQUENCES

SUB TOPIC: DIVISIBILITY TESTS

Test for 2.

A Number is divisible by 2 if the digit in the one's place is 0, 2, 4, 6, or 8 eg 1460

Test for 3:

A number is divisible by 3 if the sum of its digits is divisible by 3 eg 741 = 7 + 4 + 1 = 12

Test for 4:

A number is divisible by 4 if the number formed by its last two digits is divisible by 4. eg 572. The last two digits are 7 and 2 therefore the number formed is 72 which is divisible by 4. Hence 572 is divisible by 4.

Test for 5

A number is divisible by 5 if the last digit in the ones place is either 0 or 5. eg 360 or 805.

Activity

1. Write any two numbers divisible by 2
2. Which of the numbers is divisible by 3
   34 236 11190 2783
3. Which of the numbers is divisible by 4
   4612 139 8500 7869

Mathematics is the Key

Test for 6:
A number is divisible by 6 if it is divisible by 2 and 3. In other words a number is divisible by 6 if it is even and the sum of its digits is divisible by 3.
Example:
618 is divisible by 6 since it is an even number and the sum of its digits 6 + 1 + 8 = 15 is divisible by 3.

738 is divisible by 6 since it is an even number and the sum of its digits 7 + 3 + 8 = 18 is divisible by 3. Therefore 738 is divisible by 6.

Test for 7:
When the last digit of a number is doubled and the result is subtracted from the number formed by the remaining digits, the outcome is divisible by 7.

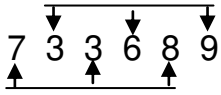
Example: Take the number 861. the last digit is 1 and the number formed by the remaining digits is 86, double 1 to give (1+1)= 2
Subtract 2 from 86 to give (86 – 2) = 84
84 is divisible by 7. Hence 861 is also divisible by 7.

Test for 8:
A number is divisible by 8 if the number formed by the last three digits is divisible by 8.
Example:
In the number 7960,760 is number formed by the last three digits. It is divisible by 8 therefore 7960 is divisible by 8.

Test for 9:
A numbers is divisible by 9 if the sum of its digits is divisible by 9.
Example: 198 the sum of 198 is 1+9+8 = 18
18 is divisible by 9 therefore 198 is divisible by 9.

Test for 10:
A number is divisible by 10 if the digit in the ones place is 0 eg 70, 60, 120, 3010.
A number which is divisible by 10 is also divisible by 2 and 5.

Test for 11:
A number is divisble by 11 if the difference between the sum of the digits in even places and the sum of the digits in the odd place is zero (0) or divisible by 11.

eg Even position: 

Odd position

Mathematics is the Key

Sum of the numbers in odd positions = 7 + 3 + 8 = 18
Sum of the numbers in even positions = 3 + 6 + 9 = 18
Difference between sums =18 – 18 = 11
Since difference is divisible by 11
∴ the number 676390 is divisible by 11.

Activity

1. Which of the following numbers is divisible by 6
   456 1476 129
2. Circle the numbers divisible by10
   34 290 190 2789
3. Which of the following numbers is divisible 9
   1476 91099 189 4567

SUB TOPIC: WHOLE, NATURAL, ODD, EVEN AND PRIME NUMBERS

(i) Whole numbers:
All positive numbers with zero (0) inclusive form a set of whole numbers
eg 0, 1, 2, 3, 4, 5, 6, 7, 8, 9,……

(ii) Natural numbers:
Natural numbers are counting numbers. The first natural number is 1
eg 1, 2, 3, 4, 5, 6, 7, 8, 9, …..

(iii) Odd numbers:
Any number which I not exactly divisible by 2
eg 1, 3, 5, 7, 9, …..

(iv) Even numbers:
Any number which is exactly divisible by 2. The first even number is 0
eg 2, 4, 6, 8,

(v) Prime numbers:
Numbers with only two factors. One and itself. The first prime number is 2. 2 is the only even/prime number.
eg 2, 3, 5, 7, ….

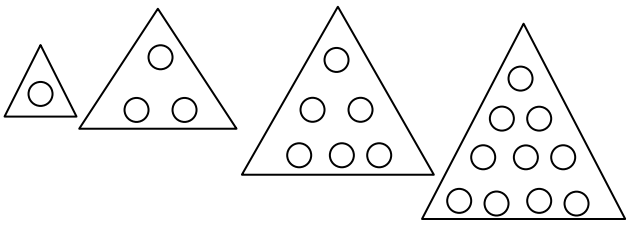
Activity

1. Find the sum of the first five;
   (a) Prime numbers
   (b) Even numbers
   (c) Odd numbers
2. Find the product of the fourth prime number and the third whole number.

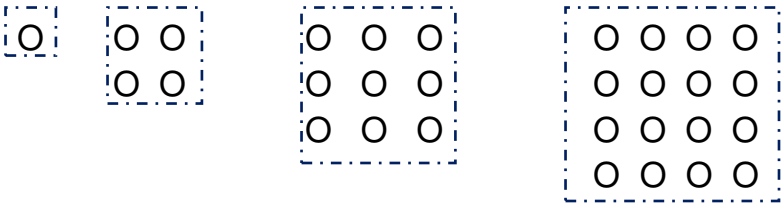
Mathematics is the Key

(i) Composite numbers:
Numbers with more than two factors. Eg 4, 6, 8, 9 , 10, 12,……

(ii) Triangular numbers:
Numbers got by adding consecutive counting numbers eg 1, 3, 6, 10, ….



(iii) Square numbers:
Numbers got by adding consecutive odd numbers starting from 1.



1 1 + 3 1 + 3 + 5 1 + 3 + 5 + 7

1 4 9 16

OR
Numbers got after multiplying consecutive counting numbers by themselves.

1 x 1	2 x 2	3 x 3	4 x 4	5 x 5
1	4	9	16	25

(iv) **Cube numbers**:
Numbers got by multiplying a number by itself three times.

Eg $1 \times 1 \times 1 = 1^3 - 1$
$2 \times 2 \times 2 = 2^3 = 8$
$3 \times 3 \times 3 = 3^3 = 27$
$4 \times 4 \times 4 = 4^3 = 64$
$5 \times 5 \times 5 = 5^3 = 125$

1. Find the sum of the first 8 composite numbers.
2. Find the sum of the third and the seventh triangular numbers.
3. Find the product of the fourth square number and the sixth cube number.

Mathematics is the Key

SUB TOPIC: finding sum of consecutive counting numbers using the formula

Sum of consecutive counting numbers

$$n(\frac{n+1}{2})$$

Examples .

1. Find the sum of the first 20 counting numbers.

$$n(\frac{n+1}{2})$$

$$20(\frac{20+1}{2})$$

$$20 \times \frac{21}{2}$$

$$10 \times 21$$

$$\underline{210}$$

2. Find the sum of the first 15 counting numbers.
3. Find the sum of the first 40 counting numbers
4. What is the 100th triangular number?

SUB TOPIC: MULTIPLES AND FACTORS

(i) Multiples:

These are numbers which are obtained by multiplying a number by consecutive counting numbers ie. x1 x 2 x 3 , etc

Examples:

(i) M6 = {6 x 1, 6 x 2, 6 x 3, 6 x 4, 6 x 5, 6 x 6, 6 x 7……}
6 12 18 24 30 36 42

(ii) M8 = {8 x 1, 8 x 2, 8 x 3, 8 x 4, 8 x 5, 8 x 6, 8 x 7 ….}
8 16 24 32 40 48 56 ….

(ii) M9 = {9 x 1, 9 x 2, 9 x 3, 9 x 4, 9 x 5, 9 x 6, 9 x 7…..}
9 18 27 36 45 54 63 ….

(ii) Factors:

Any one of a pair of numbers which when multiplied gives the same multiple is called a Factor.

Mathematics is the Key

List examples:

All factors of 6

6 ÷ 1 = 6

6 ÷ 2 = 3

6 ÷ 3 = 2

6 ÷ 6 = 1

F_6 = {1, 2, 3, 6}

Note F_6 means factors of 6.

1 x 6 = 6

2 x 3 = 6

F_6 = {1, 2, 3, 6}

Find factors of 9.

1 x 9 = 9

3 x 3 = 9

F_9 = {1, 3, 9}

Activity

1. ***Find the first 10 multiples of;***
   - ***5***
   - ***6***
   - ***12***
   - ***9***
2. ***Find the 20th multiple of 5***
3. ***Find all factors of;***
   - ***12***
   - ***15***
   - ***24***
   - ***29***
   - ***36***

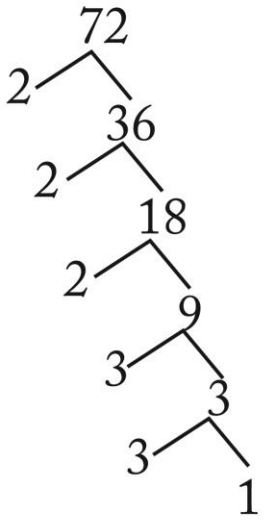
SUB TOPIC: PRIME FACTORISATION

Prime factorise 72

Ladder method

2	72
2	36
2	18
3	9
3	3
	1

factor tree method



The answer can be written in three ways.

(a) Multiplication form

$2 \times 2 \times 2 \times 3 \times 3$

Mathematics is the Key

(b) Power/exponent form/superscript form

$2^3 \times 3^2$

(c) Set notation/subscript form

$\{2_1, 2_2, 2_3, 3_1, 3_2\}$

Activity

1. ***Prime factorise the following as instructed***

(a) 36

(b) 48(multiplication form)

(c) 100(set notation)

(d) 80(power form)

(e) 64(multiplication form)

SUB TOPIC: Lowest common Multiple(L.C.M) AND Highest Common Factor(H.C.F)

(i) Find the LCM of 24, 36 and 40.

2	*24*	*36*	*40*
2	*12*	*18*	*20*
2	*6*	*9*	*10*
3	*3*	*9*	*5*
3	*1*	*3*	*5*
5	*1*	*1*	*5*
	1	*1*	*1*

LCM = 2 x 2 x 2 x 3 x 3 x 5

= 4 x 6 x 15

= 4 x 90

= 360

(ii) Find the HCF of 6, 8 and 12.

2	*6*	*8*	*12*
	3	*4*	*6*

GCF = 2

Activity

1. **Find the LCM of 4 and 12**
2. **Find the LCM of 12 and 16**
3. **Find the GCF of 15 and 18**
4. **Find the GCF of 24 and 36**

Mathematics is the Key

SUB TOPIC: APPLICATION OF LCM AND GCF

REMEMBER

The least number that is divided by more than one numbers in called LCM.

The biggest number that divides more than one number at ago is called GCF.

The product of the LCM and GCF is equal to the product of the two numbers.

TRY THESE

(i) Find the least number which is exactly divisible by 6, 8 and 12.

(ii) What is the smallest number of sweets that can be shared by 3, 4 or 6 pupils leaving 5 sweets as a reminder?

(iii) Two bells are used in Star p/s at intervals of 30 minutes and 40 minutes respectively. They are first rung together at 8:45 am, when will the two bells ring together again?

(iv) The product of two numbers is 240. One of them is 60, work out their:

(a) LCM

(b) GCF

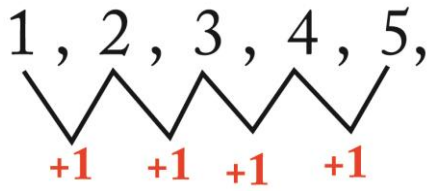
(v) The LCM of x and y is 48 and HCF is 4. If x=16 find y.

SUB TOPIC: CONSECUTIVE NUMBERS

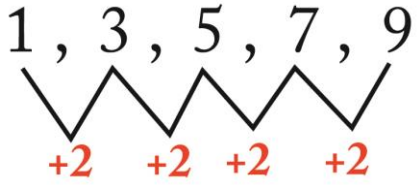
Consecutive numbers are numbers which follow each other using a defined pattern.

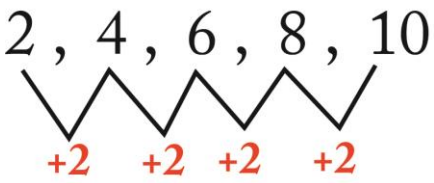
NOTE THE FOLLOWING

- ***Counting number, integers and whole numbers have a range / a pattern of one.***



- ***Even numbers and odd numbers have a range of two.***





Mathematics is the Key

Examples:

(i). *The sum of three consecutive counting numbers is 18. Find the numbers.*

Let the first number be r.

1st	2nd	3rd	Sum
R	R + 1	R + 2	18

$$R + R + 1 + R + 2 = 18$$
$$R + R + R + 1 + 2 = 18$$
$$3R + 3 = 18$$
$$3R + 3 - 3 = 18 - 3$$
$$3R = 15$$
$$\frac{3R}{3} = \frac{15}{3}$$
$$\underline{R = 5}$$

1ST NO.

$R = 5$

2ND NO.

$R + 1$ *but* $R = 5$

$5 + 1 = 6$

3RD NO.

$R + 2$ *where* $R = 5$

$5 + 2 = 7$

The numbers are

5, 6, AND 7

Example ii.

(ii).The sum of 3 consecutive odd numbers is 15. Find the numbers

Let the first number be y.

1st No.	2nd No.	3rd No	Total
Y	Y + 2	Y + 4	15

$$Y + Y + 2 + Y + 4 = 15$$
$$Y + Y + Y = 2 + 4 = 15$$
$$3Y + 6 = 15$$
$$3Y + 6 - 6 = 15 - 6$$
$$3Y = 9$$
$$\frac{3Y}{3} = \frac{9}{3}$$
$$\underline{Y = 3}$$

1st No.

$y = 3$

2nd No.

$y + 2 = y$

Where $y = 3$

$3 + 2 = 5$

3rd No.

$y + 4$

where $y = 3$ $3 + 4 = 7$

The numbers are

3, 5, and 7

(iii) The sum of 4 consecutive even numbers is 76. What are the numbers?

(iv) The sum of three consecutive integers is 84. Find the numbers

(v) The sum of 3 consecutive odd numbers is 39. Find the numbers

Mathematics is the Key

SUB TOPIC: FINDING SQUARES

Examples:

a) Find the square of 4.

$$42 = 4 \times 4 = 16$$

b) Find the square of 25

$$25^2 = 25 \times 25 = 625$$

c) Find the square of the following numbers

- 6
- 10
- 16
- 30
- 0.25

SUB TOPIC: FINDING SQUAREROOTS

(i) Find the square root of 4.

$\sqrt{4} = 2$	4
2	2
	1

$= \sqrt{2 \times 2} = 2$

(ii) Find the square root of $7\ ^1/_9$

$$\sqrt{7\frac{1}{9}} = \sqrt{\frac{64}{9}}$$

2	64
~~2~~	32
2	16
~~2~~	8
2	4
~~2~~	2
	1

3	9
~~3~~	3
	1

$\sqrt{9} = 3$

$$\sqrt{7\frac{1}{9}} = \sqrt{\frac{64}{9}} = \frac{8}{3} = 2\frac{2}{3}$$

$\sqrt{64} = 2 \times 2 \times 2 = 8$

(iii) Find the square root of the following

- 81
- 196
- 400
- $20\frac{1}{4}$

(iv) Find the square root of 0.36

Mathematics is the Key

SUB TOPIC: **FINDING MISSING NUMBERS WHEN GIVEN SSEQUENCES**

REMEMBER:

- Increasing sequences use addition patterns and multiplication patterns
- Reducing sequences use subtraction patterns and division patterns
- Some sequences fall under types of numbers
- Only prime numbers and composite numbers are the only types of numbers without defined patterns.

Examples

1. Find the next numbers in the sequences below.

   a) 2, 3, 5, 8, 12, **17, 23**

   $2 + 1 = 3$

   $3 + 2 = 5$

   $5 + 3 = 8$

   $8 + 4 = 12$

   $12 + 5 = \mathbf{17}$

   $17 + 6 = \mathbf{23}$

   b) 18, 17, 14, 9, **2** , **-7**

   $18 - 1 = 17$

   $17 - 3 = 14$

   $14 - 5 = 9$

   $9 - 7 = \mathbf{2}$

   $2 - 9 = \mathbf{-7}$

   c) 2, 3, 5, 7, 11, **13**, **17**

   They are prime numbers

2. Find the next numbers in the following sequences.

   A) 2, 3, 6, 12, 22, _____, _____

   B) 64, 32, 16, 8, 4, _____,_____

   C) 1, 3, 6, 10, _____, _____

   D) 81, 64, 49, 36, _____, _____

   E) 3, 4, 12, 39,_____,_____

Mathematics is the Key

TOPICAL EXERCISE:

1. Add: 426 + 1519 + 3
2. Subtract 105 from 200
3. Evaluate $3^x \div 3^2 = 27$
4. $5^3 \times 5^{-2} \div 5^1$
5. There were 32 apples in each box and 12 boxes in each carton. How many apples did Annet get if she bought 124 cartons?
6. What is the sum of 8456 litres of petrol and 45631 litres?
7. There were 38600 chicken on the teacher's farm. 12364 were sold on Idd day. How many remained?
8. At a party, 4848 people were served with sodas each. How many crates of soda were bought if each crate contains 24 bottles?
9. Work out (a) 2.5 x 13 + 2.5 x 7
10. 4.5 x 75 – 4.5 x 25
11. What number must be added to 54068 to give 60000?
12. Find the sum of even numbers between 13 and 31.
13. List down all the composite numbers between 2 and 15.
14. Find the G.C.F of 8 and 12.
15. What is the Lowest Common Multiple of 6, 8 and 16?
16. Workout the square root of 961.
17. The sum of 3 consecutive natural numbers is 63. Find the numbers.
18. Find the next number in the sequence: 4, 7, 6, 9, 8, 11, …
19. What is the Smallest number which when divided by 9 and 11 leaves a remainder of 2?
20. Bulangiti buses leave for Kasese every 3 hours and Gateway buses leave for Soroti every four hours. Two buses set off from Kampala's bu park at 7:30am. When will the two buses leave together again?
21. The G.C.F of two numbers is 2 and their L.C.M is 24. If one of the numbers is 8, find the second number.
22. The sum of 3 consecutive even numbers is 36. Find their range.
23. Find the cube root of 64.
24. The area of a square garden is 169m2. Fin d its perimeter.
25. Find the square root of 0.81

Mathematics is the Key

SUB TOPIC: OPERATIONS OF FRACTIONS(Addition and subtraction)

Examples:

1. ***workout*** $\frac{1}{3}+\frac{1}{2}$

$$\frac{1}{3}+\frac{1}{2}=\frac{2+3}{6}$$
$$=\frac{5}{6}$$

2. ***Workout***: $1\frac{3}{4}+1\frac{5}{6}$

$$1\frac{3}{4}+1\frac{5}{6}$$
$$\frac{7}{4}+\frac{11}{6}$$
$$\frac{21\ +\ 22}{12}=\frac{43}{12}$$
$$3\ \frac{7}{12}$$

3. ***Workout:*** $\frac{3}{4}-\frac{1}{3}$

$$\frac{3}{4}-\frac{1}{3}$$
$$\frac{9-4}{12}$$
$$\frac{5}{12}$$

4. **Workout:** $3\ \frac{5}{6}-1\frac{4}{5}$

$$3\ \frac{5}{6}-1\frac{4}{5}$$
$$\frac{23}{6}-\frac{9}{5}$$
$$\left(\frac{23}{6}\times\frac{5}{5}\right)-\left(\frac{9}{5}\times\frac{6}{6}\right)$$
$$\frac{115-54}{30}$$
$$\frac{61}{30}$$
$$2\ \frac{1}{30}$$

Workout the following

(a) $\frac{1}{5}+\frac{2}{3}$

(b) $\frac{7}{8}-\frac{3}{5}$

(c) $2\frac{1}{2}+3\frac{4}{7}$

(d) $5\frac{4}{5}-3\frac{2}{7}$

Mathematics is the Key

SUB TOPIC: OPERATION ON FRACTIONS(multiplication of fractions)

Examples:

1. *Workout*: $\frac{1}{5} \times 3$

$\frac{1}{5} \times 3$

$\frac{3}{5}$

2. ***Workout:*** $\frac{1}{3} \times \frac{3}{4}$

$\frac{1}{3} \times \frac{3}{4}$

$\frac{1}{4}$

3. ***Workout:*** $2\frac{1}{4} \times 1\frac{1}{5}$

$\frac{9}{4} \times \frac{6}{5}$

$\frac{27}{10}$

$2\frac{7}{10}$

4. ***Workout the following***

(a) $\frac{3}{7} \times 35$

(b) $\frac{2}{3} \times \frac{3}{10}$

(c) $\frac{5}{11} \times 1\frac{1}{5}$

(d) $4\frac{3}{7} \times 3\frac{2}{3}$

SUB TOPIC: OPERATION ON FRACTIONS (Division of fractions)

Examples:

1. ***Workout:*** $\frac{2}{5} \div 2$

$\frac{2}{5} \div 2$

$\frac{2}{5} \times \frac{1}{2}$

$\frac{1}{5}$

2. ***Workout:*** $\frac{3}{4} \div \frac{1}{2}$

$\frac{3}{4} \div \frac{1}{2}$

$\frac{3}{4} \times \frac{2}{1}$

$\frac{3}{2}$

$1\frac{1}{2}$

Try these:

1. ***Workout the following.***

(a) $\frac{3}{4} \div \frac{1}{3}$

(b) $\frac{4}{5} \div \frac{1}{8}$

(c) $\frac{5}{11} \div \frac{7}{22}$

(d) $5\frac{3}{4} \div 3\frac{1}{2}$

Mathematics is the Key

Brackets
Of
Division
Multiplication
Addition
Subtraction

Examples:

1. Workout : $\frac{2}{3} of \frac{3}{4} - \frac{1}{3}$

$$\frac{2}{3} of \frac{3}{4} - \frac{1}{3}$$
$$\left(\frac{2}{3} \times \frac{3}{4}\right) - \frac{1}{3}$$
$$\frac{1}{2} - \frac{1}{3}$$
$$\left(\frac{1}{2} \times \frac{3}{3}\right) - \left(\frac{1}{3} \times \frac{2}{2}\right)$$
$$\frac{3}{6} - \frac{2}{6}$$
$$\frac{3-2}{6}$$
$$\frac{1}{6}$$

2. : $\boldsymbol{Workout \frac{5}{6} - \frac{3}{4} \div \frac{3}{2}}$

$$\boldsymbol{\frac{5}{6} - \frac{3}{4} \div \frac{3}{2}}$$
$$\boldsymbol{\frac{5}{6} - \left(\frac{3}{4} \div \frac{3}{2}\right)}$$
$$\boldsymbol{\frac{5}{6} - \frac{3}{4} \times \frac{2}{3}}$$
$$\boldsymbol{\frac{5}{6} - \frac{1}{2}}$$
$$\boldsymbol{\frac{\left(\frac{5}{6} \times 6\right) - \left(\frac{1}{2} \times 6\right)}{6}}$$
$$\boldsymbol{\frac{5-3}{6}}$$
$$\boldsymbol{\frac{2}{6}}$$
$$\boldsymbol{\frac{1}{3}}$$

Activity

1. **Workout the following.**
   - **(a)** $\boldsymbol{\frac{1}{2} - \frac{3}{4} + \frac{5}{6}}$
   - **(b)** $\boldsymbol{\frac{2}{3} \times \frac{1}{3} \div \frac{3}{4}}$
   - **(c)** $\boldsymbol{\frac{3}{7} of \frac{5}{6} + 3\frac{1}{3}}$

Mathematics is the Key

SUB TOPIC: APPLICATION OF FRACTIONS IN REAL LIFE SITUATION

Word problems

Examples:

1. ***A boy had a jerry can full of water. He used $\frac{13}{20}$. What fraction remained?***

$$1 - \frac{13}{20} = \frac{20}{20} - \frac{13}{20} = \frac{7}{20}$$

2. Mary bought a cake and she ate $\frac{1}{3}$ in the morning, $\frac{5}{12}$ in the afternoon and the rest in the evening. What fraction of the cake did she eat in the evening.

$$1 - \left(\frac{1}{3} + \frac{5}{12}\right)$$

$$1 - \left[\left(\frac{1}{3} \times \frac{4}{4}\right) + \frac{5}{12}\right]$$

$$1 - \left(\frac{4}{12} + \frac{5}{12}\right)$$

$$1 - \frac{9}{12}$$

$$\frac{12}{12} - \frac{9}{12}$$

$$\frac{3}{12}$$

$$\frac{1}{3}$$

3. If $\frac{2}{3}$ of a number is 40. What is the number?

Let the number be m

$$\frac{2}{3} of\ m = 40$$

$$\frac{2}{3} \times m = 40$$

$$\frac{2m}{3} = 40$$

$$3 \times \frac{2m}{3} = 40 \times 3$$

$$2m = 120$$

$$\frac{2m}{2} = \frac{120}{2}$$

$$\underline{m = 40}$$

4. $\frac{3}{4}$ of a number is 180. Find the number.
5. How many half litre cups of water can fill a 20 litre jerrycan?
6. In a class, $\frac{2}{5}$ are boys and the rest are girls.

Mathematics is the Key

(a) Find the fraction of girls.

(b) If there are 45 girls, how many pupils are in the class?

(c) If $\frac{1}{3}$ of the pupils have black shoes, how many pupils do not have black shoes?

7. The tank was $\frac{2}{3}$ full of water. One day , James used $\frac{1}{4}$ of the water for washing and 100 litres remained.

(a) What fraction of the tank was used for washing?

(b) How many litres of water can it hold when full?

8. A, B and C contributed to start a Company. A paid $^{3}/_{10}$ of the cost and B contributed $^{5}/_{10}$ of the cost.

i. What fraction did C contribute?

ii. If C contributed shs 30,000 what was their total contribution?

DECIMALS

SUB TOPIC: CHANGING VULGAR FRACTIONS TO DECIMALS

Examples

1. Convert $\frac{5}{8}$ to a decimal fraction

$$
\begin{array}{r}
0.625 \\
8\overline{)\,50} \\
-48 \\
\hline
20 \\
-16 \\
\hline
40 \\
-40 \\
\hline
00 \\
\hline
\end{array}
$$

$\frac{5}{8} = 0.625$

Try these

1. Convert the following fractions to decimals

(a) $\frac{1}{2}$ ***(b)*** $\frac{1}{4}$ ***(c)*** $\frac{1}{8}$

Mathematics is the Key

SUB TOPIC: CHANGING DECIMALS TO VULGAR FRACTIONS

Examples:

1. Convert the following decimals to fractions

(a) 0.125

$$0.125 = \frac{\cancel{125}^{1}}{\cancel{1000}_{8}}$$

$$0.125 = \frac{1}{8}$$

$(b)\ 7.25$

$$7.25 = 7 + \frac{\cancel{25}^{1}}{\cancel{100}_{4}}$$

$$0.25 = 7 + \frac{1}{4}$$

$$0.25 = 7\frac{1}{4}$$

Activity

1. Convert the following decimals to fractions
   - **(a) 0.5**
   - **(b) 0.75**
   - **(c) 0.45**
   - **(d) 1.4**
   - **(e) 12.08**

SUB TOPIC: CHANGING VULGAR FRACTIONS TO RECURRING DECIMALS

Examples: Convert the following to decimal

(b) $\frac{3}{11}$

$$\begin{array}{r|l} 11 & 0.2727\ldots \\ \hline & 30 \\ & -22 \\ \hline & 80 \\ & -77 \\ \hline & 30 \\ & -22 \\ \hline & 80 \\ & -77 \\ \hline & 30 \end{array}$$

$\frac{5}{8} = 0.2727\ldots$

(a) $\frac{1}{12}$

$$\begin{array}{r|l} 12 & 0.8333\ldots \\ \hline & 100 \\ & -96 \\ \hline & 40 \\ & -36 \\ \hline & 40 \\ & -36 \\ \hline & 40 \\ & -36 \\ \hline & 4 \end{array}$$

$\frac{5}{8} = 0.8333\ldots$

Convert the following to decimal

(a) $\frac{4}{11}$

(b) $\frac{1}{15}$

Mathematics is the Key

(c) $\frac{7}{9}$ (d) $\frac{9}{11}$

SUB TOPIC: CHANGING RECURRING DECIMALS TO VULGAR FRACTIONS

Examples:

- Changing recurring decimals to rational numbers:

1. $0.333\ldots$

$Let\ the\ No.be\ y$

$y = 0.333\ldots$

$10 \times y = 0.333\ldots \times 10$

$10y = 3.33\ldots$

$10y = 3.33\ldots.$

$-y\ -0.33\ldots$

$\frac{9y}{9} = \frac{3}{9}$

$y = \frac{1}{3}$

2. $0.4545\ldots..$

$Let\ the\ No.be\ t$

$t = 0.4545\ldots..$

$100 \times t = 0.4545\ldots \times 100$

$100t = 45.45\ldots$

$\underline{-t \quad -0.45\ldots}$

$99t = 45$

$\frac{99t}{99} = \frac{45}{99}$

$y = \frac{5}{11}$

3. $0.1666\ldots..$

$Let\ the\ No\ be\ a$

$a = 0.1666\ldots$

$10 \times a = 0.1666\ldots \times 10$

$10a = 1.666\ldots..$

$100 \times a = 0.166\ldots. \times 1000$

$100\,a = 16.666\ldots$

$100a = 16.666\ldots.$

$\underline{-10a = -1.666\ldots.}$

$90a = 15$

$\frac{90a}{90} = \frac{15}{90}$

$a = \frac{1}{6}$

Mathematics is the Key

Activity.

Convert the following recurring decimal fractions to vulgar fractions.

(a) 0.333… **(c) 0.6363…**

(b) 0.1212.... **(d) 0.01666…**

SUB TOPIC: DECIMALS (Addition and of decimals)

Examples:

Workout the following

1. 3.4 + 0.23

$$\begin{array}{r} 3.4 \\ +0.23 \\ \hline 3.63 \end{array}$$

2. 5 – 0.03

$$\begin{array}{r} 5.00 \\ -0.03 \\ \hline 4.97 \end{array}$$

Activity

Workout the following

(a) $4.57 + 4.94$

(b) $4.01 - 2.97$

(c) $5.47 + 23.98$

(d) $2 - 0.45$

SUB TOPIC: DECIMALS (Multiplication of decimals)

Examples:

Workout the following

1. 27.36 x 6

$$\begin{array}{r} 27.36 \\ \times \quad 6 \\ \hline 164.16 \end{array}$$

2. 11.9 x 0.3

$$\frac{119}{10} \times \frac{3}{10}$$

$$\frac{357}{100}$$

$$3.57$$

Multiply the following.

(a) 4.25×0.08

(b) 12.45×3.6

(c) 90.06×1.5

Mathematics is the Key

SUB TOPIC: DECIMALS (Division of decimals)

Examples:

1. $0.72 \div 9$

$\frac{72}{100} \div \frac{9}{1}$

$\frac{72}{100} \times \frac{1}{9} = \frac{8}{100}$

0.8

2. $0.12 \div 0.3$

$\frac{12}{100} \div \frac{3}{10}$

$\frac{12}{100} \times \frac{10}{3} = \frac{4}{10}$

0.4

Workout the following

(a) $6.4 \div 0.08$

(b) $1.25 \div 2.5$

(c) $1.6 \div 1.2$

SUB TOPIC: DECIMALS (using BODMAS)

Examples

1. **Workout**. $8 - 5.16 + 3.07$

Re-arrange first 8 + 3.07 – 5.16

8 .0 0	***11 . 0 7***
+ 3. 0 7	***- 5. 1 6***
11.0 7	***5. 9 1***

2. Workout :$0.2 \times 1.6 - 2.7$

$(0.2 \times 1.6) - 1.7$

$3.2 - 1.7$

1.5

3. $Workout$: $2.4 \div 1.2\ of\ 0.2$

$2.4 \div (1.2\ of\ 0.2)$

$2.4 \div (1.2 \times 0.2)$

$\frac{24}{10} \div \left(\frac{12}{10} \times \frac{2}{10}\right)$

$\frac{24}{10} \div \left(\frac{24}{100}\right)$

$\frac{24}{10} \times \frac{100}{24}$

10

Mathematics is the Key

Activity

Workout the following

(a) $5.6 - 7.8 + 6.12$

(b) $1.6 + 0.6 \times 1.2$

(c) $3.5 \times 0.12 \div 0.4$

(d) $1.0\ of\ 6.4 \div 0.08$

SUB TOPIC: DECIMALS (mixed operation)

Examples:

Simplify the following

1. $\frac{0.24\ x\ 0.3}{0.8}$

$\left(\frac{24}{100} \times \frac{3}{10}\right) \div \left(\frac{8}{10}\right)$

$\frac{24}{100} \times \frac{3}{10} \times \frac{10}{8}$

$\frac{3 \times 3}{100} = \frac{9}{100}$

$\underline{0.09}$

2. $\frac{0.06 \times 2.4}{1.2}$

3. $\frac{0.24 \times 1.6}{3.6}$

4. $\frac{2.7 \times 0.54}{1.63 + 0.17}$

SUBTOPIC: Word problems on decimals

1. A carpenter bought 3 pieces of timber each measuring 1.97m.Find the total length of the timber he bought.

$1.97 \times 3m$

$\frac{197}{100} \times \frac{3}{1} m$

$\frac{591}{100} m$

$\underline{5.91\ m}$

Mathematics is the Key

2. How many 0.5 litre cups can be got from a 20 litre jerry can?

$$20 \div 0.5$$
$$20 \div \frac{5}{10}$$
$$20 \times \frac{10}{5}$$
$$4 \times 10$$
$$40\ cups$$

3. **How many 0.25 cups can fill a 15 jerry can of water?**
4. **James cut 2.5 m pieces of cloth from a 40 metre piece of cloth. How many pieces did he get?**

RATIOS AND PROPORTIONS

A ratio is a comparison of objects. A ratio is written as 1:2 and it is read as one to two. If the ratio of boys to girls in the class is 2:3, it means that where there are two boys in the class there are three girls.

SUB TOPIC: Expressing quantities as ratios

Examples:

1. A class has 20 boys and 30 girls. What is the ratio of boys to girls?

$$\textit{The ratio of boys to girls.}$$
$$\underline{\textit{Number of boys}}$$
$$\textit{Number of girls}$$
$$\frac{20}{30}$$
$$\frac{2}{3}$$

$$\underline{\textit{The ratio of boys to girls is } 2:3 \textit{ and the ratio of girls to boys is } 3:2}$$

Activity

2. On Mr.Okello's farm, there are 40 cows, 25 goats, 60 hens and 15 pigs. Find the;
   (a) Ratio of goats to cows
   (b) Ratio of hens to pigs
   (c) Ratio of pigs to cows
   (d) Ratio of cows to the total number
   (e) Cows to goats to pigs to hens

Mathematics is the Key

SUB TOPIC: Sharing quantities in ratios

Examples:

1. Bob, Bonny and Ben shared 60 oranges in the ratio of 2:3:5 respectively. How many oranges did each boy get?

$\underline{\boldsymbol{Total\ ratio}}$

$\boldsymbol{2+3+5=10}$

$\underline{\boldsymbol{Bob}}$

$\boldsymbol{\frac{2}{10}\times 60 = 2\times 6 = 12\ Oranges}$

$\underline{\boldsymbol{Bonny}}$

$\boldsymbol{\frac{3}{10}\times 60 = 3\times 6 = 18\ Oranges}$

$\underline{\boldsymbol{Ben}}$

$\boldsymbol{\frac{5}{10}\times 60 = 5\times 6 = 30\ Oranges}$

2. Share 18 in the ratio 4:5

$\boldsymbol{Total\ ratio = 4+5=9}$

$$\boldsymbol{1st\ share = \frac{4}{9}\times 18 = 4\times 2 = 8}$$

$$\boldsymbol{2nd\ share = \frac{5}{9}\times 18 = 5\times 2 = 10}$$

3. In a class of 80pupils,the ratio of boys to girls is 3:5
   (a) Find the number of girls
   (b) Find the number of boys
   (c) If $\frac{3}{4}$ of the girls have school uniform, how many girls don't have uniform?
4. James, Jack and Oscar shared sh.24,000 in the ratio of 3:7:2 respectively. How much money did each get?

SUB TOPIC: Finding the number shared in the given ratio

Examples:

1. Mary, Jane and shared money in the ratio 2:3:1 respectively. If Mary got shs 12,000. How much money did they share?

$\boldsymbol{Total\ ratio = 2+3+1=6}$

$$\boldsymbol{Mary\ had\ 2\ parts\ rept\ sh.12,00}$$

$$\boldsymbol{1\ part\ repts\ \frac{sh.12000}{2}}$$

$$\boldsymbol{6\ parts\ rept\ \frac{sh.12000}{2}\times 6}$$

$$\boldsymbol{sh.12000\times 3}$$

$$\boldsymbol{sh.36,000}$$

$\underline{\boldsymbol{They\ shared\ sh\ 36,000}}$

Mathematics is the Key

2. The ratio of boys to girls in a class is 2:3. If there are 45 girls, how many pupils are in the class?
3. The number of goats, cows and sheep on a certain farm are in the ratio of 4:3:5 respectively. There are 40 sheep than on the farm. Find the number of each type of animal on the farm

SUB TOPIC: Increasing quantities in a given ratio

Example1: Increase 80kg in the ratio of 5:4

$$\frac{5}{4} \times 80kg$$
$$5 \times 20kg$$
$$\underline{100kg}$$

Example 2: Increase sh.2,000 in the ratio of 2:5

$$\frac{5}{2} \times sh.2,000$$
$$5 \times sh.1,000$$
$$\underline{sh.5,000}$$

Increase the following as instructed

a) 400g in the ratio of 1:4
b) Sh.10,000 in the ration of 5:13
c) 8,000g in the ratio of 2:3
d) Sh.28,000 in the ration of 7:20

SUB TOPIC: Finding ratio of increase

$$Ratio\ of\ increase = \frac{New\ no.}{old\ no.}$$

$$Ratio\ of\ increase\ =\ new\ number\ :\ old\ number$$

Examples:

1. In what ratio must 30 be increased to 50?

$$New : old$$
$$50 : 30$$
$$\frac{50}{10} : \frac{30}{10}$$
$$\underline{5 : 3}$$

Mathematics is the Key

2. The number of pupils in a school increased from 480 by 60. In what ratio did it increase?

   $\boldsymbol{Old\ no.} = 480$

   $\boldsymbol{New\ no.} = 480 + 60 = 540$

   $\boldsymbol{New : old}$

   $\boldsymbol{540 : 480}$

   $\boldsymbol{\frac{540}{60} : \frac{480}{60}}$

   $\underline{\boldsymbol{9 : 8}}$
3. In what ratio must 90 be increased to 120
4. Allen's salary increased from sh.90,000 to sh.115,000. In what ratio did Allen's salary increase?
5. The number of pupils in the class increased by 20 to 85. In what ratio did it increase?

SUB TOPIC: Finding numbers increased in ratios

1. **What number becomes 54 when increased in the ratio of 9:8?**

   Let the number becomes k

   $\boldsymbol{\frac{9}{8} \times k = 54}$

   $\boldsymbol{\frac{9k}{8} = 54}$

   $\boldsymbol{8 \times \frac{9k}{8} = 54 \times 8}$

   $\boldsymbol{9k = 54 \times 8}$

   $\boldsymbol{\frac{9k}{9} = \frac{54 \times 8}{9}}$

   $\boldsymbol{k = 6 \times 8}$

   $\underline{\boldsymbol{k = 48}}$
2. The number of pupils in a class increased in the ratio of 3:4 to 120. How many pupils were in class before?
3. What number becomes 30 when increased in the ratio of 4:5?
4. Peters new salary is sh.300,000. Find his old salary if it was increased in the ratio of 15:13.

SUB TOPIC: Decreasing quantities in a given ratio

Example1: Decrease 80kg in the ratio of 5:4

$\boldsymbol{\frac{4}{5} \times 80kg}$

$\boldsymbol{4 \times 16kg}$

$\underline{\boldsymbol{64kg}}$

Mathematics is the key

Example 2: Decrease sh.2,000 in the ratio of 2:5

$$\frac{2}{5} \times sh.2,000$$
$$2 \times sh.400$$
$$\underline{sh.800}$$

Decrease the following as instructed

a) 400g in the ratio of 1:4
b) Sh.10,000 in the ration of 13:20
c) 8,000g in the ratio of 3:4
d) Sh.28,000 in the ration of 9:14

SUB TOPIC: FINDING RATIO OF INCREASE

$$Ratio\ of\ decrease = \frac{New\ no.}{old\ no.}$$

$$Ratio\ of\ decrease\ = \ new\ number : \ old\ number$$

Examples:

1. In what ratio must 30 be decreased to 24?

$$New: old$$
$$24:30$$
$$\frac{24}{6}:\frac{30}{6}$$
$$\underline{4:5}$$

2. The number of pupils in a class decreased from 480 by 60. In what ratio did it decrease?

$$Old\ no. = 480$$
$$New\ no. = 480 - 60 = 420$$
$$New: old$$
$$420:480$$
$$\frac{420}{60}:\frac{480}{60}$$
$$\frac{42}{6}:\frac{48}{6}$$
$$\underline{7:8}$$

3. In what ratio must 90 be decreased to 75?
4. Dan's salary reduced from sh.90,000 to sh.85,000. In what ratio did Dan's salary reduce?
5. Jamada had 200 mangoes and later he sold 80 oranges. In what ratio did his oranges reduce?

Mathematics is the Key

SUB TOPIC: Finding numbers decreased in ratios

1. **What number becomes 64 when increased in the ratio of 8:11?**
   Let the number becomes k

$$\frac{8}{11} \times m = 64$$
$$\frac{8m}{11} = 64$$
$$11 \times \frac{8m}{11} = 64 \times 11$$
$$8m = 64 \times 11$$
$$\frac{8m}{8} = \frac{64 \times 11}{8}$$
$$m = 11 \times 8$$
$$\underline{m = 88}$$

2. The number of pupils in a class reduced in the ratio of 2:3 to 60. How many pupils were in class before?
3. What number becomes 63 when decreased in the ratio of 7:13?
4. After having an accident, Ann's eggs got broken and reduced in the ratio of 3:7 if she remained with 45 eggs, how many eggs did she have at first?

SUB TOPIC: Direct proportion

Examples:

1. Two books cost sh. 2000. Find the cost of 6 similar books.

$$2\ books\ cost\ sh\ 2000$$
$$1\ book\ costs\ \frac{sh\ 2000}{2}$$
$$6\ books\ cost\ \frac{shs\ 2000}{2} \times 6$$
$$2000\ \times\ 3$$
$$\underline{Shs\ 6,000}$$

2. The cost of 4 rulers is sh.2,800. Find the cost of 13 similar rulers.
3. A bicycle can cover a distance 20 km in just 40minutes. What distance can it cover in 120 minutes moving at the same speed?
4. Find the cost of 12 pencils if 8 pencils cost sh.1,200.
5. The cost of 3 pairs of stockings is sh.7,500. Find how pairs of stockings can one buy with sh.12,500.

Mathematics is the Key

SUB TOPIC: Indirect/inverse proportion

Examples:

1. 4 men take 9 days to complete a job. How long will 12 men take to finish the job at the same rate?

$$4\ men\ take\ 9\ days$$
$$1\ man\ takes\ 9 \times 4\ days$$
$$12\ men\ take\ \frac{9 \times 4}{12}\ days$$
$$\underline{3\ days}$$

2. If 12 girls can sweep the compound in 90 minutes, how long will 15 girls take to sweep the same compound?
3. 8 boys can slash the compound in 6 hours. How many boys are needed to slash the compound in 16 hours?
4. A taxi can cover a distance in 4 hours at a speed of 60km/hour, at what speed can a taxi move in order to cover the same distance in 3hours

PERCENTAGES

Percentage means every out of one hundred.

The symbol for percentage is %

If the percentage of girls is 60%, this means that if there are 60 girls in a class of 100.

SUB TOPIC: Expressing percentages as fractions

Examples

1. **Express 50% as a vulgar fraction**

$$50\% = \frac{50}{100}$$
$$= \frac{5}{10}$$
$$= \frac{1}{2}$$

2. **Convert 35% to a fraction**

$$35\% = \frac{35}{100}$$
$$= \frac{7}{20}$$

Mathematics is the Key

3. **Change $33\frac{1}{3}\%$ to a fraction.**

$$33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100}$$
$$= \frac{100}{3} \div 100$$
$$= \frac{100}{3} \times \frac{1}{100}$$
$$= \frac{1}{3}$$

Activity

Convert the following percentages to fractions

(a) 40%

(b) 20%

(c) 75%

(d) $16\frac{1}{2}\%$

(e) 5.75%

SUB TOPIC: Expressing fractions as percentages

Examples

1. Convert $\frac{1}{4}$ to percentage.

$$\frac{1}{4} = \frac{1}{4} \times 100\%$$
$$= 25\%$$

2. **Express $\frac{2}{5}$ as a percentage.**

$$\frac{2}{5} = \frac{2}{5} \times 100\%$$
$$= 2 \times 20\%$$
$$= 40\%$$

3. **Express $\frac{2}{3}$ as a percentage.**

$$\frac{2}{3} = \frac{2}{3} \times 100\%$$
$$= \frac{200}{3}\%$$
$$= 66\frac{2}{3}\%$$

Mathematics is the Key

4. **Express the following as percentages**

(a) $\frac{3}{4}$

(b) $\frac{3}{5}$

(c) $\frac{7}{10}$

(d) $\frac{1}{3}$

(e) $\frac{1}{8}$

SUB TOPIC: Expressing percentages as ratios

Examples

4. **Express 50% as a vulgar fraction**

$$50\% = \frac{50}{100}$$
$$= \frac{5}{10}$$
$$= \frac{1}{2}$$
$$\underline{50\% = 1:2}$$

5. **Convert 35% to a fraction**

$$35\% = \frac{35}{100}$$
$$= \frac{7}{20}$$
$$\underline{35\% = 7:20}$$

6. **Change $33\frac{1}{3}\%$ to a fraction.**

$$33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100}$$
$$= \frac{100}{3} \div 100$$
$$= \frac{100}{3} \times \frac{1}{100}$$
$$= \frac{1}{3}$$
$$33\frac{1}{3}\% = 1:3$$

Mathematics is the Key

Activity

Convert the following percentages to fractions

(a) $\mathbf{40\%}$

(b) $\mathbf{20\%}$

(c) $\mathbf{75\%}$

(d) $\mathbf{16\frac{1}{2}\%}$

(e) $\mathbf{2.5\%}$

SUB TOPIC: Expressing ratios as percentages

Examples

5. Convert $1:4$ to percentage.

$$1:4 = \frac{1}{4}$$

$$\frac{\mathbf{1}}{\mathbf{4}} = \frac{\mathbf{1}}{\mathbf{4}} \times \mathbf{100\%}$$

$$= \mathbf{25\%}$$

6. Express $2:5$ as a percentage.

$$\mathbf{2:5} = \frac{\mathbf{2}}{\mathbf{5}}$$

$$\frac{\mathbf{2}}{\mathbf{5}} = \frac{\mathbf{2}}{\mathbf{5}} \times \mathbf{100\%}$$

$$= \mathbf{2} \times \mathbf{20\%}$$

$$= \mathbf{40\%}$$

7. Express $2:3$ as a percentage.

$$2:3 = \frac{2}{3}$$

$$\frac{\mathbf{2}}{\mathbf{3}} = \frac{\mathbf{2}}{\mathbf{3}} \times \mathbf{100\%}$$

$$= \frac{\mathbf{200}}{\mathbf{3}}\%$$

$$= \mathbf{66}\frac{\mathbf{2}}{\mathbf{3}}\%$$

8. **Express the following as percentages**

(f) $\mathbf{3:4}$

(g) $\mathbf{3:5}$

(h) $\mathbf{7:10}$

(i) $\mathbf{1:3}$

(j) $\mathbf{1:8}$

Mathematics is the Key

SUB TOPIC: Expressing percentages as decimals

7. Express 50% as a vulgar fraction

$$50\% = \frac{50}{100}$$
$$= \frac{5}{10}$$
$$= 0.5$$

8. Convert 35% to a fraction

$$35\% = \frac{35}{100}$$
$$= 0.35$$

9. **Change $33\frac{1}{3}\%$ to a fraction.**

$$33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100}$$
$$= \frac{100}{3} \div 100$$
$$= \frac{100}{3} \times \frac{1}{100}$$
$$= \frac{1}{3}$$
$$= 0.333\ldots$$

Activity

Convert the following percentages to fractions

(f) 40%

(g) 20%

(h) 75%

(i) $16\frac{1}{2}\%$

SUB TOPIC: Expressing decimals as percentages

9. Convert 0.25 to percentage.

$$0.25 = \frac{25}{100} \times 100\%$$
$$= 25\%$$

10. Express 0.4 as a percentage.

$$0.4 = \frac{4}{10} \times 100\%$$
$$= 4 \times 10\%$$
$$= 40\%$$

Mathematics is the Key

11. Express 0.53 as a percentage.

$$0.53 = \frac{53}{100} \times 100\%$$
$$= 53\%$$

12. Express the following as percentages

(k) 0.75
(l) 0.6
(m) 0.7
(n) 0.333 ...
(o) 0.125

SUB TOPIC: Expressing quantities as percentages

1. In a school, there are 150 boys and 100 girls. Express the number of;

(a) girls as a percentage

$$\frac{100}{100 + 150} \times 100\%$$
$$\frac{10}{25} \times 100\%$$
$$10 \times 4\%$$
$$40\%$$

(b) boys as a percentage

$100\% - 40\% = 60\%$

2. On a farm, there are 20 goats and 15 sheep.

(a) Find the percentage of sheep on the farm

(b) Find the percentage of goats on the farm

3. James spent sh.5,000 and saved the rest of his sh.20,000 which he had.

(a) calculate the percentage of the money he spent.

(b) calculate the percentage of the money he saved.

4. Write 20 as a percentage of 80.

5. Amos got 12 out of 25 in a Math test. Express his mark as a percent.

SUB TOPIC: Expressing one quantity as percentage of another

Example I

1. Express 15 minutes as percentage of an hour.

$$\frac{15}{60} \times 100\%$$
$$\frac{1}{4} \times 100\% = 25\%$$

2. Express 60cm as a percentage of 2m

Mathematics is the Key

3. **Express 9 items as a percentage of $2\frac{1}{2}\ dozens$.**
4. **What is 400m as a percentage of a kilometre?**
5. **Express 40 minutes as a percentage of 2 hours**

SUB TOPIC: Finding quantities equivalent to a percentage

Examples

1. **What is 20% of 60 mangoes?**

$$20\%\ of\ 60\ mangoes$$
$$\frac{20}{100}\times 60\ mangoes$$
$$2\times 6\ mangoes$$
$$12\ mangoes$$

2. **What is $33\frac{1}{3}\ of\ 45\ books$?**

$$33\frac{1}{3}\%\ of\ 45\ books$$
$$33\frac{1}{3}\%\times 45\ books$$
$$\frac{33\frac{1}{3}}{100}\times 45\ books$$
$$\left(\frac{100}{3}\div 100\right)\times 45\ books$$
$$\left(\frac{100}{3}\times\frac{1}{100}\right)\times 45\ books$$
$$\frac{1}{3}\times 45\ books$$
$$\underline{15\ books}$$

3. **What is 78% of sh.40,000?**
4. **What is 34% of 250?**
5. **What is 60% of 50?**
6. **What is 12% of sh.69,000?**

SUB TOPIC: Sharing quantities using percentage

Examples

1. Tom and Jerry shared 120 sweets. If Tom got 60%;
   (a) What percentage did Jerry get?

$$100\% - 60\% = 40\%$$

Mathematics is the key

(b) How many oranges did each get?

$\underline{Tom}$

$\frac{60}{100} \times 120\ sweets$

6×12

$\underline{72\ sweets}$

$\underline{Jerry}$

$\frac{40}{100} \times 120$

4×12

$\underline{48\ sweets}$

2. In a school of 600 pupils,25% were absent and the rest were present on a certain day.

a) How many pupils were present?

$\mathbf{100\% - 25\% = 75\%}$

$\mathbf{75\%\ of\ 600}$

$\frac{\mathbf{75}}{\mathbf{100}} \times \mathbf{600}$

$\mathbf{75 \times 6}$

$\mathbf{450\ pupils}$

b) How many pupils were absent?

$\mathbf{600 - 450 = 250\ pupils}$

3. Three boys Peter , James and Boaz shared sh.50,000.Peter got 30%, James got 45% and Boaz got the rest.
   (a) What percentage did Boaz get?
   (b) How much money did Peter get?
   (c) How much money did James get?
   (d) How much money did Boaz get?

4. In a class of 80 pupils, 45% are boys and the rest are girls
   (a) Find the percentage of girls.
   (b) Find the number of boys in the class.
   (c) Find the number of girls in the class.

5. Nanyonjo earns sh. 12,000. She spends 75% and saves the rest.
   - How much does she spend?
   - How much does she save?

Mathematics is the Key

Examples:

1. If 20% of a number is 40, what is the number?

$$\textbf{Let the number be } m$$
$$20\% \text{ of } m = 40$$
$$\frac{20}{100} \times m = 40$$
$$\frac{m}{5} \times 5 = 40 \times 5$$
$$\underline{m = 200}$$

2. If 80% of the children at the health centre were immunized against measles in the month of April,

(a) what percentage of the children were immunized in other months?

$$100\% - 80\% = 20\%$$

(b) How many children were immunized altogether given that 1600 children were immunized in April?

$$\textbf{Let the total number of children be } y$$
$$80\% \text{ of } y = 1600$$
$$\frac{80}{100} \times y = 1600$$
$$\frac{8y}{10} = 1600$$
$$10 \times \frac{8y}{10} = 1600 \times 10$$
$$8y = 1600 \times 10$$
$$\frac{8y}{8} = \frac{16000}{8}$$
$$y = 2,000 \text{ children}$$

(c) How many children were immunized in other months?

$$\frac{20}{100} \times 2000 \text{ children}$$
$$20 \times 20$$
$$400 \text{ children}$$

Activity

1. If 30% of my salary is spent on food and I save sh. 21,000. What is my salary?
2. If 15% of a number is 90. Find the number.

Mathematics is the Key

3. If 40% of a class is absent;
    a. What percentage is a present?
    b. How many pupils are in class if 24 pupils are absent in class?
4. 35% of the pupils in a school like rice while 10% like potatoes. If the rest like posho,
   (a) What percentage of pupils like posho?
   (b) How many pupils are in school if 63 pupils like posho?

SUB TOPIC: Forming and solving equations involving percentages

1. There are 20% more boys than girls in a class.

a) Find the percentage of girls.

Let the %ge of girls be m

boys	girls	TL
m+20	m	100

$$\boldsymbol{m + m + 20 = 100\%}$$
$$\boldsymbol{2m + 20 = 100}$$
$$\boldsymbol{2m + 20 - 20 = 100 - 20}$$
$$\boldsymbol{2m = 80}$$
$$\boldsymbol{\frac{2m}{2} = \frac{80}{2}}$$
$$\boldsymbol{\underline{m = 40\%}}$$

b) Find the percentage of boys.

$$\boldsymbol{m + 20\%}$$
$$\boldsymbol{40 + 20\%}$$
$$\boldsymbol{60\%}$$

c) If there are 90 boys in the class, how many pupils are in the class?

Let the total number of pupils be w

$$\boldsymbol{\frac{60}{100} \times w = 90}$$
$$\boldsymbol{100 \times \frac{60w}{100} = 90 \times 100}$$
$$\boldsymbol{60w = 90 \times 100}$$
$$\boldsymbol{\frac{60w}{60} = \frac{90 \times 100}{60}}$$
$$\boldsymbol{\underline{w = 150\ pupils}}$$

d) How many girls are in the class?

$$\boldsymbol{150 - 90 = 60\ girls}$$

Mathematics is the Key

2. On Kashande's farm, there are 10% more goats than cows. If there are 36 cows,
   (a) find the percentage of goats on the farm.
   (b) find the number of animals on the farm.
   (c) how many goats are on the farm
3. In a certain meeting, there were 30% more males than females. If there were 130 males,
   (a) find the percentage of females.
   (b) how many people attended the meeting?
   (c) how many females attended the meeting?

SUB TOPIC: Increasing quantities using percentages

Examples:

1. Increase 800 by 20%

$$\textbf{New amount} := \ 100\% + 20\% \ of \ old \ amount$$
$$= \ 120\% \times 800$$
$$= \frac{120}{100} \times 800$$
$$= \underline{960}$$

2. Increase 800 pupils by 12 ½ %:

$$New \ number \ = \ 100\% + 12\ ½\ \% \ of \ old \ number$$
$$= \ 112\ ½\ \% \ of \ 800 \ pupils$$
$$= \frac{225\%}{2} \times 800 \ pupils$$
$$= \frac{225}{2} \div 100 \times 800$$
$$= \frac{225}{2} \times \frac{1}{100} \times 800$$
$$= (225 \ x \ 4) \ pupils$$
$$= \underline{900 \ pupils}$$

3. **Increase the following as instructed**
   - **90 by 15%**
   - **400 by 60%**
   - **Sh.20,000 by 20% by 30%**

Mathematics is the Key

$$Percentage\ increase\ = \frac{increase}{old\ no.} \times 100\%$$

Examples:

1. By what percentage will 480 be increased to become 540?

Old number = 480
New number = 540
Increase = 540 – 480
= 60

Percentage increase:

$\frac{60^{1}}{480_{8}}$ **x 100%**

$\frac{100\ \%}{8}$

12 ½ %

2. When 240 is increased, it becomes 288. Calculate the percentage increase

Old number = 240
New number = 288
increase = 288 – 240
= 48

Percentage increase = $\frac{48}{240} \times 100\%$

= 20%

3. The number of pupils in a school increased from 500 to 650 in just one term. Calculate the percentage increase
4. Mary's salary increased from sh.400,000 by sh.50,000. Calculate her percentage increase.

Mathematics is the Key

SUB TOPIC: FINDING THE ORIGINAL NUMBER AFTER %age INCREASE

Examples:

1. What amount of money when increased by 20% becomes Sh.1440?

$$\textbf{Let the amount be } x.$$
$$\textbf{New amount } = (100\% + 20) \textit{ of } x$$
$$120\% \times x = sh.1440$$
$$\frac{120\,x}{100} = sh.1440$$
$$10 \times \frac{12x}{10} = sh.1440\ x\ 10$$
$$12x = sh.14400$$
$$\frac{12x}{12} = \frac{sh.14400}{12}$$
$$\underline{x = sh.1,200}$$

2. The number of pupils in a class increased by 10% to 44 pupils. Find the number of pupils before the increase.
3. What number becomes 10400 when increased by 30%?

SUB TOPIC: DECREASING QUANTITIES USING PERCENTAGES

1. Decrease sh. 1,500 by 10%

$$\textbf{New amount as percentage}$$
$$100\% - 10\% = 90\%$$
$$\textbf{New amount}: = 90\% \textit{ of } sh.1500$$
$$\frac{90}{100} \times sh.1500$$
$$90 \times 15$$
$$\underline{sh.1350}$$

2. Decrease 720 dollar a by $33\frac{1}{3}\%$

$$\textbf{New percentage} = 100\% - 33\frac{1}{3}\% = 66\frac{2}{3}\%$$
$$\textbf{New amount} = 66\frac{2}{3}\% \textit{ of } 720\ dollars$$
$$\frac{200}{3}\% \textit{ of } 720\ dollars$$
$$\frac{200}{3} \times \frac{1}{100} \times 720\ dollars$$
$$2 \times 240\ dollars$$
$$\underline{480\ dollars}$$

Mathematics is the Key

Decrease the following as instructed

(a) 800 by 15%
(b) 200 goats by 20%
(c) 480 pupils by 40%
(d) Sh.200,000 by 5% then 30%

SUB TOPIC: FINDING PERCENTAGE DECREASE

$$\textbf{Percentage decrease} = \frac{\textbf{decrease}}{\textbf{old no.}} \times 100\%$$

Examples:

1. When 240 is decreased, it becomes 192. Calculate the percentage decrease.

$\textbf{Old number} = 240$
$\textbf{New number} = 192$
$\textbf{Decrease} = 240 - 192$
$= 48$

Percentage decrease $= \frac{48}{240} \times 100\%$

= 20%

2. By what percentage will 540 be decreased to become 480?

$\textbf{Old number} = 540$
$\textbf{New number} = 480$
$\textbf{decrease} = 540 - 480$
$= 60$

Percentage increase:

$$\frac{\cancel{60}^{1}}{\cancel{540}_{9}} \times 100\%$$

$$\frac{100}{9}\%$$

$11\frac{1}{9}\%$

3. The number of pupils in a school decreased from 500 to 650 in just one term. Calculate the percentage increase
4. Mary's salary decreased from sh.4,000,000 by sh.500,000. Calculate her percentage decrease.

Mathematics is the Key

SUB TOPIC: FINIDNG THE ORIGINAL NUMBER AFTER THE DECREASE

Examples:

1. A worker's salary was decreased by 35% to sh.1560.

$$\textbf{Let the old salary be } x.$$
$$\textbf{New salary} = (100\% - 35\%) \textit{ of } x$$
$$1560 = \frac{65x}{100}$$
$$1560 \times 100 = \frac{65x}{100} \times 100$$
$$\frac{\cancel{65}\, x}{\cancel{65}} = \frac{1560 \times 100}{65}$$
$$\underline{x = shs.\,2400}$$

2. What number when decreased by 25% becomes 30,000?
3. What amount of money becomes sh.sh.7,200 when decreased by 10%?

SUB TOPIC: PERCENTAGE PROFIT

$$\textbf{Percentage profit} = \frac{profit}{CP} \times 100\%$$
$$\boldsymbol{PROFIT = SP - CP}$$

Examples:

1. An article was bought at sh.100,000 and sold at sh.120,000. Calculate the percentage profit.

$$Cost\ price = sh.100{,}000$$
$$Selling\ price = sh.120{,}000$$
$$Profit = 120{,}000 - 100{,}000$$
$$= 20{,}000$$
$$\textbf{Percentage profit}$$
$$\frac{sh.20{,}000}{sh.100{,}000} \times 100\%$$
$$\frac{2}{10} \times 100\%$$
$$2 \times 10$$
$$\underline{20\%}$$

2. Alison bought a hankie at sh.1,600 and later sold it at sh.2,000. Find his percentage profit.
3. A man sold a goat at sh. 120,000 making a profit of sh.20,000. Calculate his percentage profit.
4. Moses bought a shirt for sh.6,000 and sold it making a profit of sh.2,000.
   (a) Find his selling price.
   (b) Find his percentage profit.

Mathematics is the Key

SUB TOPIC: PERCENTAGE LOSS

$$Percentage\ loss\ = \frac{loss}{CP} \times 100\%$$

$$LOSS = CP - SP$$

1. I bought a radio at sh.100,000 but I was forced to sell it at sh.80,000. Find my percentage loss.

$Buying\ price\ = sh.100,000$

$Selling\ price\ = sh.80,000$

$Loss\ = BP - SP$

$sh.100,000 - sh.80,000$

$sh.20,000$

$Percentage\ loss$:

$$\frac{loss}{CP} \times 100\%$$

$$\frac{20,000}{100,000} \times 100\%$$

$$\frac{100\%}{5} = 20\%$$

2. Kakuru bought a book for sh.5,000 and sold it for sh.4,500. Calculate his percentage loss.
3. Mugisha sold a rabbit for sh.15,000 making a loss of sh.4,000.calculate his percentage loss.
4. Mercy bought a blouse for sh.15,000 and sold it at a loss of sh.3,000.
   (a) At what price did he sell the blouse?
   (b) Find her percentage loss

SUB TOPIC: Finding SP when percentage profit/loss and CP are given

REMEMBER

- **The cost price (CP) is the old number.**
- **The selling price(SP) is the new number.**
- **When given percentage increase(%ge profit), increase the old number(CP) to get the new number(SP).**

$$If\ the\ \%ge\ profit\ is\ k\%$$

$$\frac{100\% + k\%}{100} \times CP = SP$$

Mathematics is the Key

- **When given percentage decrease(%ge loss), decrease the old number(CP) to get the new number(SP).**

$$\boldsymbol{If\ the\ \%ge\ loss\ is\ m\%}$$
$$\boldsymbol{\frac{100\% - m\%}{100} \times CP = SP}$$

Examples

1. After selling a shirt which he bought at sh.8,000, the shopkeeper made a profit of 20%. How much money did he sell the shirt?

   $\boldsymbol{SP = \frac{100 + 20}{100} \times sh.8,000}$

   $\boldsymbol{\frac{120}{100} \times sh.8,000}$

   $\boldsymbol{120 \times sh.80}$

   $\boldsymbol{\underline{sh.9,600}}$

2. James bought a goat at sh.120,000 and later sold it at a loss of 10%, how much did he get after selling the goat?

   $\boldsymbol{SP = \frac{100 - 10}{100} \times sh.120,000}$

   $\boldsymbol{\frac{90}{100} \times sh.120,000}$

   $\boldsymbol{90 \times sh.1,200}$

   $\boldsymbol{\underline{sh.108,s000}}$

3. A skirt was bought at sh.10,000. How much was it sold if a profit of 20% was raised?
4. After selling a tray of eggs, a farmer made a profit of 5%. At what price did he sell the tray of eggs if the cost price of the tray of eggs is sh.9,000?
5. Ashraf bought a phone for sh.200,000. If he sold it at a loss of 15%, how much did he sell the phone?

Mathematics is the Key

SUB TOPIC: Finding CP when percentage profit and SP are given

Examples:

1. After selling a pair of shoes at sh. 21,000, a trader made a profit of 20%. Find the buying price of the pair of shoes.

$Cost\ price\ as\ a\ percentage\ = 100\%$

$Selling\ price\ as\ a\ percentage\ = 100\% + 20\% = 120\%$

$\mathbf{120\%\ represents\ = sh.21,000}$

$\mathbf{1\%\ represents\ = \frac{shs.21000}{120}}$

$\mathbf{100\%\ represents\ = \frac{shs.700}{4} \times 100}$

$= (25 \times 700)$

$\underline{= shs.17,500}$

2. By selling a blanket at sh. 36000, a trader made a profit of 20%. Calculate the cost price of the blanket
3. By selling a radio at sh. 66,000, Amos got a profit of 10%. Find the cost price of the radio.

SUB TOPIC: Finding CP when percentage loss and SP are given

1. By selling his cow at sh. 34,000, Obala made a loss of 15%. At what price had he bought the cow?

Loss = 15%

CP = 100%

SP = 100% - 15%

= 85%

85% of CP = shs.34,000

$\frac{85}{100}\ cp = shs.34,000$

$\cancel{100} \times \frac{85cp}{\cancel{100}} = shs.34,000 \times 100$

$85cp = shs.3,400,000$

$\frac{85cp}{85} = \frac{shs.3,400,000}{85}$

CP = shs.40,000

2. .A dealer sold a bicycle for sh. 45000 making a loss of 10%.
   (a) Calculate the original price of the bicycle.
   (b) How much did he lose?
3. A man made a loss of 20% after selling a sheep for sh.16,000. Find the cost price of the sheep.

Mathematics is the Key

Terms used

- **PRINCIPAL:**
  Money borrowed, money banked and money lent .
- **RATE:**
- **TIME:**
- **SIMPLE INTEREST:**
- **AMOUNT:**

$$SIMPLE\ INTEREST = PRINCIPAL \times RATE \times TIME$$
$$SI = P \times R \times T$$
$$AMOUNT = PRINCIPAL + SI$$

Example:

1. A man deposited sh.40,000 for 5 years at a simple interest rate of 2% per year.
   (a) Calculate his simple interest.

$$SI = PTR$$
$$= 40,000 \times 5 \times 2\ \%$$
$$= 40,000 \times 5 \times \frac{2}{100}$$
$$= 400 \times 5 \times 2$$
$$= 400 \times 10$$
$$= shs\ 4,000$$

   (b) Find the total amount after 5 year

$$Amount = Principle + Interest$$
$$shs\ (40,000 + 4,000)$$
$$shs\ (44,000)$$

7. Calculate the simple interest on sh.8000 for 2yrs at 10% per annum
8. Calculate the simple interest on sh.24000 for 8 months at simple interest rate of 15% per year.
9. Calculate the simple interest on sh. 24000 for 8 months at a simple interest rate of 2% per month.

Mathematics is the Key

SUB TOPIC: FINDING INTEREST RATE

Example:

1. Calculate the rate of interest if shs 30,000 can yield a simple interest of shs 1,125 in 9 months.

$$PTR = SI$$

$$\frac{shs.30,000}{1} \times \frac{9}{12} \times \frac{R}{100} = shs, 1, 125$$

$$\frac{shs.2700R}{12} = Shs. 1, 125$$

$$12 \times \frac{shs.2700R}{12} = shs. 1, 125 \times 12$$

$$shs. 2700R = shs. 1, 125 \times 12$$

$$\frac{\cancel{shs.2700R}}{\cancel{shs.2700}} = \frac{\cancel{shs.}13,\cancel{500}}{\cancel{shs.}2\cancel{700}}$$

$$R = 5\%$$

2. Nabifo deposited sh.50000 on her saving s account. At the end of 3yrs the simple interest earned was sh.15000. Calculate the rate of interest.

REFERENCE

A New MK Primary Mathematics Bk 7 Pg 138 - 139

SUB TOPIC: CALCULATING PRINCIPAL

Example:

1. What principal will yield shs 6,000 at 5% per year for 3 years?

SI = 6000
R = 5% per year
T = 3 years
P x R x T = Simple interest

$$P \times \frac{5}{100} \times 3 = 6000$$

$$\frac{15P}{100} = 6000$$

$$100 \times \frac{15P}{100} = 6000 \times 100$$

$$\frac{15P}{15} = \frac{600,000}{15}$$

P = shs.40,000

Principal = shs.40,000

Mathematics is the Key

2. A farmer borrowed money at 12 ½ per year. After 2 years, a simple interest of shs 8,000 was paid. Find the amount borrowed.

Solution:

SI = shs.8,000
T = 2 years
R = 12 ½ %
$P = \frac{SI \times 100}{R \times T}$
$P = shs.\frac{8,000 \times 100}{12\frac{1}{2} \times 2}$
$P = shs.800,000 \div \frac{25}{2} \times 2$
$P = shs.\frac{800,000}{25}$
P = shs.32,000
Principal = shs.32,000

3. Ali borrowed money from a bank that offers a 10% p.a rate for 4 years. If he paid sh.32,000 after 4 years. How much did he borrow?
4. What sum of money will yield sh.4,800 in 4 years at 3% p.a?

REFERENCE
A New MK Primary Mathematics Bk 7 Pg 140

SUB TOPIC: CALCULATING TIME

Example:

1. In what time will shs 12,000 yield an interest of shs 1,800 at 5% per year.

P x T x R = SI
SI = 1800=
P = 12,000
R = 5%
P x R x T = SI
$12,000 \times \frac{5}{100} \times T = shs.1800$
$\frac{600}{600} T = \frac{\cancel{1800}^{3}}{\cancel{600}_{1}}$
T = 3 years

2. How long will sh.48,000 take to yield sh.5400 at 15% per year?

P = sh.48,000
R = 15% per year
SI = sh.5400
P x R x T = SI
$Shs.48,000 \times \frac{15}{100} \times T = sh.5400$
shs.480 x 15T = shs.5400
$shs.\frac{7200T}{7200} = \frac{shs.5400}{shs.7200}$
T = ¾ years
$= (\frac{3}{4} \times 12)$
= 9 months

3. **How long will sh.48,000 take to yield sh.7,200 at a rate of 5% per year?**

REFERENCE
A New MK Primary Mathematics Bk 7 Pg 142

Mathematics is the Key

TOPICAL EXERCISE ON FRACTIONS

1. Name the types of fractions and give an example on each.
2. Divide: $^{2}/_{3} \div {}^{1}/_{3}$
3. Simplify: ½ - ¼ - $^{1}/_{3}$
4. Salim's bicycle got spoilt after he had covered a distance of 20km which was ¼ of his journey. How long was the journey?
5. In a class of 120 pupils, the ratio of girls to boys is 4:2. Find the number of boys.
6. Work out: ¼ + $^{3}/_{5}$.
7. Simplify: $\frac{0.27 \times 0.06}{0.9 \times 0.3}$
8. Work out: ¼ - $^{1}/_{8}$
9. Otim had 30km still to cover after traveling 3/5 of the journey. How was the journey?
10. Simplify: ½ ÷ ¼
11. Subtract: ½ - ¼
12. In Sir Apollo Schools, ¾ of the pupils who sat for the Primary Leaving Examination passed.
    (a) If those who failed were 30, find the number of pupils who passed.
    (b) What percentage of pupils failed the examination?
13. $^{2}/_{3} - ½$
14. Add: 35.7 + 0.35
15. A bus broke down after covering 5/7 of the journey. The remaining distance to complete the journey was 140km. How long was the whole journey?
16. Divide: 4.2 ÷ 0.03
17. Add: 4.05 + 11.4 + 2.36
18. Usamah spent ¼ of his salary on food, 1/3 of the remainder on debts and saved shs 3,600= .
    (a) How much did he spend on paying debts?
    (b) What are his earnings per month?
19. Arrange in ascending order: ½, ¾, 0.03 and 2/3.
20. The cost of 4 rules is shs 800. What is the cost of 6 similar rulers?
21. 5 handkerchiefs take 30 minutes to dry when exposed to the sunshine. How long will 12 handkerchiefs take to dry if exposed to the same sunshine?
22. 12 men can build a classroom in 5 days.
    (a) How many men are needed to do the whole job in 1 day?
    (b) How long will 10 men take to do the job?

FRACTIONS (PERCENTAGES) TOPICAL QUESTIONS:

1. Express 2:5 as a percentage.
2. Change 0.8 as a percentage
3. Express 66.6% as a fraction to the lowest terms.
4. Express 40cm as a percentage of 2M.
5. What is 10% of 2200 pencils?
6. A bag of cement cost shs 5,600. How much will it cost after a 30% increase?

Mathematics is the Key

7. Asiimwe deposited shs 50,000 in Uganda Commercial Bank which offers an interest of 30% per year. How much money will Asiimwe have in the Bank after six months?
8. Okello bought a car at shs 2,500,000 and sold it to Otim at a profit of 20%. Otim then sold it to Tumwine at a loss of 15%. How much did Tumwine pay for the car?
9. If 280 is increased by x it become 392. Find the value of x.
10. Decrease 65kg by 5.
11. A farmer has the following animals:
    Chicken = 30
    Goats = 35
    Sheep = 15
    Rabbits = 10
    What percentage of the total animals are rabbits.
12. Mugisha bought about at shs 200,000 and sold it as shs 180,000 what was his percentage loss?
13. (a) Okello's wage was increased by 10% to shs 77,000 per month. Find his salary?
    (b) If his new wage of shs 77,000 was decreased by 5%, find his final wage.
14. A man spent 20% of his salary on food, 10% on transport, 40% on medical care and the rest on rent.
    (i) Find the percentage of his salary spent on rent.
    (ii) How much does he spend on medical care if he earns 800,000 as his salary?
    (iii) How much more is spent o food than transport?
15. Fatuma had shs 5,000 if she used 10% of her money to buy soap what was her balance?
16. The cost price of a 50kg bag of sugar is shs 45,000. At what price must he sell each kilogram in order to make a profit of 20%.
17. Kakeeto bought three bags of soya beans at shs. 21,000 each. If each bag weighed 70kg and sold each kg at shs 250.
    (a) Calculate his percentage gain or loss.
    (b) At what price must he sell each kg in order to make a profit of 20%?

Mathematics is the Key

DATA HANDLING

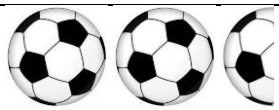
SUB TOPIC: PICTO GRAPHS(review)

Definition:

A picto graph is where we use pictures to represent quantities of actual items.

Example:

The graph below shows the number of balls that were given to different schools.

Upper P/s	
Rukondo P/S	
Lower P/s	
Star Parents' P/s	
Rukungiri P/s	

Given that  stands for 80 balls.

(a) How many more balls did Rukungiri p/s get than Rukondo p/s?

$\mathbf{5-1=4}\ \boldsymbol{pictures}$

$\mathbf{4\times 80}$

$\underline{\mathbf{320}\ \boldsymbol{more\ balls}}$

(b) Which schools had the same number of balls?

Star Parents' Primary School and Upper Primary School

(c) Find the total number of balls that were given out to the five schools.

$\mathbf{16\frac{1}{2}\times 80}$

$\mathbf{\frac{33}{2}\times 80}$

$\mathbf{33\times 40}$

$\mathbf{1320}\boldsymbol{balls}$

Mathematics is the Key

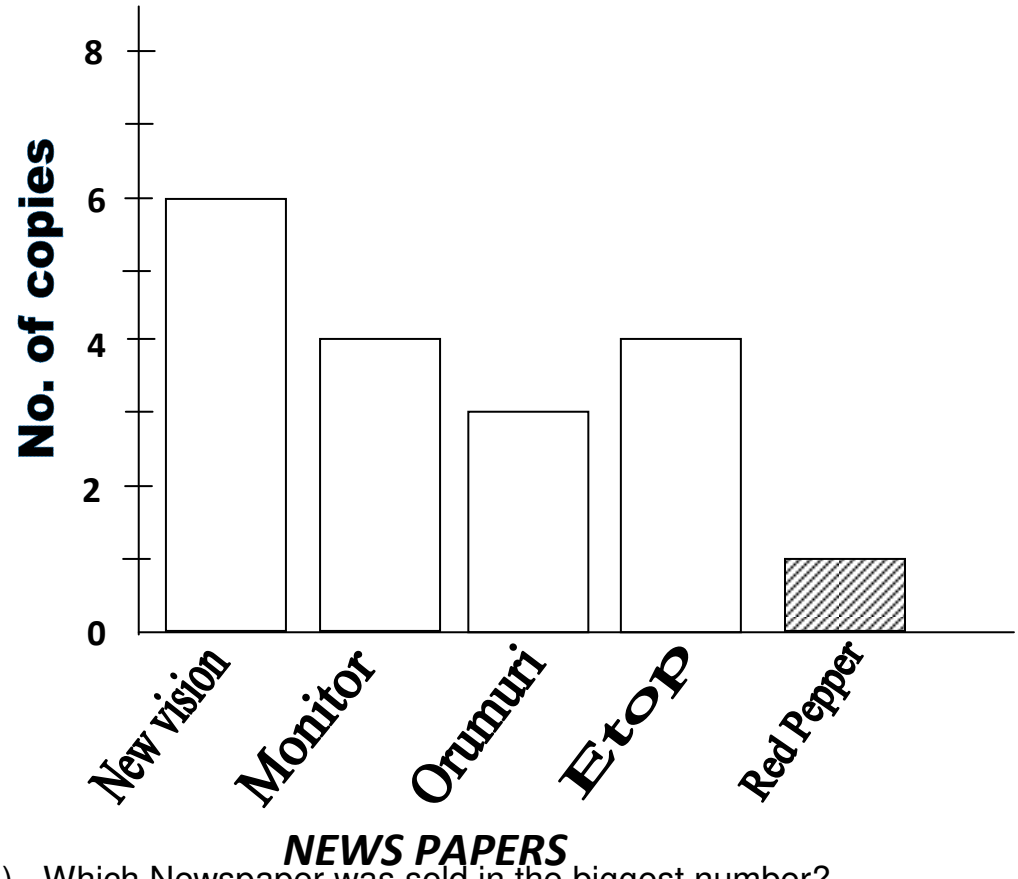
(d) Calculate the average number of books that were distributed to the five schools.

$$Average = \frac{sum\ of\ items}{number\ of\ items}$$
$$= \frac{1320}{5}$$
$$= 265\ balls$$

SUB TOPIC: BAR GRAPHS(review)

Example:

The bar graph represents the copies of Newspapers which were sold to the Education Manager's office on a certain day. Use it to answer the questions that follow:



(a) Which Newspaper was sold in the biggest number?
New vision

(b) How many copies were sold altogether?
6 + 4 + 3 + 4 + 1
18 copies

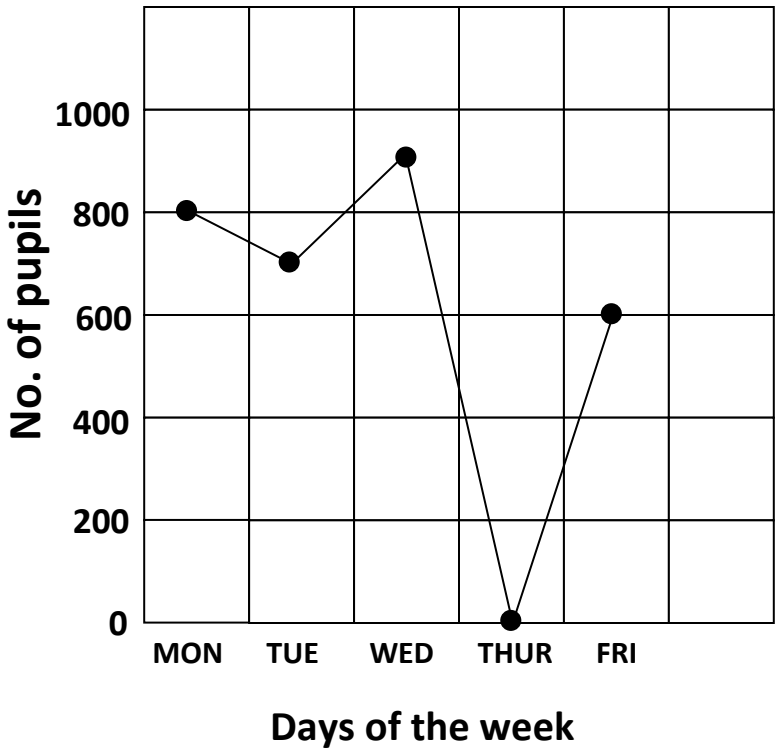
(c) Which newspaper was sold in the least number ?
Red pepper

(d) How many more copies of New Vision were sold than the Red Pepper?
6 – 1 = 5 more copies

Mathematics is the Key

Example 1:

The graph represents the schools' daily attendance for a week. Use the information on the graph to make a table showing the daily attendance.



Questions

(i) On which day was the attendance high?

$\boldsymbol{On\ Wednesday}$

(ii) On which day was the attendance 600?

$\boldsymbol{On\ Friday}$

(iii) How many pupils attended on Tuesday?

$\boldsymbol{700\ pupils}$

(iv) What was the average attendance that week?

$$\boldsymbol{Average} = \frac{\boldsymbol{sum\ of\ items}}{\boldsymbol{number\ of\ items}}$$

$$= \frac{800 + 700 + 900 + 0 + 600}{5}$$

$$= \frac{3000}{5}$$

$$= \boldsymbol{600\ pupils}$$

(v) How many more pupils attended on Wednesday than Tuesday?

$\boldsymbol{900 - 700 = 200\ more\ pupils}$

Mathematics is the Key

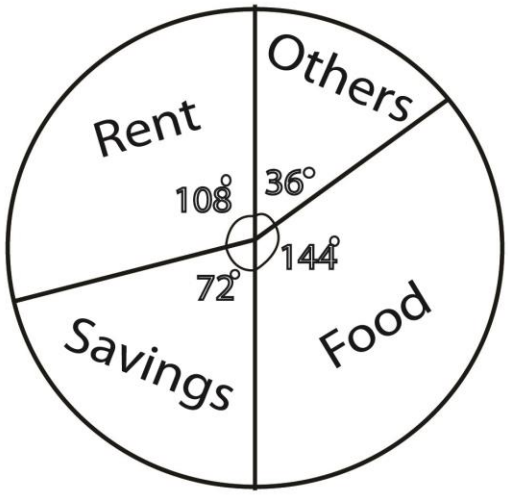
SUB TOPIC: **PIE CHARTS INVOLVING DEGREES**

REMEMBER:

Angles in all sectors of a pie chart add up to $360°$

Example:

1. The pie chart below shows the monthly expenditure and savings of Mr. Mugisha who earns sh.72,000



(a) How much does he spend on each item?

Savings

$\frac{72°}{360°} \times sh.72,000$

$72 \times sh.200$

Sh.14,400

Rent

$\frac{108°}{360°} \times sh.72,000$

$108 \times sh.200$

Sh.21600

Food

$\frac{144°}{360°} \times sh.72,000$

$144 \times sh.200$

Sh.28,800

Others

$\frac{36°}{360°} \times sh.72,000$

Sh.7,200

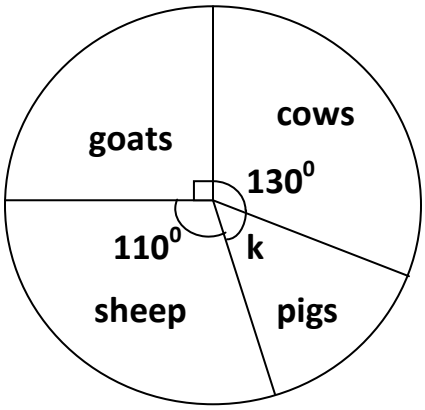
(b) Change the sector angle for others and percentages.

$\frac{36°}{360°} \times 100\%$

10%

Mathematics is the Key

2. The pie chart below shows how 72 animals are distributed on Mr. Kato's farm. Use it to answer the questions that follow.



(a) Find the value of k

$$\mathbf{k + 110° + 130° + 90° = 360°}$$
$$\mathbf{k + 330° = 360°}$$
$$\mathbf{k + 330° - 330° = 360° - 330°}$$
$$\underline{\underline{\mathbf{k = 30°}}}$$

(b) How many cows are on the farm?

$$\frac{\mathbf{130°}}{\mathbf{360°}} \times \mathbf{72}$$
$$\frac{\mathbf{13}}{\mathbf{36}} \times \mathbf{72}$$
$$\mathbf{13 \times 2}$$
$$\mathbf{26\ cows}$$

(c) How many more sheep than goats are on the farm?

$$\mathbf{110° - 90° = 20°}$$
$$\frac{\mathbf{20°}}{\mathbf{360°}} \times \mathbf{72}$$
$$\frac{\mathbf{2}}{\mathbf{36}} \times \mathbf{72}$$
$$\mathbf{2 \times 2}$$
$$\mathbf{4}\ \boldsymbol{more\ sheep}$$

(d) Express the sector angle for goats as a percentage.

$$\frac{\mathbf{90°}}{\mathbf{360°}} \times \mathbf{100\%}$$
$$\frac{\mathbf{1}}{\mathbf{4}} \times \mathbf{100\%}$$
$$\mathbf{25\%}$$

Mathematics is the Key

(e) What is the ratio of cows to pigs?

$$\frac{130^\circ}{30^\circ} = \frac{13}{3}$$

$$\underline{13:3}$$

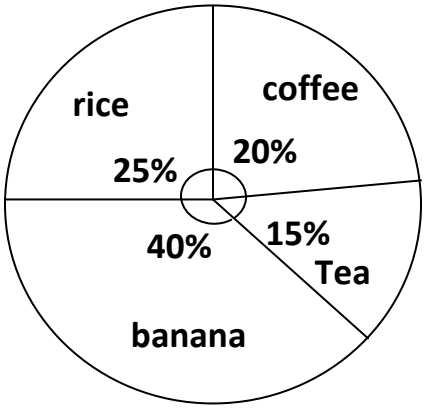
SUB TOPIC: PIE CHARTS INVOLVING PERCENTAGES

REMEMBER:

Percentages in all sectors of the pie chart add up to 100%

Examples

1. Study the pie chart below which shows how 60 acres of land were cultivated



a. What area of the land was used for Tea planting?

$$\frac{15}{100} \times 60\ acres$$

$$\frac{3}{2} \times 6$$

$$3 \times 3$$

$$\underline{9\ acres}$$

b. What area of the land was used for coffee planting?

$$\frac{20}{100} \times 60\ acres$$

$$2 \times 6$$

$$\underline{12\ acres}$$

c. What area of the land was used for rice planting?

$$\frac{25}{100} \times 60\ acres$$

$$\frac{5}{2} \times 6$$

$$5 \times 3$$

$$\underline{15\ acres}$$

Mathematics is the Key

d. Express the area of land for banana planting as a fraction

$\frac{40}{100}$

$\frac{4}{10}$

$\frac{2}{5}$

e. How many more acres of land were used for banana planting than tea planting?

$40\% - 15\% = 25\%$

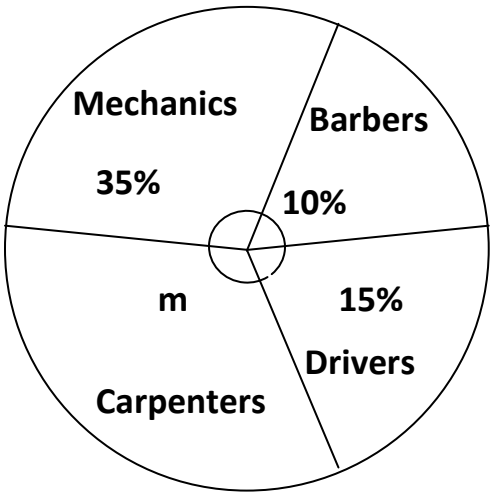
$\frac{25}{100} \times 60\ acres$

$\frac{5}{2} \times 6$

5×3

$15\ more\ acres$

2. The pie chart below shows how the COVID-19 task force of a certain district shared 40,000kg of posho flour to different groups of people who were stopped from working. Use it to answer the questions that follow.



a. Find the value of m

$$m + 10\% + 35\% + 15\% = 100\%$$
$$m + 60\% = 100\%$$
$$m + 60\% - 60\% = 100\% - 60\%$$
$$m = 40\%$$

Mathematics is the Key

b. How many kilograms of posho were given to drivers?

$$\frac{15}{100} \times 40,000\text{kg}$$
$$15 \times 400\text{kg}$$
$$60,00\text{kg}$$

c. How many more kilograms of posho were given to carpenters than barbers?

$$40\% - 10\% = 30\%$$
$$\frac{30}{100} \times 40,000kg$$
$$30 \times 400$$
$$12,000kg$$

d. What is the ratio of the mechanics' share to the total share?

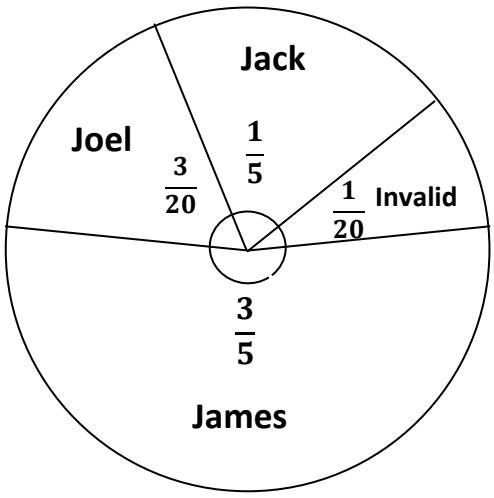
$$\frac{35}{100}$$
$$\frac{7}{20}$$
$$7:20$$

SUB TOPIC: PIE CHARTS INVOLVING FRACTIONS

REMEMBER:

Fractions in all the sectors add up to 1 whole.

1. The pie chart below shows how three boys got their votes in Boona fm p/s given that 720 votes were cast altogether. Use it to answer the questions that follow.



(a) How many votes did James get?

$$\frac{3}{5} \times 720$$
$$3 \times 144$$
$$432\ votes$$

Mathematics is the Key

(b) How many votes did Jack get?

$$\frac{1}{5} \times 720$$
$$1 \times 144$$
$$144\ votes$$

(c) How many votes were invalid?

$$\frac{1}{20} \times 720$$
$$1 \times 36$$
$$36\ votes$$

(d) How many more votes did James get than Joel?

$$\underline{Joel}$$
$$\frac{3}{20} \times 720$$
$$3 \times 36$$
$$108\ votes$$

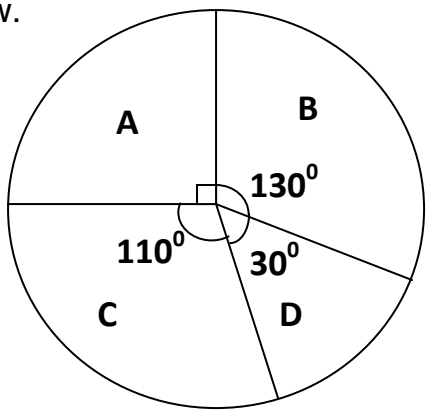
$$\underline{432\ votes - 108\ votes = 324\ more\ votes}$$

(e) Who won the election?

James

SUB TOPIC: SOLVING PROBLEMS INVOLVING PIE-CHARTS

1. Study the pie-chart below which shows the number of COVID-19 testing kits that were distributed in different countries in 2020 and use it to answer the questions that follow.



Mathematics is the Key

(a) How many kits were distribute altogether if country D got 15 million kits?

$$let\ the\ total\ number\ of\ kits\ be\ P$$
$$\frac{30^\circ}{360^\circ} \times P = 15,000,000$$
$$\frac{36}{3} \times \frac{3P}{36} = 15,000,000 \times \frac{36}{3}$$
$$P = 15,000,000 \times 12$$
$$\underline{P = 180,000,000\ kits}$$

(b) How many kits were distributed to country B?

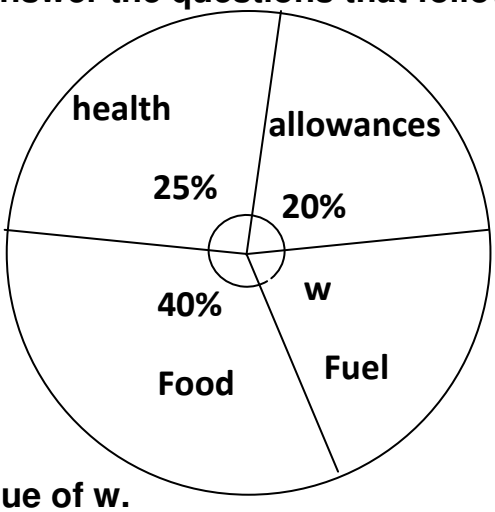
$$\frac{130^\circ}{360^\circ} \times 180,000,000\ kits$$
$$130 \times 500000$$
$$\underline{65,000,000\ kits}$$

(c) How many more kits were distributed to country C than country A?

$$110^\circ - 90^\circ = 20^\circ$$
$$\frac{20^\circ}{360^\circ} \times 180,000,000\ kits$$
$$20 \times 500000$$
$$\underline{10,000,000\ more\ kits}$$

Your turn

The pie chart below shows how the District COVID-19 task force distributed money. Use it to answer the questions that follow.



(a) Find the value of w.
(b) Find the total amount of money distributed if sh.60m was given the health sector.
(c) Find the amount of money for food?
(d) How much money was paid to the workers as allowances?
(e) Express the amount of money for fuel as a fraction.

Mathematics is the Key

SUB TOPIC: CONSTRUCTION OF PIE-CHARTS

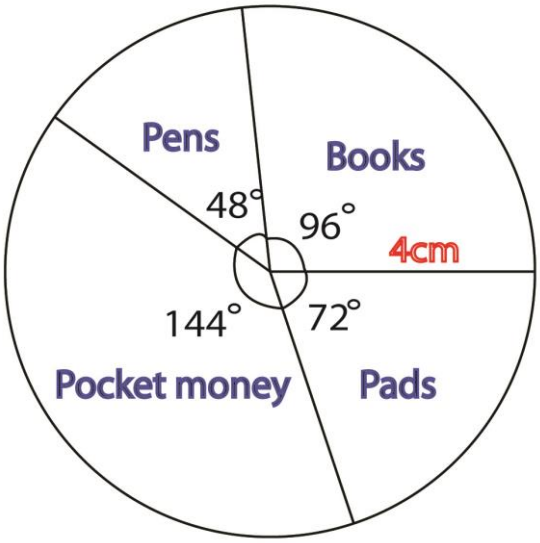
The table below shows how Allen spent her money on the first day of the term

Item	Money
Books	sh.8,000
Pens	Sh.4,000
Pads	Sh.6,000
Pocket money	Sh.12,000

Construct a pie chart using a radius of 3.5cm showing the above information

$$Total: sh.8,000 + sh.4,000 + sh.6,000 + 12,000 = sh.30,000$$

Books	Pens	Pads	Pocket money
$\frac{sh.8,000}{sh.30,000} \times 360°$	$\frac{sh.4000}{sh.30,000} \times 360°$	$\frac{sh.6000}{sh.30,000} \times 360°$	$\frac{sh.12000}{sh.30,000} \times 360°$
$8 \times 12°$	$4 \times 12°$	$6 \times 12°$	$12 \times 12°$
$96°$	$48°$	$72°$	$144°$



$$check$$
$$96° + 48° + 72° + 144° = 360°$$

Try these

1. On Adam's farm there are 9 goats, 6 cows, 3 pigs and 7 sheep. Using a radius of 4 cm, construct an accurate pie chart.
2. Father shared his land as follows

   $\frac{1}{3}$ *to the first born*

   $\frac{2}{9}$ *to the second born*

   $\frac{1}{9}$ *to the last born*

   The rest to the wife

   Use the information to construct a pie chart
3. In a certain town, 40% of the population are Baganda, 10% are Basoga, 30% are Bagisu and the rest are Acholi. Draw an accurate pie-chart for the above information

Mathematics is the Key

4. Nambooze spends her monthly salary as follows ;
   sh. 12,000 on school fees
   sh. 6000 on transport and
   sh. 18,000 on food
   Draw an accurate pie chart for this information

SUB TOPIC: Measures of central tendency and range (STATISTICS)

NOTE THESE:

- **Mode**
  The most frequent value in an observation.
- **Model frequency**
  The number of times the mode appear.
- **Median**
  This is the middle number got after arranging in either ascending or descending order.
- **Mean / Average**
  The measure of central tendency of a set of values computed by dividing the sum of the values by their number.
- **Range**
  The difference between the smallest and the largest observation in a sample
- **Frequency**
  The number of times an event appears in an experiment.

Example:

1. Amuza scored the following marks in MID term exams

$$SST - 60$$
$$MTC - 85$$
$$ENG - 82$$
$$SCI - 60$$
$$RE - 53$$

(a) Calculate his mode

Marks	Freq
85	1
82	1
60	2
53	1

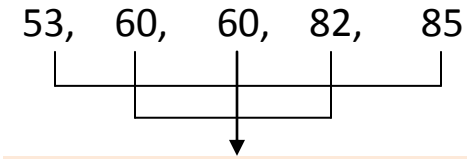
$\boldsymbol{Mode = 60}$

(b) Find his range

$$\boldsymbol{Range = H - L}$$
$$\boldsymbol{= 85 - 53}$$
$$\boldsymbol{= 32}$$

Mathematics is the Key

(c) What is his median mark?



$Median = 60$

(d) Find his mean mark

$$\boldsymbol{Mean} = \frac{\boldsymbol{sum\ of\ items}}{\boldsymbol{no.\ of\ items}}$$

$$= \frac{\mathbf{53 + 60 + 60 + 82 + 85}}{\mathbf{5}}$$

$$= \frac{\mathbf{340}}{\mathbf{5}}$$

$$= \mathbf{68}$$

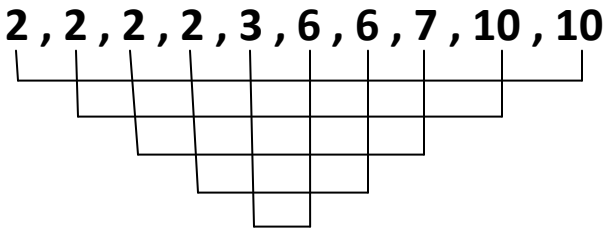
2. The table below represents the goals scored by different teams.

Goals scored	2	3	6	7	10
Number of teams	4	1	2	1	2

(a) Find the mode.
2 goals

(b) What was the modal frequency?
4

(c) Calculate the median



Median = $\frac{\mathbf{3+6}}{\mathbf{2}}$

$= \frac{\mathbf{9}}{\mathbf{2}}$

= 4.5

Mathematics is the Key

(d) Calculate the mean

$$Mean = \frac{SI}{NI}$$
$$= \frac{2\times4+3+6\times2+7+10+10}{4+1+2+1+2}$$
$$= \frac{50}{10}$$
$$= 5$$

3. Find the medium of the following scores 3, 1, 2, 0, 6, 1, 4
4. The table below shows the performance of pupils in a P.7 class in mathematics exam.

Marks	100	90	80	70	60	50	40	30
Freq	0	2	1	1	6	4	4	2

(a).How many pupils are in P.7 class?
(b).What was the highest mark obtained in this exam?
(c).Workout the range
(d)Calculate the average mark.

SUB TOPIC: COMPLEX AVERAGE/INVERSE OF AVERAGE

Examples

1. The average weight of 7 boys is 32kg.find their total weight

$$\boldsymbol{Mean = \frac{Total}{Number\ of\ boys}}$$
$$\boldsymbol{Total\ weight = Mean \times number\ of\ boys}$$
$$\boldsymbol{= 32 \times 7}$$
$$\boldsymbol{= 224\ kg}$$

2. The average of 10 numbers is 16. Find their total

$$\boldsymbol{Mean = \frac{Total}{Number}}$$
$$\boldsymbol{Total = Mean \times number}$$
$$\boldsymbol{= 16 \times 10}$$
$$\boldsymbol{= 160\ years}$$

3. The average mark of Gideon in 4 exams is 82. Find his total mark.
4. The mean age of 5 girls is 13 years. Find their total age.
5. What is the total weight of 12 children if their average weight is 27kg.
6. Calculate the total height of 8 pupils if their average height is 115cm.

Mathematics is the Key

Examples

1. The average of 4 boys in a group is 12 years. A young boy of 7 years joined the group. Find the average age of the 5 boys.

$$Mean = \frac{Total}{Number\ of\ boys}$$

$$Total\ age = Mean\ age \times number\ of\ boys$$
$$= 12 \times 4$$
$$= \underline{48\ years}$$

$$Mean\ age\ of\ 5\ boys = \frac{Sum\ of\ ages}{Number\ of\ boys}$$
$$= \frac{48 + 7}{5}$$
$$= 55$$
$$= 11\ years$$

2. The average of weight of 6 pupils is 30kg. when the teacher joins them, their average becomes 36kg. Find the weight of the teacher.

$$\underline{total\ weight\ of\ 6\ pupils}$$
$$Total\ weight = Mean \times number$$
$$= 30 \times 6$$
$$= \underline{180\ kg}$$

$$\underline{Total\ weight\ of\ 6\ pupils\ and\ the\ teacher}$$
$$Total\ weight = Mean \times number$$
$$= 36 \times 7$$
$$= \underline{252\ kg}$$

$$\underline{weight\ of\ the\ teacher}$$
$$252kg - 180kg = 72kg$$

Try these

1. The average mark of 36 pupils in a class is 5. Two pupils whose marks are 20 and 24 leave the group. Find the average mark of the remaining pupils.
2. The mean age of 5 children is 12years, if a sixth child joins them, the mean age becomes 11years, find the age of the 6th child.
3. The average weight of 6pupils is 40kg; the average weight of other 4 pupils is 30kg. Find the average weight of all the pupils

Mathematics is the key

3. The table below shows the marks obtained by some pupils in a test. Use the information to answer the questions that follow.

Marks	40	m	60	70
Number of pupils	2	6	3	3

If the mean mark is 55, find the value of m

$$\boldsymbol{Mean = \frac{sum\ of\ items}{number\ of\ items}}$$

$$\frac{40 \times 2 + m \times 6 + 60 \times 3 + 70 \times 3}{2 + 6 + 3 + 3} = 55$$

$$\frac{80 + 6m + 180 + 210}{14} = 55$$

$$14 \times \frac{6m + 470}{14} = 55 \times 14$$

$$6m + 470 = 770$$

$$6m + 470 - 470 = 770 - 470$$

$$6m = 300$$

$$\frac{6m}{6} = \frac{300}{6}$$

$$\underline{m = 50}$$

Example 3

The mean of y + 1, 5 and y is 6. Find the value of y.

$$\frac{(y + 1) + 5 + y}{3} = 6$$

$$\frac{y + y + 5}{3} = 6$$

$$3 \times \frac{2y + 6}{3} = 6 \times 3$$

$$2y + 6 = 6 \times 3$$

$$2y + 6 - 6 = 18 - 6$$

$$\frac{2y}{2} = \frac{12}{2}$$

$$\underline{y = 6}$$

Try these

1. The table below represents the goals scored by different teams.

Goals scored	2	3	k	7	10
No. of teams	4	1	2	1	2

Mathematics is the Key

(a) Find the value of k if thee mean number of goals is 5
(b) Find the modal number of goals.
(c) What was the modal frequency?
(d) Calculate the median

2. The average of a, a-7, 3 and 2a is 8.Find the value of a.

SUB TOPIC: PROBABILITY

Probability is a measure of the likelihood of an event happening. Probability ranges from 0 to 1

REMEMBER

Probability of zero (0) means that there is no chance at all.
Probability that is less than a half means that it is a bad chance.
Probability that is a half means that the chances are 50 50.
Probability that is greater than a half means that it is a good chance.
Probability of one (1) means that you have all chances

Probability= $\frac{number\ of\ events}{sample\ space}$

Example: A basket has 2 ripe mangoes and 6 row mangoes. What is the probability of Twaha picking a ripe mango at random?

: $Probability = \frac{number\ of\ events}{sample\ space}$

$n(E) = 2$

$Total\ chances\ (SS) = 2 + 6 = 8$

$Probability = \frac{2}{8}$

Try these

1. What is the probability that a baby will be produced by a pregnant mother?
2. The probability that peter will pass his examinations is $\frac{2}{7}$. What is the probability that he will not pass his examinations?
3. In a tin there are 30 blue and red pens. If the probability of picking a red pen is $\frac{3}{5}$, how many red pens are in the tin?
4. In a football match a team will either win, draw or lose a game.

(a) What is the probability that a team wins the game?
(b) Find the probability that a team draws the match.
(c) What is the probability of a team losing a match?

Mathematics is the Key

Example 1:

If a coin is tossed once, what is the probability of getting a head on the top?

$$\boldsymbol{Total\ chances} = \{\boldsymbol{H}, \boldsymbol{T}\}$$

$$\boldsymbol{Number\ of\ possible\ outcomes(SS)} = \boldsymbol{2}$$

$$\boldsymbol{Expected\ out\ comes} = \{\boldsymbol{H}\}$$

$$\boldsymbol{n(E)} = \boldsymbol{1}$$

$$\boldsymbol{Probability} = \frac{\boldsymbol{n(E)}}{\boldsymbol{SS}}$$

$$= \tfrac{1}{2}$$

Example 2:

When a die is rolled once, what is the probability of getting an even number on top?

$$Probability\ space = \{all\ expected\ out\ comes\}$$

$$\{1, 2, 3, 4, 5, 6\}$$

$$(s.s) = 6$$

$$Expected\ outcomes = \{all\ desired\ chances\}$$

$$(E) = \{2, 4, 6\}$$

$$n(E) = 3$$

$$\boldsymbol{Probability} = \frac{\boldsymbol{n(E)}}{\boldsymbol{SS}} = \frac{\boldsymbol{3}}{\boldsymbol{6}}$$

Try these

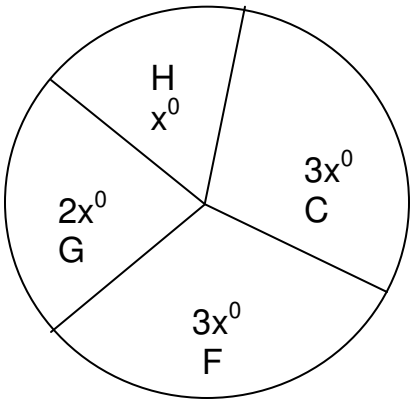
1. A coin is tossed once. What is the probability of getting ;
   (a) A head on top
   (b) A tail on top
   (c) A head or a tail on top
2. A dice is tossed once. What is the probability of getting;
   (a). an even number on top.
   (b). a prime number on top.
   (c). a number less than five on top

Mathematics is the Key

TOPICAL EXERCISE ON GRAPHS

1. Hamisa kept the following daily record of the number of people who visited their home in a week: 3, 5, 3, 2, 0, 3, 5. Find the mean.
2. A die is rolled once. What is the probability that a composite number will show on top?
3. The average height of Peter, James and John is 51cm. If the height of Peter is 53cm and that of James is 46cm Find the height of John.
4. Mary kept the following record of rainfall in centimeters 4, 3, 6, 5, 3, 0. Find the mode.
5. A FOOT BALL TEAM CAN WIN, DRAW OR LOSE A Match. What is the probability that it will win a Match?
6. The mean of the scores: 8, 7, 6, 5, (a – 5) is 6
   (a) Find the value of a.
   (b) Find the range of the scores.
7. Sumaya scored the following marks in her homework exercises: 2, 5, 7, 3, 10, 4, 7, 11, 8, 3
   (a) Find her median mark
   (b) Find the mean mark
   (c) Find the probability that Sumaya scored a mark above her mean mark
8. Find the mean of x, 4, 2x, 6 and 2x.
9. What number is mid way of ½ and 1/3?
10. The average of 3, 5, 4, 7, 9, 5 and y is 5. Find:
    (a) the value of y
    (b) the median
    (c) the mode

11. The pie chart below shows how a farmer has divided his land. C is for cash crops, G is for grazing, F is for food crops and for other purposes . The land available is 720 hectares.



   (a) How many hectares are left for grazing?
   (b) If he pays rent of sh. 20,000 per hectare per year, how much will he pay for land reserved for cash crops?

Mathematics is the Key

12. In a Mathematics test given to a class, the marks scored frequency and total marks scored are shown in the table below.

Marks scored	Frequency	Total marks
4	4	16
_____	9	45
6	_____	84
7	8	_____
9	5	45

(a) Complete the table
(b) What was the mode?
(c) How many pupils were in the class?
(d) What was the average mark scored?

13. Study the frequency table and answer the questions that follow:

Marks scored	20	40	70	50
No. of children	2	3	1	1

(a) How many pupils did the test?
(b) Find their mean mark.
(c) Calculate their median mark.
(d) What was the modal mark.
(e) Workout the range

MONEY

SUB TOPIC: Shopping lists

Example

1. A mother had a twenty thousand shilling note and bought the following items.
1 ½ kg of beans at shs.3,000 per kg.
500g of salt at sh. 2,600 each kg.
2 bars of soap at sh.8,000
12 tomatoes at sh.800 for every 4 tomatoes
(a) How much did she spend altogether?

Mathematics is the Key

Beans	Salt	Soap	Total exp.
$1\frac{1}{2}kg \times sh.3{,}000$ $\frac{3}{2} \times sh.3{,}000$ $3 \times sh.1{,}500$ $sh.4{,}500$	$1kg = 1000g$ $\frac{500}{1000} \times$ sh. 2,600 $50 \times sh.26$ $sh.1{,}300$	$sh.8{,}000$ **Tomatoes** $\frac{12}{4} \times sh.800$ $3 \times sh.800$ $sh.2{,}400$	$sh.4{,}500$ $sh.1{,}300$ $sh.8{,}000$ $+sh.2{,}400$ $sh.16{,}200$

(b) Find her change

$Change = Money\ at\ hand - Total\ expenditure$

$= \boldsymbol{sh.20{,}000 - sh.16{,}200}$

$= \boldsymbol{sh.3{,}800}$

Activity

1. During the COVID-19 pandemic, a lady bought the following items.

   $3\ bottles\ of\ sanitizers\ at\ sh.5{,}000@\ bottle$

   $6\ bars\ of\ soap\ at\ sh.4{,}000@bar$

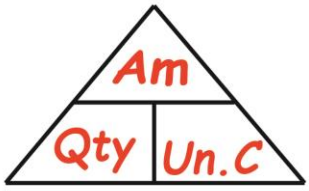
   $12\ face\ masks\ at\ sh.2{,}500\ each$

   $A\ box\ of\ gloves\ at\ sh.12{,}000$

   (a) How much money was spent altogether?

   (b) If she went with 2-fifty shilling notes, calculate her change.

SUB TOPIC: Completing table bills



$Amount = Qty \times Un.C$

$Qty = \frac{Amount}{Un.C}$

$Un.C = \frac{Amount}{Qty}$

1. **Study the shopping table below which shows how Alvas bought items for the birthday party and use it to answer the questions**

Item	*Quantity*	*Unit cost*	*Amount*
Sugar	*2kg*	*Sh.3,600*	*Sh.7,200*
Rice	*4kg*	*Sh. 3,000*	*Sh.12,000*
Meat	$1\frac{1}{2}kg$	*Sh.12,000*	*Sh.18,000*
Cooking oil	*500ml*	*Sh.5,000@litre*	*Sh.2,500*
Total expenditure			*Sh.49,700*

Mathematics is the Key

(a) Complete the table

Sugar

$2 \times sh.3{,}600 = sh.7{,}200$

rice

$sh.12{,}000 \div 4$

$= sh.3{,}000$

meat

$sh.18{,}000 \div 1\frac{1}{2}$

$sh.18{,}000 \div \frac{3}{2}$

$sh.18{,}000 \times \frac{2}{3}$

$sh.6{,}000 \times 2$

$sh.12{,}000$

Cooking oil

$\frac{500}{1000} \times sh.sh.5{,}000$

$sh.500 \times 5$

$sh.2{,}500$

(b) Find the change given that he went with sh.50,000.

$\boldsymbol{sh.50{,}000 - sh.49{,}700 = sh.300}$

2. Complete the shopping table below

Item	*Quantity*	*Unit cost*	*Amount*
Books	*5*	*Sh.2,000*	*Sh._____*
Pens	_____	*Sh. 700*	*Sh.6,300*
pencils	*half dozen*	*Sh.4,500@doz*	*Sh._____*
Reams	*2*	*Sh._____*	*Sh.50,000*
Total expenditure			*Sh._____*

SUB TOPIC: CURRENCY (comparison of currencies)

Below are some of the countries with their currency

COUNTRY	***CURRENCY***
Burundi	*Burundi francs (BF)*
Zambia	*Kwacha (Kch)*
Zimbabwe	*Zimbabwe Dollar (Z$)*
German	*Deutsch mark (DM)*
Egypt	*Egyptian pound*
America	*US Dollar(US$)*
Britain	*GB pound(£)*
Kenya	*Kenya shillings (Ksh)*
Tanzania	*Tanzania shilling (TZ sh)*
Rwanda	*Rwanda francs (RF)*

Mathematics is the Key

Examples

1. Given that

$1US\$ = Ugsh.3{,}700$

$1\ TZ\ sh. = Ugsh.2.2$

$1ksh = ugsh.$

a) How much in Uganda shillings is equivalent to $20 plus Tzsh. 30,00?

$\mathbf{1US\$ = Ugsh.3{,}700}$

$\mathbf{Ugsh\ 3{,}700 \times 20}$

$\mathbf{Ugsh\ 74{,}000}$

$\mathbf{1\ TZsh = Ugsh\ 2.2}$

$\mathbf{TZ\ shs\ 30{,}000 = Ush.\frac{22}{10} \times 30{,}000}$

i. $\mathbf{= Ush.66{,}000}$

Total Uganda currency

$\mathbf{Ugsh\ 74{,}000}$

$\mathbf{+\ Ugsh\ 66{,}000}$

$\mathbf{Ush.140{,}000}$

b) Kizito works with the Tanzania high commission and his monthly salary is Ugsh.33,000. What is his salary in Tanzania currency?

$\mathbf{Ugsh.2.2 = TZsh1}$

$\mathbf{33{,}000 \div 2.2}$

$\mathbf{33000 \div \frac{22}{10}}$

$\mathbf{33000 \times \frac{10}{22}}$

$\mathbf{3000 \times 5}$

$\mathbf{TZsh.15{,}000}$

c) A trader sold maize to Kenya for K sh. 150,000. How much money did he get in Uganda shillings given that 1 ksh. = Ugsh.20

$\mathbf{Ksh\ 1\ equivalent\ to\ U\ sh\ 20}$

$\mathbf{Ugsh.20 \times 150{,}000}$

$\mathbf{Ugshs\ 3{,}000{,}000}$

d) Musiime exported coffee to USA and earned US$ 25,000. He also exported maize to Kenya and earned K shs 500,000.Calculate his total earning in Uganda currency.

e) Convert £ 37,000 to Uganda shillings.

f) Mr Santu Daniel went to the Forex Bureau with Ugsh. 207200. How much in US$ did he get in exchange.

g) Convert GBP ____ to Kenya shillings.

Mathematics is the key

1. The table below shows the rates at which different currencies are bought and sold.

CURRENCY	BUYING(UGX)	SELLING(UGX)
1 US dollar	3600	3650
1 Euro	4000	4020
1 Rwa. franc	4.0	5.0

(a) How many Euros did Musa get for ugsh.603,000?

$1\ Euro\ =\ Ugsh.4{,}020$

$\boldsymbol{Ugsh.603,000}$

$\boldsymbol{Ugsh.4,020}$

60300

402

150 *Euros*

(b) Amiina came from Rwanda with 111,000 Rwandese francs and exchanged them for us dollars. How many US dollars did she get from the bank?

Rwanda francs to Ugsh

$1\ Franc\ =\ Ugsh.4$

$111{,}000\ \times\ 4$

$Ugsh.444{,}000$

Ugsh to US dollars

$Ugsh.3700\ =\ 1US\ dollar$

$Ugsh.444{,}000$

$Ugsh.3700$

4440

37

$120\ US\ dollars$

Activity

1. **The table below shows how money is bought and sold in a Barclays bank in Uganda shillings.**

CURRENCY	BUYING(UGX)	SELLING(UGX)
1 US dollar	3700	3750
1 ksh	18	20
1 *Pound* (£)	4500	4650

(a) How much money in UG shillings can one get with ;

i. 125 US dollars?

ii. 5000 Kenya shillings?

iii. 789 Pounds?

(b) How much money in US dollars can one get from UGSH.3562500?

(c) How many Kenya shillings are equivalent to 780 Pounds?

Mathematics is the Key

SUB TOPIC: Bank notes

Examples

1. Bank notes in a bundle are numbered from $AM\ 0024354$ to $AM\ 0024453$. How many notes are in that bundle?

$$\begin{array}{r} \boldsymbol{Last\ note - first\ note} \\ \boldsymbol{AM\ 0024453} \\ \underline{\boldsymbol{-AM0024354}} \\ \boldsymbol{99} \end{array}$$

$$\boldsymbol{99 + 1 = 100\ notes}$$

2. A bundle of bank notes are numbered from $KQ\ 1234567$ to $KQ\ 1234636$

(a) How many bank notes are in the bundle?

$$\begin{array}{r} \boldsymbol{Last\ note - first\ note} \\ \boldsymbol{KQ1234636} \\ \underline{\boldsymbol{-KQ1234567}} \\ \boldsymbol{49} \end{array}$$

$$\boldsymbol{49 + 1 = 50\ notes}$$

(b) How much money is contained in the bundle if it contains five thousand shilling notes?

$$\begin{array}{r} \boldsymbol{sh.\,5,000 \times 50} \\ \underline{\boldsymbol{sh.\,250,000}} \end{array}$$

3. **How many notes are in a bundle of notes numbered from;**
   - **(a) CG1994489 to CG1994588**
   - **(b) DU9951653 to DU9951702**
   - **(c) WG7207450 to WG7207550**
4. **Fifty thousand uganda shilling notes are numbered from BW5275381 to BW5275430. How much money is contained in this bundle?**
5. **A bundle of one thousand bank notes contains 100 bank notes. If the last note is numbered FM3450718;**
   - **(a) Find the number for the first note.**
   - **(b) How much money is contained in the bundle?**

Mathematics is the Key

DISTANCE, SPEED AND TIME

- Revision about conversion of time

SUB TOPIC: Conversion of 12 hour time to 24 hour time

Example

1. Change 2:00am to 24 hour clock

2:00am
+00:00
02 00 hrs

2. Change 8:30pm to 24 hour lock

8:30 pm
+12:00
20 30 hrs

NOTE:

12 noon and 12 mid night is special time which means that we just state the answer as shown below.

12:30 am = 00:30 hrs

12:30 pm = 12:30hrs

3. Change the following time to 24hour clock.

(a) 5:30am
(b) 4:18pm
(c) 12:12am
(d) 12:19pm
(e) 11:11pm

REFERENCE

A New MK Primary Mathematics 2000 Bk 7 Pg 412 (New Edition)

SUB TOPIC: Changing 24 hour clock to 12 hour clock

Example

1. Write 0436 hrs in the 12-hour clock

04 36 hrs
- 00 00
4:36 am

2. Write 2340 hrs in the 12-hour clock time

23 40hrs
-12 00
11:40 pm

3. Write 1245hrs in 12 hour clock

1245hrs = 12:45 pm

4. Write 0045hrs in 12 hour clock

0045hrs = 12:45hrs

Mathematics is the Key

5. **Write the following time in 12 hour clock.**

(a) $0319hrs$

(b) $1529hrs$

(c) $1256hrs$

(d) $0013hrs$

(e) $1943hrs$

SUB TOPIC: Finding duration

$$Duration = Ending\ time - Starting\ time$$
$$Duration = ET - ST$$

Example

1. A lesson started at 8:30 am and ended at 11:00 am. How long did the lesson take?

11:00 am
- 8:30 am
2:30

2hours 30minutes

$2\frac{30}{60}\text{hours} = 2\frac{1}{2}\ hours$

2. A bus left Nairobi at 1315 hours and arrived in Kampala at 1630 hrs. How long did the journey take?

1630 hrs
- 1315 hrs
3 15

3hours 15minutes

$3\frac{15}{60}\ \text{hours} = 3\frac{1}{4}\ \text{hours}$

3. A party started at 2000hrs and ended at 11:30pm. How long did the party last? (Express 11:30pm in 24 hr-clock)

11:30pm
+12:00hrs
2330hrs

200hrs
-2000hrs
3:30

The party lasted for 3 hours and 30 minutes.

4. A baby slept at 10:00pm and woke up at 3:30 am. How long did the baby sleep?

10:00pm to 12:00 mid night
12:00
+10:00
2:00

Total time
2:00
+ 3:30
5:30

The baby slept for 5 hours 30 minutes

Mathematics is the Key

5. A man started his journey at 6:35am and reached the destination at 10:00am.how long did the journey take?
6. A motorist left town A at 11:00am and reached town B at 3:00pm. How long did he take to move from tow A to town B?
7. Jamil started digging at 6:50am and ended at 1000hrs. How long did he take digging?
8. How many hours are their between 8:00pm to 3:00am?

SUB TOPIC: More problems on duration

REMEMBER

$$Duration = ET - ST$$
$$ET = ST + Duration$$
$$ST = ED - Duration$$

Examples

1. A 45 minute lesson ended at 5:20pm. At what time did the lesson start?

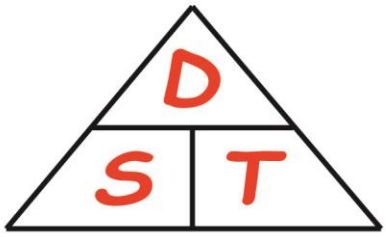
$$ST = ET - Duration$$
$$5{:}20pm$$
$$-00{:}45$$
$$4{:}35pm$$

2. Hope started the journey at 8:00am and took 1hr 30minutes. At what time did the journey end?

$$ED = ST + Duration$$
$$8{:}00am$$
$$+1{:}30$$
$$9{:}30am$$

3. A motorist moved for 3hours from town A to Town B. if he reached town B at 7:30 pm, at what time did he start the journey?
4. Mercy started revising at 5:45am and took $2\frac{1}{2}$ hours. At what time did he end the revisions?
5. A truck moved for 5 hours and reached the destination at 2:00am. At what time did he start the journey?

Mathematics is the Key



$$\text{Distance} = S \times T$$

$$\text{Speed} = \frac{D}{T}$$

$$\text{Time} = \frac{D}{S}$$

Distance is measured in km or m

Examples

1. Alex moved from town A to town B at a speed of 40km/hr for 2hours. How far is town A from town B?

$$\begin{aligned} \boldsymbol{D} &= \boldsymbol{S} \times \boldsymbol{T} \\ &= \frac{\boldsymbol{40km}}{\boldsymbol{hr}} \times \boldsymbol{2hrs} \\ &= \boldsymbol{40km} \times \boldsymbol{2} \\ &= \boldsymbol{80km} \end{aligned}$$

2. A car travelled for $2\frac{1}{2} hours$ at a speed of 80km/hr. How far did he move?

$$\begin{aligned} \boldsymbol{D} &= \boldsymbol{S} \times \boldsymbol{T} \\ &= \frac{\boldsymbol{80km}}{\boldsymbol{hr}} \times \boldsymbol{2}\frac{\boldsymbol{1}}{\boldsymbol{2}}\boldsymbol{hrs} \\ &= \boldsymbol{80km} \times \frac{\boldsymbol{5}}{\boldsymbol{2}} \\ &= \boldsymbol{40km} \times \boldsymbol{5} \\ &= \boldsymbol{200km} \end{aligned}$$

3. A bus travelled from town Q to town R for 6 hours at a speed of 65km/hr. What is the distance between town Q and R?
4. Allen moved from town Y at 4:30pm and reached town X at 5:00pm. If she was moving at a speed of 120km,
   (a) How long did he take travelling?
   (b) How far is town X from town Y?

Mathematics is the Key

SUB TOPIC: Finding Speed

The units for speed are km/hr or m/s

Examples

1. Kagoma takes 45 minutes to drive from home to town a distance of 30km. Calculate his speed in km/hr.

$$\boldsymbol{Speed = \frac{distance}{time}}$$
$$\boldsymbol{= 30km \div \frac{45}{60} hrs}$$
$$\boldsymbol{= 30km \times \frac{60}{45} hrs}$$
$$\boldsymbol{\underline{= 40km/hr}}$$

2. James covered a distance of 80km in just 2 hours. At what speed was he moving?
3. A bus moved for $2\frac{1}{2}$ hours from town A to town B. If the distance from town a to town b is 100km, find the speed at which the bus was moving.
4. Daniel covered 45km in only 45 minutes. Find his speed in km/hr.

SUB TOPIC: Finding Time

Examples

1. A driver covered 60km at a speed of 15km/hrs. How long did he take travelling?

$$\boldsymbol{Time = \frac{D}{S}}$$
$$\boldsymbol{Time = \frac{60km}{15km/hr}}$$
$$\boldsymbol{\underline{\underline{Time = 4\ hours}}}$$

2. A boy moved a distance of 180m at a speed of 2m/s. How many seconds did he take to cover the distance?

$$\boldsymbol{Time = \frac{D}{S}}$$
$$\boldsymbol{Time = \frac{180m}{2m/s}}$$
$$\boldsymbol{\underline{Time = 90seconds}}$$

3. Calculate the time taken to cover 80km at a speed of 20km/hr
4. Amon travelled from home to school at a speed of 80km/hr which is a distance of 120km. How long did he take to reach school?
5. A truck moving at 150km/hour covered a distance of 450km. how long did the journey take?

Mathematics is the Key

SUB TOPIC: Changing km/hr to m/s

Example

1. Change 90km/hr to m/s

$$90km/hr = \frac{90km}{1hr}$$
$$1km = 1000m$$
$$1hour = 3600s$$

$$= \frac{90 \times 1000}{1 \times 3600}$$
$$= 25\ m/s$$

2. Change the following as to m/s
   - **(a) 72km/hr**
   - **(b) 108km/hr**
   - **(c) 180km/hr**
   - **(d) 144km/hr**

REFERENCE

A New MK Primary Mathematics Bk 7 pg 331 (old edition)

SUB TOPIC: Changing m/s to km/hr

Example

1. Change 10m/s to km /hr

$$10m/s = \frac{10m}{1s}$$
$$1\ hour = 3600\ sec$$
$$1\ km = 1000m$$

$$10m/s = \frac{10 \div 1000}{1 \div 3600}$$
$$= \frac{10}{1000} \div \frac{1}{3600}$$
$$= \frac{10}{1000} \times \frac{3600}{1}$$
$$= 36\ km/hr$$

2. Convert the following m/s to km/hr
   - (a) $40m/s$
   - (b) $15\ m/s$
   - (c) $25m/s$
   - (d) $5m/s$

Mathematics is the Key

1. .Dungu travelled from town A to town B at a speed of 60km/hr for 3 hours. Then he went to town C from B at a speed of 80km/hr in $2hrs$. Calculate the average speed for the whole journey.

   Average speed = $\frac{TDC}{TTT}$

   Distance 1

   $D = S \times T$

   $= 60km/hr \times 3hrs$

   $= 60 \times 3km$

   $= 60 \times 3km$

   $= \underline{180km}$

   Distance 2

   $D = S \times T$

   $= 80km/hr \times 2hrs$

   $= 80 \times 2km$

   $= \underline{160km}$

   $TDC = 180km + 160km = 340km$

   $TTT = 2hrs + 3hrs = 5hrs$

   $$\textbf{Average speed} = \frac{340km}{5hrs}$$

   $$\underline{=68km/hr}$$

2. A bus driver left town **A** at 6:00am driving at an average speed of 30km/hr for 2 hours to town **B**. he stopped at **B** for 30minutes and then left for **C** driving at 60km/hr for $2\frac{1}{2}$hours.

   (a) Calculate his average speed.

   (b) At what time did he reach town C.

3. A bus driver left town **M** driving at an average speed of 70km/hr for 2 hours to town **N**. He stopped at **N** for an hour and then continued to town **Q** driving at 60 km/hr for 1hour**.** Calculate his average speed.

4. A bus driver left town **R** at 6:40am driving at an average speed of 25km/hr for 2 hours to town **S**. He stopped at **S** for an hour and then left for **T** driving at 30km/hr for 3hours. Calculate his average speed for the whole journey.

Mathematics is the Key

SUB TOPIC: School Time Table

Example:

1. Study the time table below for a P.6 class in Kyebando Primary School and answer the questions that follow.

From	8:30 am	9:10 am	9:50 Am	10:30 Am	11:10 Am	11:50 Am	12:30 pm	2:00 pm	2:40 pm
To	9:10 am	9:50 am	10:30 Am	11:10 Am	11:50 am	12:30 pm	2:00 pm	2:40 pm	3:20 pm
MON	***MTC***	***ENG***		***PAPE***	***PAPE***	***R.E***		***PAPE MDD***	***PAPE MDD***
TUE.	***SCI***	***MTC***		***R.E***	***R.E***	***ENG***		***SST***	***SST***
WED.	***SST***	***ENG***		***IPS***	***SCI***	***SCI***		***ENG***	***ENG***
THUR	***ENG***	***SCI***		***MTC***	***MTC***	***L.LAG***		***R.E***	***MTC***
FRI	***MTC***	***MTC***		***KISW***	***ENG***	***SCI***		***IPS***	***IPS***

(i) How long does each lesson last?

9:~~10~~[70]am ***(60 + 10) = 70 minutes***

-8:30 am

40

Each lesson lasts for 40 minutes

(i) At what time does break end?

10:30am

(iii) For how long do the pupils take studying Science the whole week?

5 lessons x 40 minutes = 200 minutes

SUB TOPIC: Taxi and bus time tables

Example

1. The table shows the departure and arrival time of a taxi at given stations. Study it and answer the questions that follow:

Station	Arrival	Depature
Tororo		6:00am
Iganga	7:30am	7:45am
Jinja	8:35am	8:50am
Kampala	10:50am	

Mathematics is the Key

(i) How long did the taxi take to move from Tororo to Iganda?

Time of arrival – Time of departure

7:30am
- 6:00am
1:30

It took 1 hour 30 minutes

(ii) How long was the taxis stopover in Jinja?

8:50am
- 8:35am **It was 15 minutes**
0:15

(ii) How long did the taxi take to move from Iganga to Kampala?

10 : 50 am
- 7 : 45 am
3 : 15

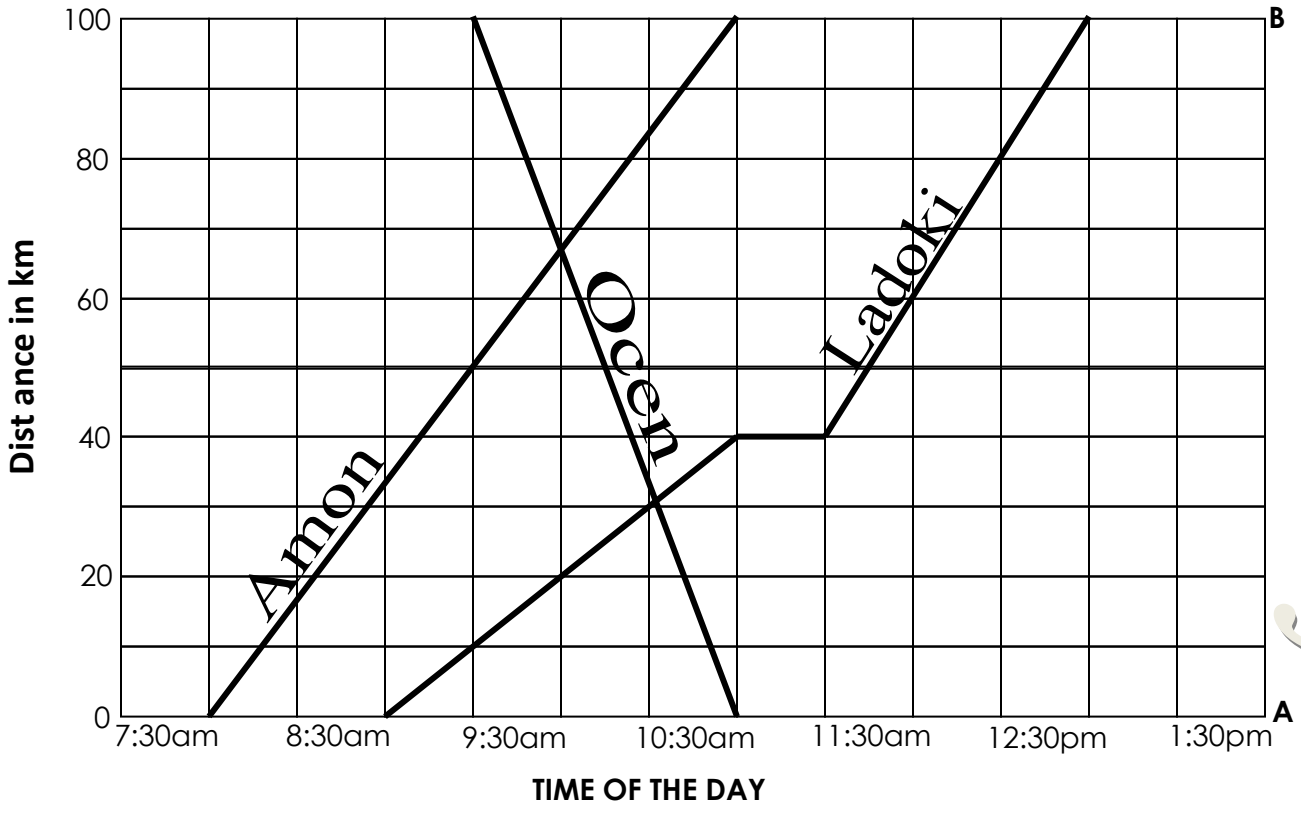
It took 3 hours and 15 minutes

SUB TOPIC: INTERPRETING TRAVEL GRAPHS (Distance Time graph)

A travel graph is one which shows the distance travelled in a period of time

Example1

The graph below shows 3 people who moved between town A and town B. Amon started from town A at 8:00 am to town B, Ladoki started the journey at 9:00am to town B and Ocen started the journey fom B at 9:30am to town A .



Mathematics is the Key

Questions

ii. What is the scale on the horizontal axis.?
One small square represents 30 minutes

iii. What is the scale on the vertical axis?
One small square represents 10 km

iv. Find the average speed for Ladoki.

$$\boldsymbol{Average\ speed} = \frac{\boldsymbol{TDC}}{\boldsymbol{TTT}}$$

$$\boldsymbol{TDC} = \boldsymbol{100\ km}$$

$$\boldsymbol{TTT} = \boldsymbol{4\ hours}$$

$$\boldsymbol{Average\ speed} = \frac{\boldsymbol{100km}}{\boldsymbol{4hrs}}$$

$$\underline{\underline{\boldsymbol{= 25\ km/hr}}}$$

v. How many hours did Amon take to complete her journey?
3hours

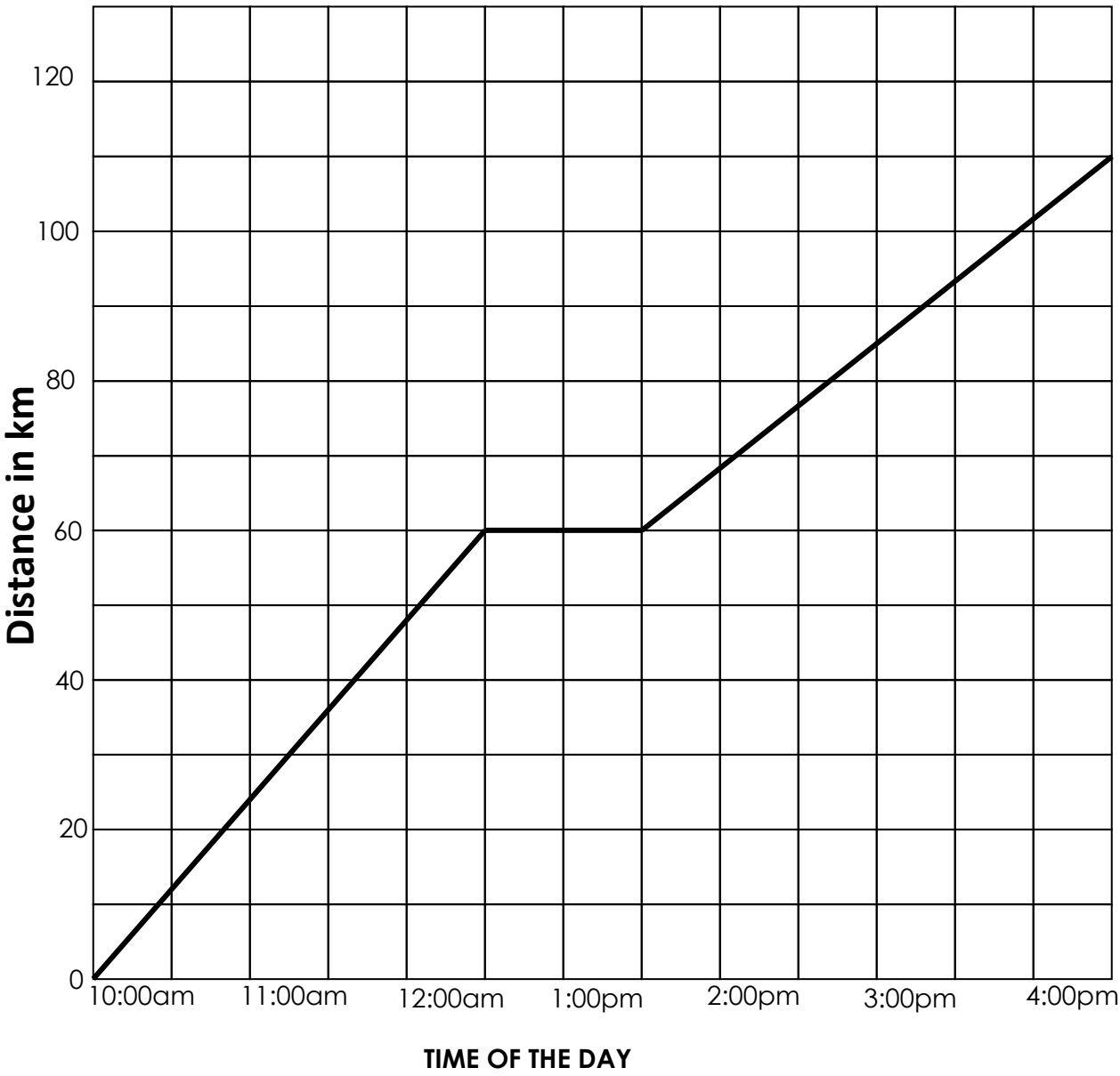
vi. At what time did Amon meet Ocen?
At 10:00am

vii. How many hours earlier did Amon arrive at town B before Ladoki?
2 hours

Mathematics is the Key

Example 2

The graph below shows how the driver moved from ASA town to OMU town via EKO town. Use it to answer the questions that follow.



Questions

a) What is the scale on the vertical axis?
1 small square represents 10km

b) What is the scale on the horizontal axis?
1 small square represents 30 minutes

c) At what time did he start the journey?
At 10:00am

d) At what time did he reach OMU?
At 4:30pm

e) How long did he take resting?
1 hour

Mathematics is the Key

f) How far is ASA from OMU?
110km

g) How long did he take to move from ASA to EKO?
2hours 30minutes

h) What is the distance from EKO to OMU?

i) At what speed was he moving from ASA to OMU?

j) Find his average speed for the whole journey.

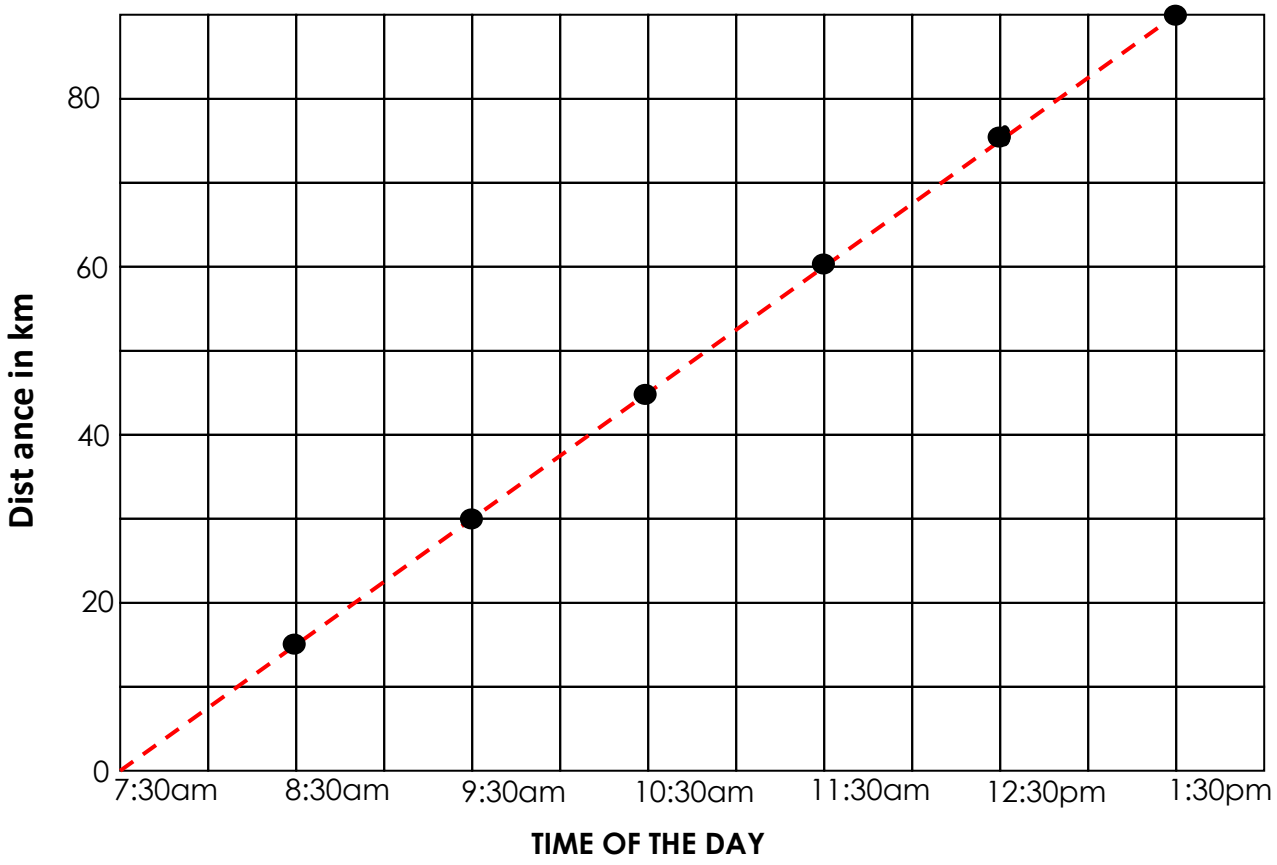
SUB TOPIC: DRAWING TRAVEL GRAPHS

Example1:

Mukasa covered a journey in 6 hours traveling at 15 K.P.H. Show the journey on the grid if he started the journey at 7:30am.

KM	0^{+15}	15km $^{+15}$	30km $^{+15}$	45km^{+15}	60km^{+15}	75km^{+15}	90km
Time	0^{+1}	1 hr $^{+1}$	2hrs $^{+1}$	3hrs^{+1}	4 hrs^{+1}	5hrs^{+1}	6hrs

A graph representing Mukasa's journey.



Example 2

Town M is 150km from town G. A motorcyclist started the journey from town M at 10:30am .He was travelling at a speed of 25km/hr for 2 hours. he rested for 30 minutes and then continued at a speed of 50km/hr for the rest of the journey to town G.

Mathematics is the Key

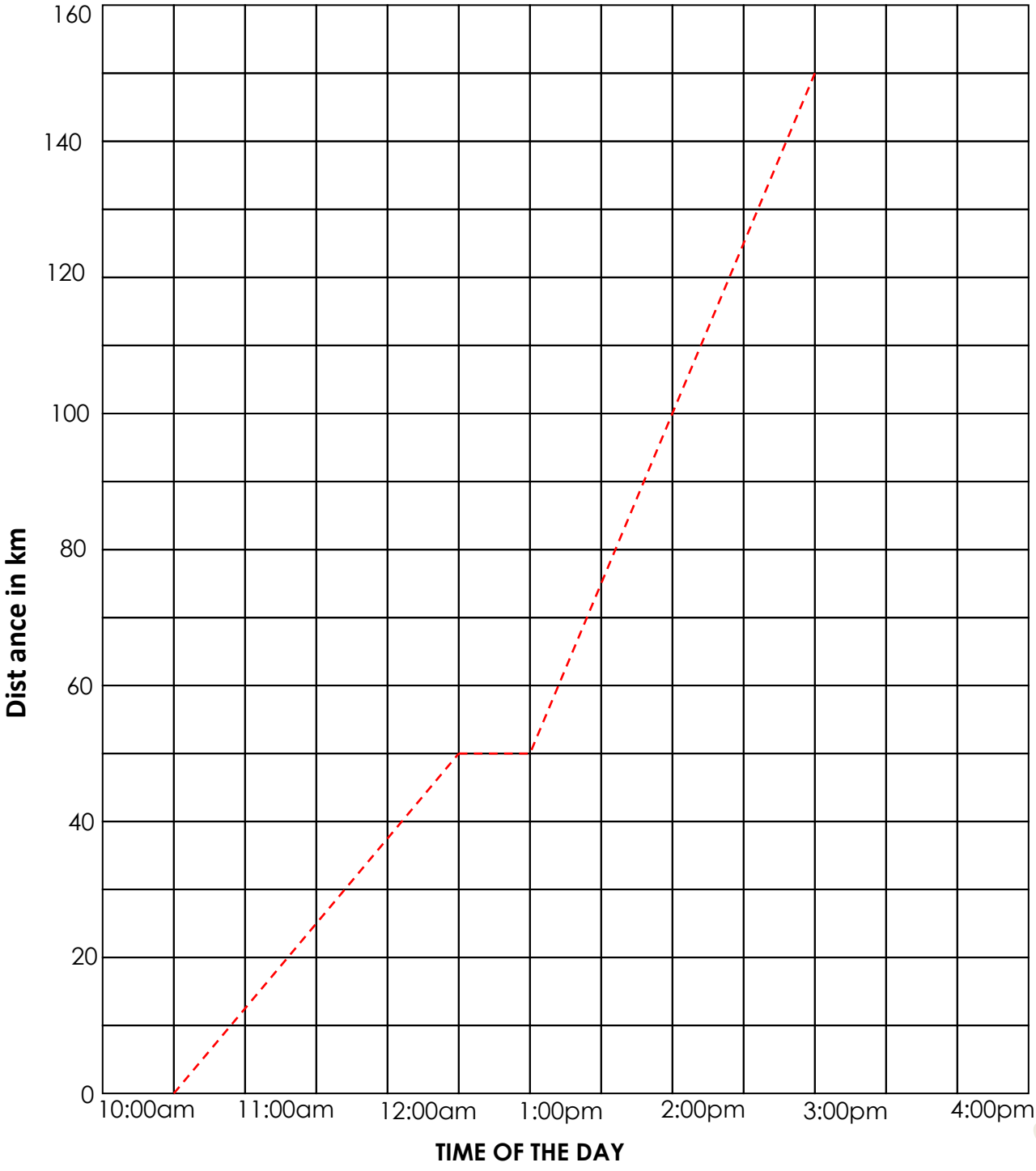
(a). ***Represent the motorcyclists journey on the graph below.***

Phase 1

Distance = S X T
= 25km/hr X 2hrs
=50 km

Phase 2

D = 150 km – 50 km =100 km
Time = 100km ÷ 50km/hr
= 2 hours



(b).At what time did he reach town G?

At 3:00 pm

Mathematics is the Key

1. Amson arrives at Kampala at 11:20pm and leaves at 2:00am to travel to Nairobi. She is due into Nairobi at 6:00am the following day. Unfortunately she is delayed and arrives at 9:30am.
   (a) How late is Amson in arriving at Nairobi?
   (b) For how long does Amson have to wait in Kampala?
   (c) At what time does Amson leave Kampala on the 24 – hour clock?
2. A lesson started at 10:30am and ended at 11:50 am. How long did the lesson last?
3. Convert 7200 seconds into hours.
4. Convert 1717 hours to a 12- hour clock.
5. Thieves escaped from the prisons at 12:15 am. Express this time in a 24-hour clock.
6. Convert 2 ½ hours to minutes.
7. It takes 4 hours for a bus traveling at 75 km/hr to move from town X to town y. Find the time taken by a bus traveling at 50km/hr to cover the same distance.
8. Express 90km/hr as m/sec.
9. Convert 10m/second to km/hour
10. A motorist covered 140km between 11:25 am and 2:55pm. Find his average speed.
11. A bus driver left town **A** at 6:00am driving at an average speed of 50km/hr for 3 hours
12. to town **B**. he stopped at **B** for 2hours and then left for **C** driving at 60km/hr for 1hour.
13. Calculate the average speed for the whole journey
14. The average speed of a car is 60km/hr for 30 minutes. What distance is covered?
15. A cyclist traveled from town P to R as follows. For 2 hours, he cycled from P to town Q a distance of 30km and then rested for 1 hour from Q. He continued for another 1 hour to town R at a speed of 40km/hr. Draw a travel graph to show his journey
16. .A school bus taking pupils to a Game park covered 75% of its journey in 1½ hours. The bus travelled at a steady speed of 80 kilometres per hour. Find how far the school is from the Game Park.

Mathematics is the Key

TERM III

LENGTH, MASS AND CAPACITY

SUB TOPIC: ***Comparing units/conversion of metric units(review)***

Examples:

Comparing metric units

Km	***Hm***	***Dm***	***Metre***	***dm***	***cm***	***mm***
Kg	***Hg***	***Dg***	***Gram***	***dg***	***Cg***	***mg***
Kl	***Hl***	***Dl***	***Litre***	***dl***	***Cl***	***Ml***

(a) Change 7m to millimetres

1m = 1000mm

7m = (7 x 1000m)

= 7000mm

(b). Change 800m to km

$$\mathbf{1000}\boldsymbol{m} = \mathbf{1}\boldsymbol{km}$$

$$\mathbf{800}\boldsymbol{m} = \frac{\mathbf{800}}{\mathbf{1000}}$$

$$= \frac{\mathbf{8}}{\mathbf{10}}$$

$$= \mathbf{0.8}\boldsymbol{km}$$

Convert the following as instructed

(a) 4km to metres

(b) 0.4 litres to milliliters

(c) 2000g to kg

(d) 50cm to m

Mathematics is the Key

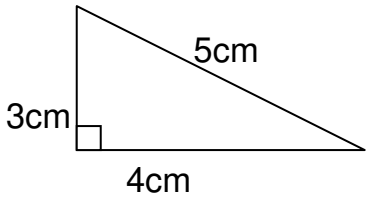
SUB TOPIC: Finding perimeter

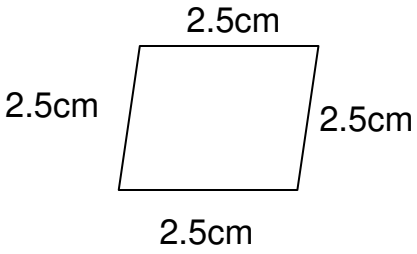
Perimeter is the total distance around the figure

Examples:

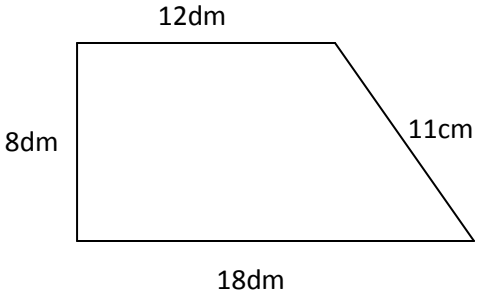
Find the distance (Perimeter) around the shapes given below:

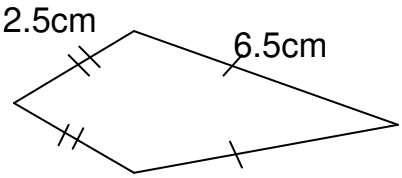
(i)





$$P = 4cm + 3cm + 5cm$$
$$= 7cm + 5cm$$
$$= 12cm$$





SUB TOPIC: FINDING AREA OF SIMPLE SHAPES

BASIC FORMULAE

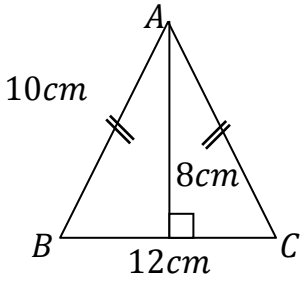
$SQUARE = S \times S$

$RECTANGLE = L \times W$

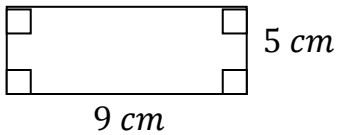
$TRIANGLE = \frac{1}{2}bh$

$TRAPEZIUM = \frac{1}{2}h(a+b)$

1. Find the area of the shapes below

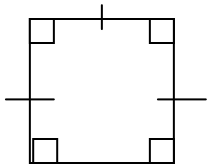


$$A = ½ \times b \times h$$
$$= ½ \times 12cm \times 8cm$$
$$= 6cm \times 8cm$$
$$A = 48cm^2$$



$$A = L \times W$$
$$= 9cm \times 5cm$$
$$= 45cm^2$$

Mathematics is the Key

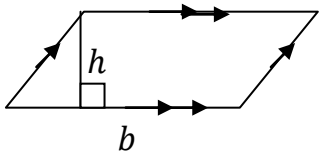


$$\boldsymbol{A = S \times S}$$
$$\boldsymbol{= 7cm \times 7cm}$$
$$\boldsymbol{= 49cm^2}$$

Try these

1. *Find the area of a square whose side is 13m*
2. *Calculate the area of a rectangle whose length is 14dm and width is 9dm.*
3. *Find the area of a triangle whose base is 25cm and height is 30cm.*

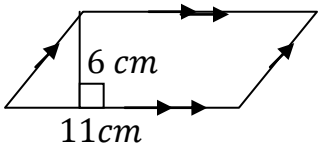
SUB TOPIC: Finding area of a parallelogram



$$\boldsymbol{PARALLELOGRAM = b \times h}$$

Examples

1. Workout the area of the figure below.

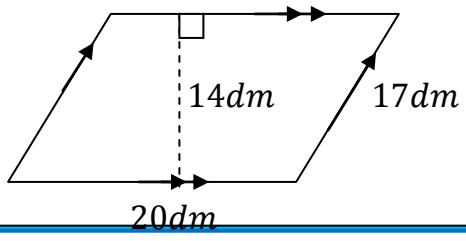


$$\boldsymbol{A = b \times h}$$
$$\boldsymbol{= 11cm \times 6\,cm}$$
$$\boldsymbol{= 66cm^2}$$

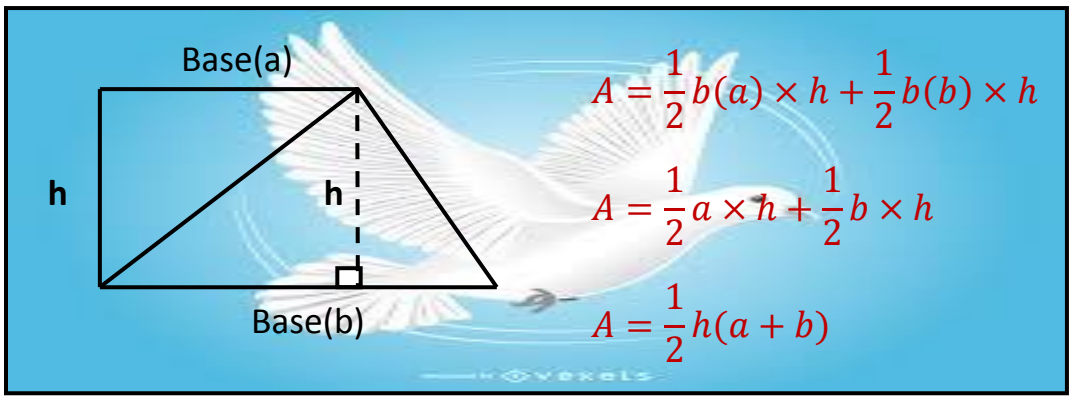
2. Find the area of a parallelogram whose base is 17cm and height is 10cm.

$$\boldsymbol{A = b \times h}$$
$$\boldsymbol{A = 17cm \times 10cm}$$
$$\boldsymbol{A = 170cm^2}$$

3. *Find the area of a parallelogram whose base and height are 16cm and 11cm respectively.*
4. Find the area and perimeter of the figure below

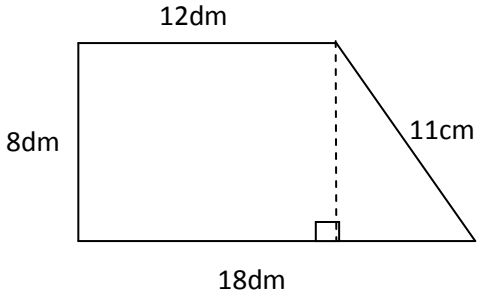


Mathematics is the Key



Examples

1. Find the area of the figure below.



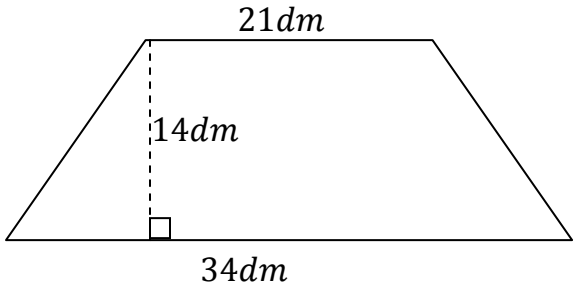
$\boldsymbol{A = \frac{1}{2}h(a+b)}$

$\boldsymbol{A = \frac{1}{2} \times 8dm(18dm + 12dm)}$

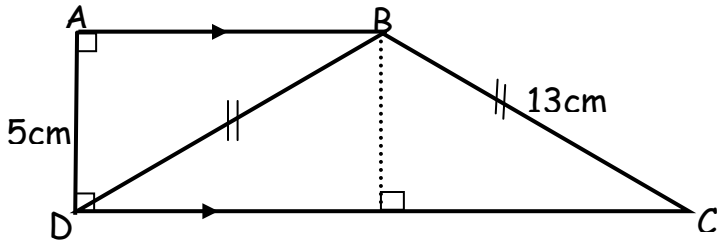
$\boldsymbol{A = 4dm \times 30dm}$

$\boldsymbol{\underline{A = 120dm^2}}$

2. Find the area of the figure below.



3. The figure below is made up of two triangles ABD and BCD. Line BC=BD = 13cm line AD = 5cm, line DC=24cm, AB= 12cm.



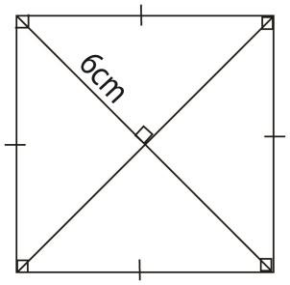
Calculate the area of the figure ABCD

Mathematics is the Key

NOTE: All shapes whose diagonals meet at a right angle use a similar formulae for area.

AREA = $\frac{1}{2} \times d_1 \times d_2$

1. Calculate the area of the square below



AREA = $\frac{1}{2} \times d_1 \times d_2$

d_1 = 6cm + 6cm

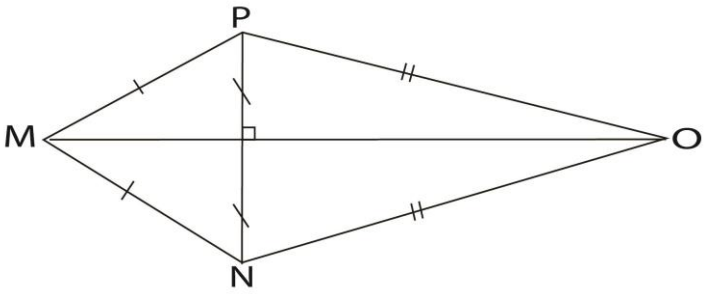
= 12 cm

Area = $\frac{1}{2} \times 12cm \times 12cm$

= 6cm x 12cm

= 72 cm²

2. In the figure below, line MO =12cm and line PN = 5cm.Calculate its area.



AREA = $\frac{1}{2} \times d_1 \times d_2$

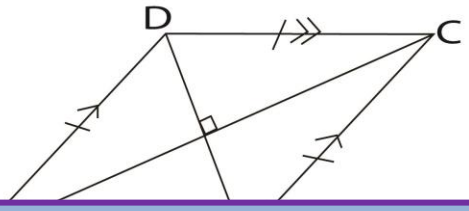
d_1 = 12 cm $\quad d_2 = 5cm$

Area = $\frac{1}{2} \times 12cm \times 5cm$

= 6cm x 5cm

= 30 cm²

3. Diagonals of rhombus ABCD measure 16m by 12m. Calculate its area.



AREA = $\frac{1}{2} \times d_1 \times d_2$

d_1 = 16m $\quad d_2 = 12m$

Area = $\frac{1}{2} \times 16m \times 12m$

= 8m x 12m

REMEMBER:
Since these shapes have diagonals which meet at a right angle.
Divide the shape into right angled triangles and look for area of each triangle.
Later combine the areas.

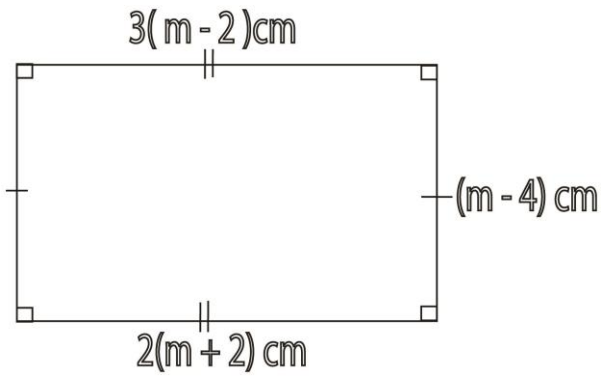
Try these

1. Find the area of a kite whose diagonals are 12cm and 4cm.
2. Find the area of a square whose diagonal is 10cm.
3. Calculate the area of a rhombus whose diagonals are 16cm and 10cm.

SUB TOPIC: Comparing sides of a polygon

Mathematics is the key

1. Study the figure below



(a) Find the value of m

$2(m + 2)cm = 3(m - 2)cm$

$2(m + 2) = 3(m - 2)$

$2m + 4 = 3m - 6$

$2m - 3m = -6 - 4$

$-m = -10$

$\frac{-m}{-1} = \frac{-10}{-1}$

$m = 10$

(a) Find its area

$Length = 2(m + 2)cm = 2(10 + 2)cm = 2 \times 12cm = 24cm$

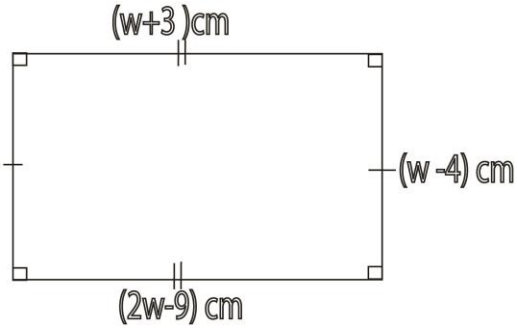
$width = (m + 4)cm = 10cm + 4cm = 14cm$

$Area = L \times W$

$= 24cm \times 14cm$

$= 336cm^2$

Use the figure below to answer the questions



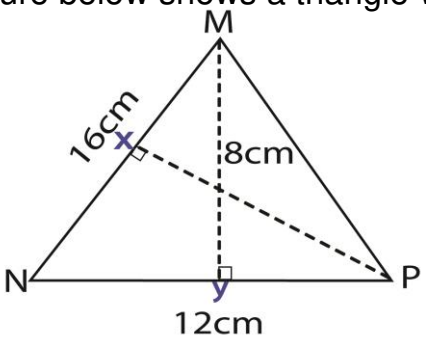
(a) Find the value of w

(b) Find the area and perimeter of the figure

Mathematics is the Key

Example 1

1. The figure below shows a triangle with two heights. Find the length XP



$$\frac{1}{2}bh = \frac{1}{2}bh$$

$$\frac{1}{2} \times 16cm \times h = \frac{1}{2} \times 12cm \times 8cm$$

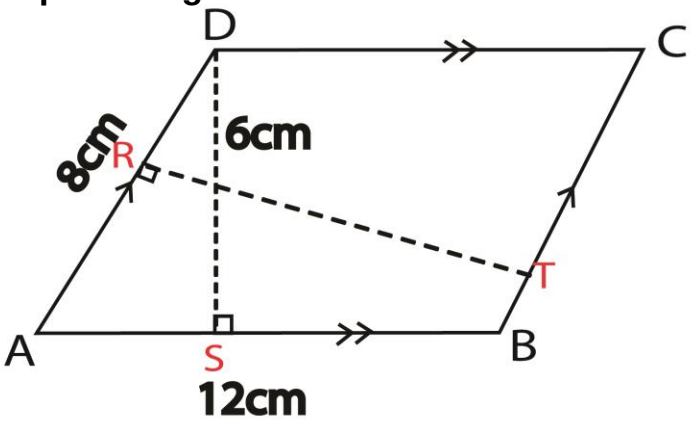
$$8cmh = 12cm \times 4cm$$

$$\frac{8cmh}{8cm} = \frac{12cm \times 4cm}{8cm}$$

$$h = 6cm$$

$$\underline{XP = 6cm}$$

2. **Study the parallelogram below and use it to answer the questions that follow**



Find the length of line RT

$$bh = bh$$

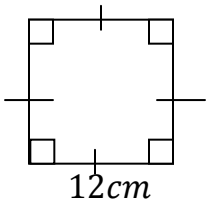
$$8cm \times h = 12cm \times 6cm$$

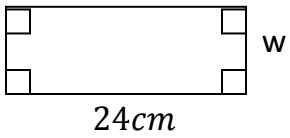
$$\frac{8cmh}{8cm} = \frac{12\cancel{cm} \times 6cm}{8\cancel{cm}}$$

$$\underline{h = 9cm}$$

Mathematics is the Key

3. The area of the rectangle is equal to the area of the square below.

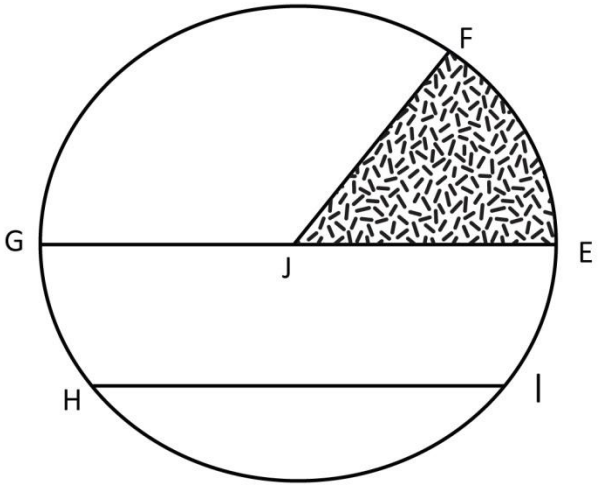




Find the value of w

$$L \times W = S \times S$$
$$24cm \times W = 12cm \times 12cm$$
$$\frac{24cmW}{24cm} = \frac{12cm \times 12cm}{24cm}$$
$$\underline{\underline{W = 6cm}}$$

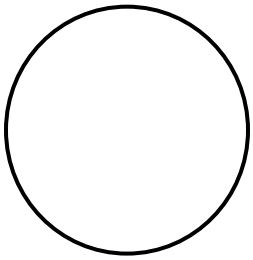
CIRCLE PROPERTIES (review)



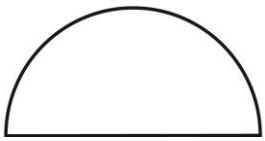
GE = diameter
JE = radius
HI = chord
FE =arc
JEF = sector
FEIHGF= circumference
JF = ???
NOTE: The diameter is the longest chord

SUBTOPIC: Finding circumference of a circle and parts of a circle.

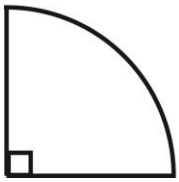
Circumference is the length of the arc.



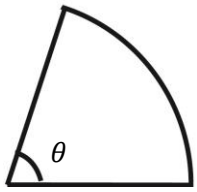
CIRCLE
$C = \pi D$



SEMI CIRCLE
$C = \frac{1}{2}\pi D$



QUADRANT
$C = \frac{1}{4}\pi D$



SECTOR
$C = \frac{\theta}{360°}\pi D$
$\theta = sector\ angle$

Mathematics is the Key

1. Calculate the circumference of ;($\pi = \frac{22}{7}$)

(a) A circle whose diameter is 7m.

$$\boldsymbol{C = \pi D}$$
$$\boldsymbol{= \frac{22}{7} \times 7m}$$
$$\underline{\underline{\boldsymbol{= 22m}}}$$

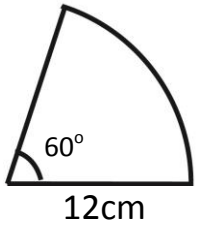
(b) A semi circle whose radius is 7cm

$$\boldsymbol{C = \frac{1}{2}\pi D}$$
$$\boldsymbol{= \frac{1}{2} \times \frac{22}{7} \times 7cm \times 2}$$
$$\boldsymbol{= 11cm \times 2}$$
$$\boldsymbol{= 22m}$$

(c) A quadrant whose radius is 14cm

$$\boldsymbol{C = \frac{1}{4}\pi D}$$
$$\boldsymbol{= \frac{1}{4} \times \frac{22}{7} \times 14cm \times 2}$$
$$\boldsymbol{= \frac{22}{4} \times 2cm \times 2}$$
$$\underline{\underline{\boldsymbol{= 22cm}}}$$

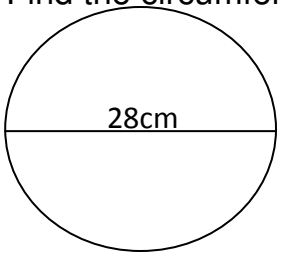
2. Calculate the circumference of the figure below.(Given that $\pi = 3.14$)



$$C = \frac{\theta}{360°}\pi D$$
$$= \frac{60°}{360°} \times 3.14 \times 12cm \times 2$$
$$= \frac{1}{6} \times \frac{314}{100} \times 24cm$$
$$= \frac{1256}{100} cm$$
$$\underline{\underline{= 12.56cm}}$$

Activity

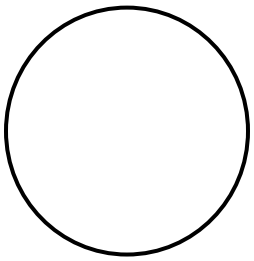
1. Find the circumference of a circle whose diameter is 14cm. ($\pi = \frac{22}{7}$)
2. Find the circumference of a semicircle whose diameter is 21cm. ($\pi = \frac{22}{7}$)
3. Calculate the circumference of a quadrant whose radius is 28m. ($\pi = \frac{22}{7}$)
4. Find the circumference of a circle below.



Mathematics is the Key

SUB TOPIC: Finding perimeter of a circle and parts of a circle

PERIMETER is the total distance around the city.



CIRCLE

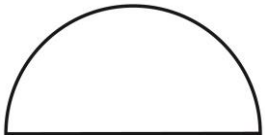
Perim. = Circ

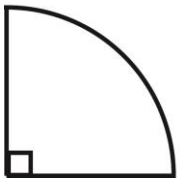
$$P = \pi D$$

SEMI CIRCLE

P = C + D

$$P = \frac{1}{2}\pi D + D$$





QUADRANT

P = C + r + r

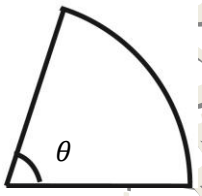
$$P = \frac{1}{4}\pi D + D$$

SECTOR

P = C + r + r

$$P = \frac{\theta}{360^\circ}\pi D + D$$

$$\theta = sector\ angle$$



Examples

1. Calculate the perimeter of ;

(a) A semi-circle whose radius is 14cm($\pi = \frac{22}{7}$)

$$P = \frac{1}{2}\pi D + D$$
$$= \frac{1}{2} \times \frac{22}{7} \times 14cm \times 2 + 14cm \times 2$$
$$= 44cm + 28cm$$
$$\underline{= 72cm}$$

(b) A quadrant whose radius is 28cm.($\pi = \frac{22}{7}$)

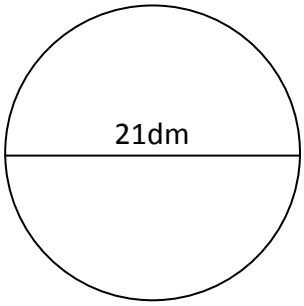
$$P = \frac{1}{4}\pi D + D$$

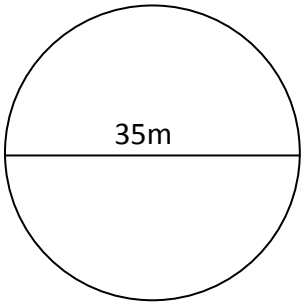
D=28cm x 2 =56cm

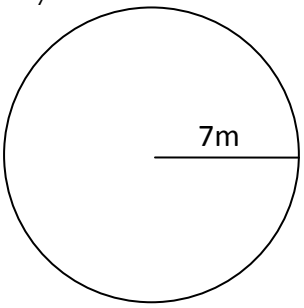
$$P = \frac{1}{4} \times \frac{22}{7} \times 56cm + 56cm$$
$$= (22 \times 2) + 20cm$$
$$= 44 + 20cm$$
$$\underline{= 64cm}$$

Activity

1. **Find the perimeter of the circles below.** ($take\ \pi = \frac{22}{7}$)







Mathematics is the Key

2. **Find the perimeter of a semicircle whose diameter is;**
   - **(a) 14cm**
   - **(b) 28dm**
3. **Find the perimeter of a quadrant whose radius is 14cm**

SUB TOPIC: Finding the radius or diameter when given circumference

Examples

1. The circumference of a circle is 88m. Find its radius.

$$\pi D = P$$
$$\frac{22}{7}D = 88m$$
$$\frac{22D}{7} = 88m$$
$$7 \times \frac{22D}{7} = 88m \times 7$$
$$22D = 88 \times 7m$$
$$\frac{22D}{22} = \frac{88 \times 7m}{22}$$
$$D = 4 \times 7m$$
$$\underline{D = 28m}$$
$$r = \frac{28m}{2}$$
$$\underline{r = 14m}$$

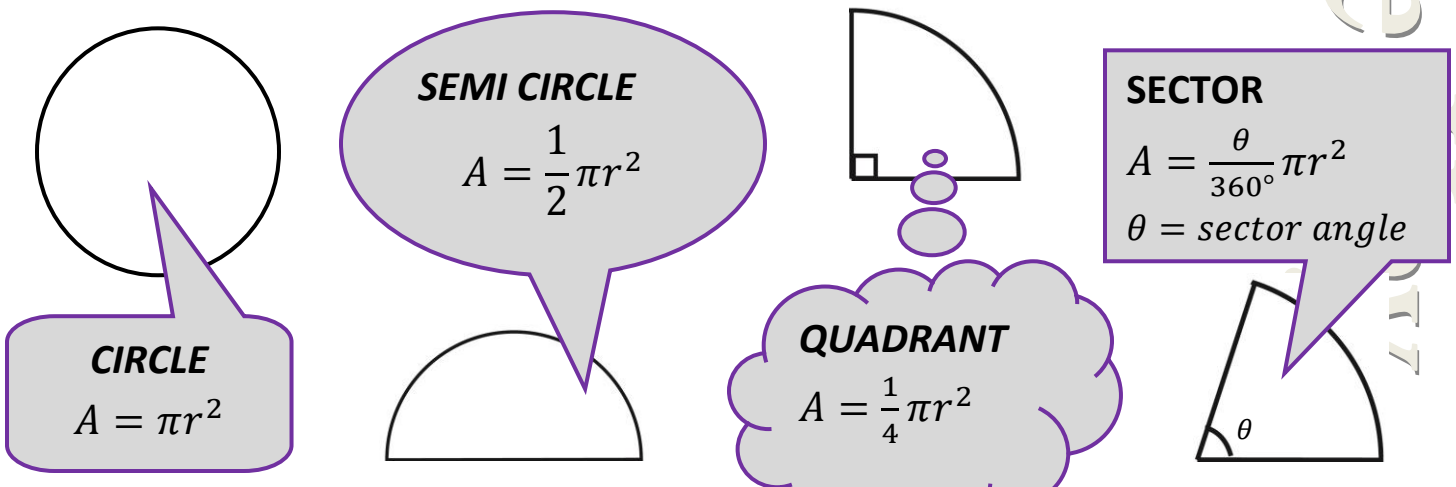
2. The circumference of a circle is 66dm. Find its diameter.

$$\pi D = C$$
$$\frac{22}{7} \times D = 66dm$$
$$\frac{22D}{7} = 66dm$$
$$7 \times \frac{22D}{7} = 66dm \times 7$$
$$22D = 66dm \times 7$$
$$\frac{22D}{22} = \frac{66dm \times 7}{22}$$
$$D = 3dm \times 7$$
$$\underline{D = 21dm}$$

Activity

1. Find the radius of a circle whose circumference is;
   (a) 44cm
   (b) 154m
   (c) 88dm
2. Find the diameter of a circle whose circumference is 110cm

SUB TOPIC: Finding area of a circle and parts of a circle



Mathematics is the art

1. Calculate the area of ;($\pi = \frac{22}{7}$)

(a) A circle whose diameter is 7m.

$$A = \pi r^2$$
$$= \frac{22}{7} \times \frac{7m}{2} \times \frac{7m}{2}$$
$$= \frac{11m \times 7m}{2}$$
$$= \frac{77}{2} m^2$$
$$= 38\frac{1}{2} m^2$$

(b) A semi circle whose radius is 7cm

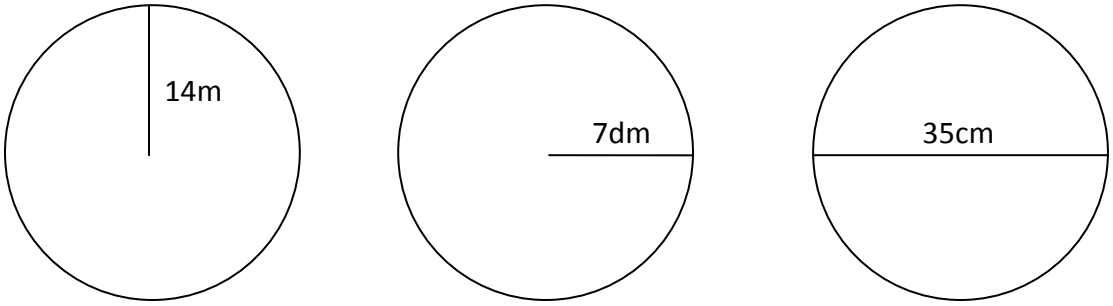
$$A = \frac{1}{2}\pi r^2$$
$$= \frac{1}{2} \times \frac{22}{7} \times 7cm \times 7cm$$
$$= 11cm \times 7cm$$
$$= \underline{\underline{77cm^2}}$$

(c) A quadrant whose radius is 14cm

$$A = \frac{1}{4}\pi r^2$$
$$= \frac{1}{4} \times \frac{22}{7} \times 14cm \times 14cm$$
$$= \frac{22}{4} \times 2cm \times 7cm$$
$$= 11 \times 7cm^2$$
$$= \underline{\underline{77\ cm^2}}$$

Activity

1. **Find the area of the figure below**



2. **Find the area of a semi circle whose radius is;**
   - **(a) 7cm**
   - **(b) 14m**
3. **Find the area of a quadrant whose radius is:**
   - **(a) 21cm**
   - **(b) 7dm**

Mathematics is the Key

SUB TOPIC: Finding radius or diameter when given area

1. The area of a circle is154cm^2. Find its radius.

$\boldsymbol{\pi r^2 = A}$

$\frac{22}{7}r^2 = 154\text{m}^2$

$\frac{22r^2}{7} = \boldsymbol{154m^2}$

$\boldsymbol{7 \times \frac{22r^2}{7} = 154m^2 \times 7}$

$\boldsymbol{22r^2 = 154 \times 7m^2}$

$\frac{22r^2}{22} = \frac{154 \times 7m^2}{22}$

$\boldsymbol{r^2 = 7 \times 7m^2}$

$\boldsymbol{r^2 = \sqrt{49m^2}}$

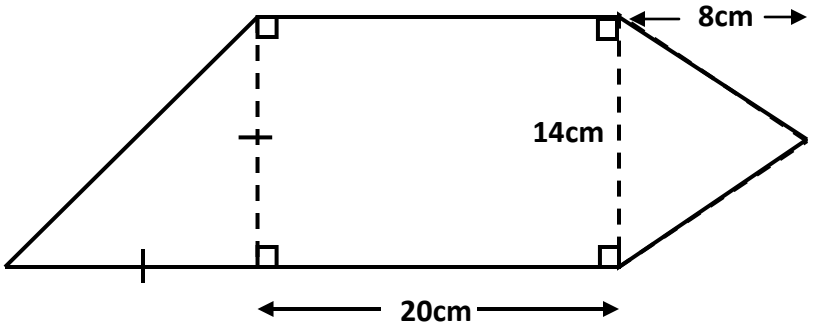
$\underline{\underline{\boldsymbol{r = 7m}}}$

2. Find the radius of a circle whose area is;
   (a) 308dm^2
   (b)1386cm^2

SUB TOPIC: Finding area of the combined shapes

Examples

1. Study the figure below and find its area.



Mathematics is the Key

Trapezium

$A = \frac{1}{2}h(a+b)$

$= \frac{1}{2} \times 14cm\big((14cm + 20cm) + 20cm\big)$

$= 7cm \times 54cm$

$\underline{= 378cm^2}$

Triangle

$A = \frac{1}{2}bh$

$= \frac{1}{2} \times 14cm \times 8cm$

$= 7 \times 8cm^2$

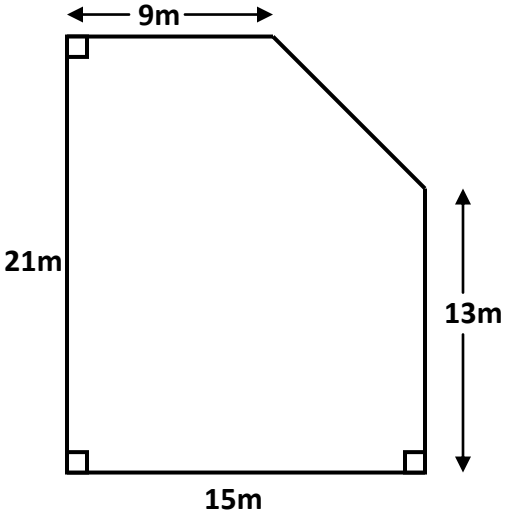
$\underline{= 56cm^2}$

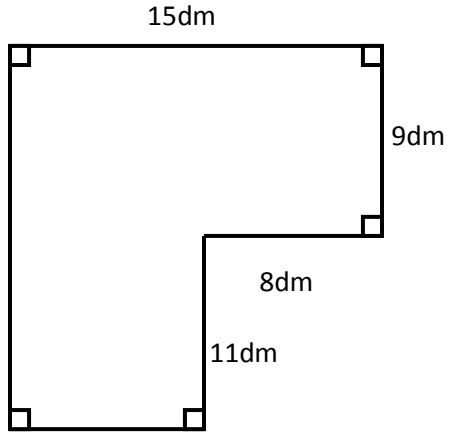
$\underline{total\ area}$

$(378 + 56)cm^2$

$\underline{434cm^2}$

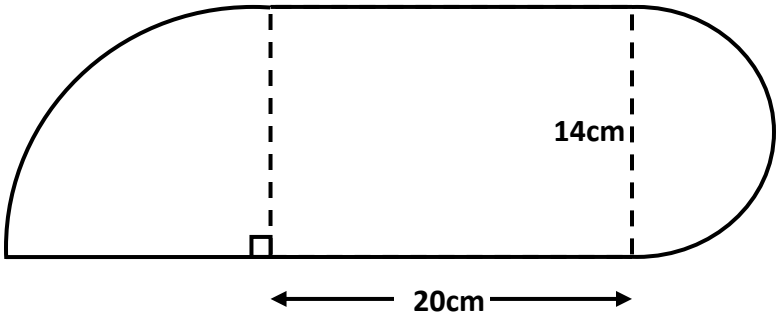
2. Find the area of the figures below





Project work

Work out the area of the figure below

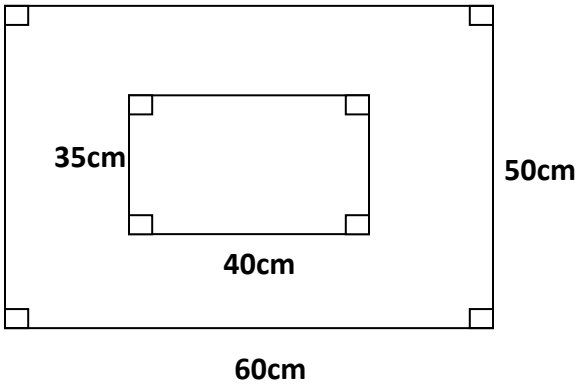


Mathematics is the Key

SUB TOPIC: Finding shaded area

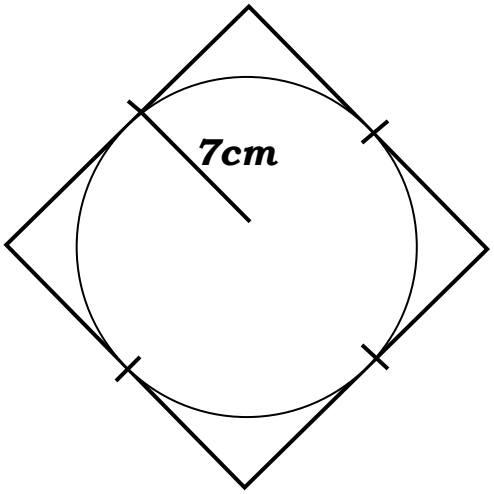
Examples

1. **Study the figure below and find the shaded area**



$$\textbf{Shaded area} = \textbf{outer area} - \textbf{inner area}$$
$$= (L \times W) - (L \times W)$$
$$= (60cm \times 50cm) - (40cm \times 35cm)$$
$$= 3000cm^2 - 1400cm^2$$
$$\underline{= 1600cm^2}$$

2. Study the figure below and use it to answer the questions that follow.



Find the shaded area($\pi = \frac{22}{7}$)

Square

$side = 7cm + 7cm = 14cm$

$A = s \times s$

$= 14cm \times 14cm$

$\underline{= 196cm^2}$

circle

$A = \pi r^2$

$= \frac{22}{7} \times 7cm \times 7cm$

$= 22cm \times 7cm$

$\underline{= 154cm^2}$

Shaded area

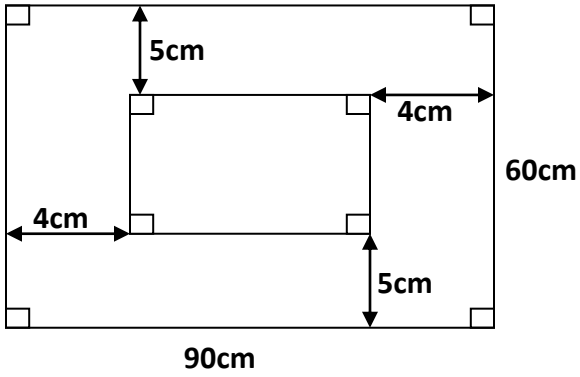
$Outer\ area - Inner\ area$

$196cm^2 - 154cm^2$

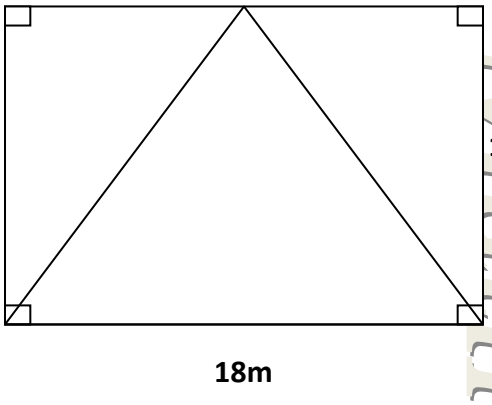
$\underline{42cm^2}$

Mathematics is the Key

3. A table of size 90cm by 60cm was partly covered with a piece of cloth as shown in the figure below. What part of the table was uncovered?

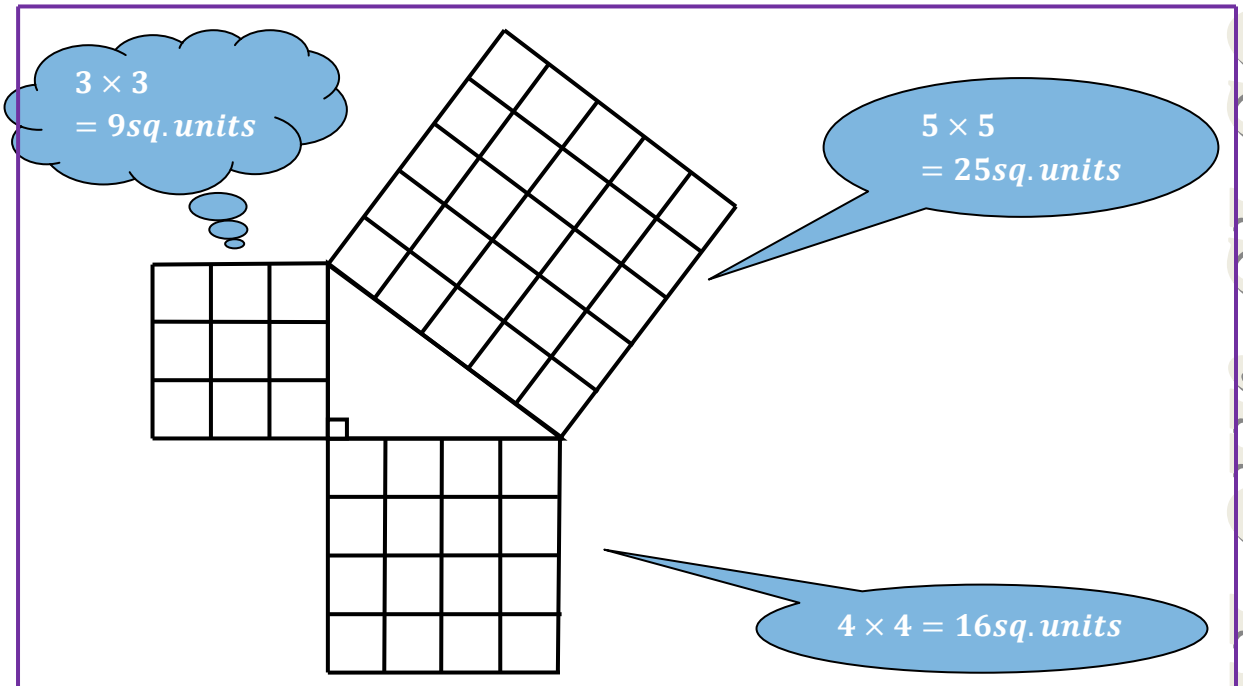


4. Find the un shaded area



SUB TOPIC: Finding missing sides using Pythagoras' theorem

Pythagoras' theorem states that the sum of the squares of the two shorter sides of a right angled triangle is equal to the square of the hypotenuse.

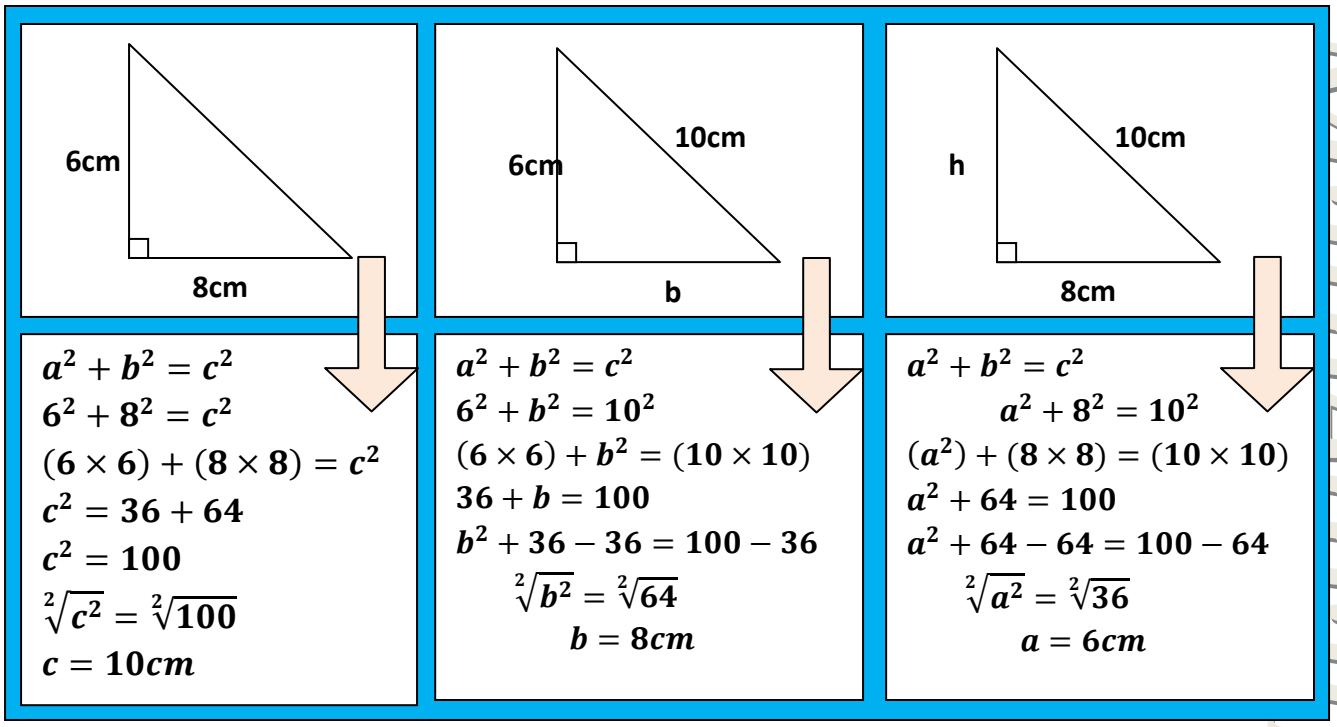


$$16squares + 9\ squares = 25\ square$$
$$base^2 + height^2 = hyp^2$$
$$a^2 + b^2 = c^2$$

Mathematics is the Key

Examples

1. **Study the triangles below and find the missing side.**



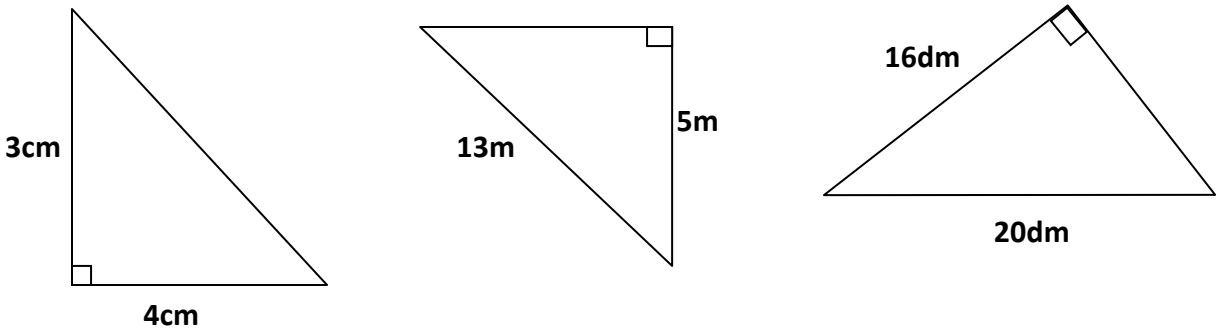
$a^2 + b^2 = c^2$
$6^2 + 8^2 = c^2$
$(6 \times 6) + (8 \times 8) = c^2$
$c^2 = 36 + 64$
$c^2 = 100$
$\sqrt[2]{c^2} = \sqrt[2]{100}$
$c = 10cm$

$a^2 + b^2 = c^2$
$6^2 + b^2 = 10^2$
$(6 \times 6) + b^2 = (10 \times 10)$
$36 + b = 100$
$b^2 + 36 - 36 = 100 - 36$
$\sqrt[2]{b^2} = \sqrt[2]{64}$
$b = 8cm$

$a^2 + b^2 = c^2$
$a^2 + 8^2 = 10^2$
$(a^2) + (8 \times 8) = (10 \times 10)$
$a^2 + 64 = 100$
$a^2 + 64 - 64 = 100 - 64$
$\sqrt[2]{a^2} = \sqrt[2]{36}$
$a = 6cm$

Activity

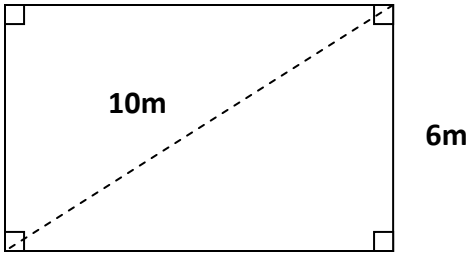
1. **Find the missing sides in the following triangles**



SUB TOPIC: Application of Pythagoras' theorem

Examples

1. Find the area of the figure below



Mathematics is the key

$a^2 + b^2 = c^2$

$6^2 + b^2 = 10^2$

$(6 \times 6) + b^2 = (10 \times 10)$

$36 + b = 100$

$b^2 + 36 - 36 = 100 - 36$

$\sqrt[2]{b^2} = \sqrt[2]{64}$

$b = 8m$

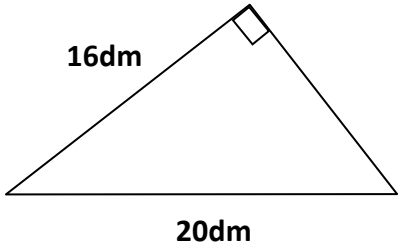
$length = 8m$

$Area = L \times W$

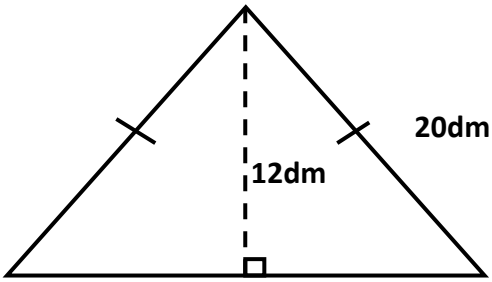
$= 8m \times 6m$

$= 48m^2$

2. Find the total distance around the figure



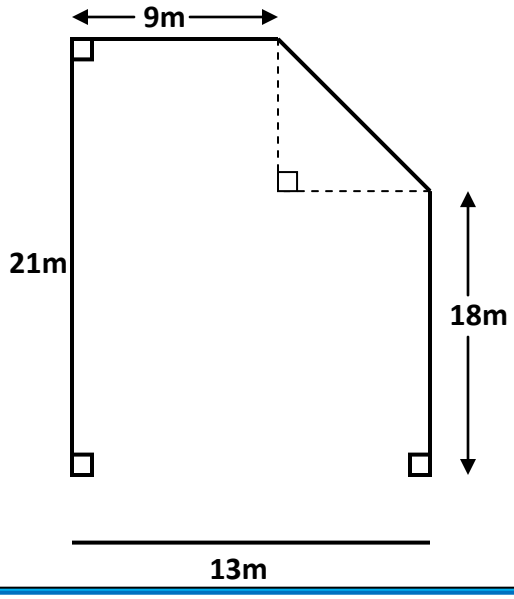
3. The figure below is an isosceles triangle. Use it to answer the questions that follow



(a) Find the area of the figure

(b) A rat moved around the figure 3 times. What distance did it cover?

4. Find the perimeter of the figure below



Mathematics is the Key

VOLUME AND SURFACE AREA

SUB TOPIC: Converting from square centimetres (cm^2) to square metres(m^2) and vice versa.

$1m = 100cm$
$1m^2 = 1m \times 1m$
$= 100cm \times 100cm$
$= 10{,}000cm^2$

Examples

1. Convert the following as instructed.
   (a). 0.5 m^2 to square centimetres.
   $\mathbf{1m^2 = 10{,}000cm^2}$
   $\mathbf{0.5m^2 = 0.5 \times 10{,}000cm^2}$
   $\underline{\mathbf{= 5{,}000cm^2}}$

   (b). 8000cm^2 to square metres
   $\mathbf{10{,}000cm^2 = 1m^2}$
   $\mathbf{5000cm^2 = \frac{5{,}000cm^2}{10{,}000cm^2} = \frac{1}{2}\ m^2}$

2. Convert the following to square centimetres.
   a. $\mathbf{2m^2}$
   b. $\mathbf{45m^2}$
   c. $\mathbf{0.03m^2}$
3. Convert the following to square metres
   a. $\mathbf{700{,}000cm^2}$
   b. $\mathbf{1{,}200cm^2}$
   c. $\mathbf{88{,}800cm^2}$

SUB TOPIC: Converting from square kilometres (km^2) to square metres(m^2) and vice versa.

$1km = 1000m$
$1km^2 = 1km \times 1km$
$= 1000m \times 1000m$
$= 1{,}000{,}000m^2$



Examples

1. Convert the following as instructed.
   (a). 0.5 km^2 to square metres.
   $\mathbf{1km^2 = 1{,}000{,}000m^2}$
   $\mathbf{0.5km^2 = 0.5 \times 1{,}000{,}000m^2}$
   $\underline{\mathbf{= 500{,}000m^2}}$

   (b). 970,000m^2 to square kilometres
   $\mathbf{1{,}000{,}000m^2 = 1km^2}$
   $\mathbf{970{,}000m^2 = \frac{970{,}000m^2}{1{,}000{,}000m^2}}$
   $\mathbf{= \frac{97}{100}\ km^2}$
   $\mathbf{= 0.97km^2}$

Mathematics is the Key

2. Convert the following to square metres.
   - **d. $2km^2$**
   - **e. $45km^2$**
   - **f. $0.03km^2$**

3. Convert the following to square kilometres
   - **d. $67{,}000{,}000m^2$**
   - **e. $1{,}200m^2$**
   - **f. $88{,}800m^2$**

SUB TOPIC: Converting from cubic metres (m^3) to cubic centimetres(cm^3) and vice versa.

$1m = 100cm$

$1m^3 = 1m \times 1m \times 1m$

$= 100cm \times 100cm \times 100cm$

$= 1{,}000{,}000cm^3$

Examples

1. Convert the following as instructed.

(a). 0.24 m^3 to cubic centimetres.

$1m^3 = 1{,}000{,}000cm^3$

$0.24m^3 = 0.24 \times 1{,}000{,}000cm^3$

$= \underline{\underline{240{,}000cm^3}}$

(b). 8,600,000cm^3 to cubic metres

$1{,}000{,}000cm^3 = 1m^3$

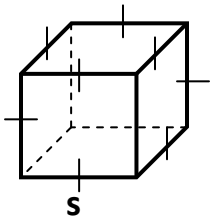
$8{,}600{,}000cm^3 = \frac{8{,}600{,}000cm^3}{1{,}000{,}000cm^3}$

$= \frac{86}{10}\ m^3 = 8.6m^3$

2. Convert the following to cubic centimetres.
   - **g. $2\frac{1}{2}m^3$**
   - **h. $82m^3$**
   - **i. $0.63m^3$**

3. Convert the following to square metres
   - **g. $3{,}900{,}000cm^3$**
   - **h. $1{,}600cm^3$**
   - **i. $40{,}800cm^3$**

SUB TOPIC: *Volume and capacity of a cube and cuboid*

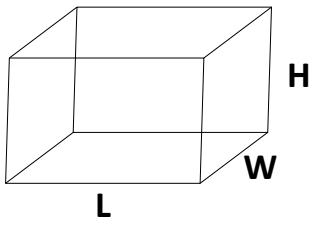


$\underline{CUBE}$

$VOLUME = b.a \times h$

$VOLUME = (S \times S) \times S$

Mathematics is the Key



$$\underline{CUBOID}$$
$$VOLUME = b.a \times h$$
$$VOLUME = (L \times W) \times H$$

NOTE:
1 litre contains $1000cm^3$

Examples

1. Find the volume of a cube whose side is 6m

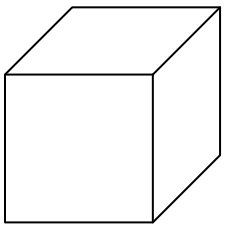
$$\begin{aligned} \boldsymbol{VOLUME} &= \boldsymbol{b.a \times h} \\ &= \boldsymbol{(S \times S) \times S} \\ &= \boldsymbol{6m \times 6m \times 6m} \\ &= \boldsymbol{36m^2 \times 6m} \\ &= \boldsymbol{216m^3} \end{aligned}$$

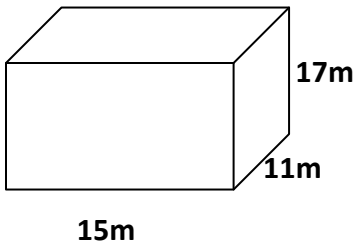
2. Calculate the volume and capacity of a cuboid measuring 12cm by 15cm by 20cm.

$$\begin{aligned} \boldsymbol{VOLUME} &= \boldsymbol{b.a \times h} \\ &= \boldsymbol{(L \times W) \times H} \\ &= \boldsymbol{12cm \times 15cm \times 20cm} \\ &= \boldsymbol{180cm^2 \times 20cm} \\ &= \boldsymbol{3600cm^3} \end{aligned}$$

$$\underline{\boldsymbol{CAPACITY}}$$
$$\boldsymbol{1000cm^3 = 1litre}$$
$$\boldsymbol{3600cm^3 = \frac{3600cm^3}{1000cm^3}}$$
$$\boldsymbol{= 3.6\ litres}$$

3. **Find the volume of the figures below**



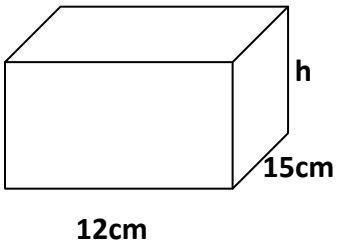


4. **Find the capacity of a rectangular tank whose dimensions measure 24cm by 16cm by 30cm.**

Mathematics is the Key

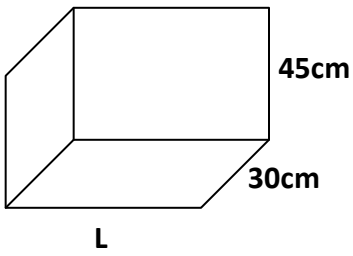
Examples

1. **The volume of the figure below is $3600cm^3$. Use it to find the missing side.**



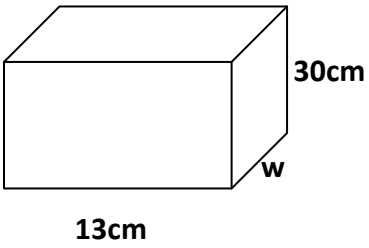
$$b.a \times h = VOLUME$$
$$(L \times W) \times H = VOLUME$$
$$12cm \times 15cm \times H = 3600cm^3$$
$$\frac{12cm \times 15cm \times H}{12cm \times 15cm} = \frac{3600cm^3}{12cm \times 15cm}$$
$$H = 20cm$$

2. Study the figure below.

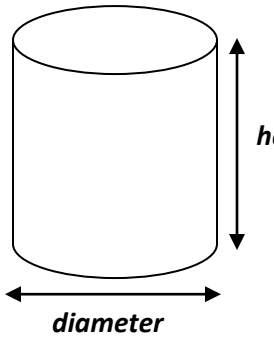


If the figure below holds 27litres, find the value of L

3. The volume of a cuboid which measures 6cm by m by 5cm is $210cm^3$. Find the value of m in cm.
4. Find the value of w in the figure below given that the volume is $6240cm^3$.



Mathematics is the Key



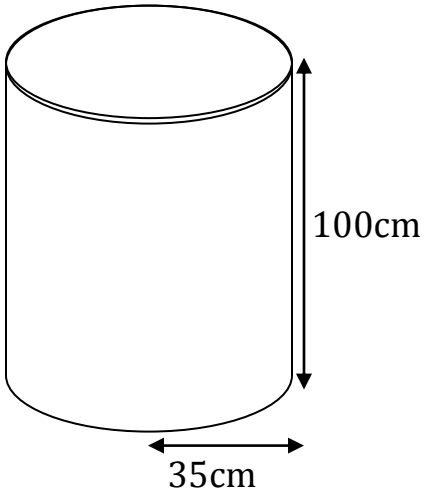
NOTE
1Litre = 1,000cm³
Volume =base area x height
$volume = \pi r^2 h$

Examples

1. Calculate the volume of a cylinder whose radius is 14cm and height is 30cm.

$$Volume = \pi r^2 h$$
$$= \frac{22}{7} \times 14cm \times 14cm \times 30cm$$
$$= 22 \times 14cm \times 2cm \times 30cm$$
$$= 44 \times 420cm^3$$
$$= \underline{18480cm^3}$$

2. Below is a cylindrical tank. Study it and use it to answer the questions that follow.



(a) Calculate the volume of the tank.

$$Volume = \pi r^2 h$$
$$= \frac{22}{7} \times 35cm \times 35cm \times 100cm$$
$$= 22 \times 5cm \times 35cm \times 100cm$$
$$= 110 \times 3500cm^3$$
$$= \underline{385,000cm^3}$$

Mathematics is the Key

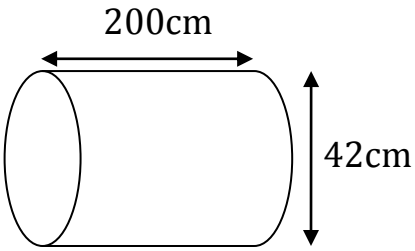
(b).How many litres of water can it hold when full.

$$1000cm^3 = 1\ litre$$

$$385,000cm^3 = \frac{385,000cm^3}{1,000cm^3}$$

$$= \underline{385\ Litres}$$

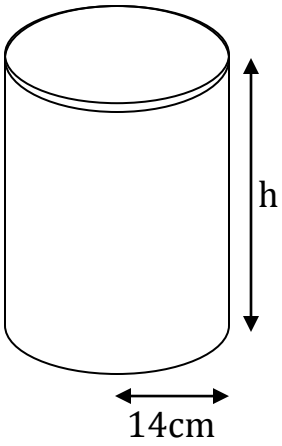
3. Find the volume of a cylinder whose;
   (a) radius is 14cm and height is 40cm
   (b) radius is 21cm and height is 60cm
   (c) diameter is 14m and height is 24m
4. Find the capacity of the figure below.



SUB TOPIC: Finding missing sides volume and capacity of cylinders

Examples

1. **The volume of the cylinder below is 18480cm^3. Find the value of h.**



$$\pi r^2 h = Volume$$

$$\frac{22}{7} \times 14cm \times 14cm \times h = 18480cm^3$$

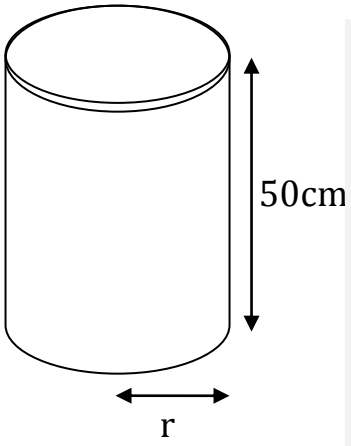
$$44cm \times 14cm \times h = 18480cm^3$$

$$\frac{44cm \times 14cm \times h}{44cm \times 14cm} = \frac{18480cm^3}{44cm \times 14cm}$$

$$\underline{h = 30cm}$$

Mathematics is the Key

2. The tank below holds 123.2litres of water when full. Find its radius



$$\frac{\pi r^2 h}{1000cm^3} = capacity$$

$$\frac{\frac{22}{7} \times r \times r \times 50cm}{1000cm^3} = 123.2\ l$$

$$1000cm^3 \times \frac{\frac{22}{7} \times r \times r \times 50cm}{1000cm^3} = 123.2 \times 1000cm^3$$

$$7 \times \frac{1100cmr^2}{7} = 123200cm^3 \times 7$$

$$1100cmr^2 = 123200cm^3 \times 7$$

$$\frac{1100cmr^2}{1100cm} = \frac{123200cm^3 \times 7}{1100cm}$$

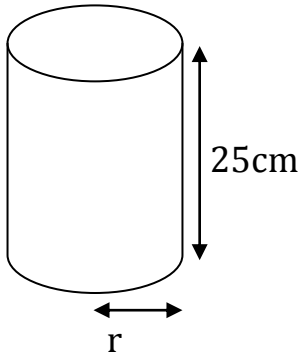
$$r^2 = 784cm^2$$

$$\sqrt{r}^2 = \sqrt{784cm^2}$$

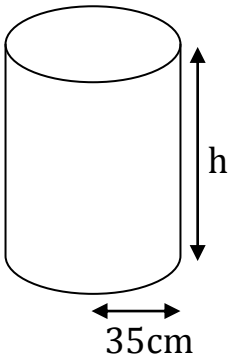
$$\underline{r = 28cm}$$

Try These

1. Find the height of a cylinder whose radius 7cm and volume is 1540cm^3.
2. The volume of the figure below is 3850cm^3. Find its radius

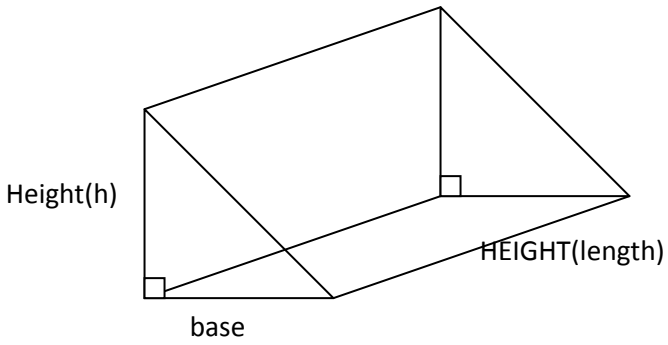


3. The cylindrical tank below holds 385 litres.



Find the value of h.

Mathematics is the Key



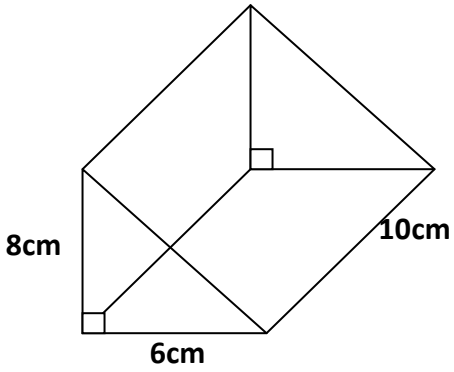
$$Volume = base\ area\ x\ height$$

$$Volume = \frac{1}{2}bh \times l$$

$$volume = \frac{1}{2}bhl$$

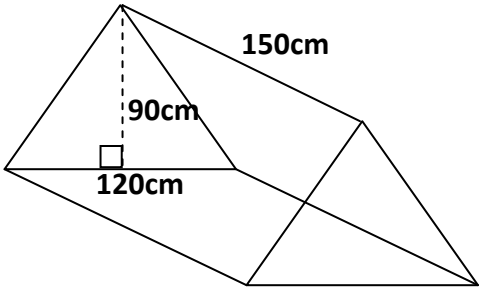
Examples

1. **Find the volume of the figure below**



$$Volume = \frac{1}{2}bhl$$
$$= \frac{1}{2} \times 6cm \times 8cm \times 10cm$$
$$= 3 \times 80cm^3$$
$$= 240cm^3$$

2. **Calculate the capacity of the figure below.**



$$Volume = \frac{1}{2}bhl$$
$$= \frac{1}{2} \times 120cm \times 90cm \times 150cm$$
$$= 60 \times 90 \times 150cm^3$$
$$= 5400 \times 150cm^3$$
$$= \underline{810{,}000cm^3}$$

$1000cm^3 = 1litre$

$$\frac{810{,}000cm^3}{1{,}000cm^3}$$

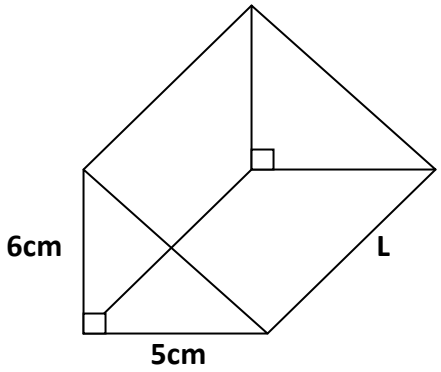
$\underline{810\ litres}$

Mathematics is the Key

SUB TOPIC: Finding missing sides of a triangular prism when given volume.

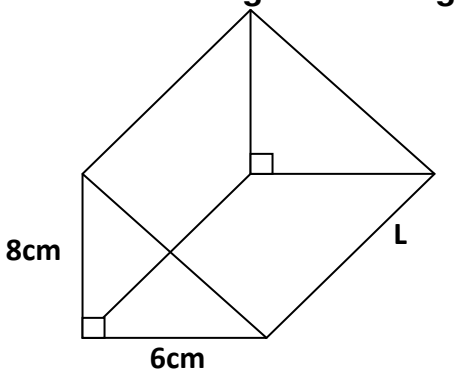
Examples

1. **Find the missing side in the figure below given that its volume is135cm^2**



$$\frac{1}{2}bhl = Volume$$
$$\frac{1}{2} \times 5cm \times 6cm \times L = 135cm^3$$
$$3cm \times 5cm \times L = 135cm^3$$
$$\frac{3cm \times 5cm \times L}{3cm \times 5cm} = \frac{135cm^3}{3cm \times 5cm}$$
$$L = 9cm$$

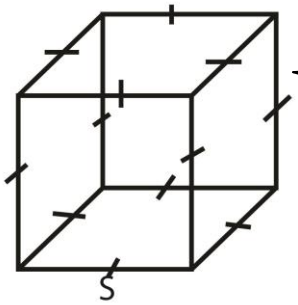
2. **Find the value of L in the figure below given that the volume is 240cm^3**



SUBTOPIC: **Total surface area of cubes and cuboids**

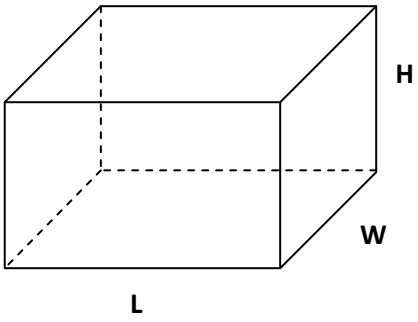
Total surface area is the area of all faces

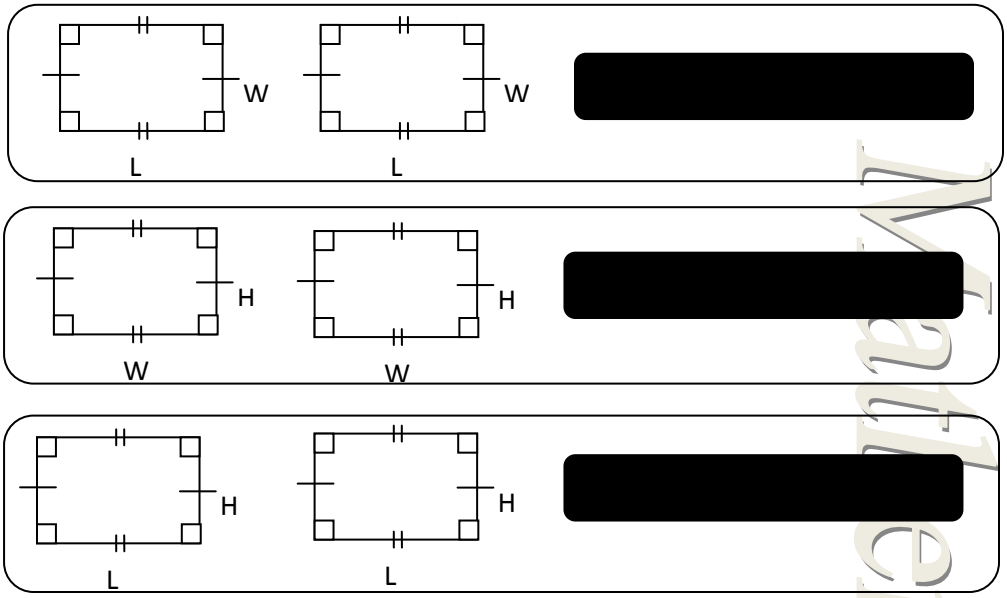
CUBE



A cube has six equal faces of which they are all squares.
Area of a square is (SXS)
$TSA = 6\ XSXS$
$TSA = 6 \times S^2$
$TSA = 6S^2$

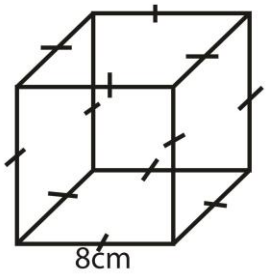
Mathematics is the Key





$TOTAL\ SURFACE\ AREA = 2(L\ X\ W) + 2(W\ X\ H) + 2(L\ X\ H)$

1. **Find the total surface area of the figures below.**

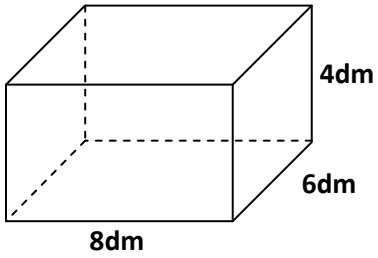


$$TSA = 6 \times S \times S$$

$$= 6 \times 8cm \times 8cm$$

$$= 6 \times 64cm^2$$

$$\underline{= 384cm^2}$$



$$TSA = 2(L\ X\ W) + 2(W\ X\ H) + 2(L\ X\ H)$$

$$= 2(8dm \times 6dm) + 2(8dm \times 4dm) + 2(6dm \times 4dm)$$

$$= 2 \times 48dm^2 + 2 \times 32dm^2 + 2 \times 24dm^2$$

$$= 96dm^2 + 64dm^2 + 48dm^2$$

$$\underline{= 208dm^2}$$

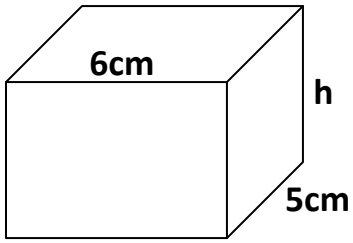
2. Find the total surface area of the box measuring 10cm by 5cm by 4cm.
3. Find the total surface of the cube whose side is 10cm.

Mathematics is the Key

SUBTOPIC: Finding missing sides when given TSA of a cuboid.

Examples

The total surface area of a cuboid is 148cm^2. Find the value of h.



$$2(L\ X\ W)\ +\ 2(W\ X\ H)\ +\ 2(L\ X\ H) = TSA$$

$$2(6cm \times 5cm) + 2(5cm \times h) + 2(6cm \times h) = 148cm^2$$

$$2 \times 30cm^2 + 2 \times 5hcm + 2 \times 6hcm = 148cm^2$$

$$60cm^2 + 10hcm + 12hcm = 148cm^2$$

$$22hcm + 60cm^2 = 148cm^2$$

$$22hcm + 60cm^2 - 60cm^2 = 148cm^2 - 60cm^2$$

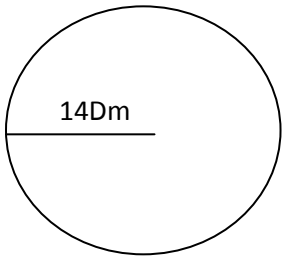
$$22hcm = 88cm^2$$

$$\frac{22hcm}{22cm} = \frac{88cm^2}{22cm}$$

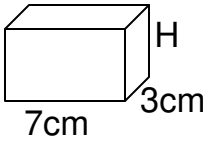
$$\underline{h = 4cm}$$

TOPICAL QUESTIONS

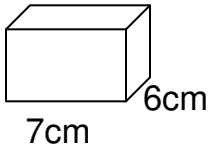
1. How many centimeters are in 0.75 metres?
2. Find the circumference of a circle whose radius is 21cm
3. Find the area of the circle below.



4. The circumference of a circle is 88m. Find the radius of the circle (Use $\pi = \frac{22}{7}$)
5. A cylindrical tank is 7m high. What is the capacity (in litres) of the tank if its radius is 7m?
6. The volume of the figure below is 105cm^3. Find its height.

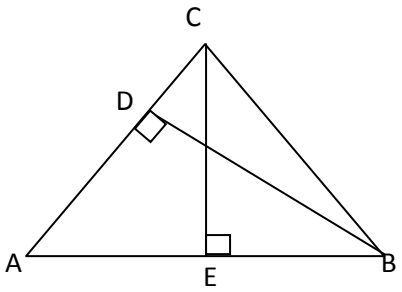


7. Find the base area of the figure below.

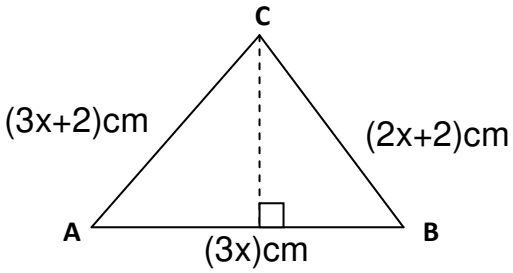


Mathematics is the Key

8. In the triangle below, AB = 12cm, CE = 10cm and AC = 16cm. Find the length of BD in cm.

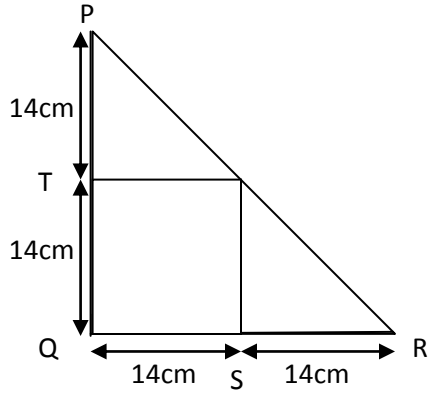


9. The figure ABC below is an isosceles triangle. Use it to answer the questions that follow.



(a) Find the value of x.
(b) Find the area of triangle ABC
(c) Calculate the perimeter of the triangle.
(d) Find the circumference of a circular compound whose radius is 14m. (take $\pi = \frac{22}{7}$)

10. In the figure below, PQ = QR = 28cm use it to answer the questions that follow.



(a) Find the area of triangle PQR.
(b) What is the area of the shaded part?

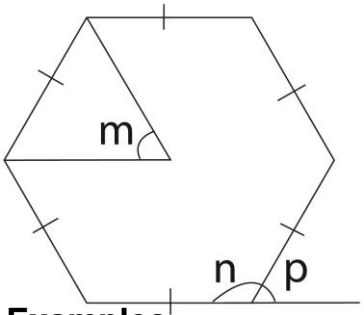
Mathematics is the Key

LINES, ANGLES AND GEOMETRICAL FIGURES

SUB TOPIC: Names of polygons

NAME	SIDES
triangles	3
quadrilateral	4
pentagon	5
hexagon	6
heptagon	7
octagon	8
nonagon	9
decagon	10
hendecagon	11
duo decagon	12

SUBTOPIC: interior and exterior angles of a polygon



[redacted]

Examples

1. The exterior angle of a regular polygon is 36°. Find the size of the interior angle?

$$\boldsymbol{Let\ the\ interior\ angle\ be\ m}$$
$$\boldsymbol{m + 36° = 180°}$$
$$\boldsymbol{m + 36° - 36° = 180° - 36°}$$
$$\underline{\boldsymbol{m = 144°}}$$

2. The interior angle of a regular polygon is 115°.find the size of its exterior angle.

$$\boldsymbol{Let\ the\ exterior\ angle\ be\ m}$$
$$\boldsymbol{m + 115° = 180°}$$
$$\boldsymbol{m + 115° - 115° = 180° - 115°}$$
$$\underline{\boldsymbol{m = 65°}}$$

3. Find the size of the exterior angle of a polygon whose interior angle is;
   (a) 120°
   (b) 80°

Mathematics is the Key

4. Find the size of an interior angle of a polygon whose exterior angle is 45°.

SUB TOPIC: Calculating the number of sides of a polygon

Examples:

1. Calculate the number of sides of a regular polygon whose exterior angle is 30°.

$$\textbf{Number of sides} = \frac{360^\circ}{each\ ext\ angle}$$

$$= \frac{360^\circ}{30^\circ}$$

No of sides = 12 sides.

2. The interior angle of a regular polygon is 144.Name the polygon.
Let the ext angle be x.

$X + 144^0 = 180^0$

$X + 144^0 - 144^0 = 180 - 144$

$X = 36^0$

Exterior angle = 36^0

No of side $= \frac{360^\circ}{36^\circ}$

= 10 sides

The polygon is a decagon

3. The interior angle of a regular polygon is 90^0 more than the exterior angle.

(a) Calculate the exterior angle

Let the ext. angle be x

Int. angle = $x + 90^0$

Ext. angle x

$x + 90^0 + x = 180^0$

$2x + 90^0 - 90^0 = 180^0 - 90^0$

$\frac{2x}{2} = \frac{90}{2}$

$x = 45^0$

ext. angle = 45^0

(b) How many sides has the polygon?

No of sides $= \frac{360^o}{45^o}$

= 8 sides

Mathematics is the Key

Calculate the number of sides of a polygon whose exterior angle is;

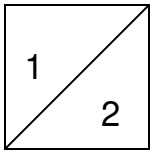
(a) $36°$

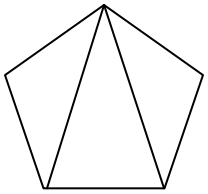
(b) $45°$

(c) $60°$

SUB TOPIC: Triangulation

Triangulation is forming triangles in a polygon.





Quadrilateral Pentagon

Number of triangles = n – 2

Polygon	***Number of sides***	***Number of triangles***
Quadrilateral	4	4 – 2 = 2 triangles
Pentagon	5	5 – 2 = 3 triangles
Hexagon	6	6 – 2 = 4 triangles
Heptagon	7	7 – 2 = 5 triangles

Examples:

1. How many triangles can be formed in a polygon with 8 sides?

$$\boldsymbol{No\ of\ triangles = n - 2}$$
$$\boldsymbol{= 8 - 2}$$
$$\underline{\boldsymbol{= 6\ triangles}}$$

2. Calculate the number of triangles of;

(a) A 6 six sided polygon

(b) A duo decagon

(c) A 20 sided polygon

Mathematics is the Key

SUB TOPIC: Number of right angles

Each triangle contains two right angles.

Number of right angles = 2 (n - 2)

= 2n – 4

Polygon	*Number of sides*	*Number of triangles*	*Number of right angles*
Quadrilateral	4	4 – 2 = 2 triangles	2 x 2 = 4 right angles
Pentagon	5	5 – 2 = 3 triangles	3 x 2 = 6 right angles
Hexagon	6	6 – 2 = 4 triangles	4 x 2 = 8 right angles
Heptagon	7	7 – 2 = 5 triangles	5 x 2 = 10 right angles

Examples:

1. How many right angles can be formed in a polygon with 8 sides?

$$No.of\ right\ angles = 6 \times 2$$
$$= 12\ right\ angles$$

2. *Calculate the number of right angles of a polygon with 11 triangles.*

$$No.of\ right\ angles = 2 \times 11$$
$$22\ right\ angles$$

3. *Calculate the number right angles of;*
   (a) A 6 six sided polygon
   (b) A duo decagon
   (c) A 20 sided polygon
   (d) A polygon with 15 triangles

SUB TOPIC: Finding number of sides of a polygon when given number of triangles or right angles

1. If 10 triangles can be formed in regular polygon, find the number of sides of the polygon.

$$No.of\ triangles = n - 2$$
$$n - 2 = 10$$
$$n - 2 + 2 = 10 + 2$$
$$n = 12\ sides$$

Mathematics is the Key

2. Find the number of sides of a polygon with 16 triangles

$$2(n-2) = no.of\ right\ angles$$
$$2n - 4 = 16$$
$$2n - 4 + 4 = 16 + 4$$
$$2n = 20$$
$$\frac{2n}{2} = \frac{20}{2}$$
$$\underline{n = 10 sides}$$

3. Find the number of sides of a polygon with;
   (a) 10 right triangles
   (b) 4 triangles
4. Name the polygon with;
   (a) 8 triangles
   (b) 18 right angles

SUB TOPIC: THE SUM OF INTERIOR ANGLES OF A REGULAR POLYGON (interior angle sum)

$$Interior\ angle\ sum = 180°(n-2)\ \ or\ 90°(2n-4)$$

Examples:

1. The interior angle of a regular pentagon is 108°. Calculate the sum of all interior angles of the polygon.

$$A\ pentagon\ has\ 5\ sides.$$
$$Each\ int.angle = 108°$$
$$The\ sum\ of\ interior\ angles = 108° \times 5$$
$$\underline{= 540°}$$

2. Calculate the interior angle sum of a regular polygon with 7 sides.

$$Int.angle\ sum = 180°(n-2)$$
$$= 180°(7-2)$$
$$= 180° \times 5$$
$$\underline{= 900°}$$

3. Each exterior angle of a polygon is 30°. Calculate the sum of the interior angles of a polygon.

$$No.of\ sides$$
$$\frac{360°}{30°}$$
$$\underline{12\ sides}$$

$$\underline{The\ sum\ of\ int.angles}$$
$$180°(n-2)$$
$$180°(12-2)$$
$$180° \times 10$$
$$\underline{1800°}$$

Mathematics is the Key

4. Find the sum of interior angles of ;
   (a) A polygon with 8sides
   (b) A polygon with 18sides
   (c) A heptagon
   (d) A polygon with 15 sides

SUB TOPIC: Finding number of sides when given interior angle sum

1. The sum of interior angles of a regular polygon is 1440°.
   (a) How many sides has the polygon?

$180°(n-2)$ = int. angle sum

$180°(n-2) = 1440°$

$$\frac{\cancel{180°}(n-2)}{\cancel{180°}} = \frac{1440°}{180°}$$

$$n - 2 = 8$$

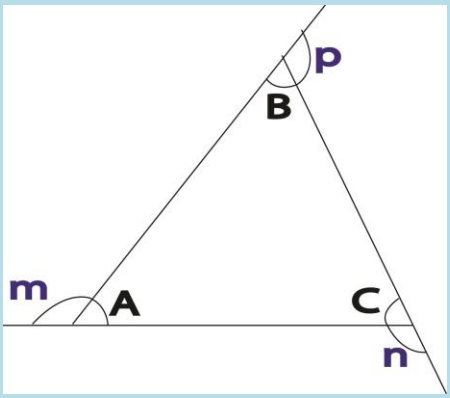
$$n - 2 + 2 = 8 + 2$$

$$\underline{n = 10 \text{ sides}}$$

   (b) What is the size of each exterior angle of the polygon?
   $360° \div 10 = 36^0$

2. Calculate the number of sides of a polygon whose interior angle sum is;
   (a) 1800°
   (b) 540°
   (c) 720°

SUB TOPIC: ANGLES OF TRIANGLES

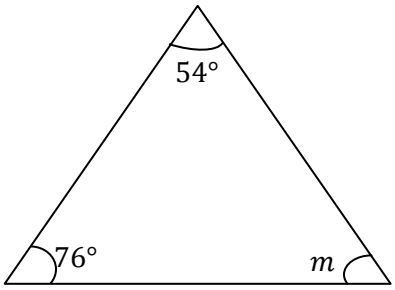


$$A + B + C = 180°$$

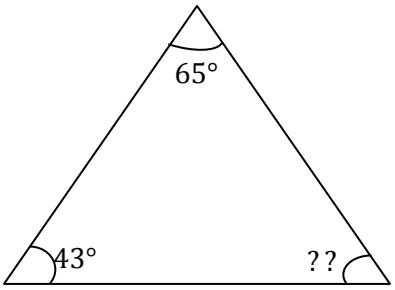
Mathematics is the Key

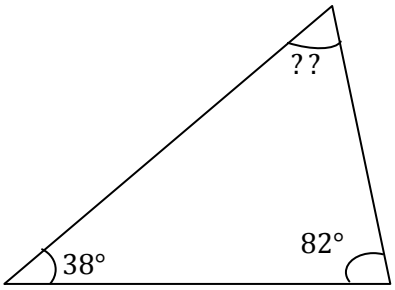
Examples

1. Find the missing angle



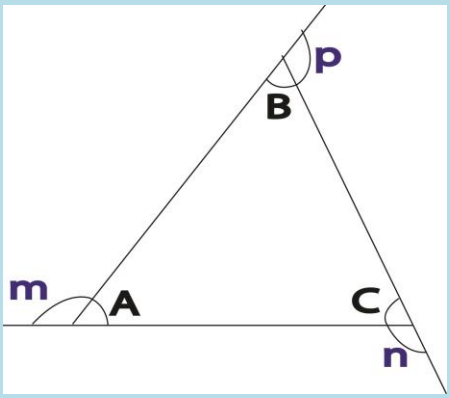
$$m + 76° + 54° = 180°$$
$$m + 130° = 180°$$
$$m + 130° - 130° = 180° - 130°$$
$$m = 50°$$





SUB TOPIC: **Interior and exterior angles of a triangle**

Angle properties of triangles



Two interior angles of a triangle add up to one opposite exterior angle

A + B = n

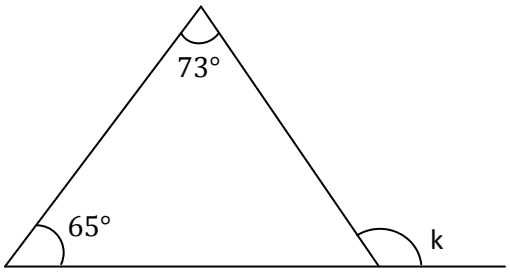
B + C = m

A + C = p

Mathematics is the Key

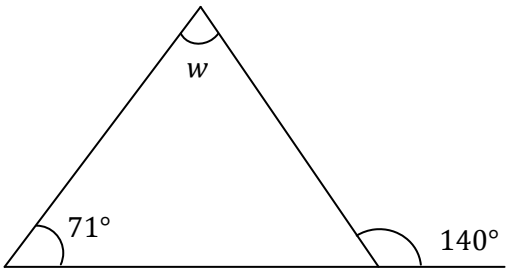
Examples

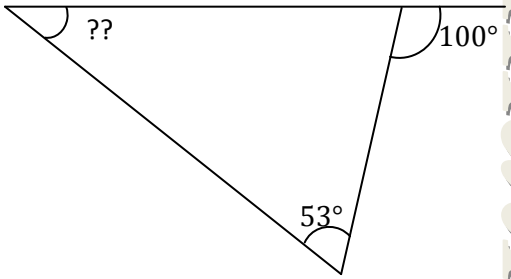
1. Find the missing angle in the figures below

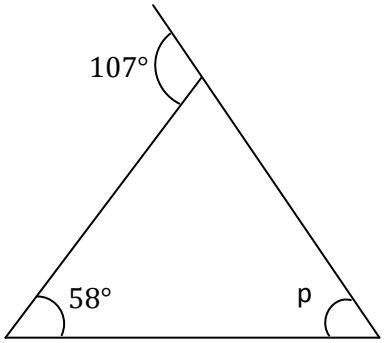


$$k = 65° + 73°$$

$$\underline{\underline{k = 138°}}$$

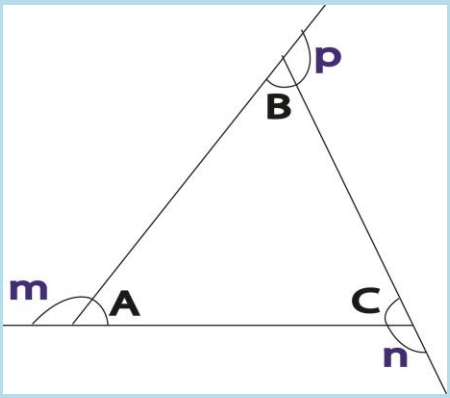






SUB TOPIC: **exterior angles of a triangle**

Angle properties of triangles



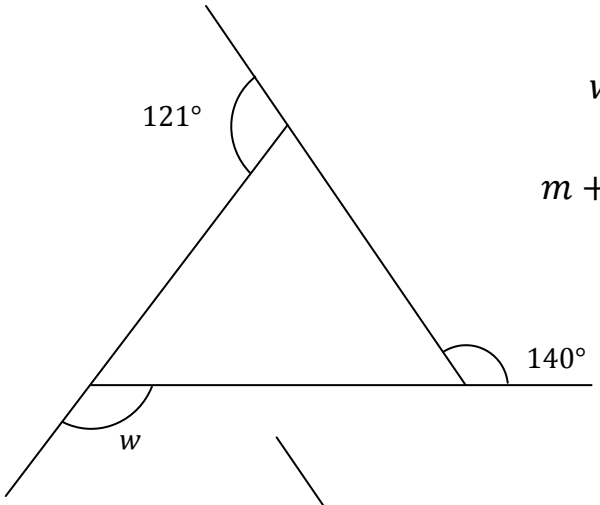
Exterior angles of every polygon add up to **360°**

m + n + p=360°

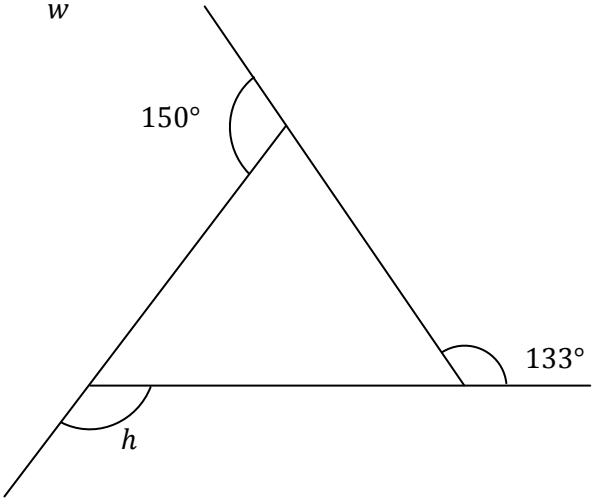
Mathematics is the Key

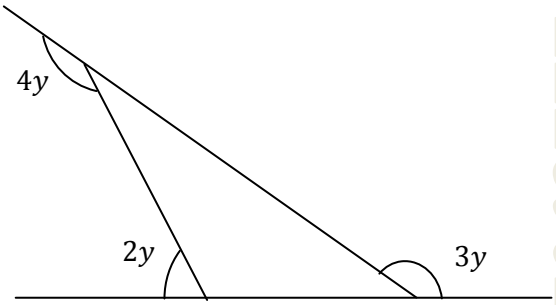
Try these

1. Find the value of the unknown in degrees.



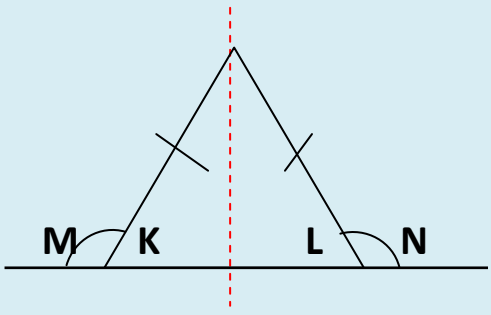
$$w + 140° + 121° = 360°$$
$$m + 261° = 360°$$
$$m + 261° - 261° = 360° - 261°$$
$$m = 99°$$





SUB TOPIC: **exterior angles of a triangle**

Angle properties of triangles



- *Two sides are equal*
- *It has one line of symmetry*
- *Base angles are equal*

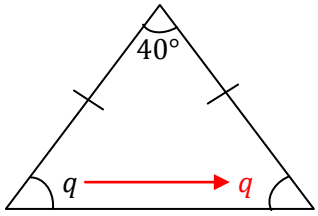
  $\angle K = \angle L$

  $\angle M = \angle N$

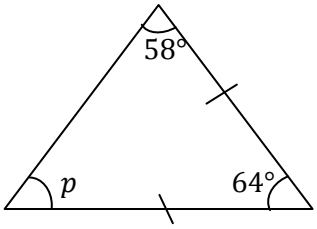
Mathematics is the Key

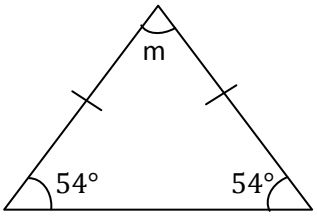
Examples

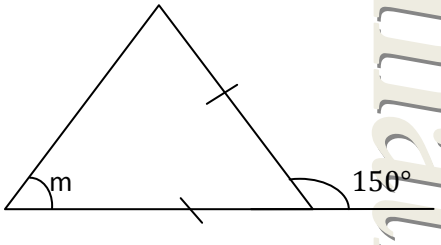
1. Find the value of the unknown in degrees.

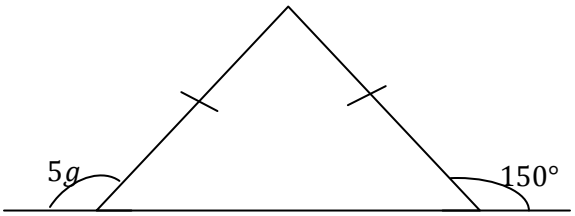


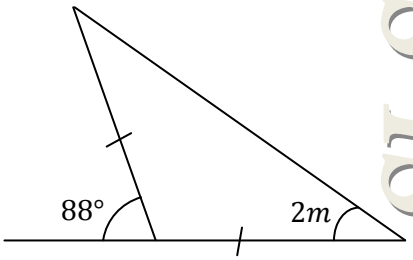
$$q + q + 40° = 180°$$
$$2q + 40° = 180°$$
$$2q + 40° - 40° = 180° - 40°$$
$$2q = 140°$$
$$\frac{2q}{2} = \frac{140°}{2}$$
$$q = 70°$$





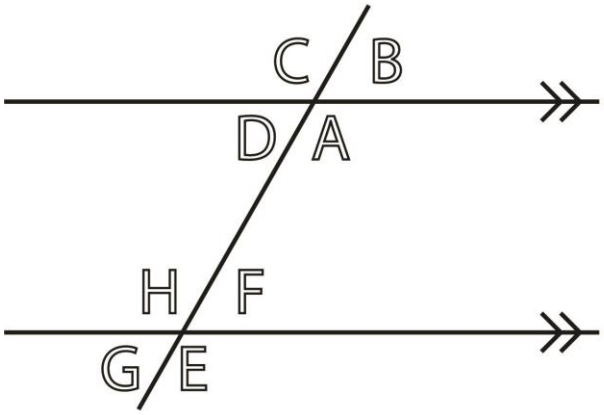






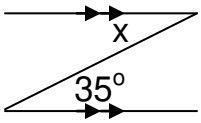
Mathematics is the Key

Properties of angles on parallel lines

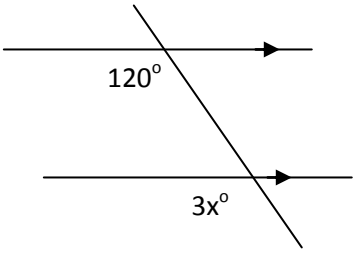


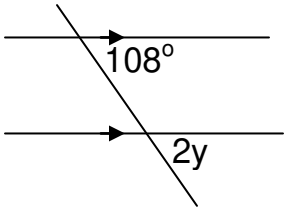
A + B = 180° (supp. ∠S)
A = C (vertically opp ∠S)
A = E (corresp ∠S)
D = G (corresp ∠s)
B = F (corresp ∠s)
C = H(corresp ∠s)
A = H & D = f (alt. Int ∠S)
G = B & C = E (Alt. ext. ∠S)
A + F = 180^0 (co.int. ∠S)
D + H = 180^0(co.int. ∠S)
C + G= 180^0 (co.ext ∠S)
B + E = 180^0 (co.ext ∠S)
H = E (vertically opp. ∠s)
A + B + C + D = 360^0 (∠S at a point)

1. Solve for the unknowns



$\underline{X = 350\ (Alt, int\ \angle S)}$

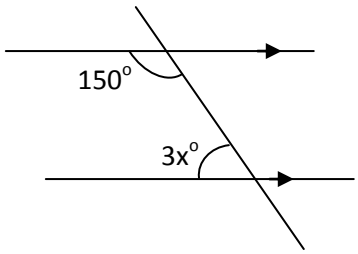


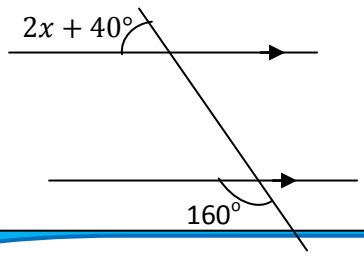


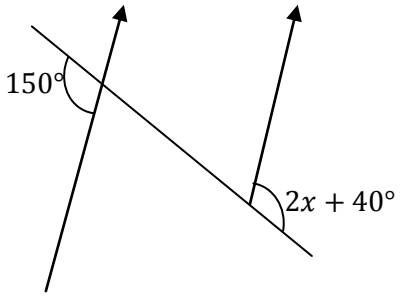
$2y = 108°\ (corr.\angle s)$

$\frac{2y}{2} = \frac{108°}{2}$

$\underline{y = 54°}$



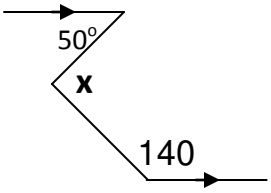


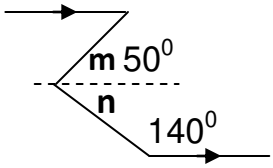


Mathematics is the Key

Examples:

1. Find the value of x.





Imaginary lines

Draw imaginary lines

$\underline{\boldsymbol{m = 50°\ (Alt.int\ \angle S)}}$

$\boldsymbol{n + 140° = 180°\ (Co.int.\angle S)}$

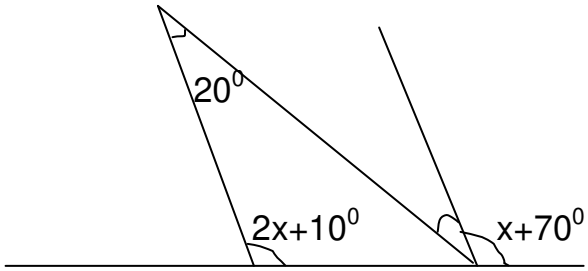
$\boldsymbol{n + 140° - 140° = 180° - 140°}$

$\underline{\boldsymbol{n = 40°}}$

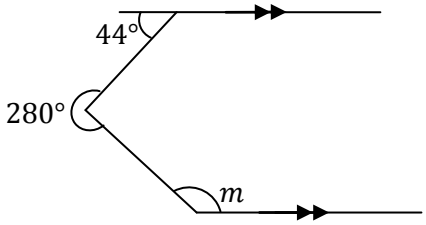
$\boldsymbol{x = 40° + 50°}$

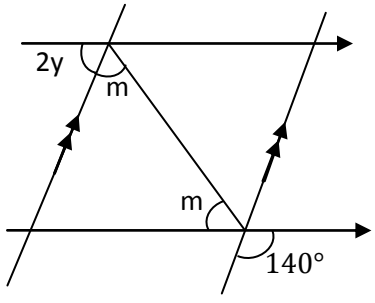
$\underline{\boldsymbol{x = 90°}}$

2. Find the value of x and k



3. Find the value of the unknowns in degrees





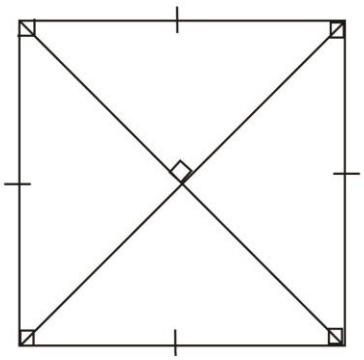
Mathematics is the Key

A quadrilateral is a figure with 4 sides.

Examples of quadrilaterals

- ***Square***
- ***Kite***
- ***Parallelogram***
- ***Rectangle***
- ***Rhombus***
- ***Trapezium***

SQUARE

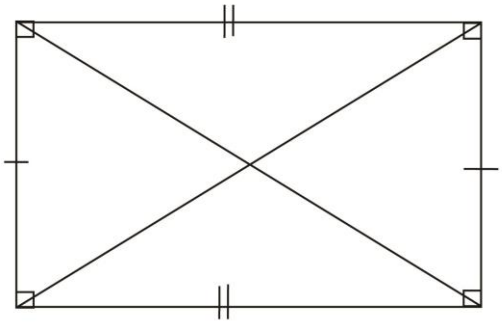


- ***All sides are equal.***
- ***It has 4 right angles.***
- ***Opposite sides are parallel.***
- ***Diagonals are equal and they bisect each other at a right angle.***
- ***It has 4 lines of folding symmetry.***
- ***Diagonals bisect each angle at every vertex.***
- ***Opposite angles are equal.***

Remember :

A square is s regular quadrilateral.

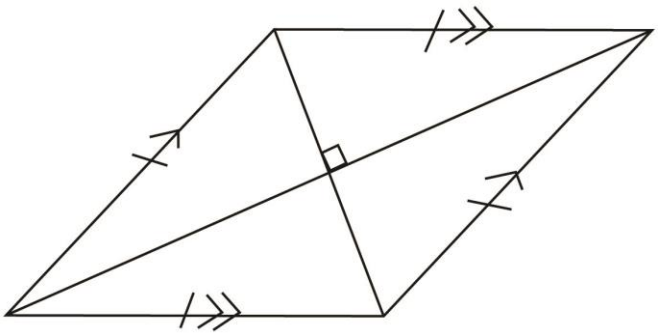
RECTANGLE



- ***Opposite sides are equal and parallel.***
- ***It has 4 right angles.***
- ***Diagonals are equal and they bisect each other.***
- ***Diagonals do not meet at right angle.***
- ***It has 2 lines of folding symmetry.***
- ***Opposite angles are equal.***

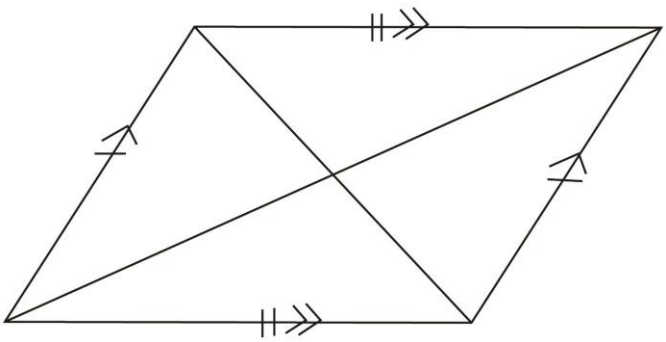
Mathematics is the 17

RHOMBUS



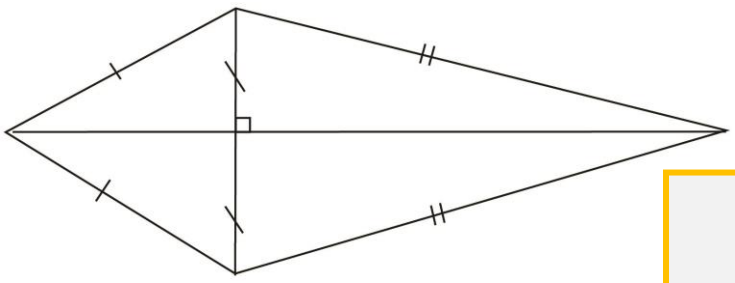
- *All sides are equal*
- *Opposite sides are parallel.*
- *Diagonals are not equal and they bisect each other at a right angle.*
- *Diagonals bisect each angle at every vertex.*
- *It has 2 lines of folding symmetry.*
- *Opposite angles are equal.*

PARALLELOGRAM



- *Opposite sides are equal and parallel.*
- *Diagonals are not equal and they bisect each other.*
- *Diagonals do not bisect each angle at every vertex.*
- *It has no lines of folding symmetry*
- *Opposite angles are equal.*

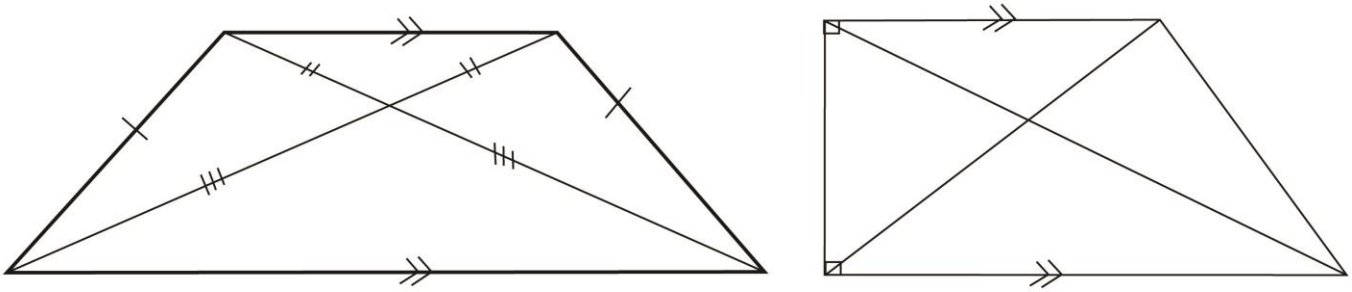
KITE



- *Adjacent sides are equal.*
- *Diagonals are not equal and they meet each other at a right angle.*
- *The longer diagonal bisects the shorter diagonal and the angles at the vertices.*
- *It has 1 line of folding symmetry.*
- *Opposite angles are equal.*

Mathematics is the

TRAPEZIUM



Isosceles trapezium

Right angled trapezium

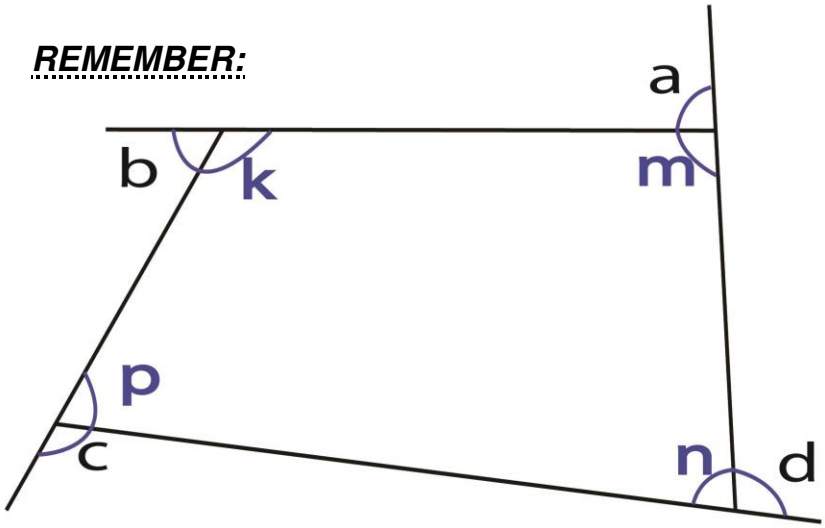
ISOSCELES TRAPEZIUM

- *Two of the sides are parallel.*
- *Diagonals are equal but they do not bisect each other.*
- *Diagonals do not bisect angles in the vertices.*
- *Opposite angles are not equal.*
- *It has 1 line of folding symmetry.*
- *Opposite angles are not equal.*

RIGHT ANGLED TRAPEZIUM

- *Two of the sides are parallel.*
- *Diagonals are not equal and they do not bisect each other.*
- *Diagonals do not bisect angles in the vertices.*
- *Opposite angles are not equal.*
- *It has no lines of folding symmetry.*
- *Opposite angles are equal.*

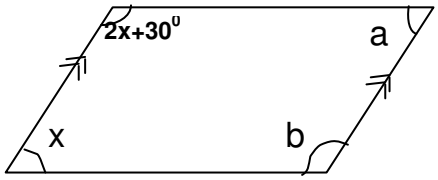
REMEMBER:



- ***Interior angle sum of a quadrilateral is 360°***
  k + m + n + p =360°
- ***Exterior angle sum of every polygon is 360°***
  a + b + c + d =360°

Mathematics is the

1. Calculate the size of angles x, b, a



SUB TOPIC: Complementary angles

An angle with 90^0 is called a right angle.

Any two angles that add up to 90^0 are complementary angles.

Examples:

ii. What is the complement of 30^0?

Let the complement be x

$X + 30^0 = 90^0$

$X + 30 - 30 = 90 - 30$

$x = 60$

iii. Find the complement of $(x + 40)^0$

$90^0 - (x + 40)^0$

$90^0 - x^\circ - 40^0$

$90^0 - 40^0 - x^\circ$

$(50 - x)^0$

iv. What angle is ½ of its complement?

Let the angle be k

ANGLE	COMPL.	TL
k	2k	90^0

$2k + k = 90^0$

$3k = 90^0$

$\frac{3k}{3} = \frac{90^\circ}{3}$

$K = 30^\circ$

v. Find the complement of ;

(a) 30°

(b) 63°

(c) $m - 15^\circ$

(d) p°

vi. What angle is 5 times its complement

Mathematics is the Key

SUB TOPIC: Supplementary angles

Supplementary angles are two angles that add up to 180^0.

Examples:

X + Y = 180^0 (supp. angles)

1. In the above figure, if x = 48^0, find y.

$$x + y = 180^0$$
$$y + 48^0 = 180^0$$
$$y + 48^0 - 48^0 = 180^0 - 48^0$$
$$\underline{y = 132^0}$$

2. What angle is ¼ of its supplement?

Let the angle be m

ANGLE	SUPPL.	TL
K	4k	180^0

$$4k + k = 180^0$$
$$5k = 180^0$$
$$\frac{5k}{5} = \frac{180^\circ}{5}$$
$$\underline{K = 36^\circ}$$

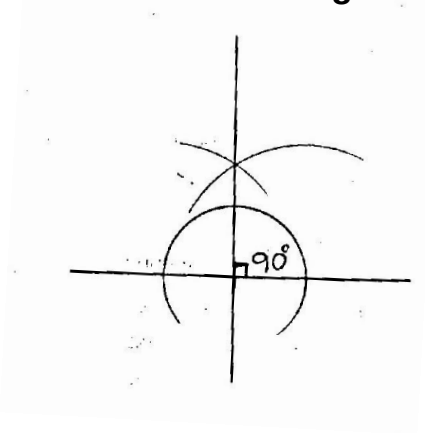
3. Find the supplement of;
   a. 135°
   b. 15°
   c. 152°
   d. $2k - 20^\circ$

4. What angle is 5 times its supplement?

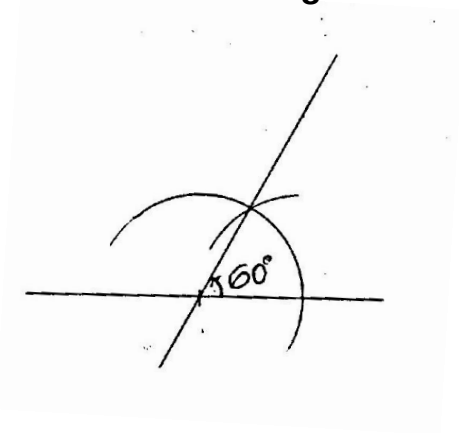
CONSTRUCTION

SUB TOPIC: Constructing special angles

1. **Construct an angle of 90°**



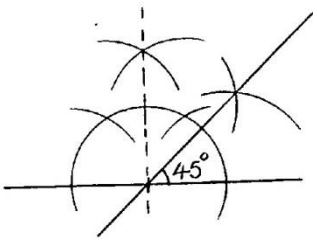
2. **Construct an angle of 60°**



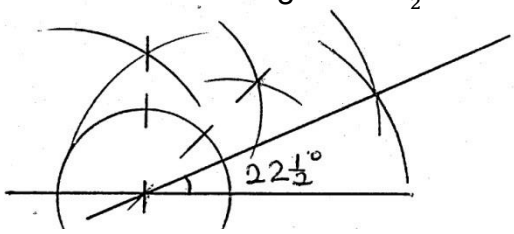
Mathematics is the Key

SUB TOPIC: Constructing other angles

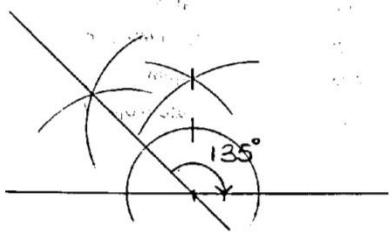
1. Construct an angle of 45°



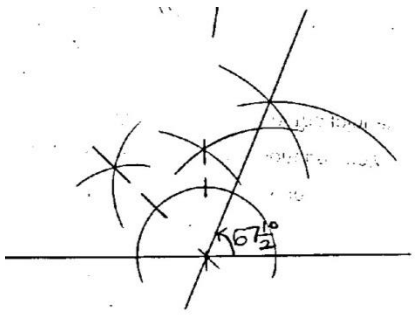
2. Construct an angle of $22\frac{1}{2}°$



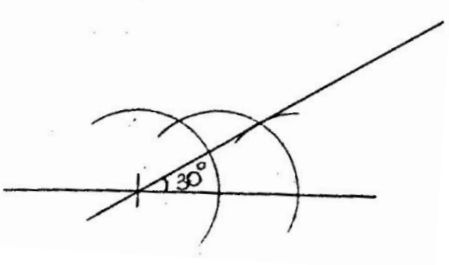
3. Construct an angle of 135°



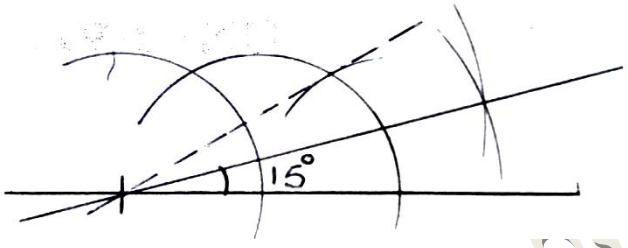
4. Construct an angle of $67\frac{1}{2}°$



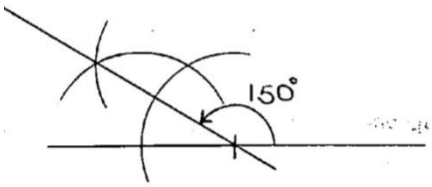
5. Construct an angle of 30°



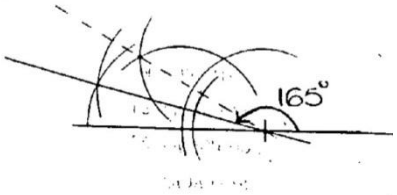
6. Construct an angle of 15°



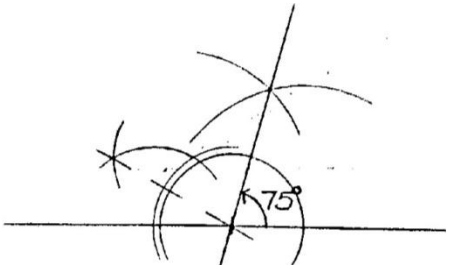
7. Construct an angle of 150°

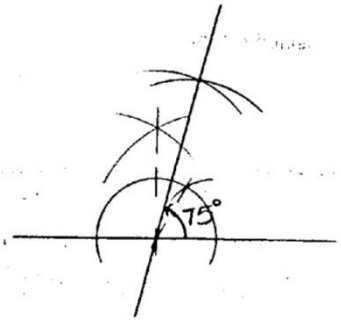


8. Construct an angle of 165°



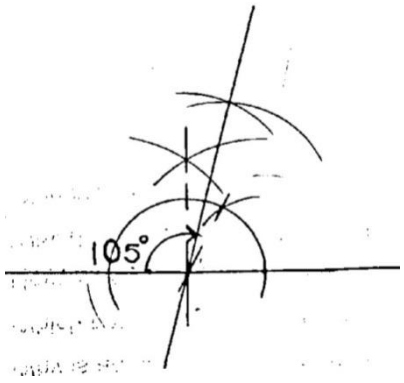
9. Construct an angle of 75°





Mathematics is the Key

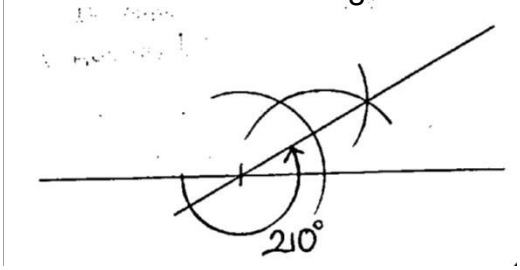
10. Construct an angle of 105°



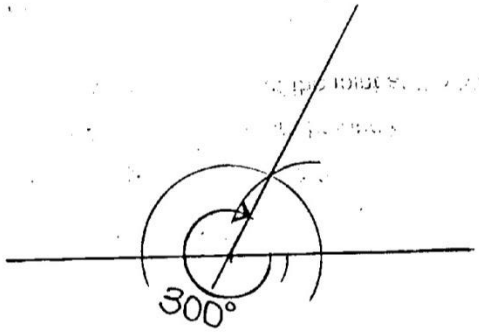
SUB TOPIC: Constructing reflex angles

A reflex angle is constructed by adding 180° to other angles

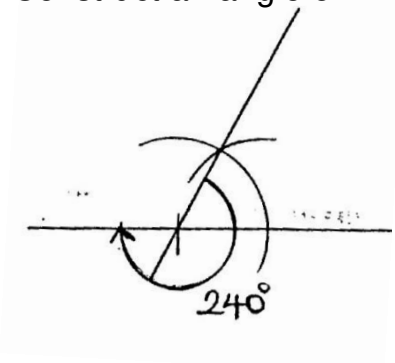
1. Construct an angle of 210°



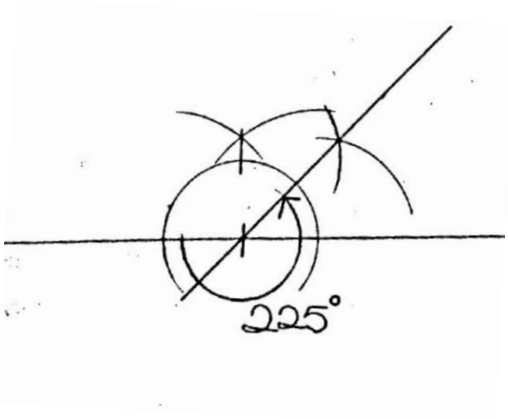
2. Construct an angle of 300°



3. Construct an angle of 240°



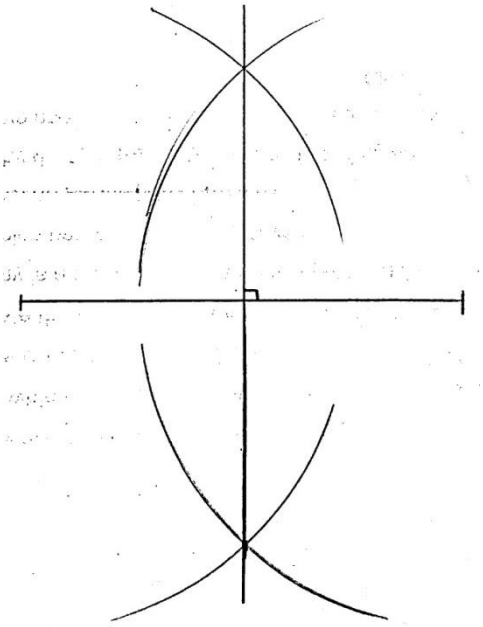
4. Construct an angle of 225°



Mathematics is the Key

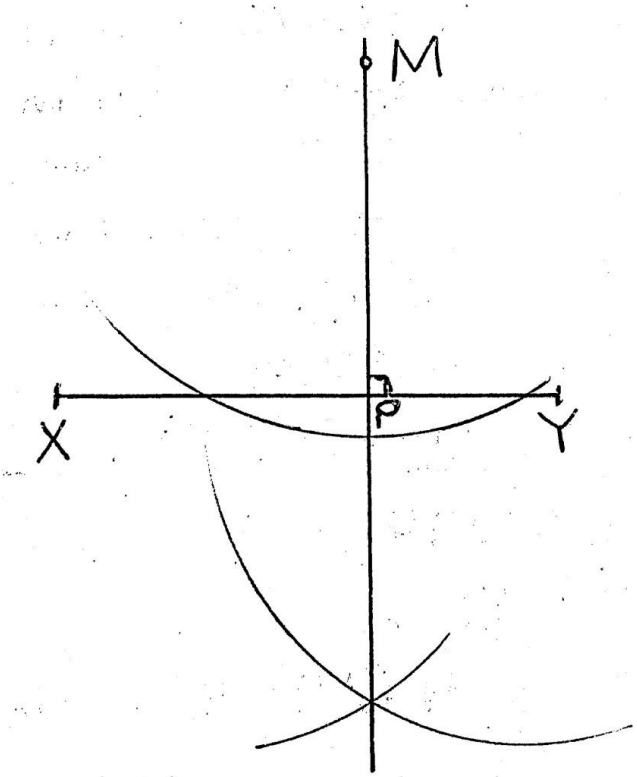
SUB TOPIC: Constructing perpendicular bisectors

1. Bisect the line below



SUB TOPIC: Constructing perpendicular from a point

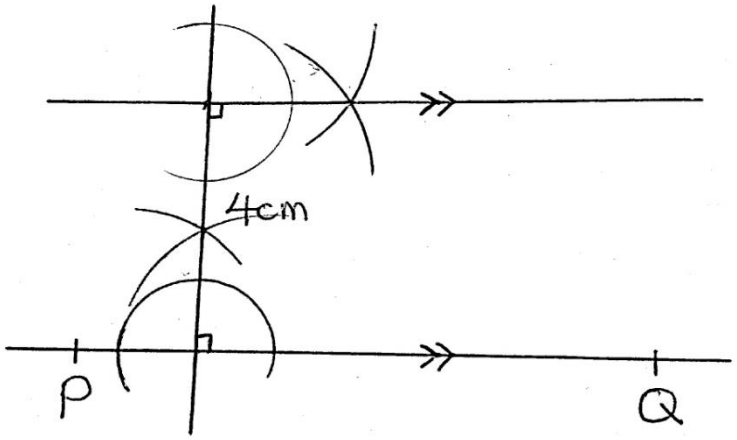
1. Using a ruler, a pencil and a pair of compasses, drop a perpendicular from M to meet line XY at p.



Mathematics is the Key

SUB TOPIC: Constructing parallel lines

1. Construct a line parallel to line PQ below such that the lines are 4 cm apart.

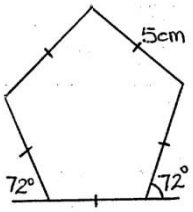


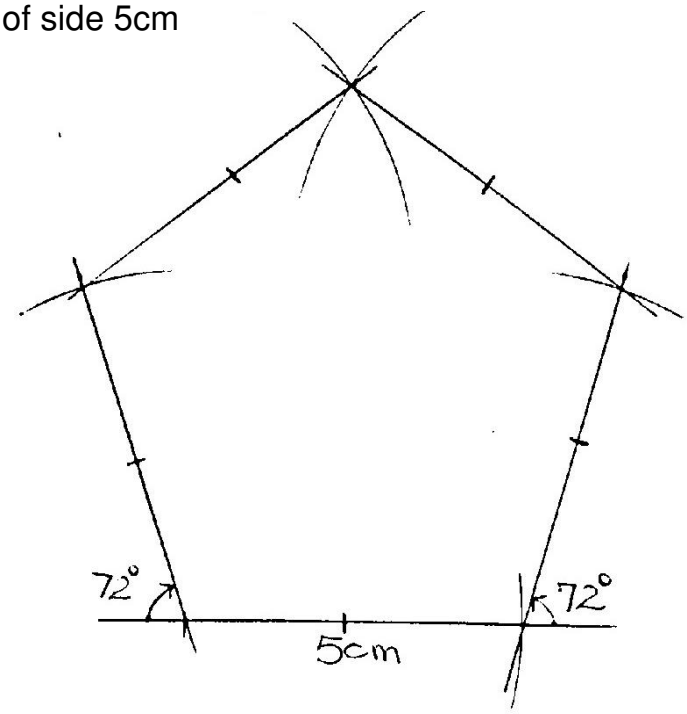
SUB TOPIC: Constructing a pentagon when given a side

1. Construct a pentagon of side 5cm

$$Ext.angle = \frac{360°}{5}$$

$$= \underline{\underline{72°}}$$



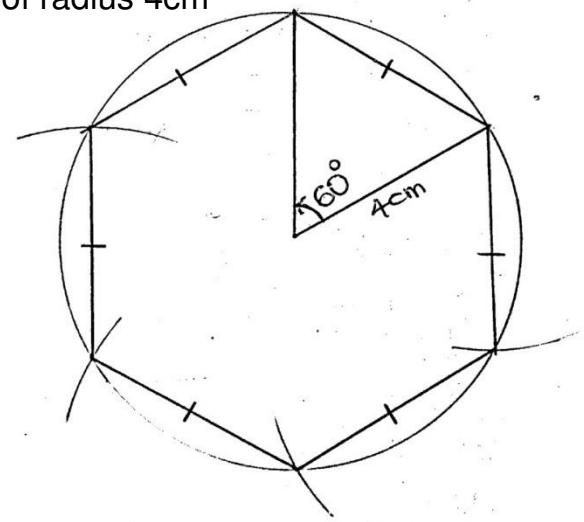


Mathematics is the Key

SUB TOPIC: Constructing polygons using a centre angle

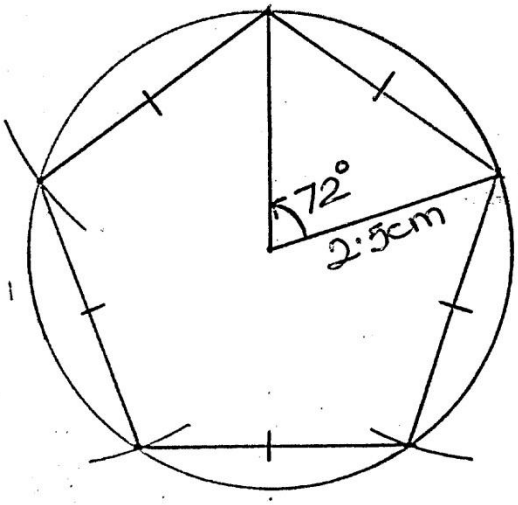
1. Construct a hexagon in a circle of radius 4cm

$$\boldsymbol{Centre\ angle} = \frac{360°}{6}$$
$$= \underline{\underline{60°}}$$



2. Construct a pentagon in a circle of radius 2.5cm

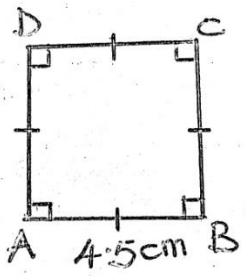
$$\boldsymbol{Centre\ angle} = \frac{360°}{5}$$
$$= \underline{\underline{72°}}$$

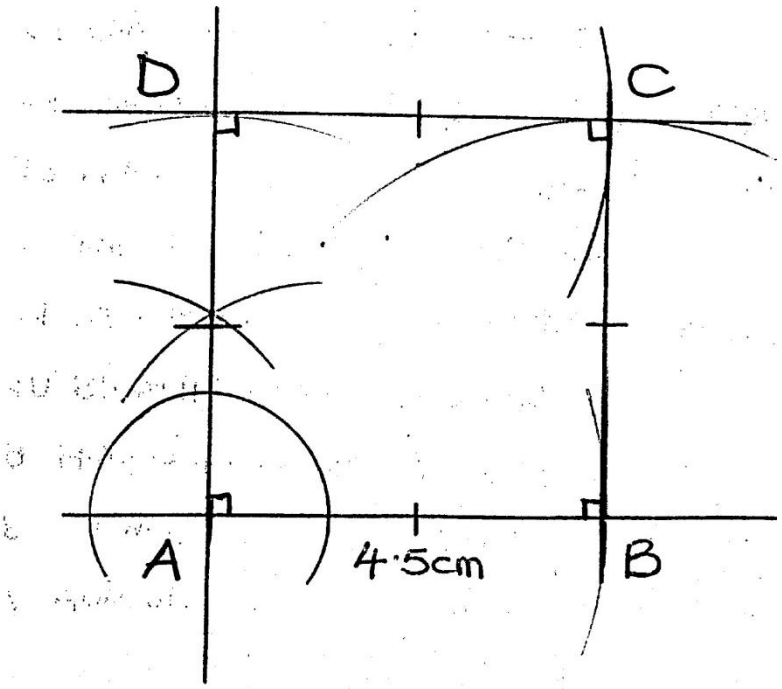


Mathematics is the Key

SUB TOPIC: Constructing a square when given side

1. Construct square ABCD of side 4.5cm

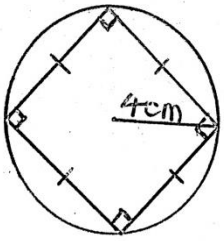




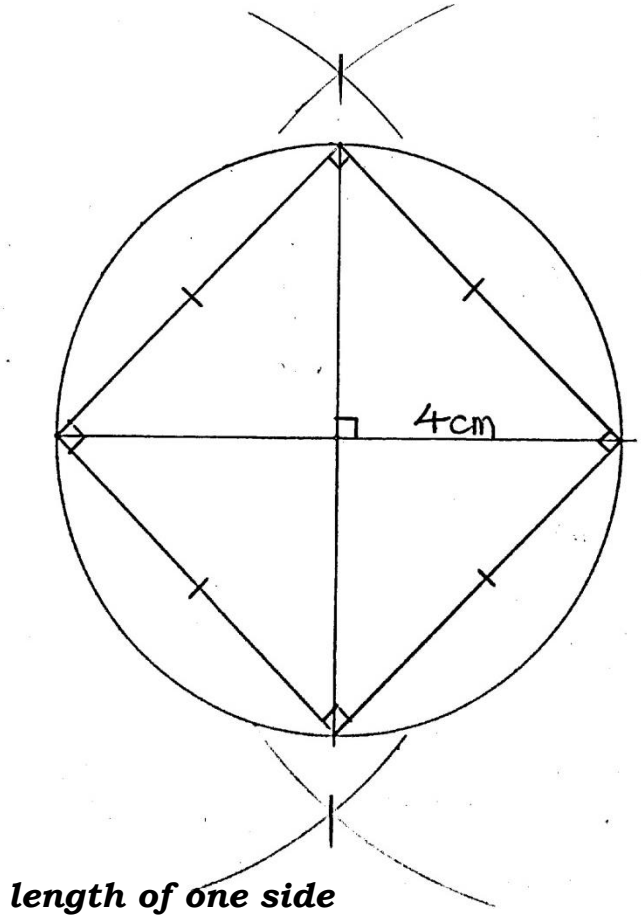
2. Construct a square of side 5.3 cm
3. Construct square MNOP where MN=4cm

SUB TOPIC: Constructing a square in a circle

1. Construct a square in a circle of radius 4cm



Mathematics is the Key

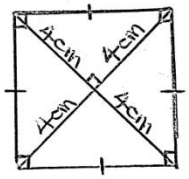


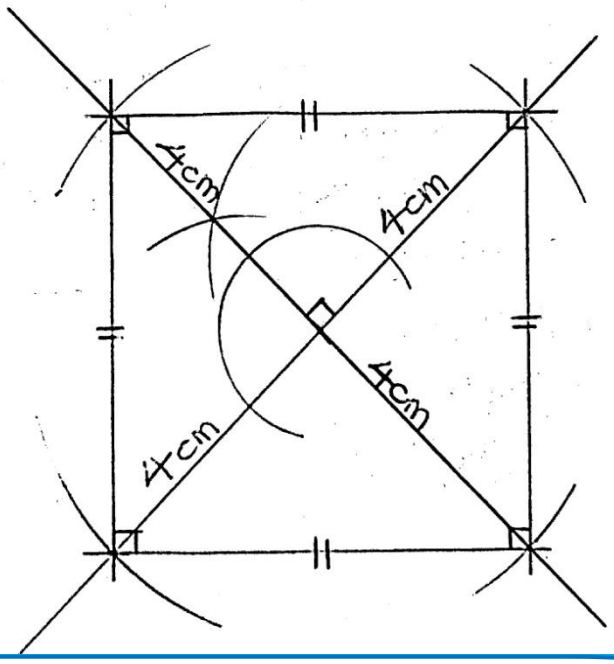
♠ ***Measure the length of one side***

2. Construct a square in a circle of radius 6cm
3. Construct a square in a circle of radius 3.5cm

SUB TOPIC: Constructing a square using diagonals

1. Construct a square whose diagonal is 8cm





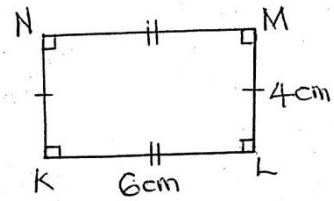
Mathematics is the Key

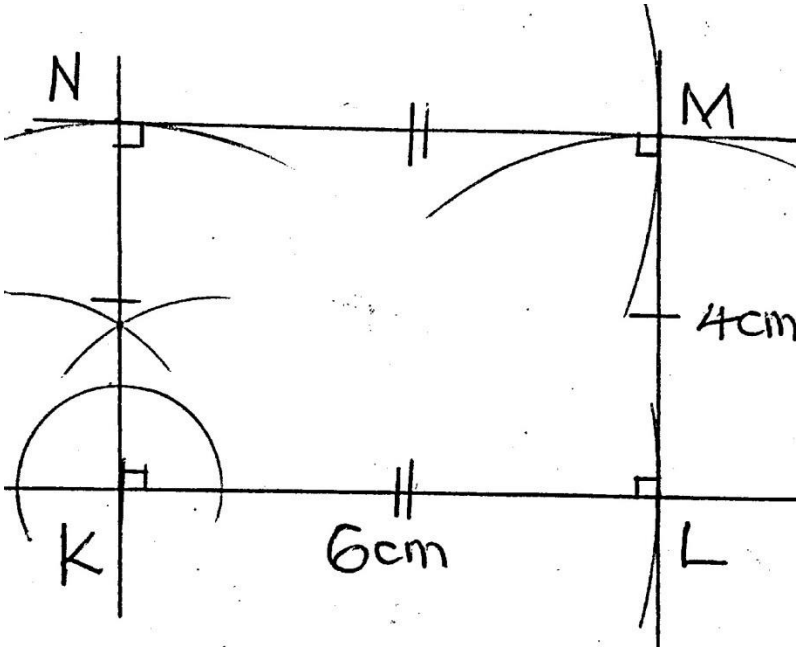
- ♠ ***Measure the length of one side***

2. Construct a square whose diagonal is 9cm
3. Construct square PQRS whose diagonal is 8cm

SUB TOPIC: Constructing a rectangle when given sides

1. Construct rectangle KLMN where KL=6cm and LM = 4cm.



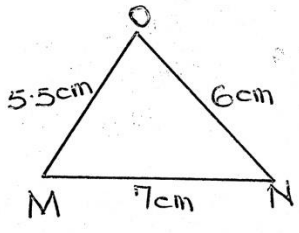


- ♠ ***Measure diagonal KM***
- ♠ ***Measure angle MKL***

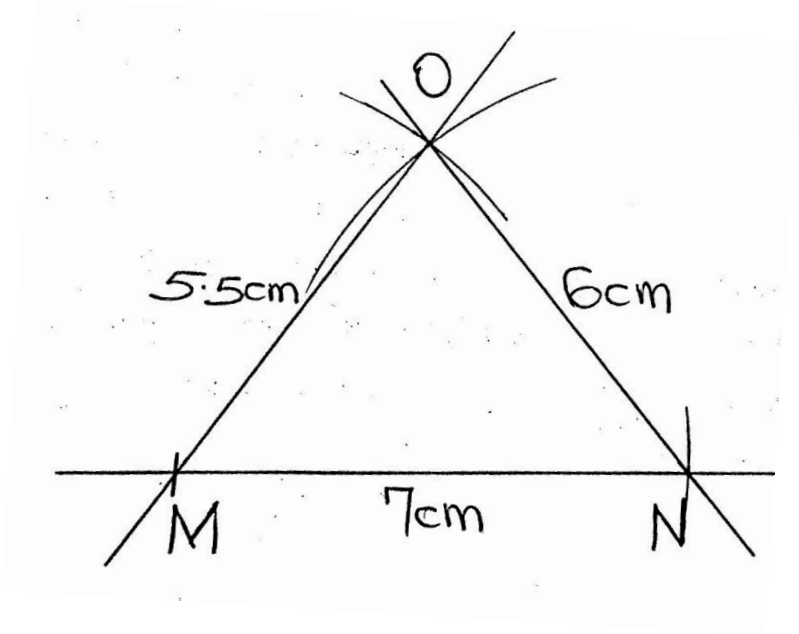
2. Construct a rectangle whose length is 7cm and width is 4.3cm.

SUB TOPIC: Constructing a triangle when given sides(SSS)

1. Construct triangle MNO where MN= 7cm, NO=6cm and MO=5.5cm



Mathematics is the Key

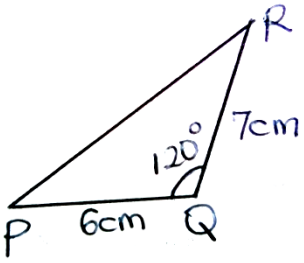


- ♠ ***Measure angle OMN.***

2. Construct triangle KLM in which KL = 7.3cm KM = LM = 8cm

SUB TOPIC: Constructing a triangle when given two sides and one angle(SAS)

1. Construct triangle PQR where line PQ = 6cm, angle PQR = 120^0 and QR=7cm.Drop a perpendicular from R to meet PQ at m.

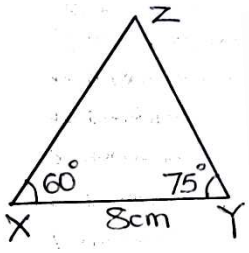


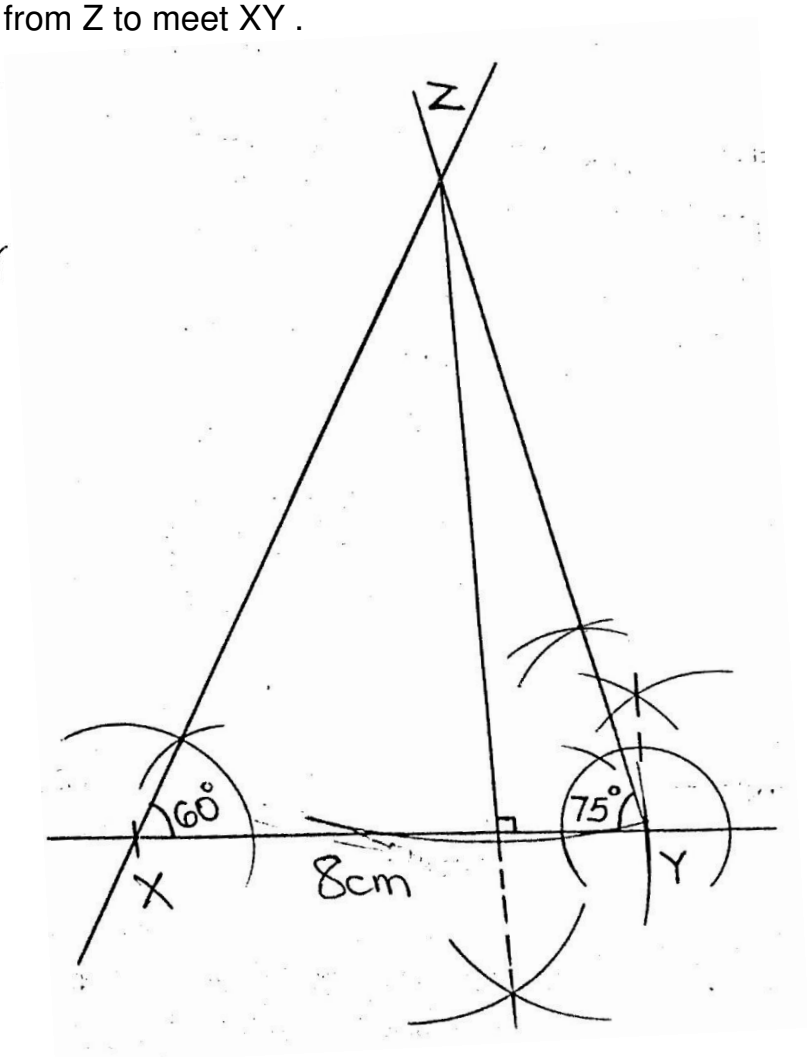
- ♠ ***Measure line RM***
- ♠ ***Measure angle RPQ***

Mathematics is the Key

SUB TOPIC: Constructing a triangle when given two angles and one side(ASA)

1. Construct triangle XYZ where XY=8cm, angle ZXY =60^0 and angle XYZ=75^0.drop a perpendicular from Z to meet XY .





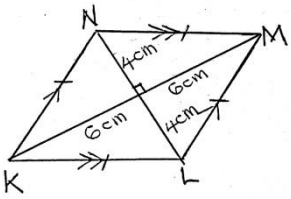
- ♠ ***Measure line XZ***
- ♠ ***Measure line YZ***
- ♠ ***Measure the height of the triangle***
- ♠ ***Find its area***

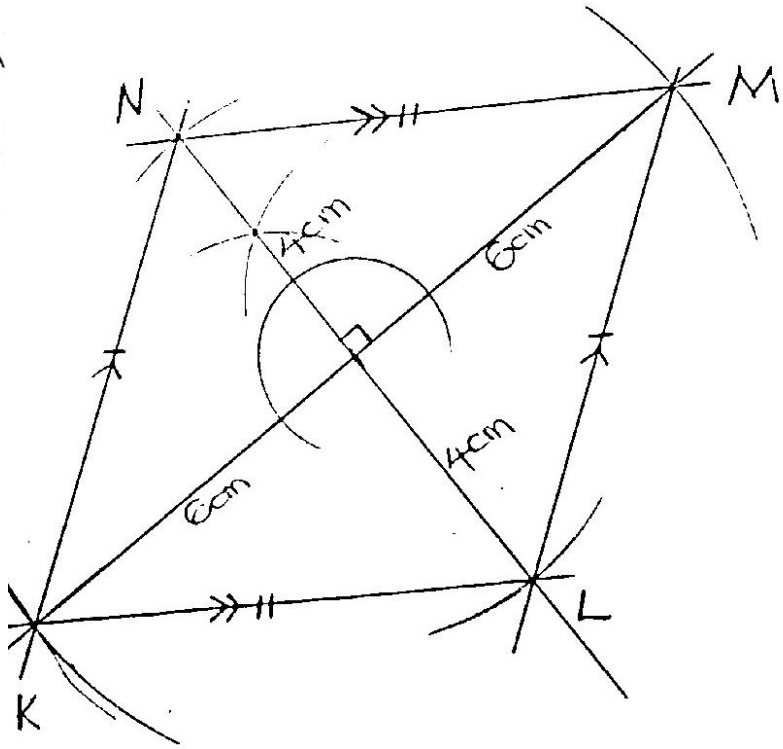
2. Construct a triangle RST where angle R = 60^0 angle S = 45^0 and RS = 5cm Measure the length of ST and angle T.

Mathematics is the Key

SUB TOPIC: Constructing a rhombus when given diagonals

1. Construct rhombus KLMN where KM=12cm and LN=8cm.



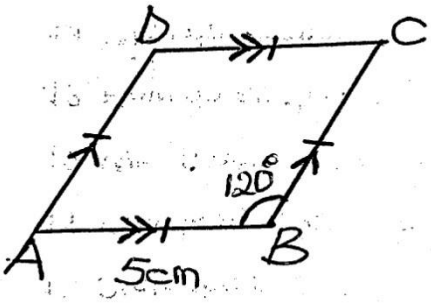


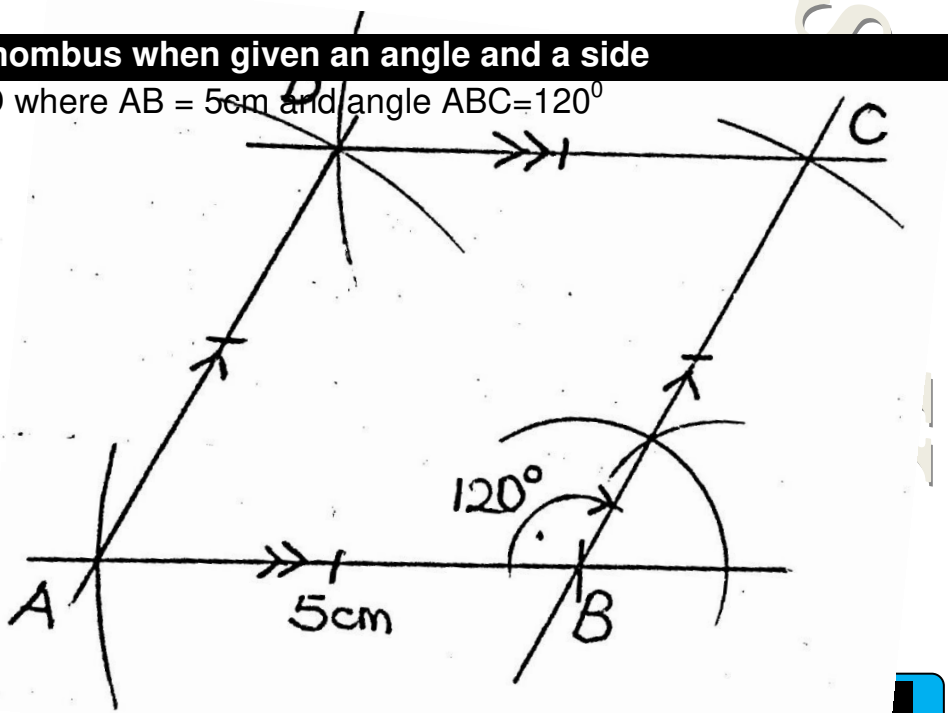
- ***Measure line LM***
- ***Measure angle NKL***
- ***Measure angle MKN***
- ***Measure angle KNL***

2. Construct a rhombus whose diagonals are 16cm and 12cm respectively.

SUB TOPIC: Constructing a rhombus when given an angle and a side

1. Construct rhombus ABCD where AB = 5cm and angle ABC=120^0



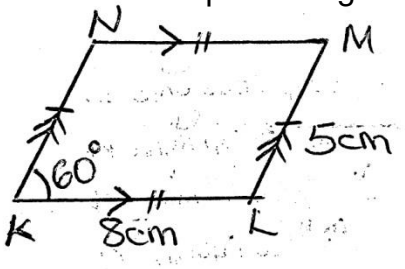


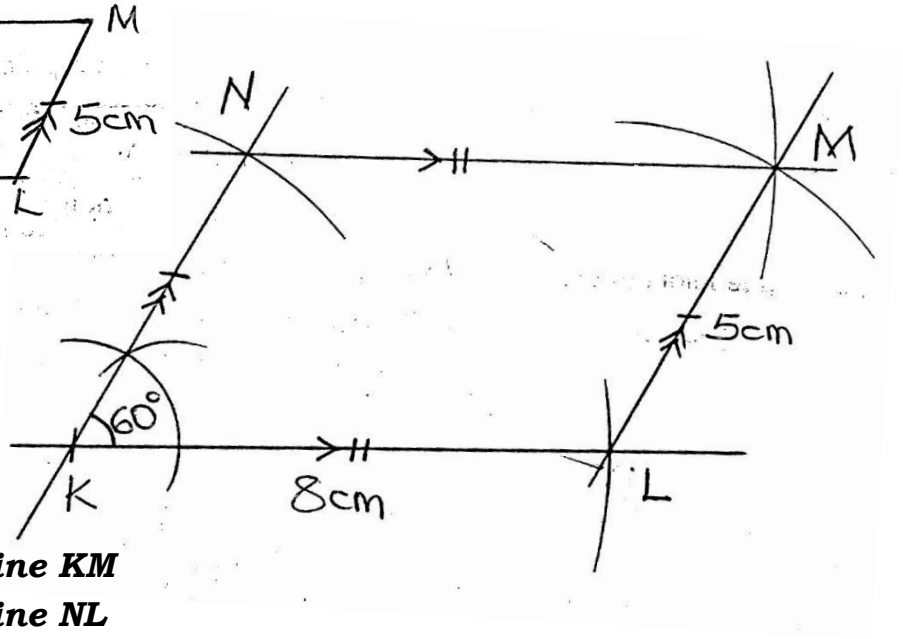
Mathematics is

- ***Measure line AC***
- ***Measure line BD***
- ***Measure angle DAB***
- ***Measure angle CAB***

SUB TOPIC: Constructing a parallelogram when given side and angle

1. Construct parallelogram KLMN where KL=8cm,LM=5cm and LKN=60^0





- ***Measure line KM***
- ***Measure line NL***
- ***Measure angle MKL***
- ***Measure angle KLM***

BEARING AND SCALE DRAWING

SUB TOPIC: Rotations/Revolutions/Complete turns

This is the act of turning around a centre or an axis

$$1\ complete\ turn/1\ rotation/1\ revolution\ =\ 360°$$

Examples

1. How many degrees are in two complete turns?

$$1\ turn = 360°$$
$$2\ complete\ turns = 360° \times 2$$
$$= \underline{720°}$$

2. How many revolutions make up 1080^0?

Mathematics is the Key

$360° = 1\ revolution$

$1080° = \frac{1080°}{360°}$

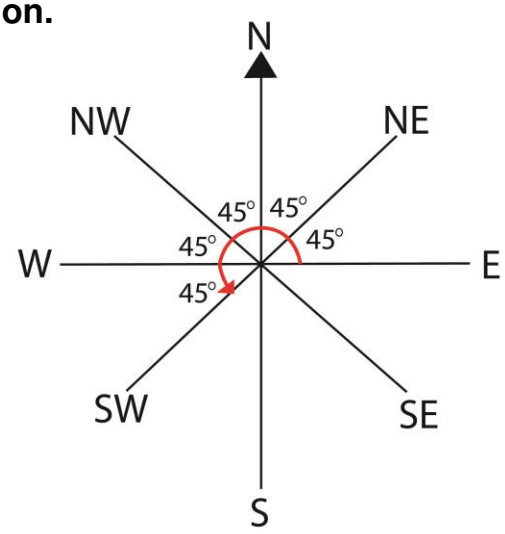
$= \frac{108}{36}$

$= 3\ revolutions$

3. How many degrees are in $\frac{1}{2}$ turn?
4. A boy made 4 complete turns. Through what angle did he turn?

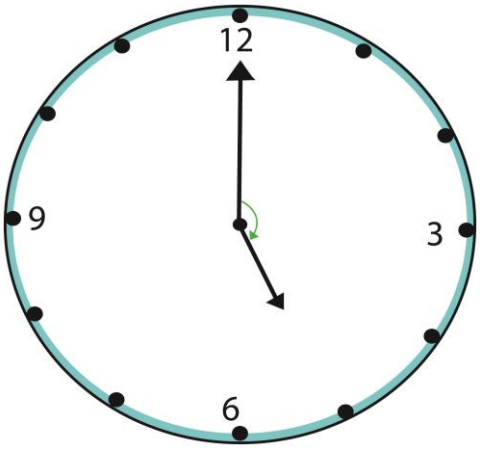
SUB TOPIC: Angles on a compass and a clock face

1. Kakuru was facing in East and turned anticlockwise through an angle of 225^0. Find his new direction.



His new direction became South West

2. Calculate the smaller angle between the hands on the clock face below.



$\frac{25}{60} \times 360°$

$25 \times 6°$

$150°$

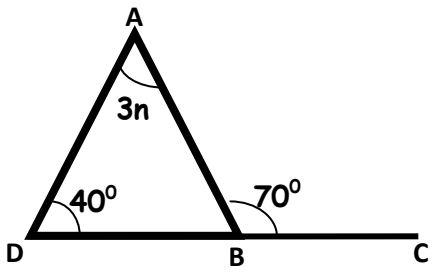
Mathematics is the Key

3. **What angle can one turn after turning from South East to North in a clock wise direction?**
4. **What smaller angle is between West and North East?**
5. **Find the smaller angle between the North West and South West**

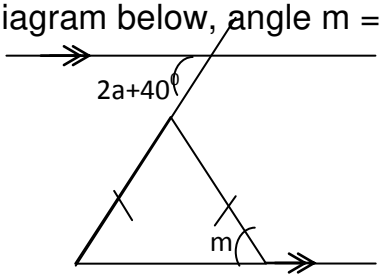
TOPICAL REVISION QUESTIONS:

1. With the help of a ruler and pair of compasses only, construct the following angles.
   (a) 30^0
   (b) 45^0
   (c) 75^0
   (d) 120^0

2. Construct using a ruler and pair of compasses only the triangles with the following measurement.
   (a) Triangle ABC where AB = 7cm, AC = 6cm and BC = 5cm
   (b) Triangle PQR where PQ = 8cm, $\angle Q = 120^0$ and QR = 5cm. Measure PR
3. What is the smaller angle between West and South West.
4. Construct a square WXYZ whose sides are 4.5cm.
5. Each interior angle of a regular polygon is 120°.
   (ii) Find the number of sides of the polygon.
   (iii) Calculate its interior angle sum.
6. How many degrees will Munduni turn through in 3 ¼ revolutions?
7. In the triangle ABC below, find the value of **n**

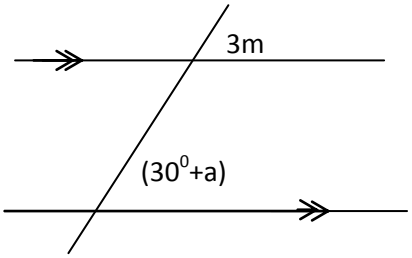


8. The supplement of $\mathbf{(a+30)^0}$ is $\mathbf{40^0}$, find the value of **a**
9. From the diagram below, angle m = 3a. Find the value of a

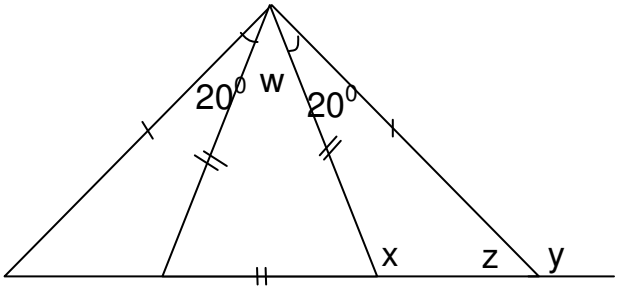


Mathematics is the Key

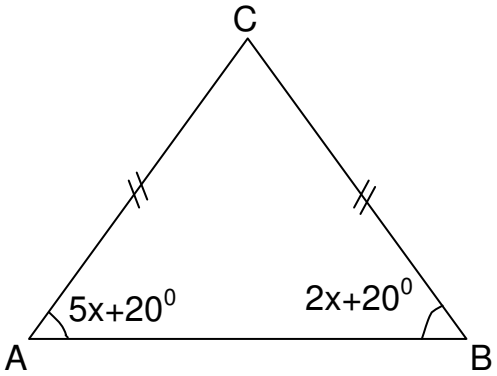
10. Given that m = 2a, find the value of a in degrees.



11. Calculate the size of angle w, x, y, z



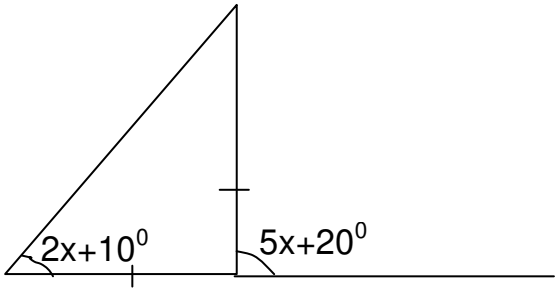
12. Use the figure below to answer the question the questions that follow.



(a) Find the value of x

(b) Find the size of angle ACB

13. find the value of x in degrees

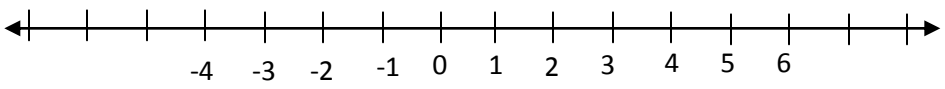


Mathematics is the Key

INTEGERS

SUB TOPIC: ORDERING AND ARRANGING INTEGERS ON A NUMBERLINE

The number line:



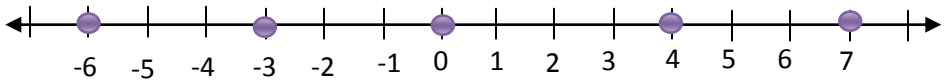
i) All integers to the left of zero are –ve.
ii) All integers to the right of zero are +ve
iii) Any integer is less than that on its right.
iv) Any integer is more than that on its left.
v) Integers on a number line are arranged in ascending order from left to right.

Examples

1. Use >, < or = to compare the pair of integers. Given:

(i) -6 < -3
(ii) -3 < 0
(iii) 0 < +4
(iv) 0 > -6
(v) -3 > -6
(vi) +7 > +4
(vii) +4 = +4
(viii) -8 = -8

2. Arrange in descending order/decreasing order the following integers:
-6, 0, +7, -3, +4



+7, +4, 0, -3, -6

3. Use >, < or = to compare the following pairs of integers.

(i) -2 ____0 **(ii) -1_____-3** **(iii) -6_____-6**
(iv) 8_____8 **(v) 5_____-5** **(vi) -7_____7**

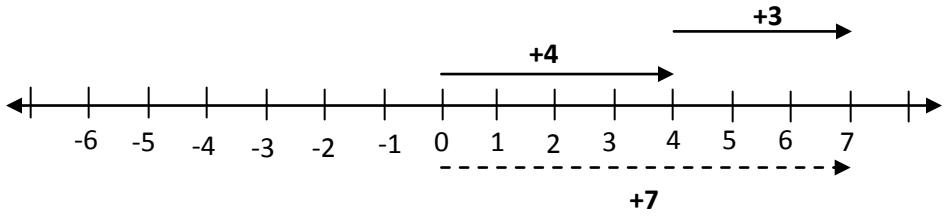
4. Arrange the following integers in ascending order (increasing order)
-8, 2, -1, 5, -3, +7

5. Arrange the integers below in descending order.
0, -7, +4, -6, +1

Mathematics is the Key

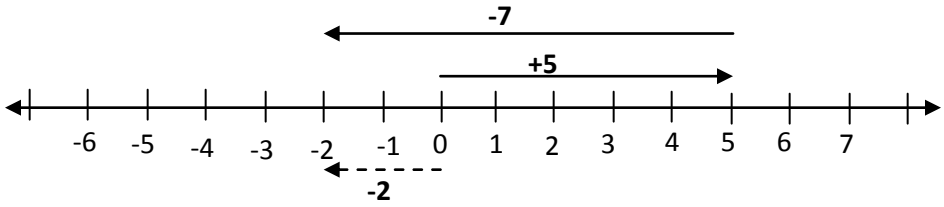
SUB TOPIC: ADDITION OF INTERS USING A NUMBER LINE

Example 1. Workout:***+4 + $^{+}$3***



+4+$^{+}$3 = +7

Example 2. Workout:***+5 + -7***



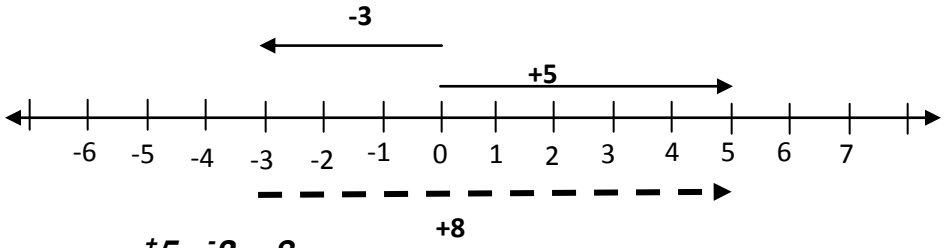
+5 + -7 = -2

Add the following using a number line

(i) -3 + +9 (ii) -4 + +5

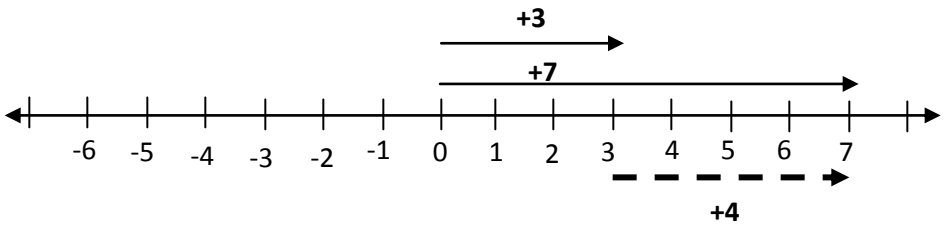
SUB TOPIC: SUBTRACTION OF INTEGERS USING A NUMBERLINE

Example 1. ***+5 - $^{-}$3***



$^{+}$5 - $^{-}$3 = 8

Example 2. ***+7 - +3***



+7-$^{+}$3 = +4

Workout the following using a number line

Mathematics is the Key

(i) -3 - -11 (ii) 8 - +8

SUB TOPIC: SUBTRACTING INTERGERS WITHOUT NUMBER LINES

Example 1.

1.Workout:+8 - +7

+8 - +7

+8 – 7

+1

Note ***- x + = -***

+ + + + + + + +

- - - - - - -

+1

2.Workout: -8 - +3

-8 - +3

-8 – 3

-11

Note ***- x + = -***

- - - - - - - -

- - -

-11

3.workout: -5 - -2

-5 + 2

+2 – 5

- 3

Note ***- x - = +***

+ +

- - - - -

-11

5. Subtract the following integers.

(i) +4 - +2 (ii) +7 - -4 (iii) -3 - +7

SUB TOPIC: ADDING INTEGERS WITHOUT USING A NUMBERLINE

Example 1.

1.Workout ***:+7 + ⁺2***

+7 + ⁺2

+7 + 2

+9

Note ***+ x + = +***

+ + + + + + +

+ +

+9

2.Workout ***:+7 + ⁻2***

+ 7 + ⁻2

+7 – 2

+5

Note ***+ x - = -***

+ + ***+ + + + +***

- -

+5

3.Workout ***:-7 + ⁻2***

-7 + -2

-7 - 2

-9

Note ***+ x - = -***

- - - - - - - -

- -

-11

Add the following integers.

(i) +1 + +7 (ii) +8 + -2 (iii) +18 + -18

Mathematics is the Key

SUB TOPIC: MULTIPLICATION OF INTEGERS

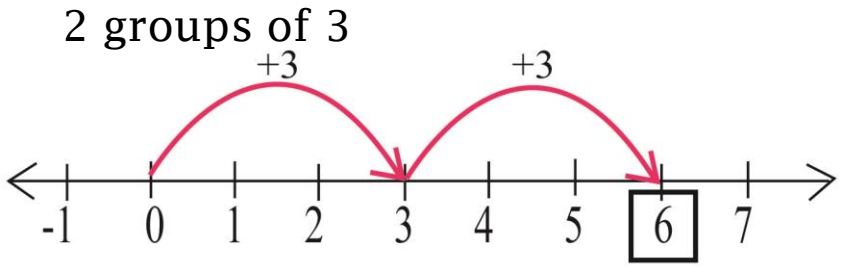
Examples:

1. +2 x +6 = +12
2. +2 x -6 = -12
3. -2 x -6 = +12

Multiplication of integers on a number line:

Examples:

1.Workout +2 x +3



2. Multiply:

(i) +4 x -2 (ii) -6 x 3

3.Workout -2 x 8 using a number line.

NOTE:

+ve x +ve = +ve
+ve x -ve = -ve
-ve x -ve = +ve

SUB TOPIC: DIVISION OF INTEGERS

NOTE:

$+ve \div +ve = +ve$
$+ve \div -ve = -ve$
$-ve \div +ve = -ve$
$-ve \div -ve = +ve$

Examples:

1. ***+16 ÷ +2 = +8***
2. ***+16 ÷ -2 = -8***
3. ***-16 ÷ +2 = -8***
4. ***-16 ÷ -2 = +8***

Divide:

(i) -9 ÷ -3 (ii) 27 ÷ -9

Mathematics is the Key

BC, LOSS, Time before, debts, below sea level are **negative.**
AD, profit, time after, above sea level are **positive**

Example 1:

A Scientist was born in 30BC and died immediately after his birthday in 76AD. How old was he when he died?

The man lived from -30 to +76
The Scientist lived for ***+76 -)-30)***
= 76 + 30
=106 years

Example 2

The temperature of a drink dropped from 10°C to -4°C. By how many degrees did drop?
*Old temp =**10°C***
*New temp = **-4°C.***
*The temp. of the drink dropped by **10°C** −(¯**4°C**)*
= 10°C + 4°C
= 14°C

Example 3

A teacher a wards 4 marks for every correct answer and deducts a mark for every wrong answer.
(a). If a pupils gets 12 correct answers in a test of 20 numbers, how many marks does he get ?

Correct answers = 12
Wrong answers = 20 -12
= 8
Marks scored = (12 x 4) – (8x1)
= 48 - 8
= 40 .

(b).If pupil gets 60 marks in a test of 30 questions, how wrong answers will he have got?

Let the wrong answers be m
Correct answers = 30 - m
4(30 - m)-(mx1) = 60
120 – 4m – m = 60
120 – 5m = 60
120 – 120 – 5m = 60 -120
-5m = - 60

$$\frac{-5m}{-5} = \frac{-60^{12}}{-5_1}$$

m = 12 wrong answers

Mathematics is the Key

Try these

1. Flavia was born in 2BC and she died in 38AD after her birthday. How old was she when she died?

2. John left a balance of shs 1,000 with the milk vendor. He then bought 5 litres of milk from the milk vendor atsh.1000 each litre. How much did he pay to meet his bill?

3. Iganga FC arrived at Nakivubo Football stadium 15 minutes before the start of the football match. The team left the stadium 15 minutes after the end of a 45 minutes first half of the match. How long was the team in the stadium?

4. In an examination you are awarded 7 marks of every correct answer and 3 marks deducted for every wrong answer. A candidate had 9 questions correct and 5 questions wrong. What mark did the candidate score?

REFERENCE

A New MK Primary Mathematics 2000 Bk 7 Pg 362 - 363 (New Edition)

FINITE/MODULAR SYSTEM

Finite system/modular system is a system of writing remainders

SUB TOPIC: writing numbers in finite system

1.Write the following in finite system.

(a) 8 in finite 5

8 = 8 ÷ 5 (finite 5)

8 = 1 rem 3 (finite 5)

8 = 3(finite 5)

2. 40 in finite 12

40 = 40÷12(finite 12)

40 = 3 rem 4 (finite 12)

40 = 4 (finite 12)

Write;

(a) **25 in finite 4**

(b) **16 in mod 7**

(c) **39 in finite 12**

(d) **100 in finite 6**

(e) **485 in mod 9**

Mathematics is the Key

SUBTOPIC: Writing equivalences in finite system

i. Write equivalent numbers of 2(mod 5)

2(mod 5) = {2, 7, 12, 17, 22, 27 …}

ii. Write the first 5 equivalent numbers of 7(finite 9)

7(finite 9) = {7, 16, 25, 34, 43}

iii. Write the first eight equivalent numbers of;

1. **3(finite 5)**
2. **2(finite 9)**
3. **11(finite 12)**
4. **6(finite 9)**
5. **1(finite 5)**

SUBTOPIC: Addition of numbers in finite system

Examples:

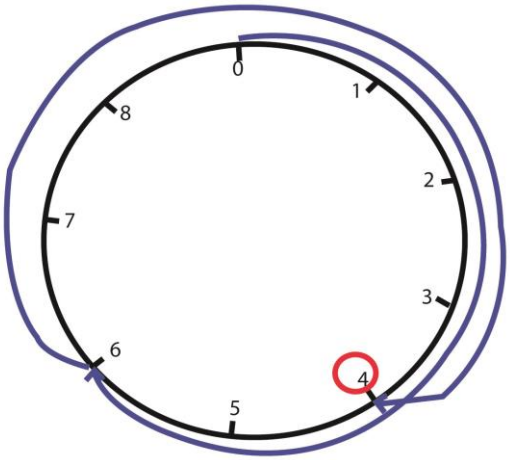
(i) Add: 6 + 7 = ___ (finite 9)

6 + 7 = ___(finite 9)

13 ÷ 9 = 1 rem 4 (finite 9)

∴ 6 + 7 = 4 (finite 9)

Using a dial / clockface



∴ 6+7 = 4 (finite 9)

(ii) Add: 8 + 6 + 3 = _____ (finite 13)

(8 + 6) + 3=___ (finite 13)

17 ÷ 13 = 1 rem 4(finite 13)

∴ 8 + 6 + 3 = 4 (finite 13)

Mathematics is the Key

(iii) Workout :3 + 4 + 5 = x (finite 7)

x = 3 + 4 + 5 (finite 7)

x = 12 ÷7 (finite 7)

x = 1 rem 5 (finite 7)

x = 5 (finite 7)

(iv) Workout the following

- $5 + 8 = ___(mod\ 9)$
- $6 + 3 = ____(finite\ 7)$
- $2 + 11 + 7 = k\ (mod\ 12)$

SUB TOPIC: SUBTRACTION IN THE FINITE SYSTEM

Workout the following

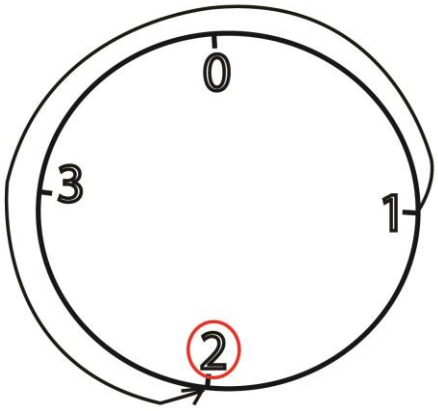
(i) 1 – 3 = ____ (finite 4)

(1 + 4) – 3___(finite 4)

5 – 3 = 2 (finite 4)

∴ 1 – 3 = 2 (finite 4)

Using a dial / clock face



∴ 1 – 3 = 2(finite 4)

(ii) $2^2 - 5 =$ ____ (finite 7)

(2 x 2) – 5 = ___ (finite 7)

4 – 5 = ___ (finite 7)

4 + 7 – 5 =___(finite 7)

11 – 5 = 6 (finite 7)

∴ 2^2 – 5 = 6 (finite 7)

(iii) $2 - 6 - 4 - 8 = ___\ (finite\ 9)$

(iv) $10 - 6 = ___(mod\ 12)$

(v) $3 - 6 = ____(mod\ 7)$

(vi) $2 - 49 = ____(finite\ 9)$

Mathematics is the Key

Examples:

Workout the following

(i) *5 x 7 = ____ (finite 9)*

5 x7 =____(finite 9)

35 ÷ 9 = 3 rem 8 (finite 9)

∴ 5 x 7 = 8 (finite 9)

(ii) 2^3 = ___(finite 7)

2^3= 2 x 2 x 2

= 4 x 2

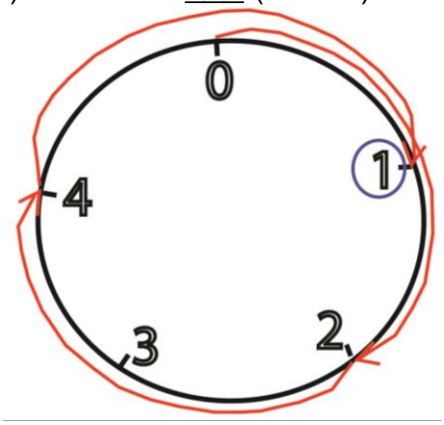
= 8

2^3= 8÷3 =1 rem 1(finite 7)

2^3= 1 rem 1(finite 7)

∴ 2^3 = 1 (finite 7)

(iii) 3 x 2 = ___ (mod 5) using a dial



∴ 3 x 2 = 1 (mod 5)

(iv) $4 \times 6 =$ _____$(mod\ 12)$

(v) $3 \times 5 =$ _____$(mod\ 7)$

(vi) $8 \times 9 =$ _____$(mod\ 4)$

(vii) $4 \times 6 =$ _____$(mod\ 9)$

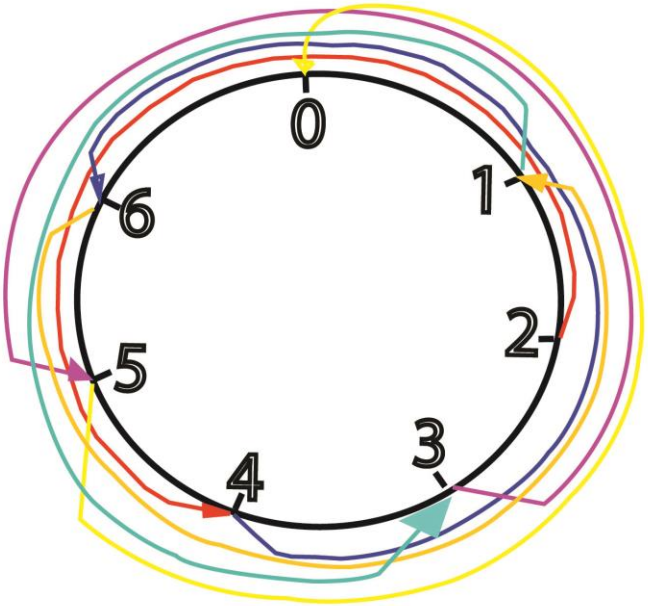
Mathematics is the Key

Example:

1. Divide 2 ÷ 5 = ___ (Mod 7)

$2 \div 5 = __ \ (mod\ 7)$
$2(mod\ 7) = \{2, 9, 16, 23, 30 \ldots\}$
$30 \div 5 = 6\ (mod\ 7)$
$\therefore\ 2 \div 5 = 6\ (mod\ 7)$

Using a dial / clock face



2. Work out the following

(a) $\mathbf{2 \div 6 = ____(mod\ 7)}$
(b) $\mathbf{4 \div 6 = ____(mod\ 5)}$
(c) $\mathbf{8 \div 11 = ____(mod\ 12)}$

SUB TOPIC: Application of finite 7 in days of the week.

(i) Today is Thursday, what day of the week will it be 82 days from today?

Thursday stands for 4
4 + 82 = ___ (finite 7)
86 = ___ (finite 7)
86 ÷ 7 = 12 rem 2 (finite 7)
2 stands for Tuesday
It will be Tuesday

Mathematics is the Key

(ii) Today is Tuesday what day of the week was it 85 days ago.

2 represents Tuesday

2 – 85 = ___ (finite 7)

85 ÷ 7 = 12 rem 1(finite 7)

85 = 1 (finite 7)

2 – 1 = 1 (finite 7)

1 stands for Monday

<u>The day was Monday.</u>

(iii) Today is Wednesday, what day of the week was it 30 days ago?

(iv) Today is Saturday, what day of the week will it be after 58 days?

SUB TOPIC: Application of finite 12 in months of the year

Digits representing specific months in the year.

JAN	FEB	MAR	APRIL	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC
1	2	3	4	5	6	7	8	9	10	11	0

Example:

(i) It is July now, which month of the year will it be after 2132 months?

7 represents July

7 + 2132 = __(finite 2)

2139 = __ (finite 12)

2139 ÷ 12 = 178 rem 3 (finite 12)

3 stands for March

<u>The month will be March.</u>

(ii) It is April now, which month of the year was it 346 months ago?

4 stands for April

4 – 346 = ___ (finite 12)

346÷ 12 = 28 rem 10 $(finite\ 12)$

$$\begin{array}{r} 28 \\ 12\overline{)346} \\ -24\downarrow \\ \hline 106 \\ -96 \\ \hline 10 \end{array}$$

346 = 10 (finite 12)

4 – 10 = (fin 12)

(4 + 12) – 10 =____ (finite 12)

16 – 10 = 6 (finite 12)

6 stands for June

<u>The month was June</u>

(iii) It is March now, which month of the year was it 206 months ago?

(iv) It is July now, which month of the year will it be after 2890 months?

Mathematics is the Key

SUB TOPIC: Applications of finite 12 in 12 hour clock

NOTE:

When the quotient is odd, the units will change (pm to am, am to pm)

When the quotient is even, the units will not change.

Example:

(ii) It is 7:00 am. What time will it be after nine hours from now?

7 + 9 = __ (finite 12)
16 = __ (finite 12)
16 ÷ 12 = 1 rem 4(finite 12)
It will be 4:00pm
(It will change to pm if the quotient is an odd number)

(iii) It is 11:00 pm what time will it be nineteen hours from now?

11 + 19 = __ (finite 12)
30 = __ (finite 12)
30 ÷ 12 = 2 rem 6
11+19 = 6 (finite 12)
It will be 6:00pm
(it will remain in pm since the quotient is an even number.)

(iv) Given that time now is 4:00am. What time of the day was it be 95 hours ago?

(v) Anitah travelled for 81 hour after leaving her home at 2:30pm. At what time did she arrive the final destination?

(vi) It is 7:00 am. What time will it be after 9 hours from now?

SUB TOPIC: Applying more than one finite at ago.

Example 1

Find the least number of oranges when divided by 6 or 8, there is always a remainder of 5.

4(mod 8) = {4, 12, 20, 28, 36 .....}
4(mod 6) = {4, 10, 16, 22, 28, 34 .....}
28 oranges

Mathematics is the Key

Example: 2

A Headmaster bought some pens. Teachers grouped them in groups of nines but seven pens were left and when they grouped them in groups of 8, 4 pens were left. When they grouped them in 3's only 1 pen was left. How many pens were bought by the headmaster?

7 (finite 9) = {7, 16, 25, 34, 43, 52, 61……}
4 (finite 8) = {4, 12, 20, 28, 36, 44, 52, 60….}
1 (finite 3) = {1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31,34, 37, 40, 43, 46, 49, 52, 55….}
The headmaster bought 52 pens.

Try these

- π A P.7 class teacher 2018 arranged his candidates in groups of 8, 6 remained when he grouped them in 11, only 2 remained and when he grouped them in 5, 1 pupil remained. How many candidates are in P.7 2018?

- π Find the least number of fruits when shared by 15 pupils or 18 pupils there is always a remainder of 3 fruits

SUB TOPIC: SOLVING EQUATIONS USING THE FINITE SYSTEM

Examples:

(i) x – 4 = 3 (mod 7)
x – 4 + 4 = 3 + 4)mod 7)
x + 0 = 7 (mod 7)
x = 7 ÷ 7 (mod 7)
x = 1 rem 0 (mod 7)
x = 0 (mod 7)

(ii) m + 4 = 3 (mod 5)
m + 4 – 4 = 3 – 4 (mod 5)
m + 0 = (3 + 5) – 4 (mod 5)
m = 8 – 4 (mod 5)
m = 4 (mod 5)

(iii) 2x – 3 = 3 (finite 4)
2x – 3 + 3 = 3 + 3 (finite 4)
2x + 0 = 6 (finite 4)
$\frac{2x}{2} = \frac{6}{2}$ ***(finite 4)***
x = 3 (finite 4)

Mathematics is the Key

(iv) 2(2x – 1) = 4 (finite 7)

2 x 2x – 1 x 2 = 4 (finite) 7)

4x – 2 = 4 (finite 7)

4x – 2 + 2 = 4 + 2 (finite 7)

4x = 6 (finite 7)

4x = 6 + 7 (finite 7)

4x = 13 + 7 (fin 7)

$$\frac{4x}{4} = \frac{20^{5}}{4_{1}}$$

X = 5

Try these

Solve the following

(a) $p + 2 = 4\ (finite\ 5)$

(b) $3\ (m - 2) = 1\ (finite\ 5)$

(c) $\frac{3y + 6}{5} = 2\ (finite\ 5)$

(d) $2(2k - 1) = 4\ (mod\ 7)$

(e) $3y = 4\ (finite\ 7)$

TOPICAL TEST

1. Find the additive inverse of the following
   a) -5
   b) 4
   c) -12
2. Work out the following without a number line
   a) -6 +- 2
   b) +5- ¯6
   c) -3 x -5
3. Workout the following using a number line
   a) -4 + ⁺5
   b) 6 - ¯3
   c) +3 x ¯ 4
4. Evaluate 33 = ___ (mode 7)
5. Write the equivalent numbers of 3(finite 5)
6. Simplify: 2 – 4 = ___ (finite 5)
7. Simplify : 5 x 6 = ___(finite 7)
8. Solve (i) y – 5 = 4 (finite 5)
   (ii) 2(x – 2) = 3 (finite 6)
9. Divide 1÷ 5 = __ (finite 6)
10. Today is Tuesday. What day of the week will it be after 46 days?
11. Today is Friday. What day of the week was it 37 days ago?
12. Find the least number when divided by 12 or 15 leaves 6 as a remainder

Mathematics is the Key

ALGEBRA

SUB TOPIC: algebraic phrases and expressions

PHRASE	EXPRESSION
Sum of p and q	$p+q$
Multiply h by six	$6\times h=6h$
Add five to b	$b+5$
Subtract p from x	$x-p$
Divide y by five	$\frac{y}{5}$
Two more than p	$p+2$
P more than three	$3+p$
Five less than k	$k-5$
K less than six	$6-k$
Double p	$p+p=2p$
Triple f	$f+f+f=3f$
Twice d	$2\times d=2d$
Three times w	$w\times 3=3w$
Two years younger than h	$(h-2)years$
Five years older than k	$(k+2)years$
Double m and add 9 to the result	$2m+9$
Square of n	$n\times n=n^2$
Square root of m	$\sqrt[2]{m}$

SUB TOPIC: SUBSTITUTITON

1. $If\ a=5, b=4\ and\ c=0$
$Find\ the\ value\ of\ a+b+c$
$5+4+0$
$9+0$
9

1. $Given\ that\ x=2\ and\ y=-2$
$Evaluate\ x-y$
$(x)-(y)$
$2-(-2)$
$2+2$
4

2. $Given\ a=\frac{3}{4}, b=\frac{1}{3}. Find\ the\ value\ of\ a+b$
$(a)+(b)$
$\frac{3}{4}+\frac{1}{3}$
$\frac{9+4}{12}$
$\frac{13}{12}$
$1\frac{1}{12}$

3. $4. If\ y=2,$
$(a). what\ is\ the\ value\ of\ 3y^2?$
$3y^2=3\times y\times y$
$=3\times 2\times 2$
$=3\times 4$
$=12$
$(b) what\ is\ the\ value\ of\ (3y)^2?$
$(3y)^2=3y\times 3y$
$=3\times 2\times 3\times 2$
$=6\times 6$
$=36$

4. $Given\ that\ a=3, b=4\ and\ c=5$
$(a). What\ is\ 3a\ x\ 3b$
$(b) What\ is\ c\ (b-a)$
5. $If\ m=2, what\ is\ the\ value\ of\ m^6?$
6. $If\ a=½, c=\frac{2}{3}\ and\ d=¼. Evaluate\ ac+d$
7. $If\ m=4, n=3\ and\ p=2, what\ is\ \frac{n^3\ x\ m^2}{mp}$

Mathematics is the Key

SUB TOPIC: Collecting and simplifying like terms

Examples:

1. $a + a + a = 3a$

2. $2p + 3p + p = 6p$

3. $2ab + ab + 5ab = 8ab$

4. $x + y + x + y + x$
   $x + x + x + y + y$
   $3x + 2y$

5. $3p - 6f - p + 2f$
   $3p - p + 2f - 6f$
   $2p - 4f$

   Simplify the following

   (a) $2m + m + 4m$

   (b) $6k + 4p - 3k - 5p$

   (c) $2xy - y + 5xy - y$

SUB TOPIC: Addition and subtraction

1. **Simplify the following**

   (a) $\frac{2m}{3} + \frac{m}{2}$

   $\frac{\mathbf{2m}}{\mathbf{3}} \times \frac{\mathbf{2}}{\mathbf{2}} + \frac{\mathbf{m}}{\mathbf{2}} \times \frac{\mathbf{3}}{\mathbf{2}}$

   $\frac{\mathbf{4m}}{\mathbf{6}} + \frac{\mathbf{3m}}{\mathbf{6}}$

   $\frac{\mathbf{4m + 3m}}{\mathbf{6}}$

   $\frac{\mathbf{7m}}{\mathbf{6}}$

   $\mathbf{1\frac{1}{6}m}$

   (b) $\boldsymbol{p - \frac{p}{3}}$

   $\frac{p}{1} - \frac{p}{3}$

   $\frac{\frac{p}{1} \times 3 - \frac{p}{3} \times 3}{3}$

   $\frac{3p - p}{3}$

   $\frac{2p}{3}$

2. Simplify the following

   (a) $\frac{3d}{4} + d + \frac{d}{2}$

   (b) $\frac{3r}{7} - \frac{2r}{6} + \frac{r}{4}$

SUB TOPIC: multiplication and division

1. **Simplify the following.**

   (a) $\frac{3k}{7} \times \frac{1}{6}$

   $\frac{\mathbf{3k}}{\mathbf{7}} \times \frac{\mathbf{1}}{\mathbf{6}}$

   $\frac{\mathbf{3k}}{\mathbf{42}}$

   $\frac{\boldsymbol{k}}{\mathbf{14}}$

   (b) $\frac{4m}{11} \div \frac{m}{15}$

   $\frac{\mathbf{4m}}{\mathbf{11}} \div \frac{\boldsymbol{m}}{\mathbf{15}}$

   $\frac{\mathbf{4m}}{\mathbf{11}} \times \frac{\mathbf{15}}{\boldsymbol{m}}$

   $\frac{\mathbf{60}}{\mathbf{11}}$

   $\mathbf{5\frac{5}{11}}$

   (c) $\frac{6x}{9} \times \frac{1}{2} \div \frac{x}{4}$

   (d) $\frac{3b}{13} \times \frac{3b}{5}$

Mathematics is the Key

SUB TOPIC: Removing brackets

REMEMBER:

- *When removing brackets, multiply the factor by every term inside brackets.*
- *A negative integer before brackets affects every sign inside brackets.*
- *A positive integer before brackets cannot affect the signs inside brackets.*

Remove the brackets and simplify.

Example:

1. $3(x + y)$

   $3(x + y)$

   $\underline{3x + 3y}$

2. $2(a - b)$

   $2(a - b)$

   $\underline{2a - 2b}$

3. $\mathbf{4(2x - 6)}$
4. $\mathbf{-9(m - 4)}$

5. $Add: x + 4 \ to \ x + 1$

   $(x + 4) + (x + 1)$

   $X + 4 + x + 1$

   $X + x + 4 + 1$

   $\underline{2x + 5}$

6. $Subtract \ y - 1 \ from \ 2y + 3$

   $(2y + 3) - (y - 1)$

   $2y + 3 - y + 1$

   $2y - y + 3 + 1$

   $\underline{y + 4}$

7. $Add. x - 4 \ to \ 3x - 5$
8. $Subtract \ 3p - 1 \ from \ 5p - 3$
9. $Find \ the \ supplement \ of \ (x - 20)°$

SUB TOPIC: Removing brackets involving fractions

Example:

Remove brackets and simplify

1. $\frac{1}{3}(3a + 9b)$

   $\frac{1}{3}(3a + 9b)$

   $(\frac{1}{3} \times 3a) + (\frac{1}{3} \times 9b)$

   $\underline{a + 3b}$

2. $\frac{3}{4}(8m - 12p)$

   $\frac{3}{4} \times 8m - \frac{3}{4} \times 12p$

   $3 \times 2m - 3 \times 3p$

   $\underline{6m - 9p}$

3. $Half \ of \ (2x + 4y) \ plus \ a \ third \ of \ (6x + 9y)$

   $\frac{1}{2}(2x + 4y) + \frac{1}{3}(6x + 9y)$

   $\frac{1}{2} \times 2x + \frac{1}{2} \times 4y + \frac{1}{3} \times 6x + \frac{1}{3} \times 9y$

   $x + 2y + 2x + 3y$

   $x + 2x + 2y + 3y$

   $\underline{3x + 5y}$

Mathematics is the key

4. $Subtract\ \frac{1}{2}(4x - 2y)\ from\ \frac{1}{3}(6x - 9y)$

$\frac{1}{3}(6x - 9y) - \frac{1}{2}(4x - 2y)$

$\frac{1}{3}\ x\ 6x - \frac{1}{3}\ x\ 9y - \frac{1}{2}\ x\ 4x + \frac{1}{2}\ x\ 2y$

$2x - 3y - 2x + y$

$2x - 2x - 3y + y$

$\underline{-2y}$

5. $Subtract\ \frac{2}{3}(6x - 3y)\ from\ \frac{1}{4}(8x - 12y)$
6. Remove brackets and simplify. $\frac{2}{5}(5x + 15y) - \frac{1}{6}(12x - 24y)$

SUB TOPIC: *POWERS or INDICES(Addition and subtraction with powers)*

Example:

Simplify the following

1. $\mathbf{2^2 + 2^4}$

$(2\ x\ 2) + (2\ x\ 2\ x\ 2\ x\ 2)$

$2\ x\ 2 + 2\ x\ 2\ x\ 2\ x\ 2$

$\underline{20}$

2. $\boldsymbol{p^2 + p^2}$

$p^2 + p^2$

$\underline{2p^2}$

3. $\mathbf{3m^3 + 4m^3}$

$3m^3 + 4m^3$

$\underline{7m^3}$

4. $\mathbf{3p^2 - 2p^3}$

$3p^2 - 2p^3 (they\ are\ unlike\ terms)$

5. $\mathbf{4m^2 - m^2}$
6. $\mathbf{20k^4 + 17k^4}$
7. $\boldsymbol{b^5 - b^3}$

SUB TOPIC: POWERS or INDICES (multiplication of powers with similar bases)

NOTE:
When multiplying powers with similar bases, write a single base and add the powers.

Example:

Simplify the following

a) $4^3\ x\ 4^2$

$\mathbf{4 \times 4 \times 4 \times 4 \times 4}$

$\mathbf{4^5}$

OR

$\mathbf{4^3\ x\ 4^2}$

$\mathbf{4^{3+2}}$

$\mathbf{4^5}$

b) $x^3 \times x^2$

$\boldsymbol{x \times x \times x \times x \times x}$

$\boldsymbol{x^5}$

OR

$\boldsymbol{x^3 \times x^2}$

$\boldsymbol{x^{3+2}}$

$\boldsymbol{x^5}$

Simplify the following

(a) $\boldsymbol{m^2 \times m \times m^4}$

(b) $\mathbf{3^2 \times 3^5}$

(c) $\boldsymbol{b^7 \times b^6}$

Mathematics is the Key

SUB TOPIC: *POWERS or INDICES*
(Division of powers with similar bases)

NOTE:
When dividing powers with similar bases, write a single base and subtract the powers.

Example:
Simplify the following.

1. $3^4 \div 3^2$

$$\frac{3 \times 3 \times 3 \times 3}{3 \times 3}$$
$$3^2$$

OR

$$3^4 \div 3^2$$
$$3^{4-2}$$
$$\underline{\underline{3^2}}$$

2. $p^8 \div p^2$

$$\frac{p \times p \times p \times p \times p \times p \times p \times p}{p \times p}$$
$$p \times p \times p \times p \times p \times p$$
$$p^6$$

OR

$$p^8 \div p^2$$
$$p^{8-2}$$
$$p^6$$

3. $n^7 \div n^9$

$$\frac{n \times n \times n \times n \times n \times n \times n}{n \times n \times n \times n \times n \times n \times n \times n \times n}$$
$$\frac{1}{n \times n}$$
$$\frac{1}{n^2}$$
$$n^{-2}$$

OR

$$n^7 \div n^9$$
$$n^{7-9}$$
$$n^{-2}$$

4. **Simplify the following**
   - **(a).** $m^2 \div m$
   - **(b).** $3^2 \div 3^5$
   - **(c).** $b^3 \div b^6$

SUB TOPIC: *POWERS or INDICES*
(Multiplication and Division of powers with similar bases)

1. Simplify the following.

i. $\frac{k^4 \times k^3}{k^5}$

$$(k^4 \times k^3) \div k^5$$
$$(k^{4+3}) \div k^5$$
$$k^7 \div k^5$$
$$k^{7-5}$$
$$k^2$$

ii. $\frac{w^3 \times w^0 \times w^6}{w^{10}}$

iii. $\frac{p^5 \times p^3}{p^4}$

Mathematics is the Key

SUB TOPIC: POWERS or INDICES (Solving for un known powers)

1. Solve for the unknowns

(a) $2^x = 8$

$2^x = 8$

$2^x = 2^3$

$\underline{x = 3}$

2	8
2	4
2	2
	1

$8 = 2^3$

(b) $3^m \times 3^2 = 81$

$3^m \times 3^2 = 81$

$3^{m+2} = 3^4$

$m + 2 = 4$

$m + 2 - 2 = 4 - 2$

$\underline{m = 2}$

3	81
3	27
3	9
3	3
	1

$81 = 3^4$

(c) $4^{2x} \div 16 = 64$

$4^{2x} \div 16 = 64$

$4^{2x} \div 4^2 = 4^3$

$4^{2x-2} = 4^3$

$2x - 2 = 3$

$2x - 2 + 2 = 3 + 2$

$2x = 5$

$\frac{2x}{2} = \frac{5}{2}$

$x = 2\frac{1}{2}$

4	64
4	16
4	4
	1

$64 = 4^3$

4	16
4	4
	1

$16 = 4^2$

(d) $5^k = 125$

(e) $2^{m+4} \times 8 = 1$

SUB TOPIC: Solving simple equations.

Example: Solve the following equations

a) $\boldsymbol{x + 5 = 13}$

$\boldsymbol{x + 5 - 5 = 13 - 5}$

$\underline{\boldsymbol{x = 8}}$

b) $\boldsymbol{2x + 6 = 18}$

$\boldsymbol{2x + 6 - 6 = 18 - 6}$

$\boldsymbol{2x = 12}$

$\boldsymbol{\frac{2x}{2} = \frac{12}{2}}$

$\underline{\boldsymbol{x = 6}}$

c) $\boldsymbol{y - 3 = 5}$

$\boldsymbol{y - 3 + 3 = 5 + 3}$

$\underline{\boldsymbol{y = 8}}$

d) $\boldsymbol{3a - 8 = 7}$

$\boldsymbol{3a - 8 + 8 = 7 + 8}$

$\boldsymbol{3a = 15}$

$\boldsymbol{\frac{3a}{3} = \frac{15}{3}}$

$\underline{\boldsymbol{a = 5}}$

e) $\boldsymbol{6m = 24}$

f) $\boldsymbol{5k - 3 = 37}$

g) $\boldsymbol{4 - x = 7}$

h) $\boldsymbol{16 = 9 + 2p}$

Type equation here.

SUB TOPIC: Solving equations involving brackets.

Solve the following equations

a) $2(m + 4) = 20$

$\boldsymbol{2(m + 4) = 20}$

$\boldsymbol{2m - 8 = 20}$

$\boldsymbol{2m - 8 + 8 = 20 + 8}$

$\boldsymbol{2m = 28}$

$\boldsymbol{\frac{2m}{2} = \frac{28}{2}}$

$\underline{\boldsymbol{m = 14}}$

b) $2(k - 2) - 3(k - 4) = -10$

$\boldsymbol{2(k - 2) - 3(k - 4) = -10}$

$\boldsymbol{2k - 4 - 3k + 12 = -10}$

$\boldsymbol{2k - 3k - 4 + 12 = -10}$

$\boldsymbol{-k + 8 = -10}$

$\boldsymbol{-k + 8 - 8 = -10 - 8}$

$\boldsymbol{-k = -18}$

$\boldsymbol{\frac{-k}{-1} = \frac{-18}{-1}}$

$\underline{\boldsymbol{k = 18}}$

c) $6(z - 4) = 0$

d) $3x - (2 - x) = 14$

e) $5(m - 2) + 6(m - 3) = 16$

Mathematics is the Key

SUB TOPIC: Solving equations involving fractions

When solving fractional equations, multiply the LCD (LCM of the denominators) on each algebraic term.

Solve the following equations

1. $\frac{1}{2}p = 6$

$$\frac{1}{2}p = 6$$
$$LCD = 2$$
$$2 \times \frac{p}{2} = 6 \times 2$$
$$\underline{p = 12}$$

2. $\frac{13t}{3} + 2 = 15$

$$\frac{13t}{3} + \frac{2}{1} = \frac{15}{1}$$
$$LCD = 3$$
$$3 \times \frac{13t}{3} + \frac{2}{1} \times 3 = \frac{15}{1} \times 3$$
$$13t + 6 = 45$$
$$13t + 6 - 6 = 45 - 6$$
$$13t = 39$$
$$\frac{13t}{13} = \frac{39}{13}$$
$$\underline{t = 13}$$

3. $0.4P + 0.5 = 2.1$

$$\frac{4P}{10} + \frac{5}{10} = \frac{21}{10}$$
$$10 \times \frac{4P}{10} + \frac{5}{10} \times 10 = \frac{21}{10} \times 10$$
$$4p + 5 = 21$$
$$4p + 5 - 5 = 21 - 5$$
$$4p = 16$$
$$\frac{4p}{4} = \frac{16}{4}$$
$$\underline{P = 4}$$

4. $3x + 7 - \frac{3x}{4} = 10$

$$\frac{3x}{1} + \frac{7}{1} - \frac{3x}{4} = \frac{10}{1}$$
$$LCD = 4$$
$$4 \times \frac{3x}{1} + \frac{7}{1} \times 4 - \frac{3x}{4} \times 4 = \frac{10}{1} \times 4$$
$$12x + 28 - 3x = 40$$
$$12x - 3x + 28 = 40$$
$$9x + 28 = 40$$
$$9x + 28 - 28 = 40 - 28$$
$$\frac{9x}{9} = \frac{12}{9}$$
$$x = 1\frac{1}{3}$$

5. $\frac{3m}{4} = 9$
6. $\frac{2p}{3} - p = 5$
7. $\frac{2k}{5} + k = 12$
8. $1.5y - 2.5 = 5.0$
9. $2p - 5 - \frac{3p}{5} = 10$

Mathematics is the Key

SUB TOPIC: Solving more equations involving fractions.

Examples:

Solve the following equations

1. $\frac{m+1}{3} + \frac{m}{4} = 2$

$$\frac{\boldsymbol{m+1}}{\boldsymbol{3}} + \frac{\boldsymbol{m}}{\boldsymbol{4}} = \boldsymbol{2}$$

$$\boldsymbol{LCD = 12}$$

$$\boldsymbol{12 \times \frac{m+1}{3} + \frac{m}{4} \times 12 = 2 \times 12}$$

$$\boldsymbol{4(m+1) + m \times 3 = 2 \times 12}$$

$$\boldsymbol{4m + 4 + 3m = 24}$$

$$\boldsymbol{4m + 3m + 4 = 24}$$

$$\boldsymbol{7m + 4 = 24}$$

$$\boldsymbol{7m + 4 - 4 = 24 - 4}$$

$$\boldsymbol{7m = 20}$$

$$\boldsymbol{\frac{7m}{7} = \frac{20}{7}}$$

$$\boldsymbol{m = 2\frac{6}{7}}$$

2. $\frac{(3x+1)}{4} = \frac{(x+2)}{2}$

$$\frac{(3x+1)}{4} = \frac{(x+2)}{2}$$

$$LCD = 4$$

$$4 \times \frac{(3x+1)}{4} = \frac{(x+2)}{2} \times 4$$

$$3x + 1 = 2(x + 2)$$

$$3x + 1 = 2x + 4$$

$$3x + 1 - 1 = 2x + 4 - 1$$

$$3x = 2x + 3$$

$$3x - 2x = 2x - 2x + 3$$

$$\underline{x = 3}$$

3. $\frac{3x-1}{4} = = \frac{7x+1}{6}$

4. $\frac{w-5}{3} - w = \frac{2w+4}{5}$

5. $\frac{3}{k+3} = \frac{2}{2k-5}$

SUB TOPIC: *Solving equations involving squares and square roots*

Examples:

Solve the following equations

1. $m^2 - 4 = 21$

$$\boldsymbol{m^2 - 4 = 21}$$

$$\boldsymbol{m^2 - 4 + 4 = 21 + 4}$$

$$\boldsymbol{m^2 = 25}$$

$$\boldsymbol{\sqrt{m^2} = \sqrt{25}}$$

$$\underline{\boldsymbol{m = 5}}$$

2. $\frac{1}{2} p^2 = 8$

$$\tfrac{1}{2}\boldsymbol{p^2 = 8}$$

$$\boldsymbol{2 \times \frac{p^2}{2} = 8 \times 2}$$

$$\boldsymbol{p^2 = 16}$$

$$\boldsymbol{\sqrt{p^2} = \sqrt{16}}$$

$$\underline{\boldsymbol{p = 4}}$$

3. $\sqrt{2k} = 14$

$$\boldsymbol{\sqrt{2k} = 14}$$

$$\boldsymbol{\sqrt{2k}^2 = 14^2}$$

$$\boldsymbol{2k = 196}$$

$$\boldsymbol{\frac{2k}{2} = \frac{196}{2}}$$

$$\underline{\boldsymbol{k = 98}}$$

4. $\frac{1}{4} x^2 = 16$

$$\tfrac{1}{4}\boldsymbol{x^2 = 16}$$

$$\boldsymbol{4 \times \frac{x^2}{4} = 16 \times 4}$$

$$\boldsymbol{x^2 = 64}$$

$$\boldsymbol{\sqrt[2]{x^2} = \sqrt[2]{64}}$$

$$\underline{\boldsymbol{x = 8}}$$

5. $\boldsymbol{b^2 = 49}$

6. $\boldsymbol{6m^2 = 54}$

7. $\boldsymbol{2w^2 - 18 = 224}$

8. $\boldsymbol{\frac{2p^2}{3} = 54}$

Mathematics is the Key

Example:

1. Baker bought 2kg of suagr at sh. 3p and 1kg of salt at sh (p + 200). Find P if Baker paid sh 3700.

The cost of 2kg of sugar is

$\boldsymbol{sh\ (2\ x\ 3p) = sh\ 6p}$

The cost of 1kg of salt is

$\boldsymbol{sh\ (p\ +\ 200)}$

$$\boldsymbol{Sh6p + sh.p + shs.200 = shs.3700}$$
$$\boldsymbol{Sh7p + sh.200 = sh.3700}$$
$$\boldsymbol{Sh7p + sh.200 - shs.200 = sh.3700 - sh.200}$$
$$\boldsymbol{Sh.7p\ =\ sh.3500}$$
$$\boldsymbol{\frac{Sh.7p}{sh.7} = \frac{sh.3500}{sh.7}}$$
$$\boldsymbol{\underline{p = 500}}$$

2. **In a market, the cost of a pawpaw is sh.800 more than the cost of a mango. A mango costs two thirds the cost of a pine apple. The total cost of three fruits is sh 4300. Calculate the cost of a pineapple.**

Let the cost of a pineapple be m

pawpaw	*pineapple*	*mango*
$\frac{2}{3}m + sh.800$	m	$\frac{2}{3}m$

$$\boldsymbol{m + \frac{2}{3}m + \frac{2}{3}m + sh.800 = sh.4,300}$$
$$\boldsymbol{\frac{m}{1} + \frac{2m}{3} + \frac{2m}{3} + \frac{sh.800}{1} = \frac{sh.4,300}{1}}$$
$$\boldsymbol{\frac{m}{1} \times 3 + \frac{4m}{3} \times 3 + \frac{sh.800}{1} \times 3 = \frac{sh.4300}{1} \times 3}$$
$$\boldsymbol{3m + 4m + sh.2,400 = sh.12,900}$$
$$\boldsymbol{7m + sh.2,400 = sh.12,900}$$
$$\boldsymbol{7m + sh.2,400 - sh.2,400 = sh.12,900 - sh.2,400}$$
$$\boldsymbol{7m = sh.10,500}$$
$$\boldsymbol{\frac{7m}{7} = \frac{sh.10,500}{7}}$$
$$\boldsymbol{\underline{m = sh.1,500}}$$

Mathematics is the Key

3. **A cup costs twice as much as a fork and a plate costs sh.600 more than a fork. If the total cost of all the three items is sh.3600, find the cost of each item.**

4. **James, Joan and Peter shared a certain amount of money. James got three times as much as Peter. Joan got sh.900 more than Peter. If Peter and James got sh.2,800, how much did Joan get?**

SUBTOPIC: Application of algebra in ages

Examples.

1. **Amon is twice as old as Bob. If their total age is 33 years. How old is each?**

Let Bob's age be A

Amon	Bob	TL
$2A$	A	33years

$$2A + A = 33$$
$$3A = 33$$
$$\frac{3A}{3} = \frac{33}{3}$$
$$A = 11years$$

Amon	Bob
$2A$ $2 \times 11 = 22yrs$	A $11years$

2. **A father is 18years older than his son. In 5 years ,their total age will be 48years. How old is each?**

Let the son's age be m

	father	son	TL
now	$m + 18$	m	
then	$m + 18 + 5$	$m + 5$	$48years$

$$m + 18 + 5 + m + 5 = 48years$$
$$m + m + 18 + 10 = 48years$$
$$2m + 28 = 48years$$
$$2m + 28 - 28 = 48 - 28$$
$$2m = 20$$
$$\frac{2m}{2} = \frac{20}{2}$$
$$\underline{m = 10years}$$

father	son
$m + 18$ $10 + 18 = 28yrs$	$10years$

Mathematics is the Key

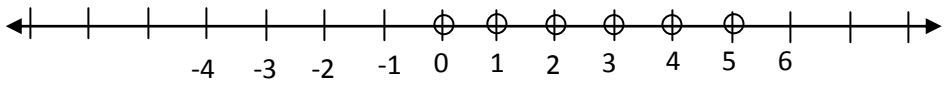
3. Alex is 15 years older than Moses. If their total age is 40 years, how old is each?
4. Jacob is 10 years younger than Jerome. Six years ago, Jerome was twice as old as Jacob. How old is Jacob?
5. A son is a half of his mother's age while the daughter is a third of his mothers age. If the total age of the son and the daughter is 30 years, how old is the mother?
6. January is a third as old as March. Four years ago the ratio of their age was 1:5.How old is each now?

SUB TOPIC: Writing solution sets

Examples:

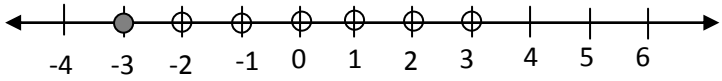
1. Write down the integers for the following inequalities.

(i) $x < 6$



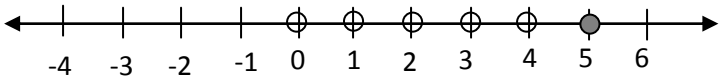
$x = \{5,4,3,2,1,0,-1 \ldots.\}\ (infinite\ set)$

(ii) $m \geq -3$



$m = \{-3,-2,-1,0,1,2 \ldots.\}\ (infinite\ set)$

(iii) $k \leq 5 (where\ k\ is\ a\ whole\ number)$



$k = \{5,4,3,2,1,0\}$

2. Write the solution sets for the following

h≥ 9

b< −4

y≤ −5

Mathematics is the Key

When diving by a negative co-efficient, the sign changes at the step of division.

Examples:

Solve the following and write the solution set

1. $4X > 20$

$4X > 20$

$\frac{4X}{4} > \frac{20}{4}$

$X > 5$

$X = \{6, 7, 8, 9, 10 \ldots.\}$

2. $-4m > 20$

$-4m > 20$

$\frac{-4m}{-4} < \frac{20}{-4}$

$m < -5$

$\boldsymbol{m} = \{\boldsymbol{-6}, \boldsymbol{-7}, \boldsymbol{-8}, \boldsymbol{-9} \ldots\}$

3. $3x + 6 < 9$

$3x + 6 - 6 < 9 - 6$

$3x < 3$

$\frac{3x}{3} < \frac{3}{3}$

$X < 1$

$x = \{0, -1, -2, -3, \ldots.\}$

4. $\frac{x}{7} - 5 > -4$

$\frac{x}{7} - 5 > -4$

$7 \times \frac{x}{7} - 5 \times 7 > -4 \times 7$

$x - 35 > -28$

$x - 35 + 35 > -28 + 35$

$x > 7$

$x = \{8, 9, 10, 11, \ldots.\}$

Mathematics is the Key

Solve the following and write the solution sets

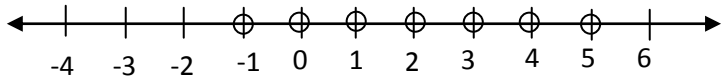
a) $5m < 20$
b) $6p > -18$
c) $2(x + 1) > 4$
d) $3(2x + 3) < 18$
e) $3y + 2 < 11$
f) $4 - k \geq 9$
g) $\frac{2w}{3} - 12 > 0$

SUB TOPIC: Compound inequalities(writing solution sets)

Examples

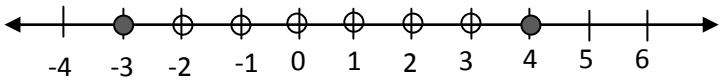
1. Write the solution set for

(a) $-2 < d < 6$



$d = \{-1,0,1,2,3,4,5\}$

(b) $4 \geq m \geq -3$



$m = \{-3, -2, -1,0,1,2,3,4\}$

(c) $-6 < w < 2$
(d) $1 < p < 9$
(e) $7 > x - 4$

SUB TOPIC: Solving and writing solution sets with compound inequalities.

Examples

Solve the following and write the solution sets

1. $8 > 2x > 2$

$8 > 2x > 2$

$\frac{8}{2} > \frac{2x}{2} > \frac{2}{2}$

$4 > x > 1$

$x = \{2,3\}$

Mathematics is the Key

2. $12 < -3x < 24$

$\mathbf{12} < -3\boldsymbol{x} < 24$

$\frac{\mathbf{12}}{\mathbf{-3}} > \frac{\mathbf{-3x}}{\mathbf{-3}} > \frac{\mathbf{24}}{\mathbf{-3}}$

$\mathbf{-4} > x > -8$

$\underline{\boldsymbol{x} = \{-5, -6, -7\}}$

3. $13 \geq 3x - 2 \geq 4$

$\mathbf{13} \geq \mathbf{3x - 2} \geq \mathbf{4}$

$\mathbf{13 + 2} \geq \mathbf{3x - 2 + 2} \geq \mathbf{4 + 2}$

$\mathbf{15} \geq \mathbf{3x} \geq \mathbf{6}$

$\frac{\mathbf{15}}{\mathbf{3}} \geq \frac{\mathbf{3x}}{\mathbf{3}} \geq \frac{\mathbf{6}}{\mathbf{3}}$

$\mathbf{5} \geq \boldsymbol{x} \geq \mathbf{2}$

$\underline{\boldsymbol{x} = \{2, 3, 4, 5\}}$

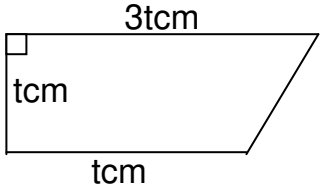
4. $12 > 3m > 3$
5. $15 \leq -5m \leq 40$
6. $-12 \geq 6b > 18$

TOPICAL WORK ON ALGEBRA

1. $Solve: x + 4x = 5$
2. $Find\ the\ value\ of\ \frac{5a - (m - a)}{a}\ when\ a = 3\ and\ m = 6$
3. Solve for b in $\frac{3}{5}(2b - 3) = 3$
4. If $\frac{1}{6}x = 1$. Find the value of x.
5. Solve $\frac{2x + 2}{3} = \frac{x + 3}{2}$
6. What is the value of $\frac{bc-d}{c^2}$ when b = 8, c = 3 and d = 6?
7. Solve: $x - 1 = 2x + 5$
8. Simplify: $(3x + 5) - (x + 1)$
9. Solve: ½ $(3y - 2) = \frac{2}{3}(2y + 3)$
10. Solve: $3(p - 4) - 2(3p - 1) = 2p - 15$
11. Simplify: $(4p - 3q) - (2q + p)$
12. Solve: $\frac{12}{x} + 2 = 6$

Mathematics is the Key

13. The area of the trapezium is 50cm^2. Find the value of t.



14. Given that a = ½, b = $\frac{1}{3}$ and c = ¼ .Find the value of $b + 2c + 3a$.

15. Subtract $2x - 4$ $from$ $5x - 4$

16. Zahara's mother bought 8 books at shs $(x - 150)$ each and 2 Mathematical sets at $sh(x + 100)$ each. She spent shs 5300 altogether. Find the amount of money spent on books.

17. Tom has three daughters; Amanda, Brenda and Kate. Brenda is 2 years younger than Amanda, Kate's age is ½ that of Brenda. The total age of the three girls is 27 years. How old is Kate?

18. Find the solution set for the following inequalities:

(i) $x > 3$ $(ii)x < -5$ $(iii)x < 2$

$(iv)x > 2$ $(v)x < 4$

(ii) Solve and give the solutions for x.

(i) $-3x < -9$ (ii)$-30 < 6x$

(iii) $3x + 2 < 11$ (iv) $4x - 5 < 19$

(iii) Solve and find the solution set for y.$\frac{y}{3} + 4 < 6$

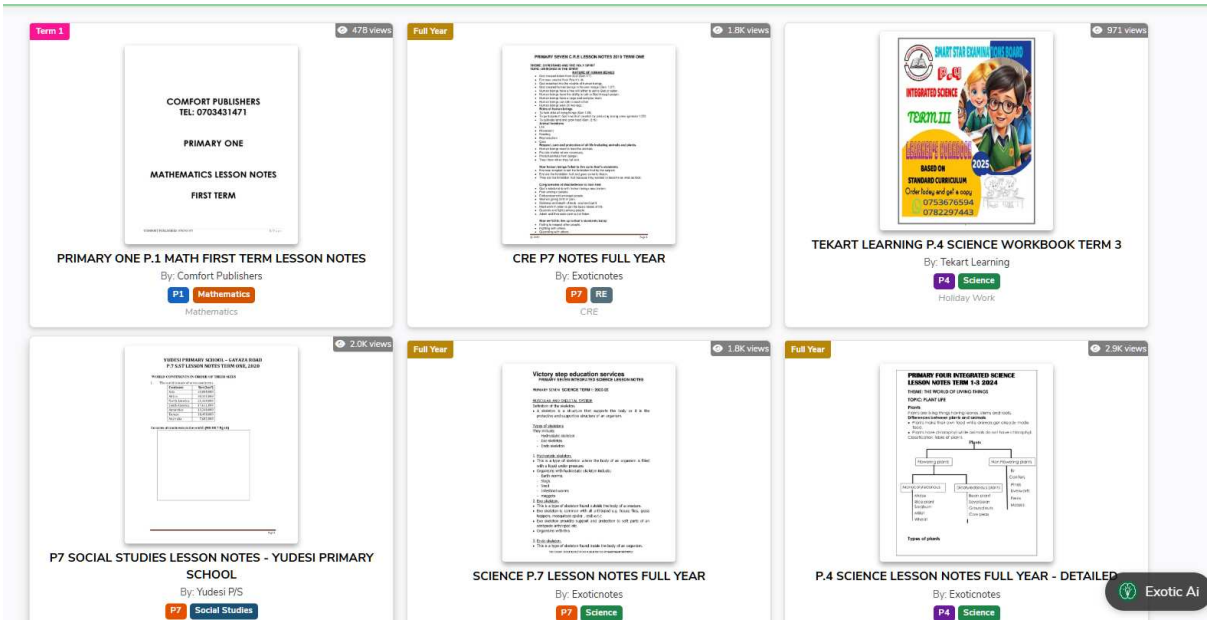
(iv) Solve the inequality below:

$8 > 2x > -4$

Mathematics is the Key

[i]Amonahereza02@gmail.com

This document was downloaded from https://exoticnotes.com



Do you need more LESSON NOTES for Primary (All classes)?

Click
https://exoticnotes.com/notes/primary/

If you need LESSON NOTES for SCIENCE (P.1 – P.7)
Click
https://exoticnotes.com/notes/primary/science/

If you need LESSON NOTES for English (P.1 – P.7)
Click
https://exoticnotes.com/notes/primary/english/

If you need LESSON NOTES for Mathematics (P.1 – P.7)
Click
https://exoticnotes.com/notes/primary/mathematics/