

# EDUCATION GIANTS



II

PRIMARY LEVEL IV

mathematics work book

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0758924184/62550123

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## **EDUCATION GIANTS EXAMINATION BOARD 2023**

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2023, holiday packages, lesson notes and plans, scheme of work, handwriting  
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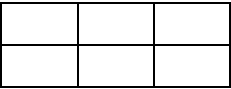
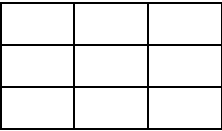
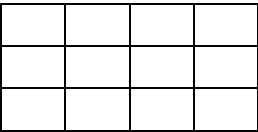
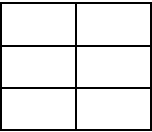
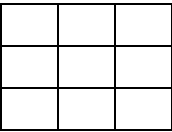

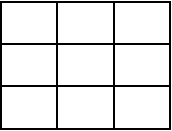
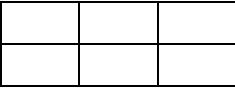
PRIMARY FOUR TERM II MATHEMATICS

TOPIC: FRACTIONS

1. Equivalent fractions

1	Find the third equivalent fraction of $\frac{2}{3}$	2	Work out the first three equivalent fractions of $\frac{3}{8}$
3	Calculate the sum of the second and fourth equivalent fraction of $\frac{4}{5}$	4	What is the 9 <sup>th</sup> equivalent fraction of $\frac{3}{5}$ ?
5	List all first five equivalent fractions of $\frac{2}{3}$	6	Find the missing number in the box. $\frac{\square}{2} = \frac{6}{12}$
7	Solve for m: $\frac{m}{2} = \frac{4}{8}$	8	Find the denominator of a fraction whose numerator is 3 and is equivalent to $\frac{6}{9}$
9	Find the same of the first two equivalent fractions of $\frac{1}{8}$	10	Find product of 4 and the 3 <sup>rd</sup> equivalent fraction of $\frac{3}{4}$

## 2. SHADING EQUIVALENT FRACTIONS

1	<p>Shade <math>\frac{1}{2}</math> of the figure below</p> 	2	<p>Shade <math>\frac{2}{3}</math> of the figure.</p> 
3	<p>What is <math>\frac{1}{4}</math> of the figure below ?</p> 	4	<p>Shade <math>\frac{1}{2}</math> in the</p> 
5	<p>Shade <math>\frac{1}{3}</math> of the figure below</p> 	6	<p>Shade <math>\frac{4}{10}</math></p> 
7	<p>Shade <math>\frac{9}{18}</math></p> 	8	<p>Shade 50% of the figure</p> 

**CHANGING MIXED FRACTION TO IMPROPER FRACTION AND VICE VERSA.**

1	Express $3\frac{1}{2}$ as an improper fraction	2	Change $4\frac{2}{5}$ to an improper fraction
3	Write $5\frac{2}{3}$ in form of $\frac{p}{q}$ Find the sum of p + q	4	Express $7\frac{1}{4}$ in form of $\frac{a}{b}$ Calculate the difference of a and b
5	Convert 4 to improper fraction	6	Express $\frac{4}{3}$ as a mixed fraction
7	Change $\frac{15}{6}$ to a mixed fraction	8	Convert $\frac{11}{3}$ to a mixed fraction
9	Write $\frac{13}{3}$ in a mixed format.	10	Express $\frac{23}{7}$ as a mixed fraction

## ADDITION AND SUBTRACTION OF FRACTIONS

1	Add: $6 - \frac{1}{2}$	2	Work out: $\frac{4}{5} + \frac{1}{3}$
3	Find the sum of $\frac{3}{4}$ and $\frac{2}{3}$	4	Calculate the difference of $\frac{3}{8}$ and $\frac{5}{8}$
5	Ario ate $\frac{3}{4}$ of the pancakes and kept the rest. Find the fraction of pancakes remained	6	Amama ate $\frac{1}{4}$ of the food, she served $\frac{1}{2}$ . What fraction of food did she remain with?
7	Mukisa walked $\frac{2}{3}$ of the distance to school and covered the rest by bicycle. Find the difference of fractions she covered by bicycle and walking	8	Shalom did $\frac{2}{5}$ of her home work in evening, $\frac{1}{5}$ in the morning and left the rest. Find the fraction of the work she didn't complete.
9	Simplify : $2\frac{1}{2} + 4\frac{2}{3}$	10	Work out: $7\frac{1}{3} - 4$

## MULTIPLICATION AND DIVISION OF FRACTIONS

1	Multiply: $\frac{1}{2} \times \frac{2}{3}$	2	Divide: $\frac{3}{4} \div \frac{1}{2}$
3	Work out: $2 \div \frac{2}{3}$	4	Simplify: $\frac{2}{5} \div 3$
5	Multiply: $2\frac{1}{2} \times 4\frac{2}{5}$	6	Work out: $3\frac{1}{2} \div 2$
7	A man had $2\frac{1}{2}$ litres of milk. He packed them in 250ml packed each, how many packets of milk did he get?	8	What is $\frac{2}{3}$ of 16 kg of rice?
9	In a class of 40 pupils. $\frac{3}{4}$ are girls, Find the number of boys.	10	Anena served 5 litres of coffee using a cup of $\frac{1}{2}$ litres to visitors. How many visitors did she serve

## DECIMAL FRACTIONS

Changing vulgar fractions to decimals and vice versa

1	<p>Change the following to vulgar fractions in their simplest form</p> <p>a) 0.5</p> <p>b) 0.25</p> <p>c) 0.004</p>		<p>e) 0.75</p> <p>f) 0.33</p> <p>g) 0.25kg</p> <p>h) 0.45 metre</p>
2	<p>Express the following as decimals</p> <p>I) <math>\frac{500\text{ml}}{1000}</math></p> <p>II) <math>\frac{250\text{g}}{1000}</math></p> <p>III) <math>\frac{700\text{g}}{1000}</math></p>	3	<p>Write the following as decimals</p> <p>I) <math>\frac{7\text{ cm}}{100}</math></p> <p>II) <math>\frac{1}{2}</math></p> <p>III) <math>\frac{1}{4}</math></p>



## DECIMAL FRACTIONS

## Place values and values of decimals

1	Write the place value of each digit in 5.6765	2	Find the value of each digit in 12.767
3	Find the value of 4 in 5.674	4	What is the place value of 5 in 5.67?
5	Find the place value and value of 7 in 0.00007	6	The value of 7 is 0.7. Find the place value of 7
7	The place value of 8 is ten hundredths. Find the value of 8	8	Find the digit in thousandths place of 7.87755
9	Calculate the value of the digit in hundredths place of 78.0097	10	Given 6.897. Find the value of the digit in thousandths place in 2 places of decimals.






















## ADDITION AND SUBTRACTION OF DECIMALS

1	Add: $3 + 0.8$	2	Add: $0.008 + 0.09$
3	Subtract: $0.09 - 0.004$	4	Work out: $9.97 - 0.32$
5	Find the sum of 6kg and 500gm (present your answer in a decimal form)	6	Find the difference of 9 and 0.01
7	Find the sum of the place value of 4 and place value of 5 in 95.9894	8	Calculate the difference of the digit in tens place and the value of 4 in 667.546
9	Find the sum of 6 and the value of the digit in thousandths place in 6.7097	10	Work out the sum of the value of 4 and the value of 2 in 0.05425

## MULTIPLICATION AND DIVISION OF DECIMALS

1	Multiply: $0.5 \times 0.2$	2	Work out: $8 \div 0.5$
3	Work out: $0.4 \div 0.8$	4	Divide: $2.5 \div 0.5$
5	Find the quotient of 1.5 and 0.3	6	What is the product of 2.5 and 2.0?
7	Work out: $\frac{0.5 \times 0.2}{0.4}$	8	Simplify: $\frac{0.6 \times 0.02}{0.3}$
9	Simplify $\frac{0.03 \div 0.4}{0.2}$	10	Work out: $\frac{0.4 + 0.6}{0.2}$

## RATIOS AND PROPORTIONS

1	<p>The ratio of boys to girls is 2:3,</p> <p>a) Find the fraction of boys</p> <p>b) Find the fraction of girls</p>	2	<p>Ochieng shared Sh.6000 to his two children, Elizabeth and Angel in the ratio of 2:4 respectively.</p> <p>How much did each child get?</p>
3	<p>Given that  represents 3 balls. How many balls are represented by      ?</p>	4	<p> represents 5 tomatoes, how many tomatoes are represented by     ?</p>
5	<p>If  represents 7 pencil. How many pencils are represented by     ?</p>	6	<p>If  represents 5 books. Draw pictures to represent 25 books.</p>
7	<p>If  represents 7 carrots, Draw pictures to represent 28 carrots</p>	8	<p>The price of a book is Sh.10000, how much is the price of 5 books.</p>
9	<p>The cost of a pair of hen is sh. 20000 Find the cost of 3 hen at the same rate.</p>	10	<p>The cost of 3 pencils is sh. 1500, how much can one pay for 4 pencils?</p>

**INTEGERS****Showing integers on a number line**

1	Show -5 on a number line	2	Show the difference of 3 and 5 on the number line
3	Show the product of 2 and 3 on a number line	4	Represent $-7^{\circ}\text{C}$ on a number line
5	Show 4 cm to the ground on a number line.	6	Represent 5 metres from the ground.
7	Show -4 on a number line.	8	Show 4 steps backward from 3
9	Find the integer which is in the right of -5	10	Show the range of -4 and -6 on a number line.

**ADDITION AND SUBTRACTION OF INTEGERS**

1. Add:  $3 + 4$  using a number line
  
  
  
  
  
  
  
  
  
  
2. Work out  $-3 + -2$  using a number line
  
  
  
  
  
  
  
  
  
  
3. Work out  $-6 + -3$
  
  
  
  
  
  
  
  
  
  
4. Subtraction 3 from 6 using a number line.
  
  
  
  
  
  
  
  
  
  
5. Add 4 steps backward to 5 steps forward.
  
  
  
  
  
  
  
  
  
  
6. Work out  $-4 - -5$
  
  
  
  
  
  
  
  
  
  
7. Simplify:  $-7 + -9$

**MULTIPLICATION OF INTEGERS**

Using a number line, work out the following.

1.  $3 \times 2$

2.  $4 \times 2$

3.  $-3 \times 2$

4.  $-3 \times -4$

5.  $3 \times -2$

6.  $4 \times -3$

**APPLICATION OF NUMBER LINE IN REAL LIFE**

1. Amama borrowed sh. 2200 from Katwere, She paid sh.700. Find her financial position.

2. Ariana borrowed sh. 1200 from his two friends each. He paid sh.900 to one of her friends. Find her debt.

3. The temperature of water was  $23^{\circ}\text{C}$  in the morning. Its is  $17^{\circ}\text{C}$  now, Find the temperature difference

4. In an interview, 1 mark is deducted for every wrong answer and 2 marks were awarded for every correct answer.

What is the score for a candidate who gives,

a) 3 correct answers and 2 wrong answers?

b) 5 correct answers and 3 wrong ones?

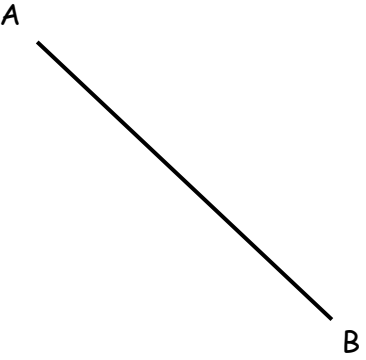



**FINITE SYSTEM/CLOCK ARITHMETICS**

**Addition and Subtraction in finite system**

1. Work out  $2 + 3 = \underline{\hspace{1cm}}$  (finite 5) Using dial
  
  
  
  
  
  
  
  
  
  
2. Simplify  $2 - 3 = \underline{\hspace{1cm}}$  (finite 6) Using dial
  
  
  
  
  
  
  
  
  
  
3. Simplify  $1 - 3 \pmod{4}$
  
  
  
  
  
  
  
  
  
  
4. Today is Monday, what day of the week will it be 7 days from now?
  
  
  
  
  
  
  
  
  
  
5. Today is Wednesday, what day of the week was 6 days back?
  
  
  
  
  
  
  
  
  
  
6. Today is Thursday, 12<sup>th</sup> October 2023. What day of the week was 15<sup>th</sup> September of the same year?

## LINES, ANGLES AND GEOMETRY

1	With a help of a pencil and a ruler, draw a line PQ of length 4cm .	2	Draw a line of 3.5 cm
3	In the space below, draw a line of segment MN of length 5cm	4	Using a ruler and a sharp pencil. Draw a line LM 6 cm.
5	Draw a diagonal line of 6cm	6	In the space below, draw a vertical line of 4 cm.
7	Using a ruler, measure the following line. 	8	Measure the length of the line below 

Drawing and construction of angles

Using a ruler and a sharp pencil only. Draw the following angles in the space provided.

1.  $56^\circ$

2.  $70^\circ$

3.  $67^\circ$

4.  $150^\circ$

5.  $58^\circ$

6.  $75^\circ$

7.  $80^\circ$

8.  $172^\circ$

**With a help of a pair of compasses, ruler and a sharp pencil only. Construct the following angles in the space provided**

**1.  $90^\circ$**

**2.  $45^\circ$**

**3.  $22\frac{1}{2}^\circ$**

**4.  $60^\circ$**

**5.  $30^\circ$**

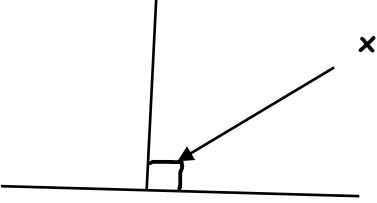
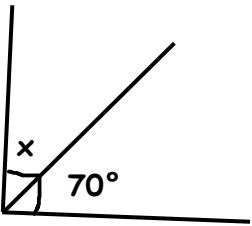
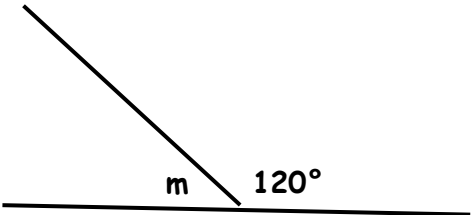
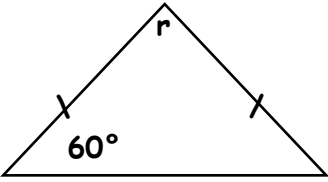
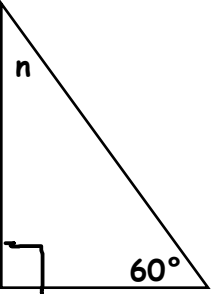
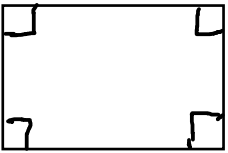


**6.  $15^\circ$**

**7.  $75^\circ$**

**8.  $135^\circ$**

ANGLES

1	How many right angles are in $270^\circ$ ?	2	Find the number of right angles in $360^\circ$
3	Find the number of straight angles in $540^\circ$	4	Name the angle $x$ 
5	Find the value of the $y$ 	6	Find the angle $m$ 
7	Find the value of $r$ 	8	Find the $n$ . 
9	How many right angles are in the shape below 	10	Find the interior angle sum of an equilateral triangle.

## GEOMETRY

### a) Two dimensional shapes

1. In the tables below, draw the required shapes.

Circle	Rectangle	Square	Triangle

Semi circle	A quadrant	A sector	Right angled triangle

Isosceles triangle	Hexagon	Parallelogram	Rhombus

A kite	Trapezium	Isosceles Trapezium	Pentagon

**a) Construction of triangle**

1. Using a pair of compasses, ruler and a sharp pencil only. Construct an equilateral triangle whose sides measure 3 cm.

2. With the help of a pair of compasses, ruler and a sharp pencil only. Construct an equilateral triangle ABC where BC is 4 cm.

3. With the help of a pair of compasses, ruler and a sharp pencil only. Construct an equilateral triangle in a circle of radius 3 cm.



**b) Construction of a square**

1. Using a ruler, sharp pencil and a pair of compasses only. Construct a square of side 4 cm .

2. Using a pair of compasses, ruler and a sharp pencil only. Construct a square PQRS where PQ is 3 cm. Draw and measure diagonal line PR.

3. With a help of a ruler, sharp pencil and a pair of compasses only. Construct a square ABCD of side 4.5 cm. Measure AC.

**c) Construction of a rectangle.**

**1. Using a pair of compasses, ruler and a sharp pencil only. Construct a rectangle of length 4 cm and width 2 cm.**

**2. Using a pair of compasses, ruler and a sharp pencil only. Construct a rectangle ABCD where  $AB = 5\text{cm}$ ,  $AD = 3\text{ cm}$ . Measure AC**

**3. Using a pair of compasses, ruler and a sharp pencil only. Construct a rectangle PQRS where PQ is 4 cm, RS is 2 cm. Measure PR**

**d) Construction of polygons**

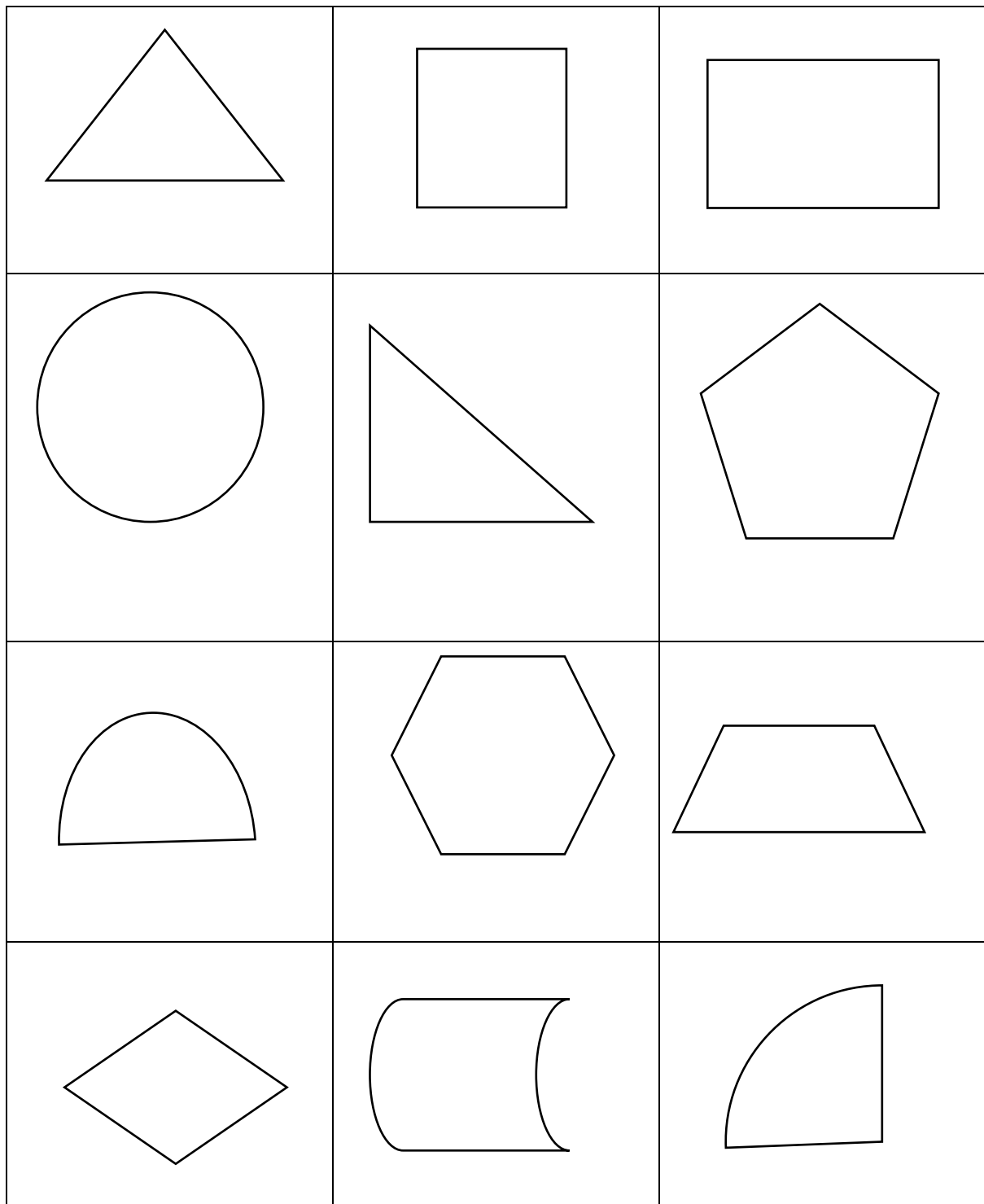
**1. Using a pair of compasses, ruler and a sharp pencil only, Construct a hexagon in a circle of radius 3 cm.**

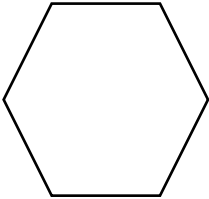
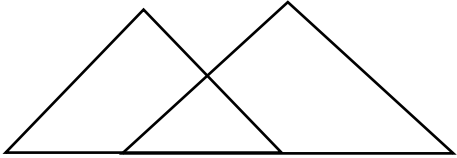
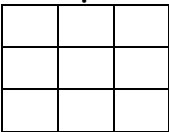
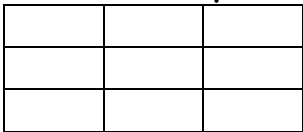
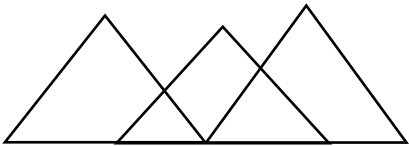
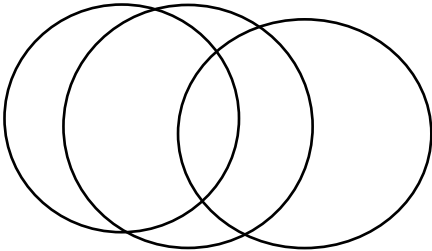
**2. Using a pair of compasses, ruler and a sharp pencil only. Construct a pentagon in a circle of radius 4cm.**

**3. Using a pair of compasses, ruler and a sharp pencil only, Construction an equilateral triangle in a circle of radius 3**

Finding the line of folding/symmetry

With a help of a ruler, show and find the line of folding symmetry in the shapes below.

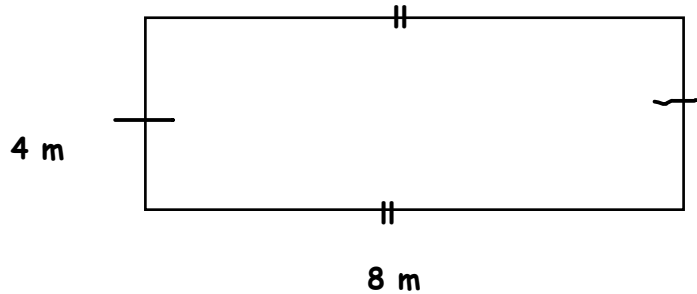


1	<p>How many triangles are in the shape below?</p> 	2	<p>Find the number of triangles in the shape below.</p> 
3	<p>How many squares can be got from pattern below?</p> 	4	<p>Find the number of rectangles formed in the pattern below.</p> 
5	<p>Find the sum of all triangles formed.</p> 	6	<p>How many circles formed pattern below?</p> 

**CORRECTION**

PERIMETER AND AREA OF QUADRILATERALS

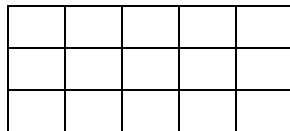
1. The figure below is a rectangle. Use it to answer the questions that follow



I) Find the perimeter of the rectangle

II) Calculate the area of the figure.

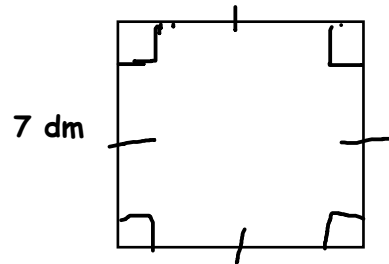
2. Study the figure below carefully and answer questions that follow



a) Calculate the perimeter of the figure

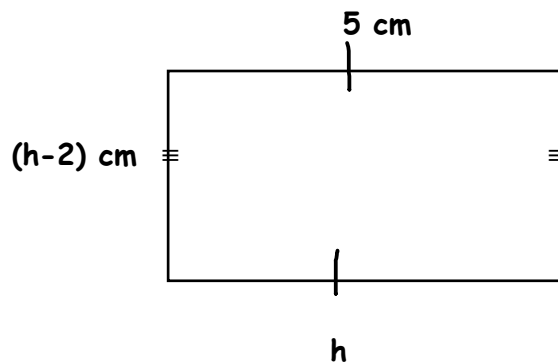
b) Find its area

3. The figure below is square. Study it carefully and answer questions that follow.



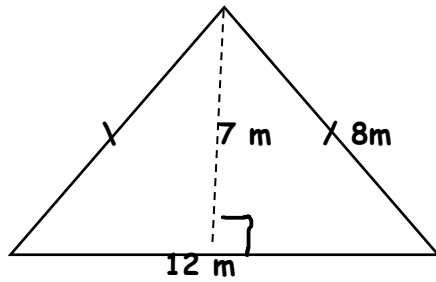
- a) Find the area of the square
- b) Calculate the total distance around the figure

4. The figure below is a rectangular piece of garlic garden. Use it to answer the questions that follow carefully.



- a) Find the value of  $h$
- b) Find the total distance around the land thrice
- c) Work out the area of the land.

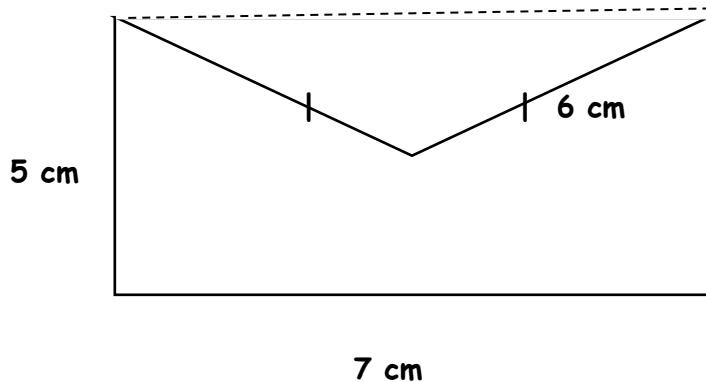
5. Study the figure below carefully and answer questions that follow.



a) Find the perimeter of the figure.

b) Calculate the area of the figure

6. The figure below is an envelope. Study it carefully and answer the questions that follow.



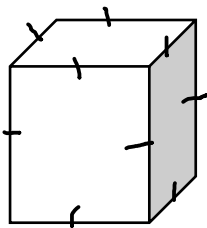
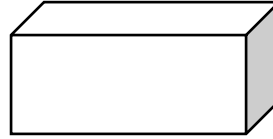
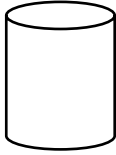
a) Work out the perimeter of an envelope.

b) Calculate the area of the envelope.



### 3 DIMENSIONAL SHAPES

1. Name the following shapes correctly.



2. In the space below, draw a cone.
3. Draw a triangular prism In the space below
4. Draw the nets of the following 3 dimensional shapes

i) Cuboid.

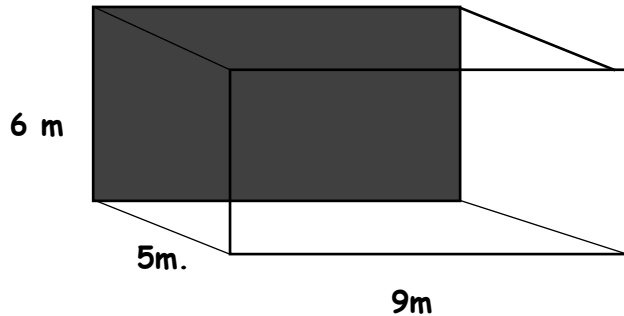
II) cube

III) cone.

IV) Cylindrical tin

Finding the number of edges, vertices and faces of 3 dimensional shapes.

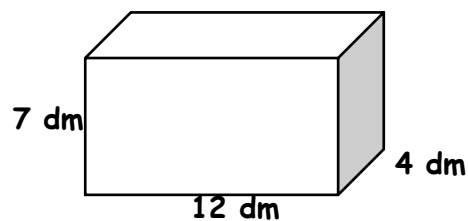
1. Study the figure below carefully and answer the questions that follow.



- a) Find the number of,
- i ) faces.....
  - ii) Vertices.....
  - iii) Edges.....

b) Calculate the area of the shaded part

2. The figure below is a box. Study it and use it to answer the questions that follow.



- a) Find the number of;
- I) Faces.....
  - II) Edges.....
  - iii) Vertices.....

b) Calculate the area of the shaded side.

**LENGTH, MASS AND CAPACITY**

***Metric system***

**LENGTH**

1. Change the following into centimetres

I) 6m

II) 7km

III)  $\frac{1}{2}$  metres

IV)  $\frac{1}{4}$  metres

V) 2.5 metres

2. Express the following as metres

I) 500 cm

II) 800 cm

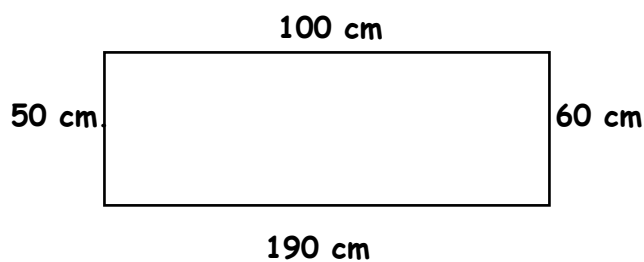
III) 90 cm

IV) 60.70 cm

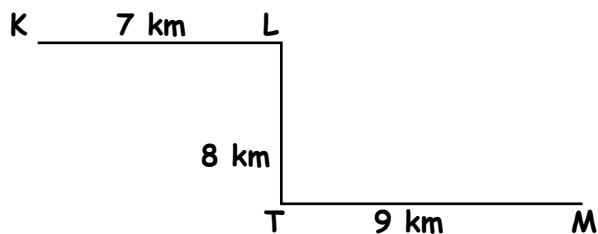
V) 3 km

**SIMPLE WORD PROBLEMS IN METRIC SYSTEM**

1. Nantalia has a height of 1.2 m. How tall is she in cm?
2. A boy covered a distance of 3km. Change his distance to metres.
3. Find the total distance around the figure below in metres.



4. The road measures 400 m wide, Find its breadth in km
5. From Starlight to Kiganda is 1.5 km. How far is it in metres.
6. How far is from K to M in metres



**MASS**

Changing kilogram to grams and vice versa

I. Express the following as grams

a) 5 kg

b) 7 kg

c) 0.3 kg

d)  $\frac{1}{2}$  kg

e)  $\frac{1}{4}$  kg

II. Convert the following to kg

a) 500g

b) 250 g

c) 9000 g

d) 1500 g

Common questions in examination

1	<p>Work out: kg                  grams</p> $\begin{array}{r} 5 \quad 560 \\ + 4 \quad 700 \\ \hline \end{array}$	2	<p>Work out: kg                  Grams</p> $\begin{array}{r} 32 \quad 600 \\ - 30 \quad 790 \\ \hline \end{array}$
3	<p>Subtract: Metres.                  Cm</p> $\begin{array}{r} 5 \quad 89 \\ - 9 \quad 96 \\ \hline \end{array}$	4	<p>Add: km                  m</p> $\begin{array}{r} 9 \quad 800 \\ + 8 \quad 890 \\ \hline \end{array}$
5	What is $\frac{1}{3}$ of 90 kg?	6	Find the number of 250g packets of salt that can be got from 4kg of salt
7	How many packets of tea of 50 g can be got from 5kg of tea leaves	8	Each man can eat $\frac{1}{4}$ kg of rice, How many men can eat 3 kg of rice?
9	Find the number of $\frac{1}{4}$ kg packets of sugar that can be got from 8kg of salt	10	Ekwee is 1.5 kg heavier than Shalom. If Shalom is 47.8 kg, Find Ekwee's mass.

**CAPACITY**

1	Convert 6 litres to ml	2.	Express 5.8 litre as milliliters
3	Change 500ml to litres	4	Convert 250 ml to litres
5	Peter milked 4 litres of milk. How many milliliters did he milk?	6	Find the number of 5 litre jerry can that can fill a tank of 50 litres
7	How many times can Amama fetch the water from the tap with 10 litres jerry can to fill a cylindrical tank of 100 litres?	8	Nyamwenge served visitors with soda from 5000 ml bottle full using a cup of 0.5 litre. How many visitors were there?
9	How many tins of 500ml can fill a tin of 12 litres?	10	What is $\frac{2}{3}$ of 45 litres?

**MONEY**

1	Write sh. 50,000 in words	2	Find the number of sh. 500 coins that can balance sh.2500 notes.
3	Find the value of 3 notes of five thousand shillings.	4	After shopping, Opio paid 4 notes of twenty thousand shillings from initial Sh.50,000. Find his change.
5	A machine detected 5 notes of sh.10,000 counterfeits. How much was the counterfeit?	6	How many notes of 20,000shs is equivalent to Sh. 100,000
7	Elizabeth deposited 6 notes of 50,000 into Starlight account as fees, How much was the fees?	8	Given that 1US\$ is equivalent to 3700 Uganda shillings. How much is 6 US\$?



9. The table below shows the money school bursar deposited in the bank on Monday, Study it carefully and answer the questions that follow.

Denomination	Number of notes	Amount
5000	.....	50,000
.....	12	24000
10,000	5	.....

a) Complete the table correctly

b) Write the total amount he deposited in words.

10. Helena went shopping and bought the following items

A kilogram of rice at sh. 5000

A litre of cooking oil at sh. 7000

A bar of soap at sh. 5500

- a) How much is 3 bars of soap and  $\frac{1}{2}$  litre of cooking oil?

b) Find her total expenditure

- c) If she had 4 notes of Sh. 5000, how much was her change?

11. Study the table below which shows how Anena spent a part of her Sh. 25000.

Use it to answer the questions that follow.

Item	Quantity	Unit price	Amount
Rice	3 kg	.....	Sh. 15000
Millet flour	.....	Sh.6000 a kg	Sh.3000
Tomatoes	4	Sh.300	Sh.....
Onions	.....	Sh.200	Sh.1000
		TOTAL	.....

a) Complete the table above

b) Find her change.

ENB OF TERM II

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Mr Ochieng Wilson Prince

Mathematics teacher

0762550123/0758924184

# **MATHEMATICAL FORMULA WITH EXAMPLES.**

1) Subsets =  $2^n$

For example;

Given that set A = {a, b, c}, find the number of subsets set A has.

Subsets =  $2^n$

$$\begin{aligned}n &= 3 \\&= 2^3 \\&= (2 \times 2) \times 2 \\&= 4 \times 2 \\&= \underline{\underline{8 \text{ subsets.}}}\end{aligned}$$

2) Proper Subsets =  $2^n - 1$

For example;

Given that set P = {a, b, c, d}, how many proper subsets does set P has?

Proper subsets =  $2^n - 1$

$$\begin{aligned}n &= 4 \\&= 2^4 - 1 \\&= (2 \times 2) \times (2 \times 2) - 1 \\&= (4 \times 4) - 1 \\&= 16 - 1 \\&= \underline{\underline{15 \text{ proper subsets.}}}\end{aligned}$$

3) Triangular number =  $n \frac{(n+1)}{2}$

n means number.

For example;

What is the 6<sup>th</sup> triangular number?

Triangular number =  $n \frac{(n+1)}{2}$

$$\begin{aligned}&= \frac{6(6+1)}{2} \\&= \frac{6 \times 7}{2} \\&= \frac{42}{2} \\&= \underline{\underline{21.}}\end{aligned}$$

4) Square number =  $n^2$

Where n stands for number.

For example;

Find the square of 4.

$$\begin{aligned}&= 4^2 \\&= 4 \times 4 \\&= \underline{\underline{16.}}\end{aligned}$$

5) Cube number =  $n^3$

Where n stands for number

For example;

What is the cube of 5?

$$= 5^3$$

$$= 5 \times 5 \times 5$$

$$= \underline{125.}$$

6) Increase = New - Old.

For example;

The number of pupils in P.6 class increased from 100 to 150 this year.

Calculate the increased number.

$$\text{Increase} = \text{New} - \text{old}$$

$$= 150 - 100$$

$$= \underline{50.}$$

$$\triangleright \% \text{ Increase} = \frac{\text{increase}}{\text{Original no.}} \times 100\%$$

For example;

The number of pupils increased from 400 to 420 in a school this year.

Calculate the percentage increase.

$$\% \text{ increase} = \frac{\text{increase}}{\text{Original no.}} \times 100\%$$

$$= \frac{420 - 400}{400} \times 100\%$$

$$= \frac{20}{400} \times 100\%$$

$$= \frac{20}{400} \times 100\%$$

$$= 5 \times 1\%$$

$$= \underline{5\%}$$

7) Decrease = Old - New

For example;

When 480 was decreased, it became 420. Calculate the decrease.

$$\text{Decrease} = \text{Old} - \text{New}$$

$$= 480 - 420$$

$$= \underline{60.}$$

$$\triangleright \% \text{ decrease} = \frac{\text{decrease}}{\text{Original no.}} \times 100\%$$

For example;

By what percentage will 100 be decreased to become 80?

$$\% \text{ decrease} = \frac{\text{decrease}}{\text{Original no.}} \times 100\%$$

$$= \frac{100 - 80}{100} \times 100\%$$

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

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

$$= 20 \times 1\%$$

$$= \underline{20\%}$$

8) Profit = Selling Price (S.P) - Buying Price (B.P)

For example;

Kevin bought a television set at sh. 800,000 and sold it later at sh. 900,000. Calculate his profit.

Profit = S.P - B.P

$$= \text{sh. } 900,000 - \text{sh. } 800,000$$

$$= \underline{\underline{\text{sh. } 100,000.}}$$

$$\text{➤ } \% \text{ Profit} = \frac{\text{Profit}}{\text{Cost price (C.P)}} \times 100\%$$

For example;

Find the percentage profit on a chair bought at sh. 10,000 and sold at sh. 12,000.

% Profit =  $\frac{\text{Profit}}{\text{C.P}} \times 100\%$

$$= \frac{12,000 - 10,000}{10,000} \times 100\%$$

$$= \frac{2,000}{10,000} \times 100\%$$

$$= 2 \times 10\%$$

$$= \underline{\underline{20\%}}$$

9) Loss = Buying Price (B.P) - Selling Price (S.P)

For example;

Isaac bought a radio at sh. 60,000 and sold it at sh. 40,000. Calculate his loss.

Loss = B.P - S.P

$$= \text{sh. } 60,000 - \text{sh. } 40,000$$

$$= \underline{\underline{\text{sh. } 20,000}}$$

$$\text{➤ } \% \text{ Loss} = \frac{\text{Loss}}{\text{C.P}} \times 100\%$$

For example;

Sophia bought a car at sh. 8,000,000 and sold it at sh. 6,000,000. Calculate her percentage loss.

% Loss =  $\frac{\text{Loss}}{\text{C.P}} \times 100\%$

$$= \text{sh. } \frac{8,000,000 - \text{sh. } 6,000,000}{\text{Sh. } 8,000,000} \times 100\%$$

$$= \text{sh. } \frac{2,000,000}{\text{Sh. } 8,000,000} \times 100\%^{25}$$

$$= 1 \times 25\%$$

$$= \underline{\underline{25\%}}$$

10) Discount = Marked Price (M.P) - Cash Price (C.P)

For example;

The marked price of a radio is sh. 40,000. After a discount Bashir paid sh. 35,000 cash. How much was the discount?

Discount = M.P - C.P

$$= \text{sh. } 40,000 - \text{sh. } 35,000$$

$$= \underline{\text{sh. } 5,000}$$

$$\text{➤ \% discount} = \frac{\text{Discount}}{\text{M.P}} \times 100\%$$

For example;

The marked price of a set is sh. 1,500. Milly paid sh. 1,200 after being given a discount. What was the percentage discount?

% discount =  $\frac{\text{Discount}}{\text{M.P}} \times 100\%$

$$= \frac{1,500 - 1,200}{1,500} \times 100\%$$

$$= \frac{300}{1500} \times 100\%$$

$$= \underline{20\% \text{ discount}}$$

11) Simple Interest (S.I) = Principal (P) × Rate (R) × Time (T)

For example;

Calculate the simple interest on sh. 40,000 kept for 3 years at a rate of 30% per year.

Simple interest = P × R × T

$$= \text{sh. } 40,000 \times \frac{30}{100} \times 3$$

$$= \text{sh. } 400 \times 30 \times 3$$

$$= \text{sh. } 12,000 \times 3$$

$$= \underline{\text{sh. } 36,000}$$

12) Amount = Principal (P) + Interest (I)

For example;

Calculate the amount on sh. 40,000 borrowed for 2 years at 10% per year.

Interest = P × R × T

$$= \text{sh. } 40,000 \times \frac{10}{100} \times 2$$

$$= \text{sh. } 400 \times 10 \times 2$$

$$= \underline{\text{sh. } 8,000}$$

Amount = Principal + Interest

$$= \text{Sh. } 40,000 + \text{sh. } 8,000$$

$$= \underline{\text{sh. } 48,000}$$

$$13) \text{ Rate} = \frac{S.I \times 100}{P \times T}$$

For example;

Sarah deposited sh. 60,000 on her savings account. At the end of 2 years the simple interest earned was sh. 12,000. Calculate the rate of interest.

$$\begin{aligned} \text{Rate} &= \frac{S.I \times 100}{P \times T} \\ &= \frac{\text{sh. } 12,000 \times 100}{\text{Sh. } 60,000 \times 2} \\ &= 6 \times 5 \\ &= \underline{30\%} \end{aligned}$$

$$14) \text{ Principal} = \frac{S.I \times 100}{R \times T}$$

For example;

What sum of money will yield an interest of Sh. 5,000 at a rate of 2% for 4 years?

$$\begin{aligned} \text{Principal} &= \frac{S.I \times 100}{R \times T} \\ &= \text{sh. } \frac{5,000 \times 100}{2 \times 4} \\ &= \text{sh. } 2500 \times 25 \\ &= \underline{\text{sh. } 65,500} \end{aligned}$$

$$15) \text{ Time} = \frac{S.I \times 100}{P \times R}$$

For example;

In what time will sh. 15,000 yield an interest of sh. 1,200 at 4% per year?

$$\begin{aligned} \text{Time} &= \frac{S.I \times 100}{P \times R} \\ &= \frac{1,200 \times 100}{15,000 \times 4} \\ &= \frac{30^2}{45} \\ &= \underline{2 \text{ years}} \end{aligned}$$

$$16) \text{ Range} = \text{Highest (H)} - \text{Lowest (L)}$$

For example;

Given the following marks scored by Mark in Mathematics papers; 70, 65, 40, 60, 20. Find his range.

$$\begin{aligned} \text{Range} &= H - L \\ &= 70 - 20 \\ &= \underline{50.} \end{aligned}$$



$$17) \text{ Mean} = \frac{\text{Total items}}{\text{No. of items}}$$

For example;

Joyce scored the following marks in her test; 50, 40, 70, 60. Calculate her mean.

$$\begin{aligned} \text{Mean} &= \frac{\text{Total marks}}{\text{No. of tests}} \\ &= \frac{50 + 40 + 70 + 60}{4} \\ &= \frac{220}{4} \\ &= 55. \end{aligned}$$

$$18) \text{ Probability} = \frac{\text{All expected outcomes (E)}}{\text{All possible outcomes (T)}}$$

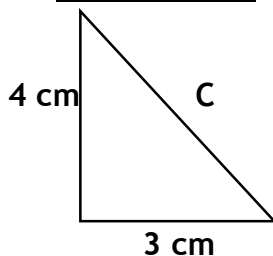
For example;

In a box, there are 7 red pens, 4 blue pens and 3 black ones. What would be the probability of choosing a blue pen?

$$\begin{aligned} \text{Probability} &= \frac{n(E)}{n(T)} \\ &= \frac{4}{7 + 4 + 3} \\ &= \frac{4}{14} \end{aligned}$$

$$19) \text{ Pythagoras Theorem: } a^2 + b^2 = c^2$$

For example;



$$\begin{aligned} a^2 + b^2 &= C^2 \\ 3^2 + 4^2 &= C^2 \\ 9 + 16 &= C^2 \\ \sqrt{25} &= \sqrt{C^2} \\ C &= 5 \end{aligned}$$

$$\begin{aligned} 20) \text{ Number of sides of a polygon} &= \frac{\text{All exterior angles}}{\text{Each exterior angle}} \text{ which is;} \\ &= \frac{360^\circ}{\text{Ext angle}} \end{aligned}$$

For example;

Calculate the number of sides of a regular polygon whose exterior angle is  $30^\circ$ .

$$\begin{aligned} \text{Number of sides} &= \frac{360^\circ}{\text{Ext angle}} \\ &= \frac{360^\circ}{30^\circ} \\ &= 12 \text{ sides.} \end{aligned}$$

- 21) Number of Triangles in a given polygon =  $(n - 2)$   
 $n$  stands for number of sides a given polygon has.

For example;

How many triangles can be formed from a Hexagon?

$$\begin{aligned}\text{Number of triangles} &= n-2 \\ &= 6-2 \\ &= \underline{\underline{4 \text{ triangles.}}}\end{aligned}$$

- 22) Number of right angles of a polygon =  $2(n - 2)$  or  $2n - 4$ .

For example;

Calculate the number of right angles in a polygon with 7 sides.

$$\begin{aligned}\text{Number of right angles} &= 2n - 4 \\ &= (2 \times 7) - 4 \\ &= 14 - 4 \\ &= \underline{\underline{10 \text{ right angles.}}}\end{aligned}$$

- 23) Interior angle sum of a polygon = Int. angle  $\times$  no. of triangle.  
 $= 180^\circ \times (n - 2) / 180^\circ(n - 2)$  or  
 $= 90^\circ(2n - 4).$

For example;

Calculate the interior angle sum of a polygon of 8 sides.

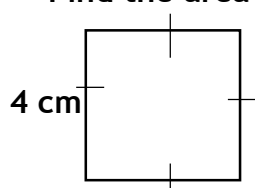
$$\begin{aligned}\text{Angle sum} &= 180^\circ(n-2) \\ &= 180^\circ(8-2) \\ &= 180^\circ \times 6 \\ &= \underline{\underline{1080^\circ}}\end{aligned}$$

## 24) AREA OF;

- i. Square =  $S \times S$  or  $(S^2)$  or  $L \times L$  or  $(L^2)$

For example;

Find the area of the square whose side is 4 cm.

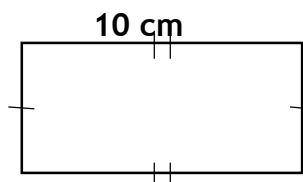


$$\begin{aligned}\text{Area} &= S \times S \\ &= 4 \text{ cm} \times 4 \text{ cm} \\ &= \underline{\underline{16 \text{ cm}^2}}\end{aligned}$$

- ii. Rectangle =  $L \times W$  or  $(lw)$

For example;

Find the area of the rectangle with length of 10 cm and 8 cm width.

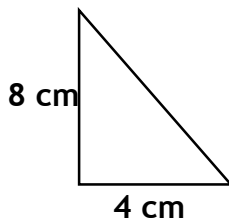


$$\begin{aligned}\text{Area} &= L \times W \\ &= 10 \text{ cm} \times 8 \text{ cm} \\ &= \underline{\underline{80 \text{ cm}^2}}\end{aligned}$$

iii. Triangle =  $\frac{1}{2} \times \text{base} \times \text{height}$  or  $\frac{(bh)}{2}$

For example;

Find the area of triangle below.

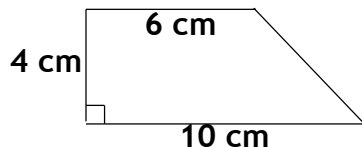


$$\begin{aligned}\text{Area} &= \frac{1}{2} \times b \times h \\ &= \frac{b \times h}{2} \\ &= \frac{4 \text{ cm} \times 8 \text{ cm}}{2} \\ &= 4 \times 4 \text{ cm}^2 \\ &= \underline{16 \text{ cm}^2}\end{aligned}$$

iv. Trapezium =  $\frac{1}{2} \times h \times (a+b)$

For example;

Find the area of the trapezium below.

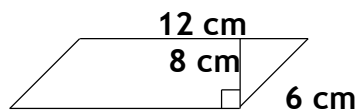


$$\begin{aligned}\text{Area} &= \frac{1}{2}h (a + b) \\ &= \frac{1}{2} \times 4 \text{ cm} \times (6 \text{ cm} + 10 \text{ cm}) \\ &= \frac{1}{2} \times 4 \text{ cm} \times 16 \text{ cm} \\ &= 4 \text{ cm} \times 4 \text{ cm} \\ &= \underline{16 \text{ cm}^2}\end{aligned}$$

v. Parallelogram = Base (B)  $\times$  Height (H) (=  $b \times h$ )

For example;

Calculate the area of the parallelogram below.

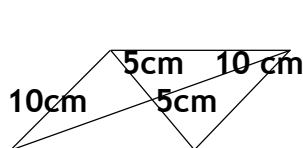


$$\begin{aligned}\text{Area} &= b \times h \\ &= 12 \text{ cm} \times 8 \text{ cm} \\ &= \underline{96 \text{ cm}^2}\end{aligned}$$

vi. Rhombus and Kite =  $\frac{1}{2} \times d_1 \times d_2$

For example;

Find the area of the rhombus below.

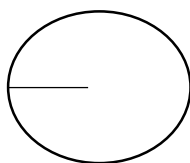


$$\begin{aligned}\text{Area} &= \frac{1}{2} \times d_1 \times d_2 \\ &= \frac{1}{2} \times 10 \text{ cm} \times 10 \text{ cm} \\ &= 10 \text{ cm} \times 10 \text{ cm} \\ &= \underline{100 \text{ cm}^2}\end{aligned}$$

vii. Circle =  $\pi r^2$

For example;

Find the area of a circle whose radius is 14 cm.

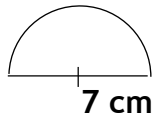


$$\begin{aligned}\text{Area} &= \pi r^2 \\ &= \frac{22}{7} \times 14 \text{ cm} \times 14 \text{ cm} \\ &= 22 \times 7 \text{ cm} \times 14 \text{ cm} \\ &= \underline{616 \text{ cm}^2}\end{aligned}$$

viii. Semi-Circle =  $\frac{1}{2}\pi r^2$

For example:

Calculate the area of a semi-circle of radius 7 cm.

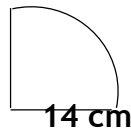


$$\begin{aligned}\text{Area} &= \frac{1}{2}\pi r^2 \\ &= \frac{1}{2} \times \frac{22}{7} \times 7 \text{ cm} \times 7 \text{ cm} \\ &= 11 \times 7 \text{ cm}^2 \\ &= \underline{77 \text{ cm}^2}\end{aligned}$$

ix. Quadrant =  $\frac{1}{4}\pi r^2$

For example:

Find the area of a quadrant of a circle with radius 14 cm.

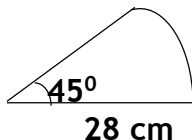


$$\begin{aligned}\text{Area} &= \frac{1}{4}\pi r^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times 14 \text{ cm} \times 14 \text{ cm} \\ &= 11 \times 2 \text{ cm} \times 7 \text{ cm} \\ &= \underline{154 \text{ cm}^2}\end{aligned}$$

x. Sector =  $\frac{\text{given angle}}{360^\circ} \pi r^2$

For example:

Calculate the area of a sector of a circle of radius 28 cm and the center angle  $45^\circ$



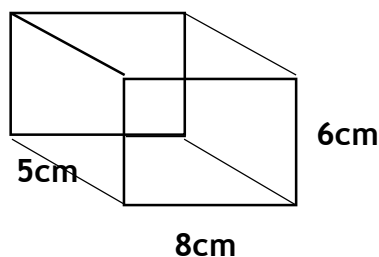
$$\begin{aligned}\text{Area} &= \frac{45^\circ}{360^\circ} \pi r^2 \\ &= \frac{1}{8} \pi r^2 \\ &= \frac{1}{8} \times \frac{22}{7} \times 28 \text{ cm} \times 28 \text{ cm} \\ &= 11 \times 28 \text{ cm}^2 \\ &= \underline{308 \text{ cm}^2}\end{aligned}$$

## 25) TOTAL SURFACE AREA (T.S.A) OF:

a. Cuboid =  $(2lw) + (2lh) + (2wh)$  or  $2(LW + LH + WH)$

For example:

Find the total surface area of a cuboid whose sides measure 8cm by 5cm by 6cm.

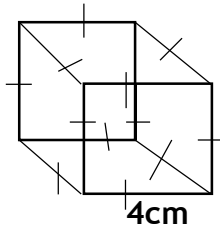


$$\begin{aligned}\text{T.S.A} &= 2((L \times W) + (L \times H) + (W \times H)) \\ &= 2((8\text{cm} \times 5\text{cm}) + (8\text{cm} \times 6\text{cm}) + (5\text{cm} \times 6\text{cm})) \\ &= 2((40\text{cm}^2) + (48\text{cm}^2) + (30\text{cm}^2)) \\ &= 2 \times 118\text{cm}^2 \\ &= \underline{236\text{cm}^2}.\end{aligned}$$

- b. Cube =  $6(S \times S)$  or  $6 \times L^2$

For example;

Calculate the total surface area of a cube whose sides' measures 4cm.

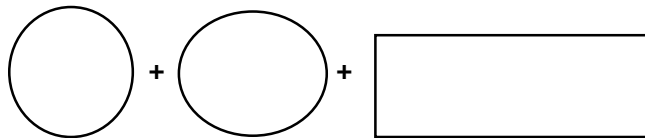


$$\begin{aligned} \text{T.S.A} &= 6 \times L^2 \\ &= 6 \times 4\text{cm} \times 4\text{cm} \\ &= 6 \times 16\text{cm}^2 \\ &= \underline{96\text{cm}^2} \end{aligned}$$

- c. Cylinder =  $2\pi r^2 + 2\pi rh$  (when closed)

For example;

Calculate the total surface area of a cylinder whose radius is 7cm and height 10cm (Use  $\pi = \frac{22}{7}$ )



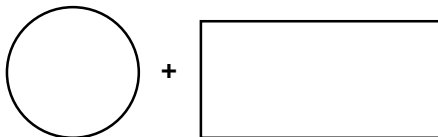
$$\begin{aligned} \text{T.S.A} &= 2\pi r^2 + 2\pi rh \\ &= (2 \times \frac{22}{7} \times 7 \times 7) + (2 \times \frac{22}{7} \times 7 \times 10) \\ &= (44 \times 7) + (44 \times 10) \\ &= 44(7+10) \\ &= 44 \times 17 \\ &= \underline{748\text{cm}^2} \end{aligned}$$

- d. Cylinder =  $\pi r^2 + 2\pi rh$  (when one side is open)

For example;

Calculate the total surface area of an open cylinder whose radius is 7cm and height 8cm (Use  $\pi = \frac{22}{7}$ )

Note: An open cylinder has one circular end.

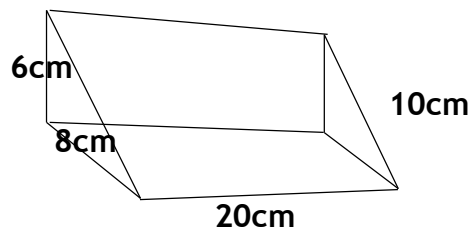


$$\begin{aligned} \text{T.S.A} &= \pi r^2 + 2\pi rh \\ &= (\frac{22}{7} \times 7 \times 7) + (2 \times \frac{22}{7} \times 7 \times 8) \\ &= (22 \times 7) + (44 \times 8) \\ &= 154 + 352 \\ &= \underline{506\text{cm}^2} \end{aligned}$$

- e. Triangular prism =  $(b \times h) + (L \times W) + (L \times W) + (L \times W)$

For example;

Find the surface area of the triangular prism below.



$$\begin{aligned} \text{T.S.A} &= (b \times h) + (L \times W) + (L \times W) + (L \times W) \\ &= (8 \times 6) \text{ cm}^2 + (20 \times 8) \text{ cm}^2 + (20 \times 6) \text{ cm}^2 + (20 \times 10) \text{ cm}^2 \\ &= 48 \text{ cm}^2 + 160 \text{ cm}^2 + 120 \text{ cm}^2 + 200 \text{ cm}^2 \\ &= \underline{\underline{528 \text{ cm}^2}} \end{aligned}$$

## 26) PERIMETER OF:

- i. Square =  $S+S+S+S$  or  $4S$

For example;

Find the perimeter of the square whose sides are 4cm

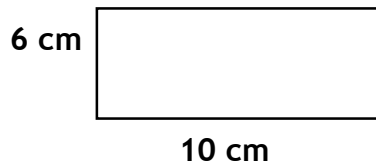


$$\begin{aligned} \text{Perimeter} &= 4 \times S \\ &= 4 \times 4\text{cm} \\ &= \underline{\underline{16\text{cm}}} \end{aligned}$$

- ii. Rectangle =  $L+W+L+W$  or  $2(L+W)$  or  $2L+2W$

For example;

Find the perimeter of the rectangle below.

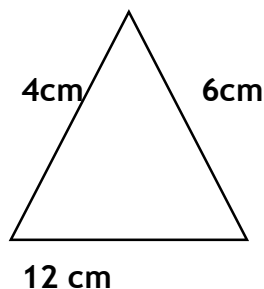


$$\begin{aligned} \text{Perimeter} &= 2(L + W) \\ &= 2(10 + 6) \text{ cm} \\ &= 2 \times 16 \text{ cm} \\ &= \underline{\underline{32 \text{ cm}}} \end{aligned}$$

- iii. Triangle =  $S_1+S_2+S_3$

For example;

Find the perimeter of triangle below.



$$\begin{aligned} \text{Perimeter} &= S + S + s \\ &= (12 \text{ cm} + 6 \text{ cm}) + 4 \text{ cm} \\ &= 18 \text{ cm} + 6 \text{ cm} \\ &= \underline{\underline{24 \text{ cm.}}} \end{aligned}$$

## 27) CIRCLES

- i. Diameter =  $2 \times \text{radius}$  ( $2r$ )

For example;

Find the diameter of a circle whose radius is 20cm.

$$\begin{aligned}\text{Diameter} &= 2 \times \text{radius} \\ &= 2 \times 20\text{cm} \\ &= \underline{40\text{cm}}.\end{aligned}$$

- ii. Radius =  $\frac{\text{Diameter}}{2}$  (D)

For example;

Find the radius of a circle whose diameter is 20cm

$$\begin{aligned}\text{Radius} &= \frac{\text{Diameter}}{2} \\ &= \frac{20\text{cm}}{2} \\ &= \underline{10\text{cm}}.\end{aligned}$$

## 28) CIRCUMFERENCE OF:

- i. Circle =  $\pi d$  (When diameter is given)  
=  $2\pi r$  (When radius is given)

For example;

Calculate the circumference of a circle whose diameter is 21cm

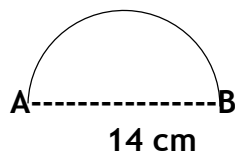
(Use  $\pi = \frac{22}{7}$ )

$$\begin{aligned}\text{Circumference} &= \pi d \\ &= \frac{22}{7} \times 21\text{ cm} \\ &= 22 \times 3\text{ cm} \\ &= \underline{66\text{ cm}}.\end{aligned}$$

- ii. Length of Semi-circle (arc) =  $\frac{1}{2}\pi d$

For example;

Find the length of the semicircular arc AB

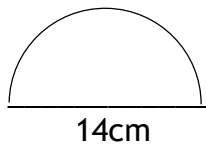


$$\begin{aligned}\text{Length AB} &= \frac{1}{2}\pi d \\ &= \frac{1}{2} \times \frac{22}{7} \times 14 \\ &= 11 \times 2 \\ &= 22\text{cm}\end{aligned}$$

iii. Perimeter of Semi-circle =  $\frac{1}{2}\pi d + d$

**For example;**

Find the perimeter of the semicircular region AB.

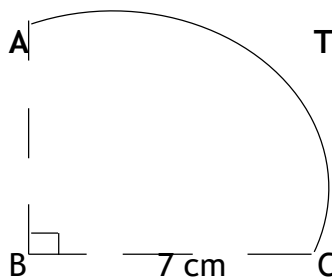


$$\begin{aligned}\text{Perimeter} &= \frac{1}{2}\pi d + d \\ &= \left(\frac{1}{2} \times \frac{22}{7} \times 14\right) + 14 \\ &= (22 + 14) \text{ cm} \\ &= \underline{36 \text{ cm}}\end{aligned}$$

iv. Length of Quadrant =  $\frac{1}{4} 2\pi r$

**For example;**

Find the length of AC of the quadrant drawn below.

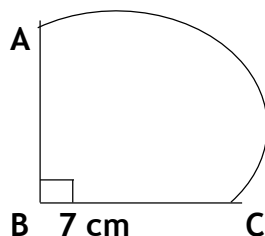


$$\begin{aligned}\text{The curved length} &= \frac{1}{4} (2\pi r) \\ &= \frac{1}{4} \times 2 \times \frac{22}{7} \times 7 \\ &= \underline{11 \text{ cm.}}\end{aligned}$$

v. Perimeter of Quadrant =  $\left(\frac{1}{4} 2\pi r\right) + r + r$

**For example;**

Find the perimeter of the figure.



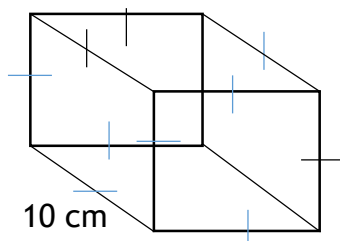
$$\begin{aligned}\text{Perimeter} &= \frac{1}{4}(2\pi r) + r + r \\ &= \left(\frac{1}{4} \times 2 \times \frac{22}{7} \times 7\right) + 7 + 7 \\ &= 11 + 7 + 7 \\ &= \underline{25 \text{ cm}}\end{aligned}$$

## 29) VOLUME OF;

a. Cube = (Base area  $\times$  height)  
=  $S \times S \times S$

**For example;**

Find the volume of the cube below.



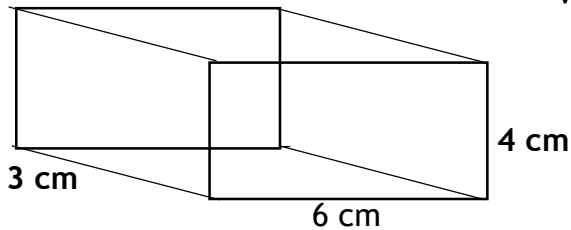
$$\begin{aligned}\text{Volume} &= s \times s \times s \\ &= (10 \text{ cm} \times 10 \text{ cm}) \times 10 \text{ cm} \\ &= 100 \text{ cm}^2 \times 10 \text{ cm} \\ &= \underline{1000 \text{ cm}^3}\end{aligned}$$



b. Cuboid = Base area  $\times$  height  
 $= L \times W \times H$

For example;

Find the volume of the cuboid below

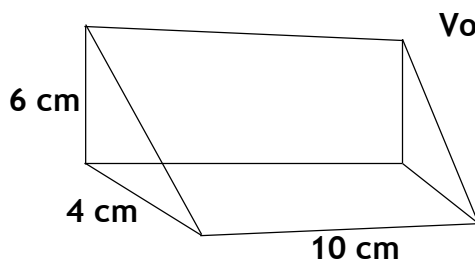


$$\begin{aligned}\text{Volume} &= L \times W \times H \\ &= (6 \text{ cm} \times 3 \text{ cm}) \times 4 \text{ cm} \\ &= 18 \text{ cm}^2 \times 4 \text{ cm} \\ &= \underline{\underline{72 \text{ cm}^3}}\end{aligned}$$

c. Triangular Prism = (Area of triangle  $\times$  length)  
 $= \frac{1}{2} b \times h \times l$

For example;

Find the volume of the figure below.

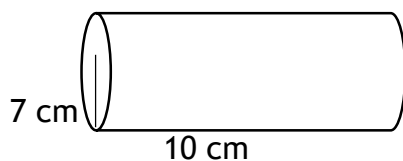


$$\begin{aligned}\text{Volume} &= \left(\frac{1}{2} \times b \times h\right) \times l \\ &= \left(\frac{1}{2} \times 4 \text{ cm} \times 6 \text{ cm}\right) \times 10 \text{ cm} \\ &= (2 \text{ cm} \times 6 \text{ cm}) \times 10 \text{ cm} \\ &= 12 \text{ cm}^2 \times 10 \text{ cm} \\ &= \underline{\underline{120 \text{ cm}^3}}\end{aligned}$$

d. Cylinder = (Area of circle  $\times$  height)  
 $= (\pi r^2) h$

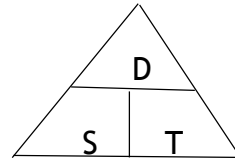
For example;

Find the volume of the cylinder below.



$$\begin{aligned}\text{Volume} &= (\pi r^2) \times h \\ &= \frac{22}{7} \times 7 \text{ cm} \times 7 \text{ cm} \times 10 \text{ cm} \\ &= (22 \text{ cm} \times 7 \text{ cm}) \times 10 \text{ cm} \\ &= 154 \text{ cm}^2 \times 10 \text{ cm} \\ &= \underline{\underline{1540 \text{ cm}^3}}\end{aligned}$$

i) Distance (D) = Speed (S) × Time (T)



For example;

James took 4 hours to cover a distance at a speed of 30 km hr. What distance did it cover?

$$\begin{aligned}\text{Distance} &= \text{speed} \times \text{time} \\ &= \frac{30\text{km}}{1\text{hr}} \times 4\text{hrs} \\ &= \underline{120\text{km}}\end{aligned}$$

ii) Speed (S) =  $\frac{\text{Distance (D)}}{\text{Time (T)}}$

For example;

Tom took 2 hours to cover a distance of 36 km on his bicycle. At what speed was she riding.

$$\begin{aligned}\text{Speed} &= \frac{\text{Distance}}{\text{Time}} \\ &= \frac{36\text{km}}{2\text{hrs}} \\ &= \underline{18\text{km/hr.}}\end{aligned}$$

iii) Time (T) =  $\frac{\text{Distance (D)}}{\text{Speed (S)}}$

For example;

How long will a car take to cover a distance of 120km at a speed of 40kmhr?

$$\begin{aligned}\text{Time} &= \frac{\text{Distance}}{\text{Speed}} \\ &= \frac{120\text{km}}{40\text{km}} \times 1\text{hr} \\ &= \underline{3\text{hrs.}}\end{aligned}$$

iv) Duration (D) = Ending Time (E.T) - Starting Time (S.T)

For example;

A plane left Entebbe at 1:00pm and arrived in Cairo at 5:30pm. How long did the flight take?

$$\begin{aligned}\text{Duration} &= \text{E.T} - \text{S.T} \\ &= 5:30\text{pm} - 1:00\text{pm} \\ &= \underline{4\text{hrs } 30\text{min or } 4\frac{1}{2}\text{hrs}}\end{aligned}$$

<u>S/W</u>	
hrs.	Min.
5	30
- 1	00
<hr/>	
4	30min

v) Ending Time (E.T) = Starting Time (S.T) + Duration (D)

For example:

A party started at 1:00pm and it lasted for 4hrs 30mins. At what time did it end?

Ending time = S.T + D

$$= 1:00\text{pm} + 4\text{hrs } 30\text{mins}$$

$$= \underline{5:30\text{pm}}$$

$$\begin{array}{r} \text{P.O.W} \\ 1 \ 00 \\ + \ 4 \ 30 \\ \hline 5 \ 30\text{pm} \end{array}$$

vi) Starting Time (S.T) = Ending Time (E.T) - Duration (D)

For example:

A party ended at 5:30pm and it lasted for 4hrs 30mins. At what time did it start?

Starting time = E.T - D

$$= 5:30\text{pm} - 4\text{hrs } 30\text{mins}$$

$$= \underline{1:00\text{pm}}$$

$$\begin{array}{r} \text{P.O.W} \\ 5 \ 30 \\ - \ 4 \ 30 \\ \hline 1 \ 00\text{pm} \end{array}$$

## CONVERSION OF METRIC UNITS

King Henry's Daughter Mary Drank Cold Milk.

Kilometer (Km)	Hectometer (hm)	Decameter (Dm)	Meter (M)	Decimeter (dm)	Centimeter (cm)	Millimeter (mm)	Length (distance)
Kilogram (Kg)	Hectogram (Hg)	Decagram (Dg)	Gram (G)	Decigram (dg)	Centigram (Cg)	Milligram (mg)	Mass (weighing)
Kiloliter (Kl)	Hectoliter (Hl)	Decaliter (Dl)	Liter (L)	Deciliter (dl)	Centiliter (Cl)	Milliliter (ml)	Capacity

Where by >>> 1 km = 1000 m

$$1 \text{ kg} = 1000 \text{ g}$$

$$1 \text{ kl} = 1000 \text{ l}$$

$$1 \text{ l} = 1000 \text{ ml}$$

For example:

Change 5km to meter.

$$\begin{array}{ccccccc} & \longrightarrow & & & & & \\ \text{Km} & \text{Hm} & \text{Dm} & \text{M} & \text{dm} & \text{cm} & \text{mm} \\ 1 & 0 & 0 & 0 & & & \end{array}$$

$$1\text{km} = 1000\text{m}$$

$$5\text{km} = (5 \times 1000) \text{ m}$$

$$= \underline{5000\text{m}}$$

Change 2liters to milliliter.

$$\begin{array}{ccccccc} & \longrightarrow & & & & & \\ \text{Kl} & \text{Hl} & \text{Dl} & \text{L} & \text{dl} & \text{cl} & \text{ml} \\ & & & 1 & 0 & 0 & 0 \end{array}$$

$$1\text{liter} = 1000\text{ml}$$

$$2\text{l} = (2 \times 1000) \text{ ml}$$

$$= \underline{2000 \text{ ml}}$$

Express 24kg as grams

$\xrightarrow{\hspace{1cm}}$   
 Kg Hg Dg G dg cg mg  
 1   0   0   0

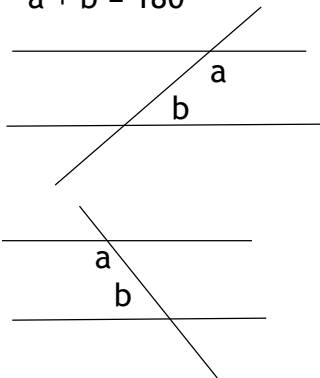
$1\text{kg} = 1000\text{g}$   
 $34\text{kg} = (34 \times 1000)\text{g}$   
 $= \underline{\underline{34000\text{grams}}}$

## ANGLES ON PARALLEL LINES.

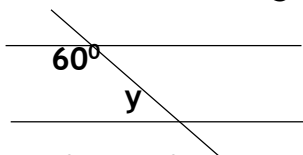
### Co-interior Angles and Co-exterior Angles.

**Note:** The sum of Co-interior angles and Co-exterior angles is equal to  $180^\circ$

Co-interior angles  
 $a + b = 180^\circ$



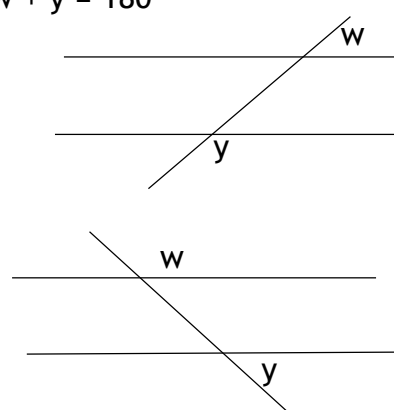
**For example;**  
 Find the value of angle marked y



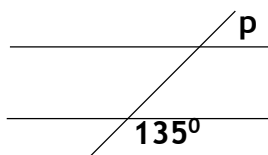
$$\begin{aligned}
 y + 60^\circ &= 180^\circ \\
 y + 60^\circ - 60^\circ &= 180^\circ - 60^\circ \\
 y + 0 &= 120^\circ \\
 y &= \underline{\underline{120^\circ}}
 \end{aligned}$$

$$\begin{array}{r}
 \text{P.O.W} \\
 \underline{180^\circ} \\
 - 60^\circ \\
 \hline
 120^\circ
 \end{array}$$

Co-exterior angles  
 $w + y = 180^\circ$



**For example;**  
 Find the size of the angle marked p



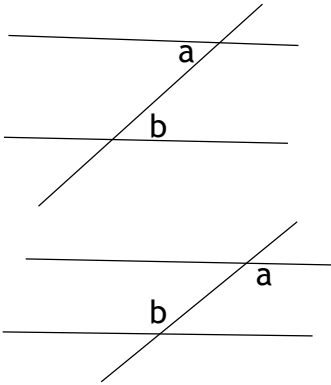
$$\begin{aligned}
 p + 130^\circ &= 180^\circ \\
 p + 130^\circ - 135^\circ &= 180^\circ - 130^\circ \\
 p + 0 &= 50^\circ \\
 p &= \underline{\underline{50^\circ}}
 \end{aligned}$$

$$\begin{array}{r}
 \text{P.O.W} \\
 \underline{180^\circ} \\
 - 130^\circ \\
 \hline
 50^\circ
 \end{array}$$

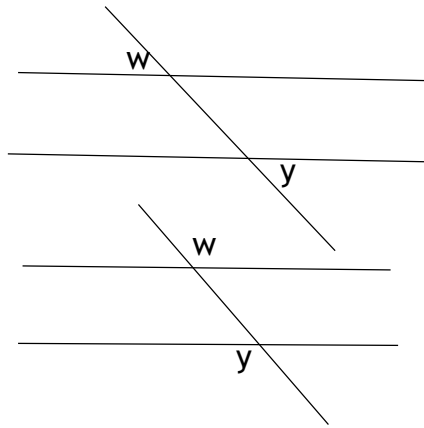
## Alternate Interior Angles and Alternate Exterior Angles

**Note:** All alternate angles are equal.

Alternate Interior angles  
 $a = b$  (alt angles)

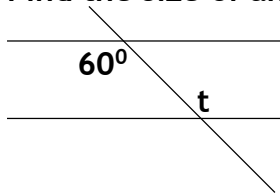


Alternate Exterior angles  
 $w = y$  (alt angles)



For example;

Find the size of angle marked  $t^\circ$

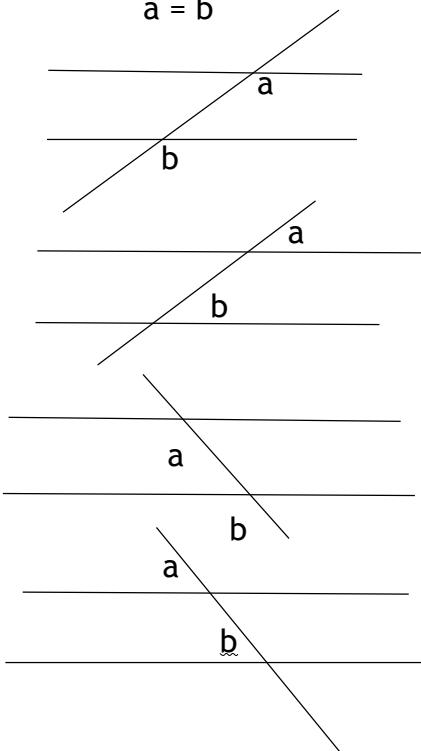


$t = \underline{60^\circ}$  (alternate angles)

## CORRESPONDING ANGLES.

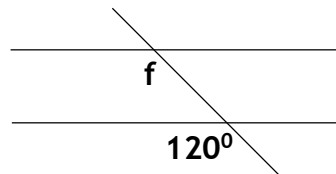
**Note:** All Corresponding angles are equal.

$a = b$



For example;

Find the size of angle marked  $f$ .



$f = \underline{120^\circ}$  (corresponding angles)

# INTEGERS

Positive (+) × Negative (-) = Negative (-)

Negative (-) × Positive (+) = Negative (-)

Positive (+) × Positive (+) = Positive (+)

Negative (-) × Negative (-) = Positive (+)

**NOTE:** Same/similar signs give positive results.

Different signs give negative results.

**BUT:** When positives are greater than negatives, the result is positive.

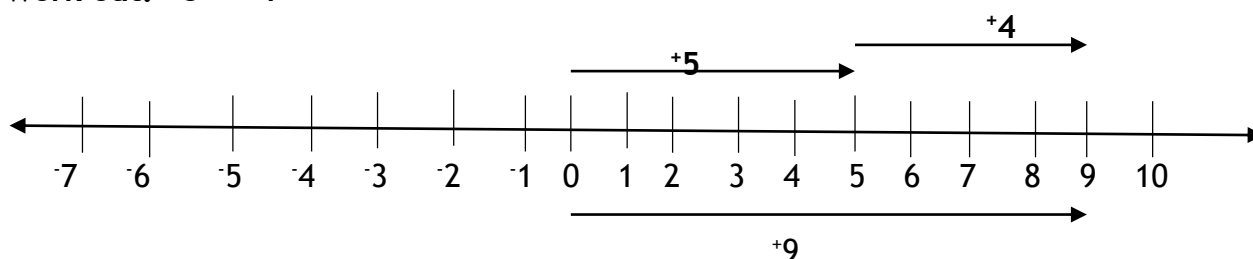
E.g.  $+5 + -3 = +2$ .

When negative is greater than positive, the result is a negative.

E.g.  $+2 + -5 = -3$ .

**For example:**

Work out:  $+5 + +4$



So,  $+5 + +4 = \underline{\underline{+9}}$

**For example:**

Workout:  $-3 + -2$  (Using mind map)


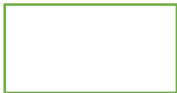





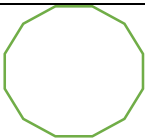
$-3 + (-2)$

$-3-2$

-ve	- - - - -	-5
+ve		

So,  $-3 + -2 = \underline{\underline{-5}}$

## **POLYGONS.**

SHAPE	NUMBER OF SIDES
Triangle 	3
Quadrilateral Like: Rectangle, Square, Parallelogram, Kite, Trapezium and Rhombus. 	4
Pentagon 	5
Hexagon 	6
Septagon 	7
Octagon 	8
Nonagon	9
Decagon 	10
Hendagon/Nuodecagon	11
Duodecagon 	12

### Aid to memory

- ❖ A polygon is a simple closed figure joined by line segments at its end points (vertices). The prefix “POLY” means many. “GONS” means corners.

## BASES

<u>BASES</u>	<u>BASE NAME</u>
Base one (1)	Unary base
Base two (2)	Binary base
Base three (3)	Trinary base/ternary base
Base four (4)	Quaternary base
Base five (5)	Quinary base
Base six (6)	Senary base/Seximal base
Base seven (7)	Septenary base/Septimal base
Base eight (8)	Octal base/Octonary base
Base nine (9)	Nonary base
Base ten (10)	Decimal base
Base eleven (11)	Undecimal base/undenary base
Base twelve (12)	Duodecimal base/dozenal

### EXAMPLES:

1. Change  $100_{\text{two}}$  to base ten.

$$\begin{aligned}
 100_{\text{two}} &= (1 \times \text{two twos}) + (0 \times \text{twos}) + (0 \times \text{ones}) \\
 &= (1 \times 2 \times 2) + (0 \times 2) + (0 \times 1) \\
 &= 4 + 0 + 0 \\
 &= \underline{4}_{\text{ten}}
 \end{aligned}$$

Aid to memory:

To change non-decimal bases to decimal base, we multiple each digit in the numeral by its place value and then find the sum of the values.

2. Change  $12_{\text{ten}}$  to base two.

Base	No.	Rem
2	12	0
2	6	0
2	3	1
2	1	1
	0	



$$12_{\text{ten}} = \underline{1100}_{\text{two}}$$

Note: To change from decimal base to non-decimal base, we divide the given base ten number by given non-decimal base and record the remainders. We then read the remainders starting from the bottom.



## TYPES AND PROPERTIES OF TRIANGLES.

### 1. Equilateral Triangle.

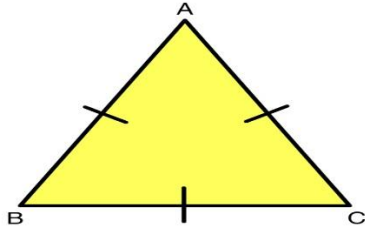
Has all the 3 sides equal

All angles are equal

Has 3 lines of symmetry

Equilateral Triangle

MATH  
MONKS



### 2. Isosceles triangle

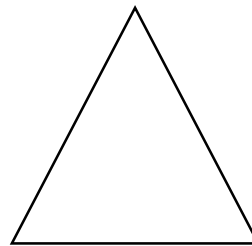
Two of its 3 sides are equal

Two opposite angles are equal

Has 1 line of symmetry

Its interior angles add up to  $180^\circ$

Its exterior angles add up to  $360^\circ$



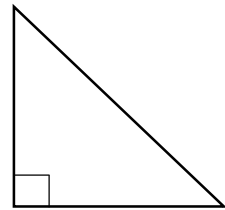
### 3. Right- angled scalene triangle

All sides are different

All angles are different but one of them is  $90^\circ$

Has no line of symmetry

Its interior angles add up to  $180^\circ$

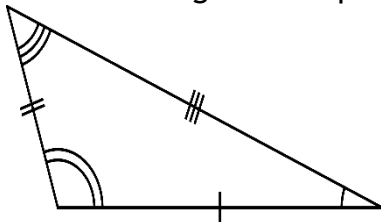


### 4. Scalene Triangle

All Its 3 sides are not equal

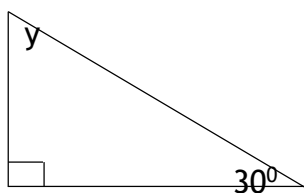
All angles are not equal

Its interior angles add up to  $180^\circ$



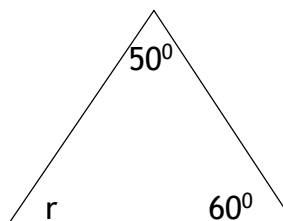
### EXAMPLES:

1. Find the size of angle y.



$$\begin{aligned} y + 30^\circ + 90^\circ &= 180^\circ \text{ (angle sum of } \Delta \text{)} \\ y + 120^\circ &= 180^\circ \\ y + 120^\circ - 120^\circ &= 180^\circ - 120^\circ \quad \left| \begin{array}{r} \text{s/w} \\ 180^\circ \\ - 120^\circ \\ \hline 60^\circ \end{array} \right. \\ y &= \underline{60^\circ} \end{aligned}$$

2. Find the size of r.



$$\begin{aligned} r + 50^\circ + 60^\circ &= 180^\circ \text{ (} \angle \text{ sum of } \Delta \text{)} \\ r + 110^\circ &= 180^\circ \\ r + 110^\circ - 110^\circ &= 180^\circ - 110^\circ \quad \left| \begin{array}{r} \text{s/w} \\ 180^\circ \\ - 110^\circ \\ \hline 70^\circ \end{array} \right. \\ r &= \underline{70^\circ} \end{aligned}$$

## ROMAN NUMERALS

Basic/Key Roman numerals.

Hindu-Arabic	1	5	10	50	100	500	1000
Roman numeral	I	V	X	L	C	D	M

**NOTE:** Other Roman numerals are got by either repeating or adding or subtracting.

**Numerals beginning with the digits 2 and 3 are got by repeating.**

Hindu-Arabic	2 = (1+1)	20 = (10+10)	200 = (100+100)
Roman numeral	II	XX	CC
Hindu-Arabic	3 = (1+1+1)	30 = (10+10+10)	300 = (100+100+100)
Roman numeral	III	XXX	CCC

**Numerals beginning with the digits 6, 7 and 8 are got by adding.**

Hindu-Arabic	6 = (5+1)	60 = (50+10)	600 = (500+100)
Roman numeral	VI	LX	DC
Hindu-Arabic	7 = (5+2)	70 = (50+20)	700 = (500+200)
Roman numeral	VII	LXX	DCC
Hindu-Arabic	8 = (5+3)	80 = (50+30)	800 = (500+300)
Roman numeral	VIII	LXXX	DCCC

**Numerals beginning with the digits 4 and 9 are by subtracting.**

Hindu-Arabic	4=(1 from 5)	40=(10 from 50)	400=(100 from 500)
Roman numeral	IV	XL	CD
Hindu-Arabic	9=(1 from 10)	90=(10 from 100)	900=(100 from 1000)
Roman numeral	IX	XC	CM

**NOTE:** When Roman numerals, a letter is never repeated more than three times.

**EXAMPLES:**

1. Express CMLXXV as a Hindu Arabic numeral.

$$\begin{array}{rcl}
 \text{CMLXXV} & = & \text{CM} \quad \text{LXX} \quad \text{V} \\
 & & \downarrow \quad \downarrow \quad \downarrow \\
 & = & 900 + 70 + 5 \\
 & = & \underline{975}
 \end{array}$$

2. Write 555 in Roman numerals.

$$\begin{array}{rcl}
 555 & = & 500 + 50 + 5 \\
 & = & \text{D} \quad \text{L} \quad \text{V} \\
 & = & \underline{\text{DLV}}
 \end{array}$$

## **DIVISIBILITY TEST.**

**Divisibility test of 2:** The numbers ending with even digits like 0, 2, 4, 6 and 8 are divisible by 2. **E.g.** 682, 794, 370, 968, etc.

**Divisibility test of 3:** A number is exactly divisible by 3 if the sum of its digits is divisible by 3 or if the sum is a multiple of 3. **E.g.**  $255 = 2+5+5 = 12$  (12 is a multiple of 3 so, 255 can be divisible of 3).

**Divisibility test of 4:** A number is divisible by 4 if the number formed by its last two digits is divisible by 4 or multiple of 4. **E.g.** 572. The last two digits are 7 and 2, the number formed is 72 and 72 is a multiple of 4 so 572 can be divisible by 4.

**Divisibility test of 5:** A number is divisible by 5 if it ends with 5 or with 0. **E.g.** 20, 35, 470, 5675.

**Divisibility 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. **E.g.** 612 is divisible by 6 since it is an even number and the sum of its digits  $6+1+2 = 9$  is divisible by 3.

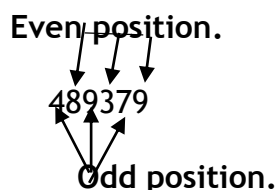
**Divisibility test for 7:** A number is divisible by 7 if the last digit of a number is doubled and the result is subtracted from the number formed by the remaining digits. The outcome is divisible by 7. **E.g.** take **315**, the last digit is 5 and the remaining number is 31, double 5 to get  $(5 \times 2) = 10$ . Subtract 10 from 31 to give  $(31 - 10) = 21$ . 21 is divisible/multiple of 7, hence 315 is also divisible by 7.

**Divisibility test for 8:** A number is divisible by 8 if the number formed by the last three digits is divisible by 8. **E.g.** The number 4376, **376** is the number formed by the last three digits which is divisible by 8 therefore, **4376** is divisible by 8.

**Divisibility test for 9:** A number is divisible by 9 if the sum of its digits is divisible or a multiple of 9. **E.g.** 135 the sum is  $(1+3+5) = 9$ .

**Divisibility test for 10:** A number is divisible by 10 if the digit in the ones place (at end) is 0. Or a number which is divisible by 10 is also divisible by 2 and 5. **E.g.** 70, 800, 180, 3050.

**Divisibility test for 11:** A number is divisible by 11 if the difference between the sum of the digits in **even places** and the sum of the digits in the **odd places** is zero (0).  
**E.g.**



Sum of the number in odd position =  $4 + 9 + 7 = 20$ .

Sum of the number in even position =  $8 + 3 + 9 = 20$ .

The difference between sum of the numbers in even positions and sum of numbers in odd positions is  $20 - 20 = 0$ . So **489379** is divisible by 11.

## **TYPES OF NUMBERS.**

**Square numbers:** When a number is multiplied by itself once, you get a square number. **E.g.**  $5 \times 5 = 25$ .

**Cube numbers:** When a number is multiplied by itself three times, a cube number is formed. **E.g.**  $3 \times 3 \times 3 = 27$

**Triangle number:** When you add consecutive counting numbers from 1, the sum is always a triangle number.

$$1 = 1$$

$$1 + 2 = 3$$

$$1 + 2 + 3 = 6$$

$$1 + 2 + 3 + 4 = 10$$

**Prime numbers:** A prime number has only 2 factors (one and itself). **E.g.** 2, 3, 5, 7, 11, 13.

**Composite numbers:** A composite number has more than 2 factors. **E.g.** 4, 6, 8, 9, 10, 12.

**Even numbers:** Are numbers which are divisible by 2.  
**E.g.** 0, 2, 4, 6, 8, 10, \_ \_ \_

**Odd numbers:** Are numbers which are not divisible by 2 or When divided by two it gives 1 as a reminder.  
**E.g.** 1, 3, 5, 7, 9, 11, 13, \_ \_ \_

### **POINTS TO NOTE IN ANSWERING OR MAKING**

1. All the working to the answers must be clearly shown.
2. Accuracy in the figures and diagrams is very important.
3. Ensure correct units are included on the answers.
4. All the work (steps) should be shown.
5. Omission of units leads to loss of marks.
6. Change of parameters for example using “X” instead of “y” given in the question leads to loss of marks.
7. Omission of labels on diagrams leads to loss marks.
8. Sketches are awarded marks.