RAPHA EXAMINATIONS BOARD
MATHEMATICS DEPARTMENT
BEST MATHEMATICS FORMULAS
BY TR. DAVID BALYOMUNSI

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

n = 3

= 2^3

= (2×2) ×2

= 4 × 2

= 8 subsets.

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

n = 4

= 2^4-1

= (2×2) × (2×2)-1

= (4 × 4) - 1

= 16 - 1

= 15 proper subsets.

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

n means number/position.

For example;

What is the 6th triangular number?

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

= $6\frac{(6+1)}{2}$

= $\frac{6 \times 7}{2}$

= $\frac{42^{21}}{2_1}$

= 21.

4) Square number = n^2

Where n stands for number.

For example;

Find the square of 4.

4^2 = 4 × 4

= 16.

5) Cube number = n^3
Where n stands for number

For example;

What is the cube of 5?

= 5^3

= 5 × 5 × 5

= 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.

Increase = New – old

= 150 – 100

= 50.

- % 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.

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

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

= $\frac{20^{5}}{\cancel{400}} \times 1\cancel{00}\%$

= 5 × 1%

= 5%.

7) Decrease = Old – New

For example;

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

Decrease = Old – New

= 480 – 420

= 60.

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

For example;

By what percentage will 100 be decreased to become 80?

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

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

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

= 20 × 1%

= 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

= sh. 900,000 – sh. 800,000

= sh. 100,000.

- % 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 × 10%

= 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

= sh. 60,000 – sh. 40,000

= sh. 20,000

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

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

= sh. $\frac{2{,}000{,}000}{8{,}000{,}000} \times 100\%$ (25)

= 1 × 25%

= 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

= sh. 40,000 – sh. 35,000

= sh. 5,000

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

For example;

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

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

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

$= \frac{\cancel{300}^{1}}{\cancel{1500}_{5}} \times \cancel{100}\%^{20}$

=20%.

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

= sh. $40,0\cancel{00} \times \frac{30}{1\cancel{00}} \times 3$

= sh. 400 × 30 × 3

= sh. 12,000 × 3

= 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

= sh. $40,0\cancel{00} \times \frac{10}{1\cancel{00}} \times 2$

= sh. 400 × 10 × 2

= sh. 8,000

Amount = Principal + Interest

= Sh. 40,000 + sh. 8,000

= sh. 48,000

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

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.

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

$= \frac{\cancel{sh.12,000}^{6} \times \cancel{100}^{5}}{\cancel{Sh.60,000} \times \cancel{2}}$

= 6 × 5

= 30%

14) 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?

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

= sh. $\frac{\cancel{5,000}^{2500} \times \cancel{100}^{25}}{\cancel{2} \times \cancel{4}}$

= sh. 2500 × 25

= sh. 62,500

15) 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?

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

= $\frac{^{30}\cancel{1,200} \times 1\cancel{00}}{15,\cancel{000} \times \cancel{4}}$

= $\frac{\cancel{30}^{2}}{\cancel{15}_{1}}$

= 2 years

16) Range = Highest (H) – Lowest (L)

For example;

Given the following marks scored by Mark in Mathematics papers;

70, 65, 40, 60, 20. Find his range.

Range = H – L

= 70 – 20

= 50.

17) 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.

Mean = $\frac{\text{Total marks}}{\text{No. of tests}}$

= $\frac{50 + 40 + 70 + 60}{4}$

= $\frac{\cancel{220}^{55}}{\cancel{4}}$

= 55.

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

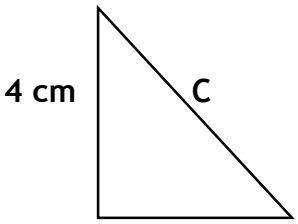
For example;

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?

$$\textbf{Probability} = \frac{n(E)}{n(S.S)}$$
$$= \frac{4}{7 + 4 + 3}$$
$$= \frac{4}{14}$$

19) Pythagoras Theorem: $a^2 + b^2 = c^2$

For example;



$$a^2 + b^2 = C^2$$
$$3^2 + 4^2 = C^2$$
$$(3 \times 3) + (4 \times 4) = C^2$$
$$9 + 16 = C^2$$
$$\sqrt{25} = \sqrt{C^2}$$
$$\sqrt{5 \times 5} = \sqrt{C \times C}$$
$$C = 5$$

20) Number of sides of a polygon = $\frac{\text{All exterior angles}}{\text{Each exterior angle}}$ which is;

$$= \frac{360^0}{\text{Ext angle}}$$

For example;

Calculate the number of sides of a regular polygon whose exterior angle is 30^0.

$$\textbf{Number of sides} = \frac{360^0}{\text{Ext angle}}$$
$$= \frac{\cancel{360^{0}}^{12}}{\cancel{30^0}}$$
$$= 12 \text{ sides.}$$

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?

Number of triangles = n-2
= 6-2
= 4 triangles.

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.

Number of right angles = 2n – 4
= (2 × 7) - 4
= 14 - 4
= 10 right angles.

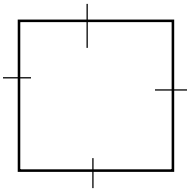
23) Interior angle sum of a polygon = Int. angle × no. of triangle.
$= 180^0(n - 2)$ **OR** $90^0(2n - 4)$

For example;
Calculate the interior angle sum of a polygon of 8 sides.
Angle sum = $180^0(n-2)$
= $180^0(8-2)$
= $180^0 \times 6$
= $\underline{\underline{1080^0}}$

24) AREA OF;

i. Square = S × S or (S^2) or L × L or (L^2)

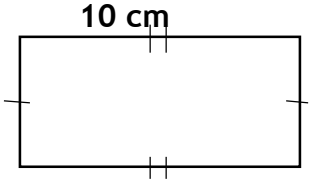
For example;
Find the area of the square whose side is 4 cm.



Area = S × S
= 4 cm × 4 cm
= $\underline{\underline{16\ cm^2}}$

ii. Rectangle = L × W

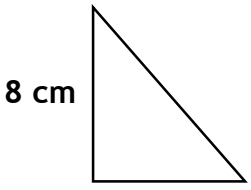
For example;
Find the area of the rectangle with length of 10 cm and 8 cm width.



Area = L × W
= 10 cm × 8 cm
= $\underline{\underline{80\ cm^2}}$

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

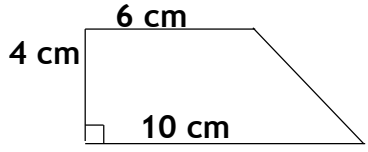
For example;
Find the area of triangle below.



Area = ½ × b × h
= $\frac{b \times h}{2}$
= $\frac{4\ cm \times \cancel{8}^{4}\ cm}{\cancel{2}_{1}}$
= 4 × 4 cm^2
= $\underline{\underline{16\ cm^2}}$

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

For example;
Find the area of the trapezium below.

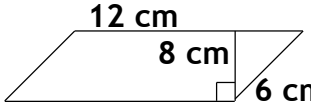


Area = ½h (a + b)
= ½ × 4 cm × (6 cm + 10 cm)
= $\cancel{\frac{1}{2}}$ × 4 cm × $\cancel{16}^{4}$ cm
= 4 cm × 4 cm
= $\underline{\underline{16\ cm^2}}$

v. Parallelogram = Base (B) × Height (H) (= b × h)

For example;

Calculate the area of the parallelogram below.



Area = b × h

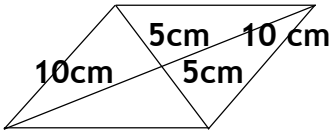
= 12 cm × 8 cm

= 96 cm²

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

For example;

Find the area of the rhombus below.



Area = ½ × d_1 × d_2

= ~~½~~ × ~~20~~^{10}cm × 10cm

= 10 cm × 10 cm

= 100 cm²

P.O.W

d_1 = 10cm+10cm

= 20cm

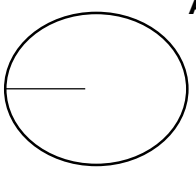
d_2 = 5cm+5cm

= 10cm

vii. Circle = πr^2

For example;

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



Area = πr^2

= $\frac{22}{\sim\!\!7_1} \times \sim\!\!14^2$ cm × 14 cm

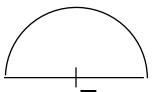
= 22 × 2 cm × 14 cm

= 616 cm²

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

For example;

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



Area = ½πr^2

= ~~½~~ × $\frac{\sim\!\!22^{11}}{\sim\!\!7_1}$ × ~~7~~cm^1 × 7 cm

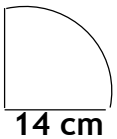
= 11 × 7 cm²

= 77 cm²

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

For example;

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



Area = ¼πr^2

= $\frac{\sim\!\!1\!\!4_1}{} \times \frac{\sim\!\!22^{11}}{\sim\!\!7_1} \times \sim\!\!14$cm^2 × ~~14~~cm^7

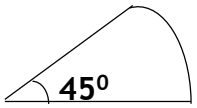
= 11 × 2 cm × 7 cm

= 154 cm²

x. Sector = $\frac{\text{given angle}}{360^0}\ \pi r^2$

For example;

Calculate the area of a sector of a circle of radius 28 cm and the center angle 45^0



Area = $\frac{45^0}{360^0}\pi r^2$

= $\frac{1}{8}\pi r^2$

= $\frac{1}{8_4} \times \frac{22^{11}}{7} \times 28^4$ cm × 28 cm

= 11 × 28 cm^2

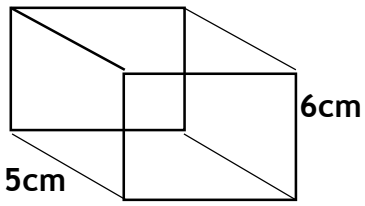
= 308 cm^2

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.



T.S.A =2(L×W) + 2(L×H) + 2(W×H)

= 2(8cm×5cm) + 2(8cm×6cm) + 2(5cm×6cm)

= (2 × 40cm^2) + (2 × 48cm^2) + (2 × 30cm^2)

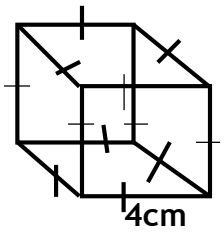
= 80cm^2 + 96cm^2 + 60cm^2

= 236cm^2.

b. Cube = 6(S×S) or 6 × L^2

For example;

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



T.S.A = 6 × L^2

= 6 × 4cm × 4cm

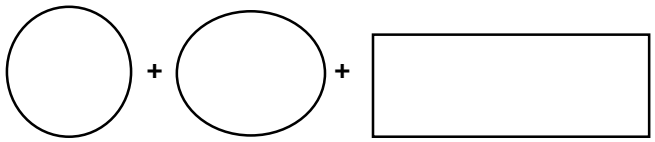
= 6 × 16cm^2

= 96cm^2

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 π= 22/7)



T.S.A = $2\pi r^2 + 2\pi rh$

= $(2\times\frac{22}{\cancel{7}}\times 7\times\cancel{7}) + (2\times\frac{22}{\cancel{7}}\times\cancel{7}\times 10)$

= (44 × 7) + (44 × 10)

= 44(7+10)

= 44 × 17

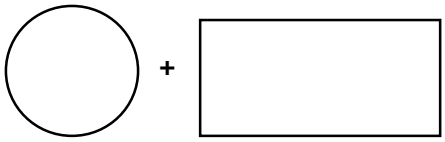
= $\underline{748cm^2}$

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 π= 22/7)

Note: An open cylinder has one circular end.



T.S.A = $\pi r^2 + 2\pi rh$

= $(\frac{22}{\cancel{7}}\times 7\times\cancel{7}) + (2\times\frac{22}{\cancel{7}}\times\cancel{7}\times 8)$

= (22 × 7) + (44 × 8)

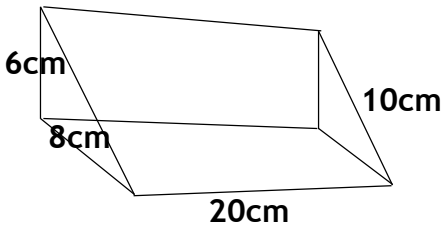
= 154 + 352

= $\underline{506cm^2}$

e. Triangular prism = (b × h) + (L ×W) + (L × W) + (L × W)

For example;

Find the surface area of the triangular prism below.



T.S.A = (b × h) + (L × W) + (L × W) + (L × W)

= (8cm × 6cm) + (20cm × 8cm) + (20cm × 6cm) + (20cm × 10cm)

= 48 cm^2 + 160 cm^2 + 120 cm^2 + 200 cm^2

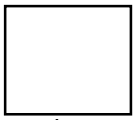
= $\underline{528\ cm^2}$

26) PERIMETER OF;

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

For example;

Find the perimeter of the square whose sides are 4cm



Perimeter = 4 × S
= 4 × 4cm
= 16cm

ii. Rectangle = L+W+L+W **OR** 2(L+W) **OR** 2L+2W

For example;

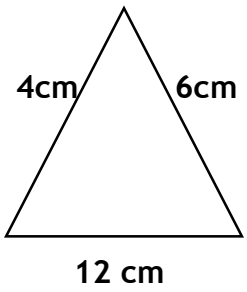
Find the perimeter of the rectangle below.

Perimeter = 2(L + W)
= 2(10cm + 6cm)
= 2 × 16 cm
= 32 cm

iii. Triangle = $S_1+S_2+S_3$

For example;

Find the perimeter of triangle below.



Perimeter = S + S + S
= (12 cm + 6 cm) + 4 cm
= 18 cm + 6 cm
= 24 cm.

27) CIRCLES

i. Diameter = 2 × radius (2r)

For example;

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

Diameter = 2 × radius
= 2 × 20cm
= 40cm.

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

For example;

Find the radius of a circle whose diameter is 20cm

Radius = $\frac{\text{Diameter}}{2}$

= $\frac{\cancel{20}\text{cm}^{10}}{\cancel{2}}$

= 10cm.

28) CIRCUMFERENCE OF;

i. Circle = πd (When diameter is given)
= 2πr (When radius is given)

For example;

Calculate the circumference of a circle whose diameter is 21cm (Use π = 22/7)

Circumference = πd

$$= \frac{22}{\cancel{7}} \times \cancel{21}\ cm^3$$

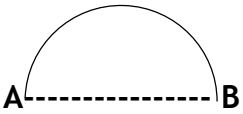
= 22 × 3 cm

= 66 cm.

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

For example;

Find the length of the semicircular arc AB



Length AB = ½πd

$$= \cancel{\frac{1}{2}} \times \frac{\cancel{22}^{11}}{\cancel{7}} \times \cancel{14}^{2}$$

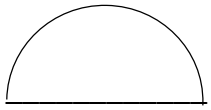
= 11 × 2

= 22cm

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

For example;

Find the perimeter of the semicircular region AB.



Perimeter = ½πd + d

$$= (\frac{1}{\cancel{2}} \times \frac{\cancel{22}^{11}}{\cancel{7}} \times \cancel{14}^{2}) + 14cm$$

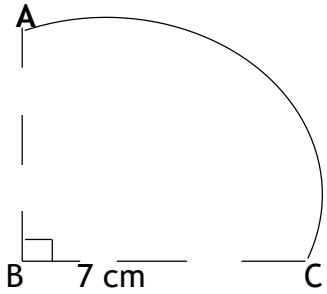
= (22 + 14) cm

= 36 cm

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

For example;

Find the length of AC of the quadrant drawn below.



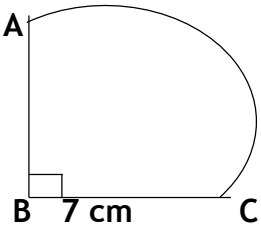
The curved length = ¼ (2πr)

$$= \frac{1}{\cancel{4}_1} \times \cancel{2}^{1} \times \frac{\cancel{22}^{11}}{\cancel{7}_1} \times \cancel{7}_1$$

= 11 cm.

v. Perimeter of Quadrant = (¼ 2πr) + r + r

For example;
Find the perimeter of the figure.

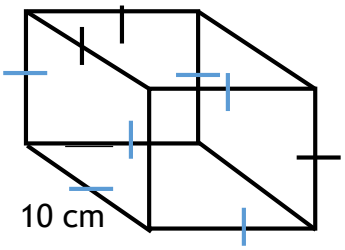


Perimeter = ¼(2πr) + r + r
= ($\frac{1}{4_1}$ × $\frac{2^1}{1}$ × $\frac{22^{11}}{7_1}$ × $\frac{7}{1}$cm) + 7cm + 7cm
= 11cm + 7cm + 7cm
= 25 cm

29) VOLUME OF;

a. Cube = (Base area × height)
= S×S×S

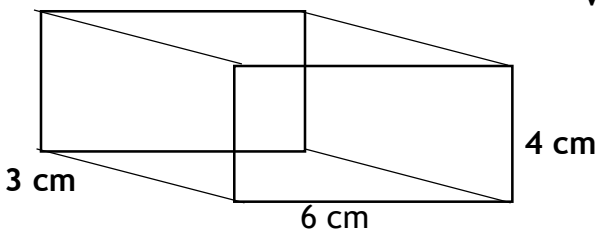
For example;
Find the volume of the cube below.



Volume = S × S × S
= (10 cm × 10 cm) × 10 cm
= 100 cm^2 × 10 cm
= 1000 cm^3

b. Cuboid = Base area × height
= L×W×H

For example;
Find the volume of the cuboid below



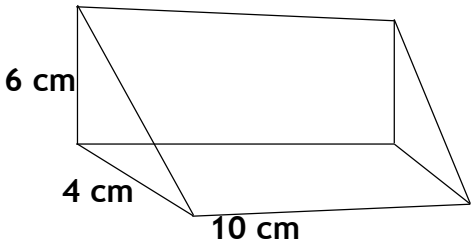
Volume = L×W×H
= (6 cm×3 cm) ×4 cm
= 18 cm^2 × 4 cm
= 72 cm^3

c. Triangular Prism = (Area of triangle × length)

$= \frac{1}{2}b \times h \times l$

For example;

Find the volume of the figure below.



Volume = (½ × b × h) × l

= (~~½~~ × ~~4~~^{2} cm × 6 cm) × 10 cm

= (2 cm × 6 cm) × 10 cm

= 12 cm^2 × 10 cm

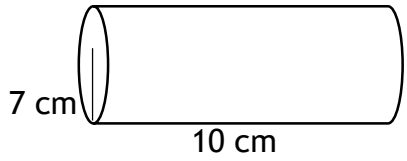
= 120 cm^3

d. Cylinder = (Area of circle × height)

$= (\pi r^2)$ h

For example;

Find the volume of the cylinder below.



Volume = (πr^2) × h

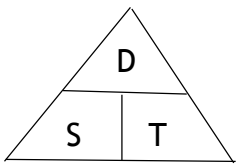
= ($\frac{22}{7}$ × ~~7~~^{1} cm × 7cm) × 10 cm

= (22 cm × 7 cm) × 10 cm

= 154 cm^2 × 10 cm

= 1540 cm^3

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?

Distance = speed × time

= $\frac{30km}{1~~hr~~}$ × 4~~hrs~~

= 120km

P.O.W

30

× 4

120

ii) Speed (S) = Distance (D)
Time (T)

For example;

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

Speed = Distance
Time
= $\frac{\cancel{36}^{18}km}{\cancel{2}_{1}hrs.}$
= 18km/hr.

iii) Time (T) = Distance (D)
Speed (S)

For example;

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

Time = Distance
Speed
= $\frac{\cancel{120km}^{3}}{\cancel{40km}_{1}} \times 1hr$
= 3hrs.

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?

Duration = E.T – S.T
= 5:30pm – 1:00pm
= 4hrs 30min or 4½hrs

P.O.W
5: 30pm
- 1: 00pm
4 hrs. 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
=1:00pm + 4hrs 30mins
= 5:30pm

P.O.W
1: 00pm
+ 4: 30
5: 30pm

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
= 5:30pm – 4hrs 30mins
= 1:00pm

P.O.W
5: 30 pm
- 4: 30
1: 00pm

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 kg = 1000 g
1 kl = 1000 l
1 l = 1000 ml

For example;

1. **Change 5km to meter.**

Km Hm Dm M dm cm mm
1 0 0 0

1km =1000m
5km = (5 × 1000) m
= 5000m

2. **Change 2liters to milliliter.**

Kl Hl Dl L dl cl ml
1 0 0 0

1liter =1000ml
2l = (2 × 1000) ml
= 2000 ml

3. **Express 24kg as grams**

Kg Hg Dg G dg cg mg
1 0 0 0

1kg =1000g
34kg = (34×1000) g
=34000grams

4. Convert 54000g to kg.

Kg Hg Dg G dg Cg mg
1 0 0 0
1000g = 1kg
1g = 1/1000kg
54000g = 1/1000 × 54000g
= 54000g
1000
= 54g

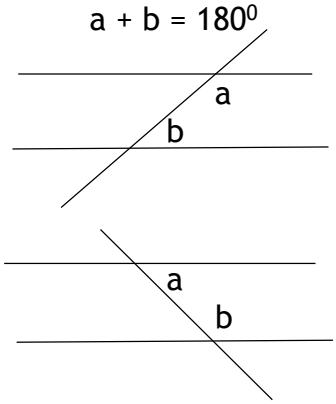
ANGLES ON PARALLEL LINES.

Co-interior Angles and Co-exterior Angles.

Note: The sum of Co-interior angles and Co-exterior angles is equal to 180^o

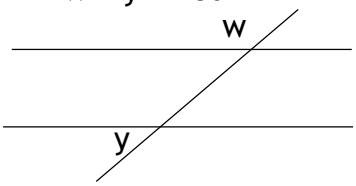
Co-interior angles

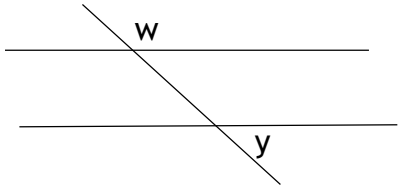
$a + b = 180^0$



Co-exterior angles

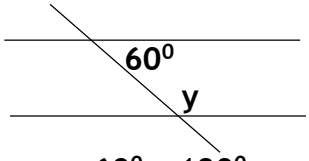
$w + y = 180^0$





For example;

Find the value of angle marked y



$y + 60^0 = 180^0$

$y + 60^0 - 60^0 = 180^0 - 60^0$

$y = \underline{\underline{120^0}}$

P.O.W

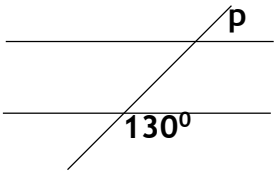
180^0

$- 60^0$

120^0

For example;

Find the size of the angle marked p



$p + 130^0 = 180^0$

$p + 130^0 - 130^0 = 180^0 - 130^0$

$p = \underline{\underline{50^0}}$

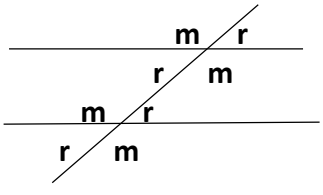
P.O.W

180^0

$- 130^0$

50^0

You can as well as use first letters from your name e.g. Mutebi Rene. (M and R) and where letters are the same it means that those angles are equal and where letters are different those angles are add up to 180^0.



Therefore; $m + r = 180^0$

$r + m = 180^0$

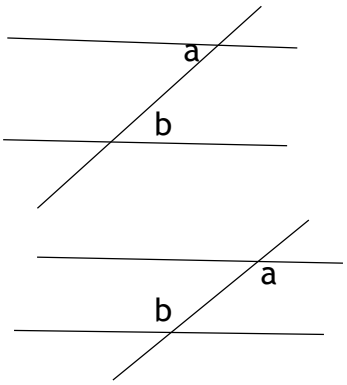
$r = r$

$m = m$

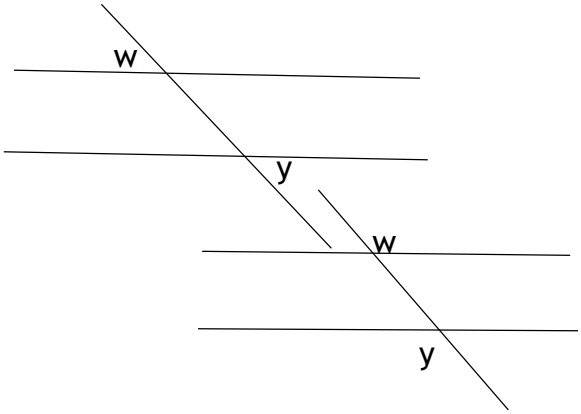
Alternate Interior Angles and Alternate Exterior Angles

Note: All alternate angles are equal.

Alternate Interior angles
a = b (alt angles)

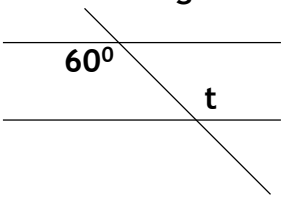


Alternate Exterior angles
w = y (alt angles)



For example;

Find the size of angle marked t^0

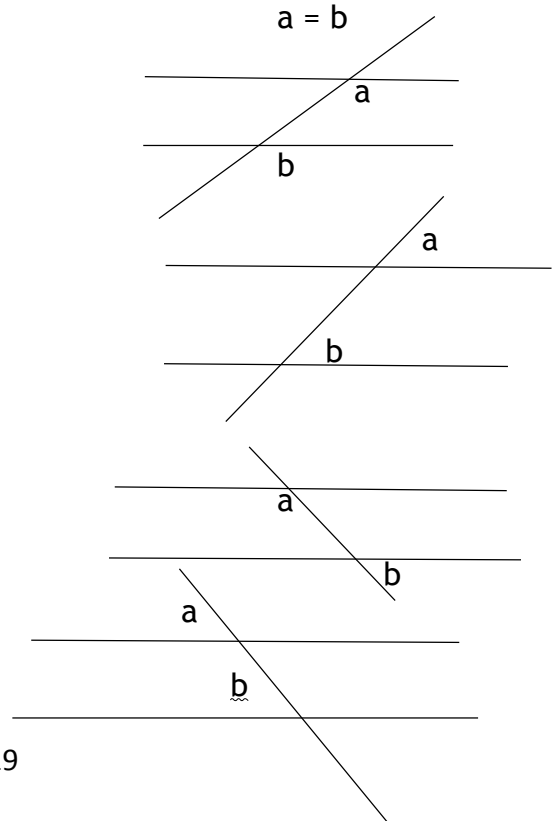


t = $\underline{\underline{60^0}}$ (alternate angles)

CORRESPONDING ANGLES.

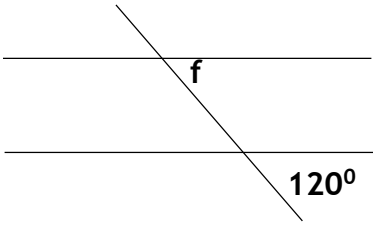
Note: All Corresponding angles are equal.

a = b



For example;

Find the size of angle marked f.



f = $\underline{\underline{120^0}}$ (corresponding angles)

INTEGERS

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

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

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

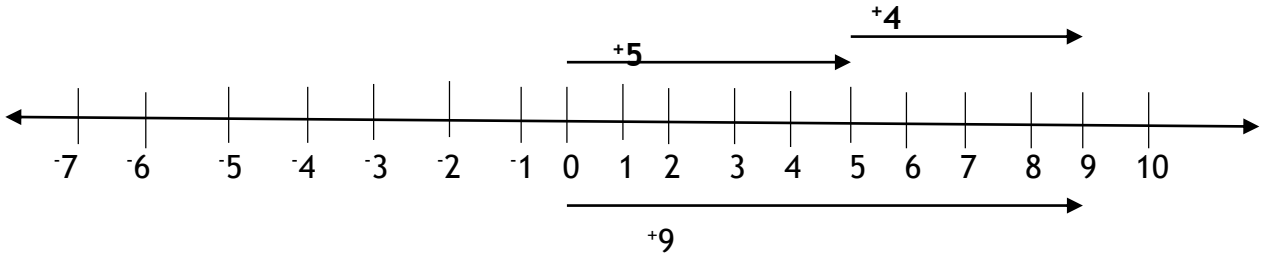
Negative (-) × Negative (-) = Positive (+)

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: $^{+}5 + {}^{+}4$



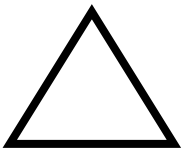
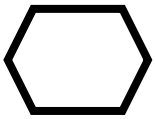
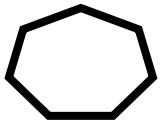
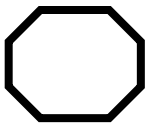
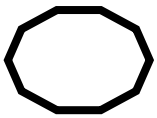
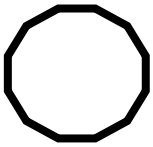
So, $^{+}5 + {}^{+}4 = {}^{+}9$

For example;
Workout: -3 + -2 (Using mind map)
-3 + (-2)
-3-2

-ve	**- - - - -**	**-5**
+ve		

So, -3 + -2 = -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

BASES	BASE NAME
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/sinary
Base seven (7)	Septenary base/Septimal base
Base eight (8)	Octal base/Octonary base
Base nine (9)	Nonary base
Base ten (10)	Decimal base, normal base, decanary
Base eleven (11)	Undecimal base/undenary base
Base twelve (12)	Duodecimal base/dozenal

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.

EXAMPLES:
1. Change 100_{two} to base ten.

100_{two} = (1 × two twos) + (0 × twos) + (0 × ones)
= (1 × 2 × 2) + (0 × 2) + (0 × 1)
= 4 + 0 + 0
= $\underline{4_{ten}}$

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.

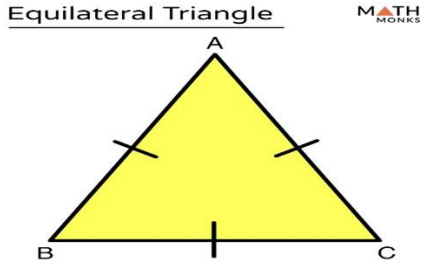
2. Change 12_{ten} to base two.

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

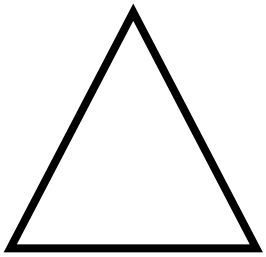
12_{ten} = $\underline{1100_{two}}$

TYPES AND PROPERTIES OF TRIANGLES.

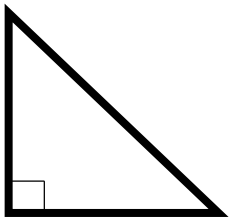
1. Equilateral Triangle.
   Has all the 3 sides equal
   All angles are equal
   Has 3 lines of symmetry



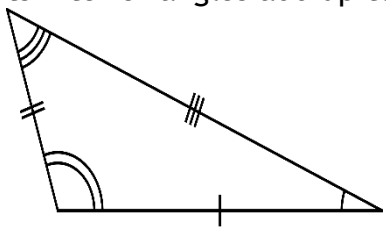
2. Isosceles triangle
   Two of its 3 sides are equal
   Two opposite angles are equal
   Has 1 line of symmetry
   Its interior angles add up to 180^0
   Its exterior angles add up to 360^0



3. Right- angled scalene triangle
   All sides are different
   All angles are different but one of them is 90^0
   Has no line of symmetry
   Its interior angles add up to 180^0

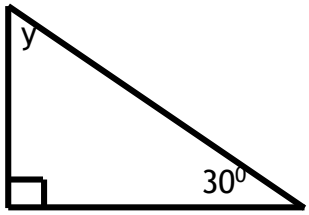


4. Scalene Triangle
   All Its 3 sides are not equal
   All angles are not equal
   Its interior angles add up to 180^0



EXAMPLES:

1. Find the size of angle y.



$y + 30^0 + 90^0 = 180^0$ (angle sum of Δ)

$y + 120^0 = 180^0$

$y + 120^0 - 120^0 = 180^0 - 120^0$

$y = \underline{60^0}$

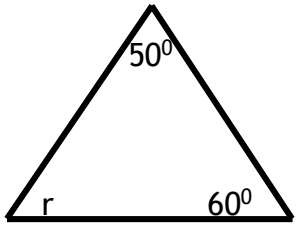
P.O.W

180^0

$-\ \underline{120^0}$

60^0

2. Find the size of r.



$r + 50^0 + 60^0 = 180^0$ (∠sum of Δ)

$r + 110^0 = 180^0$

$r + 110^0 - 110^0 = 180^0 - 110^0$

$r = \underline{70^0}$

P.O.W

180^0

$-\underline{110^0}$

70^0

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.

CMLXXV = CM LXX V

= 900 + 70 + 5

= **975**

2. Write **555** in Roman numerals.

555 = 500 + 50 + 5

= D L V

= DLV

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+5) = 10
Subtract 10 from 31 to give (31-10) = 21. 21 is divisible/multiple of 7, hence 315 is also divisible by **7.**

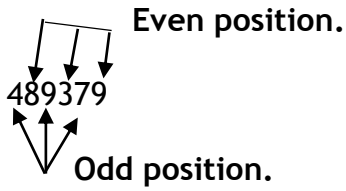
Divisibility test for 8: A number is divisible by 8 if the number formed by the last three digits is divisible by **8. E.g.** The number 4376, **376** is the number formed by the last three digits which is divisible by 8 therefore, **4376** is divisible by **8.**

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 is (it ends with 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**) or divisible by 11.

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 × 5 = 25.

Cube numbers: When a number is multiplied by itself three times, a cube number is obtained. **E.g.** 3 × 3 × 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, _ _ _

PROPERTIES OF NUMBERS

1. **Commutative property**: The order in which any two numbers are added or multiplied does not affect the results. **E.g. 7 + 2 = 2 + 7 = 9**

2. **Associative property**: When carrying out addition or multiplication of more than two numbers, the way in which numbers are grouped does not affect the sum or product. **E.g. (3 × 5) × 6 = 3 × (5 × 6) = 120**

3. **Distributive property:** When working out numbers using distributive property, the product of factor and a sum or difference is equal to the sum or the difference of the products respectively.

   E.g. Calculate: (5 × 8) + (5 × 4) using distributive property.
   = 5(8 + 4)
   = 5 × 12
   = 60

LAWS OF INDICES.

1. To multiply powers of the same base, keep the common base and add the indices or the power.
   E.g. Workout: $a^3 + a^4$
   = a^{3+4}
   = a^7
2. **To divide powers of the same base, keep the base and subtract the indices or the power.**
   E.g. Workout: $y^4 + y^5$
   = y^{4+5}
   = y^9

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.

PASS PLE

TOPIC 1: SET CONCEPT

PASS PLE

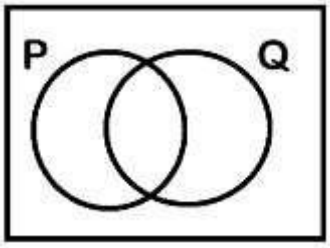
1. Given that set P = {1,3,5,7,9} and set Q = {2,3,5,7}.
Find n(PnQ).

2. Given set A = {a,b,f,k} and set B = {a,c,k}, find n(AuB).

3. Given that k = {0,1,2,3,5,7} B={0,4,6,7,9}, find n(A - B)

4. If R = {2,4,6,8} and Q = {1,2,3,5,6,7}, find n (RUQ)

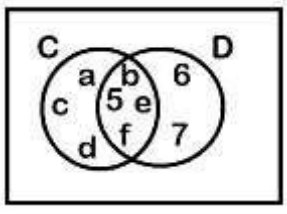
5. In the Venn diagram below, shade complement of set Q.



6. Given that set D ={c, a, t}.
List all subsets of set D.

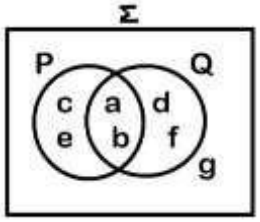
7. Set A has four elements, find the number proper subsets set A has.

8. use the Venn diagram below to find $n(D)^1$



9. Below are subsets of set P listed.
{ }, { e }, { m }, { m, e }
How many elements are in set P

10. Use the Venn diagram below to find $n(P \cap Q)^1$

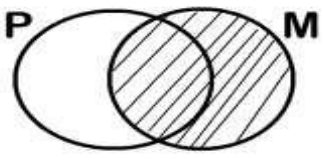


11. All dogs are animals. In the space below, draw sets to show the above information.

12. Set Y has 32 subsets, find how many proper subsets it has.

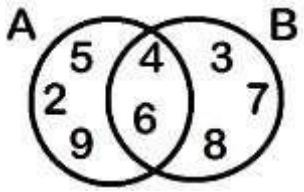
13. Given that set A = {n, t, e} and set B = {c, u, p}. What is the relationship between set A and B.

14. Describe the un shaded region



15. Given that set H has 8 subsets, how many elements are in set H.

16. In the venn diagram below, find n(B-A).



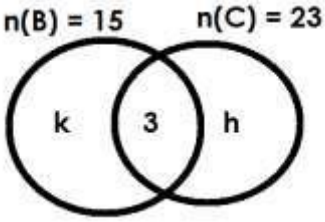
17. in the space below, draw the set symbols for;

(a) Subsets

(a) Equivalent set

18. Use the Venn diagram below to

(i) Find the value of k



(ii) Find the value of h.

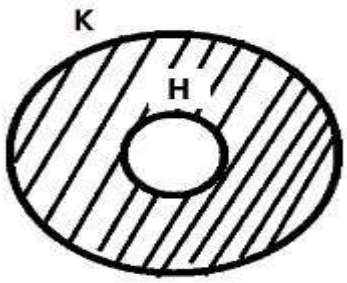
Given that:

Set D = { b, r, i, n, g }

Set E = { b, r, e, a, k }

Find the number of elements that are in set D and there are also members of set E.

20. Describe the shaded region.

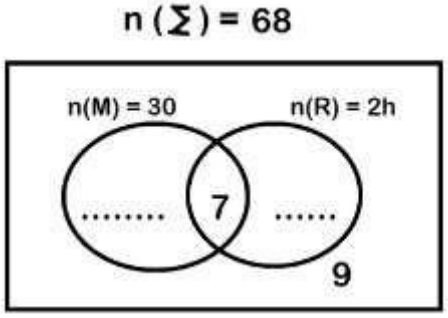


SECTION B

21. A class of 68 pupils was served matooke (M) and rice (R). 30pupils ate matooke and 2h ate rice. 7 pupils ate both matooke and rice while 9 pupils did not eat either of the foods.

(a) Use the given information to complete the Venn diagram

(2 marks)



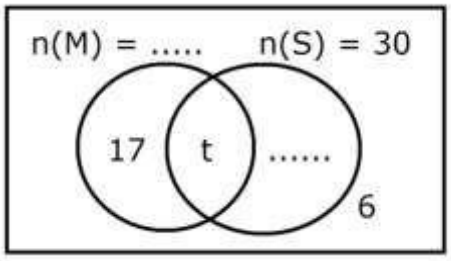
(b) How many pupils ate rice only?

(3 marks)

22. In a class party, two types of drinks were served, soda (s) and mineral water (m). 30 pupils took soda and t pupils took both soda and mineral water. 6 pupils took neither of the drinks while 17 pupils took only mineral water. The number of pupils who took soda only was twice that of those who took both soda and mineral water.

(a) Use the given information to complete

the Venn diagram below.



(2 marks)

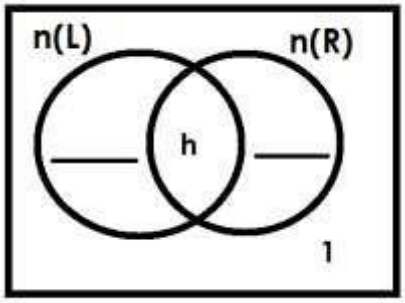
(b) Find the number of pupils who took both drinks. (2 marks)

(c) Calculate the total number of pupils in the class.(2 marks)

23. In a football team, 5 players use the left leg (L) only, h players use both the Left leg and the right leg, (h+1) use the right leg (R) only and 1 player does not use any of the legs.

(a) Use the above information to

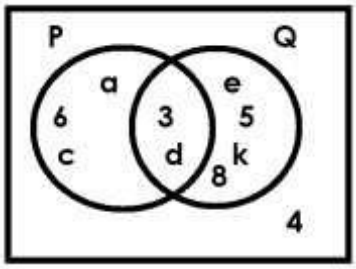
complete the Venn diagram below.



(2 Marks)

(c) If there are 8 players that use only one type of leg. Find the value of h. (3 marks)

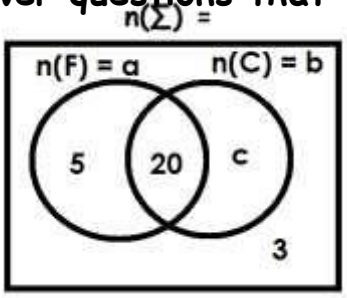
24.Use the Venn diagram to answer questions that follow



(a) Find n(PUQ)′ (2 marks)

24(b) Find the number of subsets that can be formed from members of set P (3 marks)

25. The Venn diagram below shows the number of pupils who ate two different dishes, Fish (F) and Chicken (C) at their leavers' party held in February 2020. Use it to answer questions that follow.



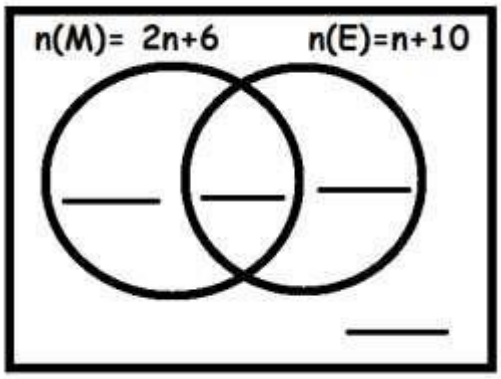
(i) If 30 pupils did not eat Fish, find the value of c? (3 marks)

(ii) How many pupils eat Chicken? (2 marks)

26.In a class of 53 pupils,

(2n+6) like Mathematics (M), (n + 10) like English (E), n pupils like both subjects and 3pupils do not like any of the two subjects.

(a) Use the above information to complete the venn diagram below. (2 marks)



(b) Find the value of n (3 marks)

27.At Kireka Primary school, p.6 pupils were served with soda Fanta (F) and Mirinda (M). 30 were served Fanta, 14 were served both Mirinda and Fanta and. 5 were not served with any of the two drinks.

(a) Draw a venn diagram and represented the above information. (4 MARKS)

(b) If the probability of picking a child at random who didn't take Fanta is 24/55. Find the number of pupils who took Mirinda only

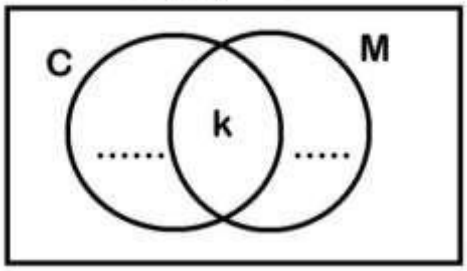
(3 marks)

28 At a party attended by 60 pupils, 42 ate chicken (C), (K + 8) ate meat (M) only. k pupils ate both chicken and meat while 6 did not eat any of the two items.

(a) Use the information given above to complete the Venn

diagram below.

$n(\Sigma) = 60$



(1 marks)

.b) Find the value of K. (2 marks)

(c) If a pupil is picked at random, what is the probability that the pupils ate meat?

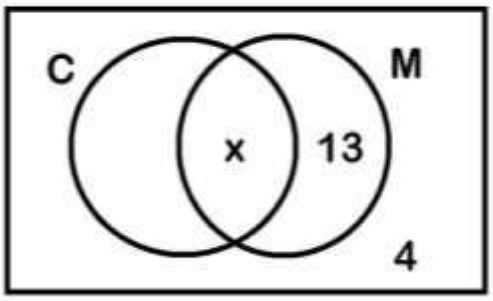
(2 mark)

29. At a birthday party attended by 40 guests, 18 ate chicken (C) only, 13 ate meat (M) only, X guests ate both chicken and meat and 4 did not eat any of the two dishes.

(a) Use the above information to

complete the Venn diagram below.

$n(\Sigma) =$



(1 mark)

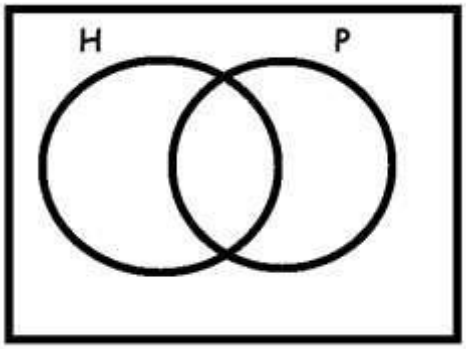
(b)Find the value of x.

(2 marks)

(C) How many guests did not eat meat at all? (2 marks)

30.Given that set H = {3,5,7,9,11 } and set P= { 4,7,6,10,11} (a) Represent the above information on the Venn diagram below

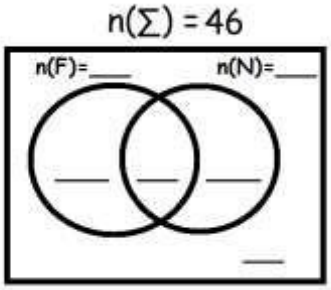
(3 marks)



(b) Find n (H – P) **(2 marks)**

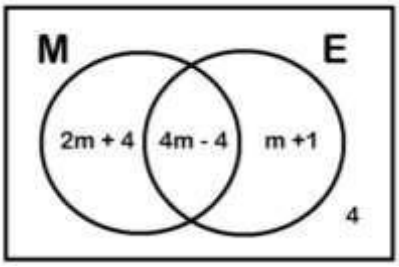
31.In a class of 46 pupils, All of them play volley ball , 28 play football (F) and volley ball, 22 play netball (N) and volley ball, while n pupils play all the three games and 4 play volley ball only.

(a) Complete the Venn diagram below **(3 marks)**



32. The Venn diagram below shows number of pupils in a class who like Mathematics(M) and those who like English(E)

Study it carefully and use it to answer the questions that follow.



(a) If the number of those who like Mathematics is five times the Number of those who like English only.

(b) Find the value of m (4 marks)

END

SECTION A (40 MARKS)

1. Work out: 6 **hundreds** + 5 **tens** + 7 **ones** = _____

2. Write 7,803,097 in **words**.

3. Write the place value of the digit **6** in the number 35**6**$2_{\textbf{seven}}$.

4. Round off **370** to the nearest **hundred** using a **number line**.

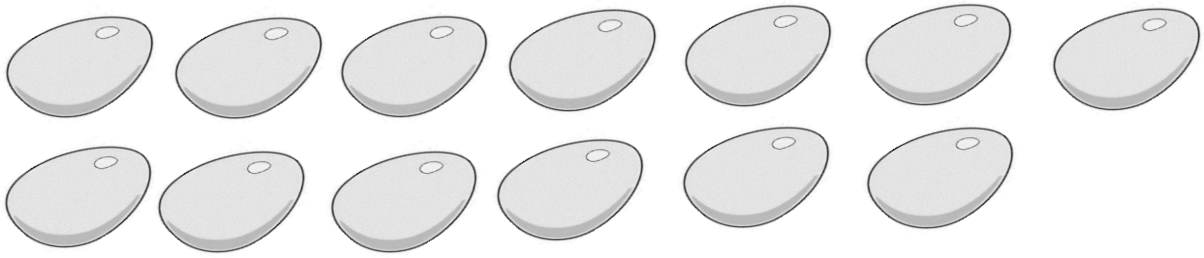
5. Expand **1,547** using **powers of ten**.

6. Find **all** the **values** of the digits in the number 83,047.

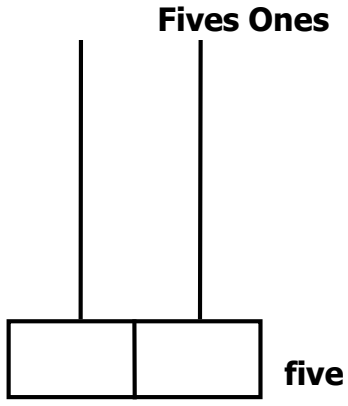
7. Convert $1011_{\textbf{two}}$ to **denary base**.

8. Express 5,600 in **scientific form**.

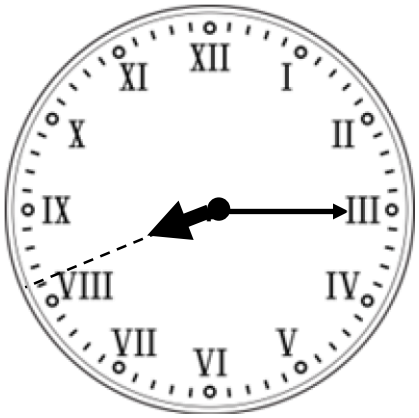
9. Below are the eggs Jonah bought from a shop. **Group** them in **fives** and write their number in **quinary system** .



10. Represent $42_{\textbf{five}}$ on the abacus below.



11. The clock face below shows the **morning time** for **taking tea** on a clock face.



Tell the time shown on the clock face.

12. Write in **figures**: '**Sixty thousand sixty three'**.

13. Convert **294** to **Roman numerals**.

14. Patrick has **5** pens. Write his number of pens in **binary base**.

15. Complete the **addition Roman numeral** table below.

+	IV	VIII	III
II	VI	_____	V
V	_____	_____	_____

16. Find the **difference** between the **place values** of **3** and **5** in the in the number **263,512**.

17. Expand $32_{\textbf{five}}$ using **values**.

18. Which number has been expressed as **1.24×10^4**?

19. Find the **number** that has been expanded as below.
(9 × 100 000) + (1 × 10 000) + (3 × 100) + (5 × 10) + (2 × 1)

20. Calculate the **quotient** of the **values** of the circled digits in the number below.
56,423

SECTION B (60 MARKS)

21.

(a) A school has **CMLII** pupils. Of these, **CCCXXI** are boys and the rest are girls.
Find the **number of girls** in **Hindu Arabic numerals**. **(04 marks)**

(b) Simplify: $\mathbf{3.2 \times 10^{-2}}$ **(02 marks)**

22. (a) Work out: $\begin{array}{r} 1\ 0\ 1_{two} \\ \times\quad 1\ 1_{two} \\ \hline \end{array}$ **(02 marks)**

(b) If $22_{\mathbf{y}} = 8_{\mathbf{ten}}$, find the value of the unknown base **y**. **(03 marks)**

23.

(a) Use the digits **4**, **3** and **7** to find the **sum** of the **largest** and the **smallest** possible 3-digit numerals that **can be formed** from them. **(03 marks)**

(b) **Round off** the **smallest** formed possible 3-digit numeral to the **nearest** tens. (02 marks)

24. Given the number **28,470**. Use it to answer the questions that follow.

(a) Find the **value of 7**. **(01 mark)**

(b) Work out the **value of 2**. **(01 mark)**

(c) Calculate the **sum** of the **values of 2 and 7**. **(02 marks)**

25.

(a) Convert **0.0734** to **standard form**. **(02 marks)**

(b) What number **has been expanded** to give:
$(26\times 10^5) + (9 \times 10^4) + (3 \times 10^2) + (4 \times 10^{-1})$ **(03 marks)**

26. (a) Change $23_{\mathbf{five}}$ to **binary system**. **(03 marks)**

(b)What is the **value of 3** in the number $2\mathbf{3}4_{\mathbf{five}}$? **(02 marks)**

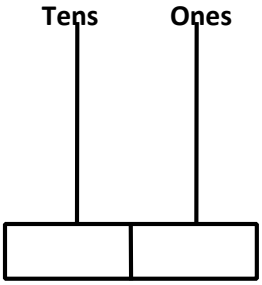
27. Work out the following:

(a) $\begin{array}{r} 111_{two} \\ +\quad 10_{two} \\ \hline \end{array}$ **(02 marks)**

(b) $\begin{array}{r} 4\ 0\ 0_{five} \\ -\quad 3\ 2_{five} \\ \hline \end{array}$ **(03 marks)**

28.

(a) Show $34_{\textbf{five}}$ on the **base ten** abacus below. **(03 marks)**



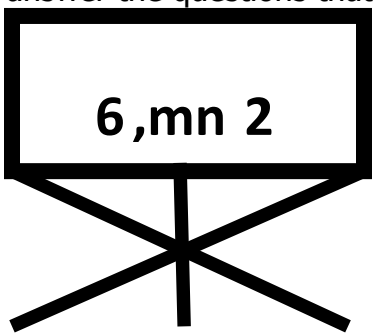
(b) Given that: $1X0_{\textbf{five}} = 63_{\textbf{seven}}$, find the missing digit X. **(03 marks)**

29. Complete the **place value table** below correctly. **(04 marks)**

DIGIT	PLACE VALUE IN WORDS	VALUE
5	_____	_____
_____	Tens	70
8	_____	80,000
NUMERAL GIVEN		80,570

Show your working here.

30. A teacher wrote a **number** on the board as shown below and some of its digits were unknowns. Use it to answer the questions that follow.



(a) If 3/8 of the value of **m** is 150, find the **value** of the digit **m**. **(02 marks)**

(b) Given that the **ratio** of the **values** of the digits **m** and **n** is **8:1** respectively, what is the **digit** represented by letter **n**. **(03 marks)**

31. By how much is **MCMLIV** more than **DLXIX** in **Roman numerals**? (05 marks)

32. Given that the **place value** of **9** is **K** and the place value of **6** is **hundreds** in a **certain number**. The **quotient** of the values of **9** and **6** in the same number is **150**. Write the **place value K** in **words**. **(05 marks)**

THE END

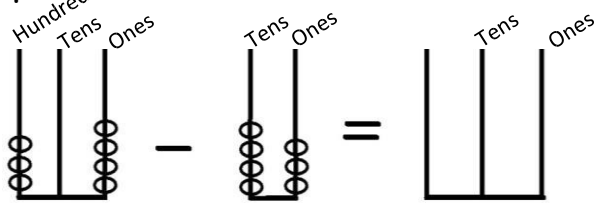
TOPIC: OPERATION ON WHOLE NUMBERS

1. Work out: 5 3 4

$$\underline{-\ 1\ 2\ 3}$$

(PLE 2019 number 1).

2. The diagrams below represent subtraction of two numbers on abacus. Study the diagrams and use them to answer the questions that follow:



(PLE 2019 number 21).

(a) Write down the numbers represented in the subtraction

(b). Work out the subtraction and represent your answer on the third abacus.

3. Work out: $36 \div 3$

(PLE 2018 number 1)

4. Work out: $(49 \times 39) + (61 \times 49)$

(PLE 2018 number 11).

5. Find the number which has been expanded below. $(3 \times 10^{2}) + (5 \times 10^{-1})$

(PLE 2017 number 7).

6. The sum of the values in the table below are the same vertically: horizontally and diagonally. Fill in the missing values.

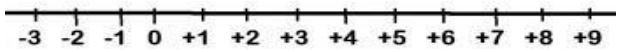
(PLE 2005 number 37).

.....	.....	28	17
25	20	19	.....
.....	24	23	18
26	15	.....	29

7. Express 0.406 in standard form.

(PLE 2013 number 22).

8. On the number line below, show 4×2 (PLE 2011 number 13).



9. Add: 254 + 46

(PLE 1999 number 1).

10. Add: 356 + 644

(PLE 2000 number 1)

11. Add: 206 to 45

(PLE 2001 number 1)

12. Find the number which has been expanded below

(PLE 2010 number 36a)

$(1 \times 10^3) + (3 \times 10^2) + (6 \times 10^0)$

13. Expand 789 using powers of ten. (PLE 2011 number 41b).

14. Find the number which has been expanded below

(PLE 2012 number 28b)

$(5 \times 10^5) + (4 \times 10^3) + (9 \times 10^0)$

15. What number has been expanded 20,000 + 600 + 8?

(PLE 2013 number 2).

16. What number has been expanded?

$(6 \times 10^3)+(2 \times 10^1)+(7 \times 10^0)+(3 \times 10^{-2})$

(PLE 2015 number 22a).

17. Work out: $(8.5 \times 14)^+ (8.5 \times 14)$.

(PLE 2015 number 22b)

18.Find the number whose scientific form is 9.85×10^3

(PLE 2014 number 14)

19) Work out: 461 + 23

(PLE 2002 number 16)

20.Work out:

$$\begin{array}{r} 9017 \\ -\ 915 \\ \hline \end{array}$$

(PLE 2004 number 1).

21. Work out:

$$\begin{array}{r} 450 \\ -\ 125 \\ \hline \end{array}$$

(PLE 2003 number 5).

22. A string is 3 m long. How many pieces of the string each measuring 20cm long can be cut from that string.(PLE 2004 number 8)

23. Work out:

$$\begin{array}{r} 230 \\ +\ 69 \\ \hline \end{array}$$

(PLE 2005 number 1).

24. Work out:

$$\begin{array}{r} 56 \\ -\ 45 \\ \hline \end{array}$$

(PLE 2006 number 1).

25. There are 30 eggs in one tray. How many trays will be required to carry 330 eggs?

(PLE 2006 number 1).

26. Work out:

$$\begin{array}{r} 43 \\ \times\ 2 \\ \hline \end{array}$$

(PLE 2007 number 1).

27. Work out:

(PLE 2011 number 1).

$$\begin{array}{r} 32 \\ \times\ 2 \\ \hline \\ \hline \end{array}$$

28. Work out:

(PLE 2012 number 14).

$$\begin{array}{r} 268 \\ \times\ 25 \\ \hline \\ \hline \end{array}$$

29. Write in figures:

"Thirty eight thousand, fifty"

(PLE 2011 number 2).

30. Write 49 in Roman numerals

(PLE 2010 number 6).

31. Trees were planted along a straight road 305 metres long, if the trees were planted 5 metre apart, how many trees were planted the road?

(PLE 2013 number 19).

32. Find: 202÷2 (PLE 2000 number 17)

33. Work out:

(PLE 2010 number 1).

$$\begin{array}{r} 6702 \\ -\ 4865 \\ \hline \\ \hline \end{array}$$

34. Work out:

(PLE 2011 number 23).

$$\begin{array}{r} 6885 \\ +\ 8437 \\ \hline \\ \hline \end{array}$$

35. Divide 6,363 ÷ 7

(PLE 2013 number 9).

36. Work out:

(PLE 2010 number 14)

$$\begin{array}{r} 165 \\ \times\ 4 \\ \hline \\ \hline \end{array}$$

37. Work out:

(PLE 2009 number 12)

$$\begin{array}{r} 200 \\ -\ 112 \\ \hline \\ \hline \end{array}$$

38. Work out: 4 x 5 using repeated addition.

39. Multiply 236 x 34 using lattice.

40. Below is a magic square use it to find the value of, a, b, c and e.

8	3	C
1	5	b
a	7	e

41. How many groups of 8 make 1616?

42. Write the mathematical sentence of 6x7.

43. Find the product of 26 and 34.

44. Work out the quotient of 1711 and 3.

45. James was born in 2009. Express his age today in scientific notation.

46. Complete using commutative property

(a) 3 + 5 =

(b) 7 x 6 =

47. Complete using commutative property

(a) 2 + 9 + 4 =

(b) 3 x 8 x 5 =

48. Work out using associative property.

(a) (2 + 9) + 4 =

(b) 3 x (8 x 5) =

49. Multiply:

50. Express four hundred four in standard form.

51. What is the range between 500 and 399?

52. Write as a single number.
$(3 \times 10^{1})+(2 \times 10^{-1})+(8 \times 10^{2})$

53. Find the number expressed in standard form.

2×10^{2}

54. Write 1 in standard form

55. The registered cases of Covid 19 by June were 45,000,000. By September they are 82,000,000. Find how many cases have registered from June September

56. Work out using distributive property.

$\left(\frac{3}{4} \times 7\right) + \left(\frac{3}{4} \times 13\right)$

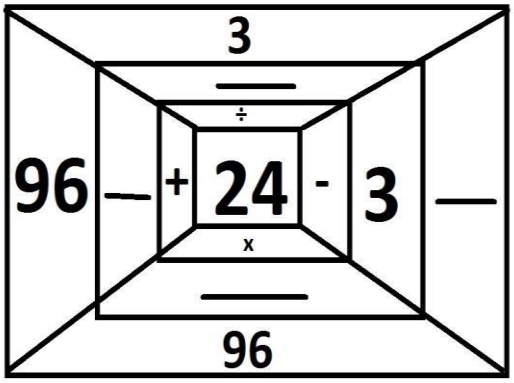
57. Work out using distributive property.

(40 ÷ 3) - (16 ÷ 3)

58. Work out using distributive property.

(24 x 7) - (16 x 5)

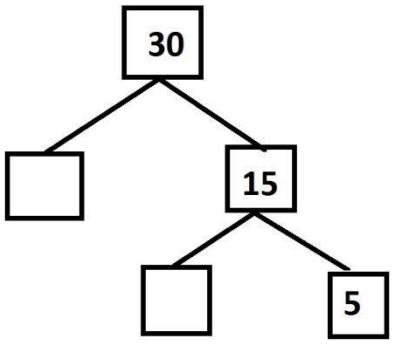
59. Complete the operations below.



60. John weighs 35kg and Thomas weighs 6kg less than him. What is the weight of John?

TOPIC: PATTERNS AND SEQUENCE

1) Find the next number in the sequence: (PLE 2019 number 11)
   58, 33, 17, 8, _____
2) Find the square root of 1.96 (PLE 2008 number 27)
3) Find the next number in the sequence. (PLE 1999 number 8)
   0, 1, 2, 3, 5, 7, 9, _____
4) Find the smallest number that can divided by 8 or 12 and leaves 5 as a remainder.
   (PLE 2019 number 14)
5) Find the square root of $3\frac{1}{16}$. (PLE 2012 number 18).
6) The area of a square flower garden is 196m^2. Find the length of each side.
7) Find the value of $2^4 + 3^0$ (PLE 2013 number 22),
8) Find the lowest common multiple (L.C.M) of 6 and 9. (PLE 1998 number 26)
9) Find the next number in the sequence: 1, 8, 27, 64,_____
   (PLE 2023 number 10)
10) Find the sum of the 5th and 8th prime numbers (PLE 2015 number 6).
11) Find the next number in the sequence. (PLE 2010 number 16)
   1, 8, 27, 64, _____
12) Write the next number in the sequence. (PLE 2009 number 23)
   1, 4, 9, 16, _____
13) Find the square root of $5\frac{4}{9}$. (PLE 2004 number 19).
14) Fill in the missing number in the factor tree. (PLE 2009 number 10)



15) In Nsawo primary school, two bells are rung at different intervals of 30 minutes and 40 minutes. If they last rung together at 10:00am, at what time will they be rung together again? (PLE 1997 number 33).
16) Without dividing 140 and 5070, show which of the number divisible by 3. (PLE 2016 number 5)
17) The Lowest common multiple (LCM) of two numbers is 72 and their greatest common factor (GCF) is 6. If one of the numbers is 24. Find the second number. (PLE 2013 number 18)

18) Find the Greatest common factor of (GFC) of 12 and 18. (PLE 2005 number 10)

19) Find the next number in the sequence. (PLE 2005 number 8)

125, 64, 27, 8, _____

20) Find the least number of sweets when divided among 8 boys or 6 girls equally, leaves 2 sweets as a remainder. (PLE 2017 number 20)

21) Find the next number in the sequence. (PLE 2000 number 5)

1, 4, 8, 19, _____

22) The area of a square room is $12\frac{1}{4}$. Find the length of one side.(PLE 2006 number 15)

23) Find the next number in the sequence. (PLE 2006 number 9)

21, 20,18,15,11, _____

24) Find the next number in the sequence. (PLE 2003 number 11)

17, 12, 8, 5, 3, _____

25) Find the square root of $12\frac{1}{4}$ (PLE 2007 number 21).

26) Find the next number in the sequence. (PLE 2018 number 10)

1, 2, 10, 37, _____

27) Find the next number in the sequence. (PLE 2017 number 4)

-11, -8, -5, -2, _____

28) Find the next number in the series. (PLE 2002 number 11)

0, 3, 5, 8, 10, _____

29) Find the next number in the sequence. (PLE 2008 number 13)

$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, 1/16, _____

30) Find the next number in the sequence. (PLE 2017 number 9)

2, 5, 7, 10, 12, _____

31) The prime factors of 12 and 90 are given

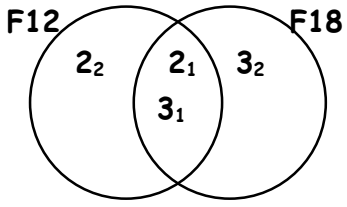
$F_{12} = 2^2 \times 3^1$

$F_{90} = 2 \times 3^2 \times 5^1$

Use the given prime factors above to find the lowest common multiple (LCM) of 12 and 90. (PLE 2016 number 13)

32) Without dividing, show which of the number 316 and 306 is divisible by 6.

33) The Venn diagram below show prime factors of 12 and 18, use it to find the LCM of 12 and 18. (PLE 2015 number 16)



34) Find the next number in the sequence 16, 8, 4, 2, _____

35) Using the numerals 4, 6 and 5. Form all possible three-digit even numbers.

36) Find the product of the next two numbers in the sequence.

2, 3, 6, 12, 22, _____, _____

37) Without dividing, show which of the numbers 92807 and 1011 is divisible by 11.

38) Without dividing, show which of the numbers 168 and 107 is divisible by 7.

39) The ratio of two numbers is 4:5. If their GCF is 9.

a. Find the numbers.

b. Find the LCM of the numbers in 39 (a).

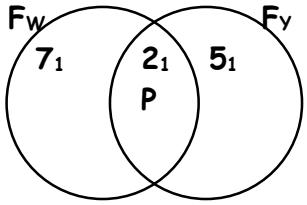
40) Find the largest number which divides 15 and gives remainder 3 and the same number when divides 19 gives remainder 1.

41) Find the lowest common factor of 12 and 16.

42) Using digits 3, 0, 5 and 4. Find the sum of the smallest and largest four digit number that could be formed using the values above.

43) Prime factorize 72 and present your answer in subscript form.

44) Use the Venn diagram below to answer questions that follow.



If the LCM of W and Y is 210. Find the value of W.

45) Find the GCF of W and Y.

46) Find the square root of 0.09.

47) Without dividing, show which of the numbers 5481 and 2262 is divisible by 9.

48) Given the prime factors of 36 and y.

$F_{36} = \{2_1, 2_2, 3_1, f\}$

$F_y = \{3_1, 5_1, f\}$.

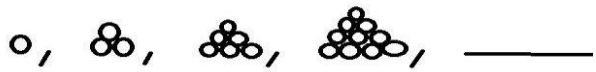
a) If the GCF of 36 and y is 9. Find the value of f.

b) Find the value of y.

49) Without dividing, show which of the numbers 246 and 335 is not divisible by 3.

50) Fill in the missing number 5, 11, 2, 7, _____

51) Draw the next groupings.



52) Find the next number in the sequence. 400, 399, 391, 364, 300, _____

53) Find the square of 16.

54) Find the smallest number when divided by 12 or 18 it does not give a remainder.

55) Bell A rings every 20 minutes, Bell B rings every 30 minutes and Bell C rings every 40 minutes. After how many hours will all the three bells ring at the same time?

56) The area of a square carpet is $1.44m^2$. Find the length of each of its one side?

57) Find the sum of the third composite number and 13th triangular number.

58) Find the next two numbers in the sequence.

1/9, 1/6, 1/3, _____, _____

59) Two consecutive numbers are (4y – 1) and (y + 9)

a) Find the value of y.

b) Find the numbers.

60) List all factors of 24.

MATHS PLE TIPS

1. Read the instructions carefully. Each question has different instructions.
2. Read the question and understand it. If possible, highlight the key words.
3. Write neatly and organize your work well.

   Write from left to right.
4. Diagram work should be done in pencil. Naming or writing points and angles in ink.
5. Use correct units.
6. Start with section A and begin by answering simple questions. Skip challenging questions.
7. All working should be shown in the correct space. Let children not lose marks due to omission of work.
8. Measure lines and angles accurately.
9. Equal signs and operation signs should be written e.g. 4 3

   × 3

   129

The following guidance is particular to topics.

1. FRACTIONS

A separating bar is a must 3 should be 3.

10 10

- When a question is "simplify", it must be done to the lowest term. For example;

$$\frac{5}{9} - \frac{2}{9} = \frac{3}{9} \quad (\div 3) = \frac{1}{3}$$

- If you get an improper fraction, change it to a mixed number. For decimal fractions, the answer should be in decimal. If it turns out to be a whole number leave it as it is.
- When expressing quantities in percentages, the percent symbol is a must.
  - Ratios must be simplified to the lowest term. Written without units.
- When rounding off decimals, there mustn't be any digits written after the required place value. E.g.

T	O	Tth	Hth	Thth
9	6	9	7	3

RPV

Round off 96.973 to the nearest tenths.

96.9
+ 0.1
97.0

96.973 Ω 97.0

2. NUMBER PATTERNS AND SEQUENCES

When finding L.C.M or G.C.F, all multiples or all factors must be listed without skipping any.

When finding G.C.F, only prime factors dividing all the numbers must be use e.g. Find the
G.C.F of 12 and 18 (PLE 2012)

2	12	18
3	6	9
	2	3

G.C.F = 2 × 3
= 6

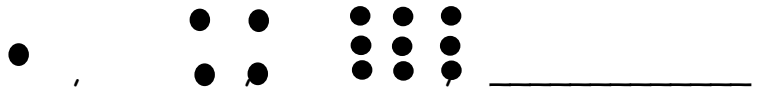
When finding the next number, the child should complete the pattern using the right method.

For example: find the next number in the sequence.

-11, -8, -5, -2, 1

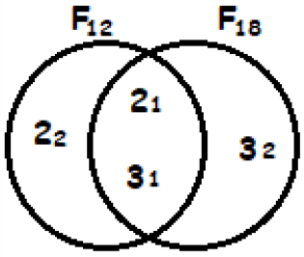
+3 +3 +3 +3

For patterns that have been illustrated, illustrations must be done.



If a Venn diagram has been drawn showing prime factors, the candidate must answer the questions, using the Venn diagrams. E.g.

Find the L.C.M of 12 and 18.



L.C.M = 2 × 2 × 3 x 3
= 36

A candidate must introduce the root symbol on the first step when

finding square roots and cube roots e.g. Find the square root of 3

$\frac{1}{16}$ $\sqrt{3\frac{1}{16}}$

If fractions; the root symbol must cover both the numerator and the denominator. Still, roots from fractions must not be reduced e.g.

Find the square root of $\frac{36}{64}$ $\sqrt{\frac{36}{64}}$ = $\frac{6}{8}$

For divisibility test, a child must follow the test but not try and error method. E.g. Which of these numbers is divisible by 3?

140 and 5070

1 + 4 + 0 = 5

5 + 0 + 7 + 0 = 12

5070 is divisible by 3.

3. SET CONCEPTS:

Common members must be identified by ticking or circling them. E.g. Given C = {2, 7, 10, 17}

D = {5, 6, 7, 11, 15}

$C \cap D = \{7\}$

Curly brackets must be used to enclose the elements. Commas are a must.

When finding the number of subsets, the child must substitute correctly. E.g. Given set K = {g, m, v, z}, find the number of subsets in set K. Remember

No. of subsets = 2^n

No. of subsets = 2^4 **m_1**

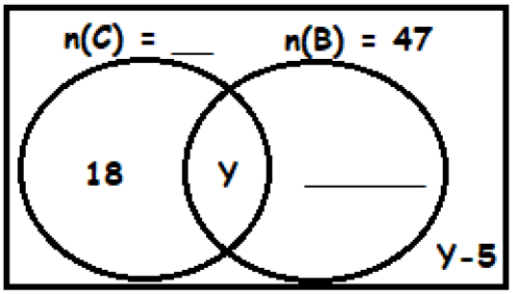
Also, the same applies when finding the number of elements in a given set when given the number of subsets e.g. $2^n = 16$ **m_1**

Candidates must list the subsets when tasked to do so other than finding the number of subsets.

For Venn diagrams, use the information given to complete it.

A candidate must make sure that every gap is filled because there is a mark for it. E.g.

$n(\mathcal{E}) = 76$



A candidate must use the right set symbols when answering a given question e.g.
P = {1, 3, 5, 7} and Q = {2, 3, 5, 7}.

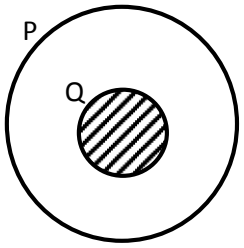
Find $n(P \cap Q)$

$P \cap Q = \{3, 5, 7\}$ **not** $n(P \cap Q) = \{3, 5, 7\}$.

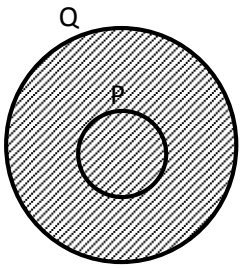
A candidate must identify the required region correctly.
E.g. If 27 like MTC altogether,
If 18 do not like English at all,
20 like science only,
5 play Hockey but not football,
7 like at least two games; 8 like at most two subjects

A candidate must learn to shade region in subsets.

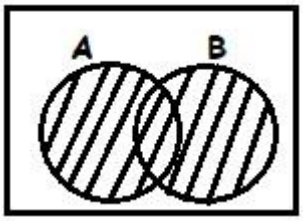
e.g. $P \cap Q = Q$



$P \cup Q = Q$



Shade either A or B (Requires one to shade union)



4. **<u>For whole numbers</u>**, place values must be written in plural form e.g. Find the place value of 4 in 3 4 0,001

Ten thousands OR Tens of thousands

When writing in words, candidates must show the place value periods. E.g. Write 650,019 in words.

Thousands	Units
650	019

= Six hundred fifty thousand, nineteen.

When writing in Roman numerals, expansion is important.
Write 955 in Roman numerals.
955 = 900 + 50 + 5

5. <u>For bases</u>, re-grouping in bases must be shown.

Add: $1\ 1\ 0\ 1_{two} + 1\ 1\ 1_{two}$ ‖ <u>P.O.W</u>

$1\ 1\ 0\ 1_{two}$ ‖ 2 + 2 = 1 rem 0

$+\ 1\ 1\ 1_{two}$ ‖ 3 + 2 = 1 rem 1

10100_{two}

The base must be written in words.

6. <u>On operation of whole numbers</u>

- A candidate must add or subtract numbers arranged vertically. Bar lines are a must to show equal signs.
- Correct arrangement of digits according to place values.
- When multiplying large numbers, long multiplication or lattice method is a must especially for those numbers not ending in zeros. Find the product of 495 × 36
- When dividing large numbers, by other large numbers, multiples must be written

$\overset{14}{\cancel{4970}\cancel{0}}$ or long division must be used.

$355\cancel{0}_1$

```
          14
      ------
3550 | 49700
     -355
      1420
     -1420
      - - -
```

M_{355} = 355, 710, 1065, 1420, 1775, 2130, 2485, 2840, 3195, 3550, 3905, 4260, 4615, 4970.

- A candidate should use brackets when expanding numbers using exponents.

H	T	O
7	8	9
10^2	10^1	10^0

$789 = (7 \times 10^2) + (8 \times 10^1) + (9 \times 10^0)$

6. TIME

i) Write 24 hr. clock system using 4 digits without the colon. (Reject with one dot).
Also its units is hours. (Hrs.)

ii) Write the specific time in 12 hr. clock system e.g. p.m. or a.m. (3:45p.m – The colon is a must).

A candidate must write the duration in hours or hours and minutes.
E.g. How long was the activity that started at 9:30a.m and ended at 11:10a.m

HRS		MIN
~~11~~ ^{10}	:	10a.m
- 9	:	30a.m
1	:	40

P.OW
(10 + 60) – 30 = 40

1 hr. 40 minutes or $1\frac{40}{60}$ hr. or $1\frac{2}{3}$ hr.

iii) A candidate must use correct units on time e.g. distance (km or m), Speed (km/hr. or m/s or km/minute), Time (hrs.)

iv) A candidate must convert time in minutes to hours when speed is to be given in km/hr. a leading statement is a must before conversions are done.

7. FOR DATA HANDLING

- A candidate must read the instructions carefully.
- Interpret the scale correctly refer PLE 2017 No. 19
  PLE 2008 No. 39

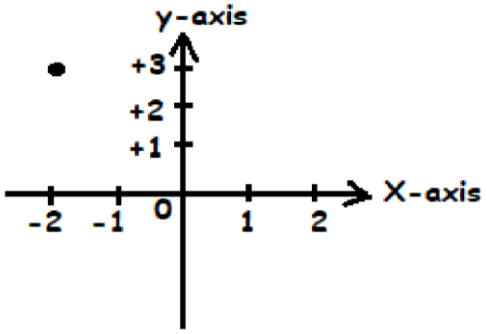
A candidate must complete the frequency table properly having shown the working.

Marks	Freq.	Total
8	9	72
7	-	21
-	4	20

- A candidate must write the co-ordinates properly

  P(-2, 3)

- A candidate must indicate points plotted on the grid



- For probability (dice or a coin or days or months)

  the sample space must be written and the expected

  chances identified by ticking or circling.

8. <u>For Length, Mass and Capacity</u>

- Metric conversion must be done after writing the correct leading statement.

Convert 3.6mto cm

1m = 100cm

3.6m = $\frac{36}{1\cancel{0}} \times 10\cancel{0}$

= <u>360cm</u>

- Use correct formulae when finding missing side for example when gives area, circumference, volume, perimeter etc.

- A candidate must first harmonise the units before any operation is done.

  E.g How many 200gm packets can be got from 2.6kg of salt?

1kg = 1000gm

2.6kg = $\frac{26 \times 100\cancel{0}}{1\cancel{0}}$

=<u>2600gm</u>

Number of packets = $\frac{\cancel{2600}^{13}}{\cancel{200}_{1}}$

= <u>13 packets</u>

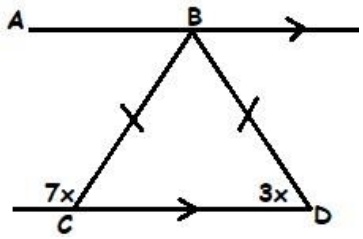
- A candidate should divide vol. of the big figure by the vol. of the small figure when finding tin full or cup full and packing to be done by diving dimension of the big figure by the ones on the small one.

  Refer to PLE 2015 No. 24, PLE 2011 No. 42

9. For Lines, Angles and Geometric figures/Geometric Construction

- A candidate must indicate information on the diagram for one to find the value of the unknown angle e.g.

  In the figure below line AB is parallel to CD and BCD is an isosceles triangle.



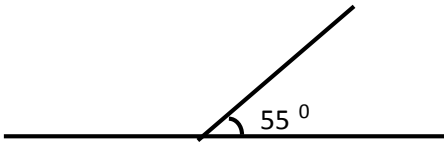
  Find the value of x.

- The candidate had to indicate angle BCD = 3x on the diagram before forming the equation to find the value of x.

$$7x + 3x = 180^0.$$

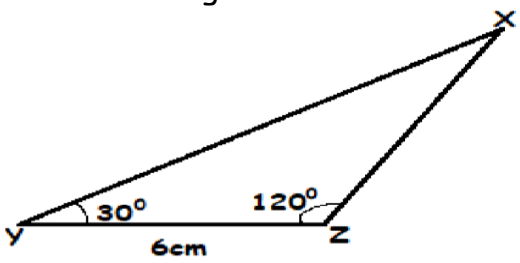
- A candidate must indicate the angle required of him or her to construct or to draw

  E.g. Using a protractor, draw an angle of 55^0 in the space below.

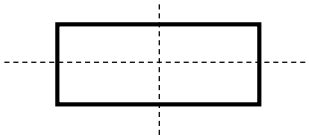


- A candidate must do the construction in pencil only. Writing dimensions and angles can be done in ink.
- A candidate must draw the sketch. All information given must be shown on the sketch. The sketch should be a reflection of the actual diagram especially angles. If an angle is 120^0, the sketch must reflect an obtuse angle. If an angle is 60^0, the sketch must reflect an acute angle.

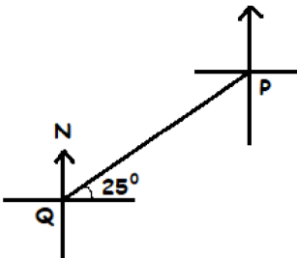
  Refer to PLE 2005 No. 34 and PLE 2020 Number 25.
  Construct a triangle XYZ in which YZ = 6cm, angle XYZ = 30^0 and angle YZX = 120^0.



- A candidate must use the right instruments to draw or construct the diagram. If he/she is to use a protractor, it must be so.
- A candidate must draw the lines of folding symmetry proportionately using a ruler. E.g. Show all the lines of folding symmetry in the figure below.

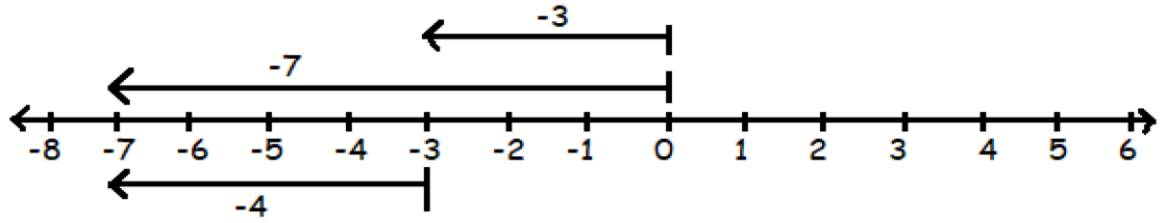


- A candidate must complete the diagram when reading/stating bearing of one place from another. e.g. Find the bearing of point Q and P in the diagram.



10. **INTEGERS**

- A candidate must write the integers on the arrows when working out on a number line. E.g. Work out -7 - ⁻3 on the number line below.



- A candidate must simplify the signs during operation.
  Simplify: ⁻6 - ⁻ 4
- 6 – (⁻ 4) = ⁻ 6 + 4 = ⁻2
- A candidate must write the finite system when dealing with finding the day after a given period of time. E.g. Today Monday, the workers on a farm are paid their salary. What day of the week will the workers' next pay be 30 days from today?

Sun	Mon	Tue	Wed	Thur	Fri	Sat
0	1	2	3	4	5	6

11. **MONEY**

- A candidate must complete the bill table in the correct spaces after showing the working. E.g. Refer to PLE 2013 No. 21 and Refer to PLE 2011 No. 32.
- A candidate must use the right exchange rate when the exchange rate table has been drawn.

  When given foreign currency, use the buying rate while when given local currency (Ug shs) Use the selling rate.
  Refer to PLE 2011 No. 35 and Refer to PLE 2015 No. 23

12. **ALGEBRA**

1. A candidate must observe the rule of multiplication of integers when opening brackets. e.g. Simplify

   $18y - 5(y + 7)$
   $18y - 5y - 35$
   $13y - 35$
2. A candidate must use brackets to show expressions treated as one term.

   E.g. Subtract $2k - 4$ from $4k + 5$
   $(4k + 5) - (2k - 4)$
   $4k + 5 - 2k + 4$
   $4k - 2k + 5 + 4$
   $2k + 9$
3. A candidate must draw a table of comparison when forming equations from word problems. E.g. A geometry set costs half as much as a book. A book costs sh. 600 more than a fountain pen. If the total cost of the three items is sh. 6,900. Find the cost of the geometry set.

Geometry set	Book	Fountain pen	Total
$\frac{1}{2}$ b	b	b-600	6900

"Think do not give up and keep practicing the journey to excellence is near you."

Encouragement quote about math

a. Without mathematics, there's nothing you can do.
b. Everything around you is mathematics.
c. Everything around you is numbers.
d. Mathematics is the most beautiful and most powerful creation of the human spirit.
e. Silence is better than unmeaning words.
f. It is not enough to have a good mind; the main thing is to use it well.
g. Mathematics is not about numbers, equations, computations or algorithms: it is about understanding.
h. It is better to solve one problem five different ways, than to solve five problems one way.
i. If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is.
j. Failure is the opportunity to begin again more intelligently.
k. Positive attitude bring positive results.

ORGANIZED BY TR. DAVID BALYOMUNSI
HEAD OF MATHEMATICS DEPARTMENT
RAPHA EXAMINATIONS BOARD
FROM FOCUS SCHOOL-BWEYOGERERE
KASOKOSO

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