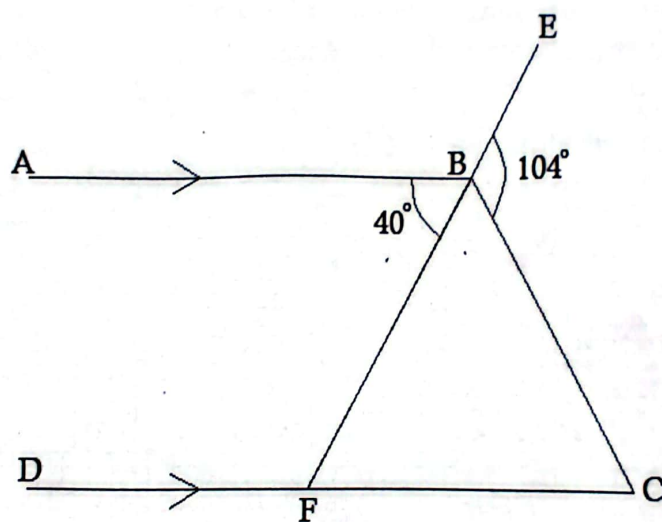


2013 QUESTIONS

1. Simplify $\frac{4-(-5)-13}{-2}$ (3 marks)
2. Simplify $3x^{-1}(2x)^2$ (3 marks)
3. Given that set $P = \{2,3\}$, write down all the subsets of the set (4 marks)
4. In figure 1, AB is parallel to DFC and EBF is a straight line. Angle CBE = 104° and ABF = 40° .



Calculate the angle BCF

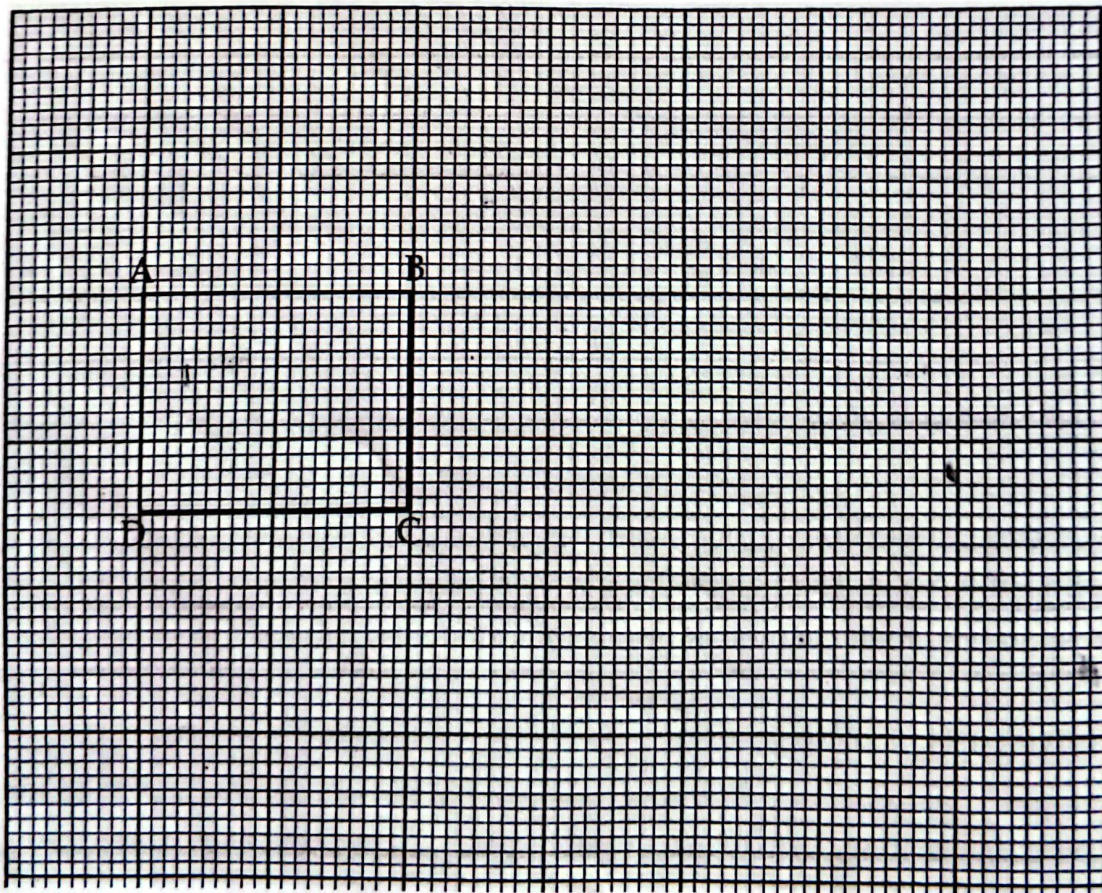
(4 marks)

5. A class discussion group consists of Chisomo, Jala, Kaligo, Sentiya, Sella, Bulla, Sofia, Kant and Sikenala. A student is chosen at random to make a presentation. Find the probability that the student's name starts with a letter S. (3 marks)
6. Convert 134_5 to base 3 (5 marks)
7. Given that in triangle ABC, angle ACB = 90° , AB = 7 cm and AC = 5 cm, calculate the length of BC giving your answer correct to one decimal place. (4 marks)

8. The table below shows the values of x and y for the equation $y = 2 - x$.

x	-3	0	2
y		2	

- a. Complete the table of values for the equation $y = 2 - x$.
(2 marks)
- b. Using a scale of 2 cm to represent 2 units on both axes, draw the graph of $y = 2 - x$.
(3 marks)
9. (a) Make t the subject of the formula $m = \frac{1}{b} - c$
(3 marks)
- (b) Solve the equation $x(x - 3) = 28$
(5 marks)
10. Given the following sequence of numbers: 12, 23, 34, ____, ____, Write down the next two numbers of the sequence.
(4 marks)
11. Figure 2 shows a quadrilateral ABCD.



Using D as a centre of enlargement and 2 as a scale factor, draw in the same figure, an enlargement of quadrilateral ABCD.
(3 marks)

(a) Solve the inequality $2p - 17 < 5p - 2$

(3 marks)

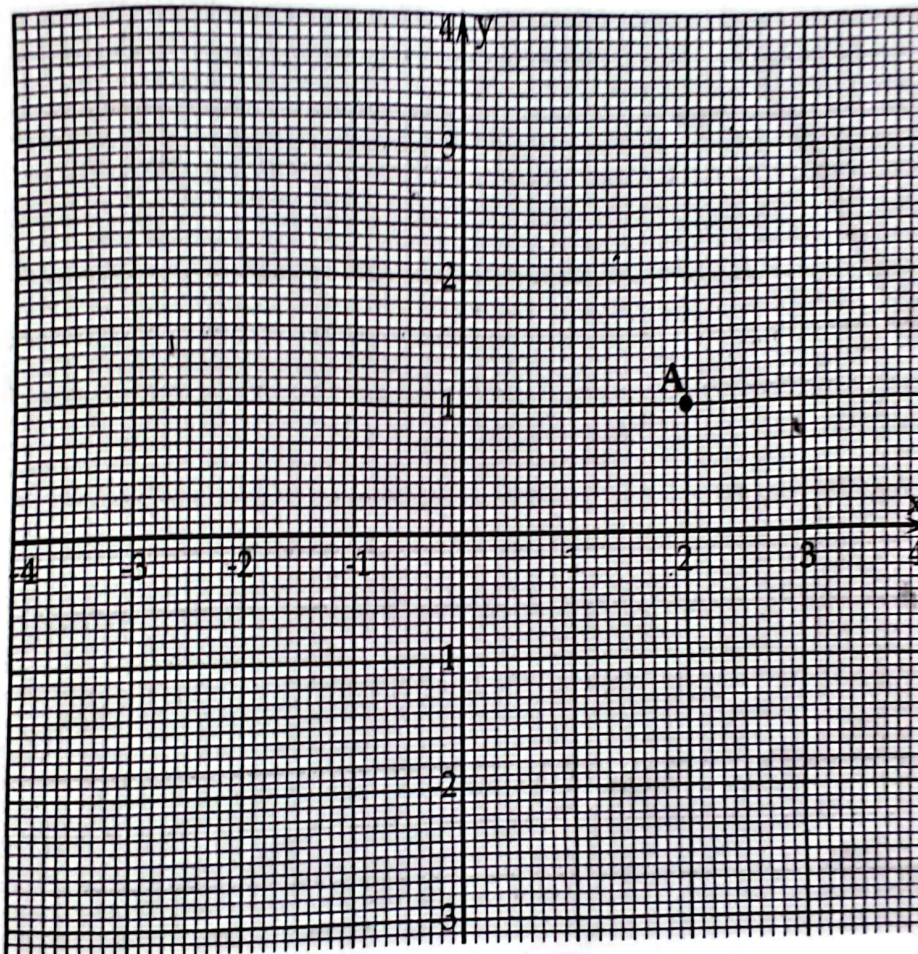
(b) The exterior angle of a regular convex polygon is 4 times its interior angle.
Given that the interior angle is y , calculate the number of sides of the polygon.

(5 marks)

12. (a) Factorise completely $m^3 - m$

(3 marks)

(b) Figure 3 shows a point A(2,1) on a grid



Given that $\overrightarrow{AB} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, Using the same grid, draw $\overrightarrow{AB}$

(4 marks)

13. (a) The electricity company charges a fixed amount of K1 041 per month and each units costs K15.15. If a family used 200 units in a certain month, calculate the bill which the family paid that month.

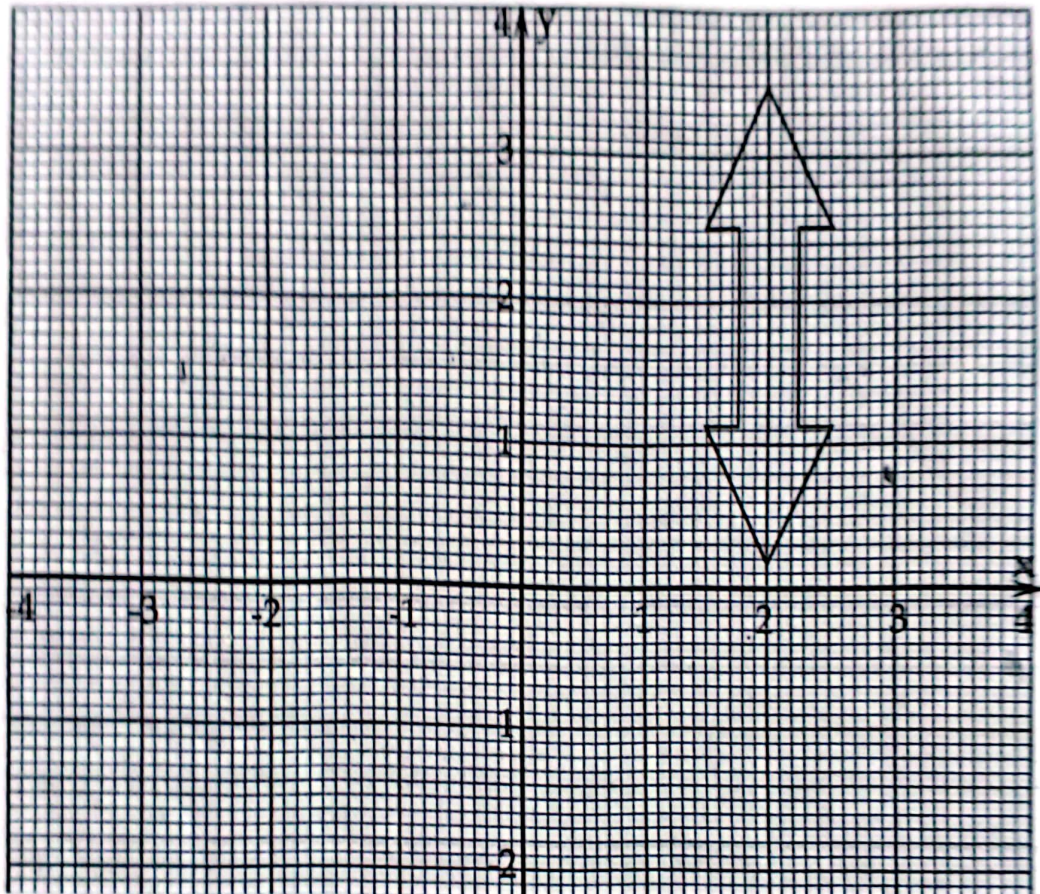
(3 marks)

(b) Given the equation $2x - y = -1$, find:

- (i) y - Intercept
- (ii) Gradient of the equation

(3 marks)

14. Figure 4 shows a diagram with arrow head both ends drawn on a graph paper.



a. In the same diagram, draw all the lines of symmetry for the diagram
(2 marks)

b. Write down the equation of the lines of symmetry drawn in 14.a.
(2 marks)

15. (a) Given that $x = -3$, $y = -6$ and $z = 9$, find the value of $\frac{xy-z}{x}$
(3 marks)

(b) Team M scored the following goals: 4, x , 1, 5 in four consecutive matches.
Given that the mean score is 3, calculate the value of x .
(4 marks)

16. (a) Using a ruler and a pair of compasses only, construct in the same diagram:

- (i) Triangle EFG in which $EF = 8 \text{ cm}$, $FG = 7 \text{ cm}$ and $GE = 6 \text{ cm}$
- (ii) A locus of points equidistant from EF and EG

(iii) A point H on the locus such that $EH = 10 \text{ cm}$

(5 marks)

(b) Measure and state the length of FH.

(1 mark)

17. Use logarithms to evaluate $(2.01)^3$ and give your answer correct to significant figures.

(4 marks)

18. Dziwa travelling by car left town A for town B 120 km away at 6:00 am at a constant speed of 40 km/h. Bweza also travelling by car left town B at 6:30 am for town A at a constant speed of 60 km/h

a. Using a scale of 2 cm to represent 30 minutes on the horizontal axis and 2 cm to represent 20 km on the vertical axis, draw on the same axes, graphs to show the journeys of Dziwa and Bweza.

(6 marks)

b. Using your graphs, find the time at which the two cars met.

(1 mark)

2013 SOLUTIONS

1. METHOD

$$\begin{array}{r}
 4 - (-5) - 13 \\
 \underline{-2} \\
 4 + 5 - 13 \\
 \underline{-2} \\
 9 - 13 \\
 \underline{-2} \\
 -4 \\
 \underline{-2} \\
 2
 \end{array}$$

2. METHOD

$$\begin{aligned}
 &3x^{-1}(2x)^2 \\
 &3 \times x^{-1}(2x)(2x) \\
 &3 \times x^{-1} \times 2x \times 2x \\
 &3 \times 2 \times 2 \times x^{-1} \times x^1 \times x^1 \\
 &12x^{-1+1+1} \\
 &12x
 \end{aligned}$$

3. Set P = {2,3}

The formula for subset is 2^n where n is number of elements in this case we have 2 elements

$$2^2 = 4$$

Therefore the subsets are $\{ \}$, $\{1\}$, $\{2\}$ and $\{1,2\}$

4. METHOD

Let angle FBC = x_1

$$BCF = y_1$$

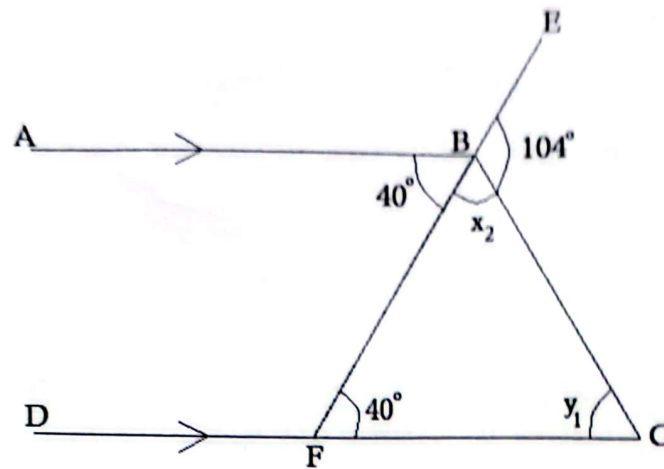
$$ABF = BFC = 40^\circ \text{ (Alternate angles)}$$

$$x_1 + 104^\circ = 180^\circ \text{ (Adjacent angles on straight line)}$$

$$x_1 = 180^\circ - 104^\circ$$

$$x_1 = 76^\circ$$

In ΔBFC



$$BFC + x_1 + y_1 = 180^\circ \text{ (sum of triangle)}$$

$$40^\circ + 76^\circ + y_1 = 180^\circ$$

$$\therefore y_1 = 180^\circ - (40^\circ + 76^\circ)$$

$$= 180^\circ - 116^\circ$$

$$\therefore y_1 = 64^\circ$$

$$\therefore BCF = y_1 = 64^\circ$$

5. METHOD

Total number of students:

Chisomo + Jala + Kaligo + Sentiya + Sella + Bulla + Sofia + Kant + Sikenala = 9

Students starts with S are Sofia, Sentiya, Sella and Sikenala = 4

$$P(S) = \frac{4}{9}$$

6. METHOD

$$1 \times 5^2 + 3 \times 5^1 + 4 \times 5^0$$

$$= 1 \times 25 + 15 + 4 \times 1$$

$$= 25 + 15 + 4$$

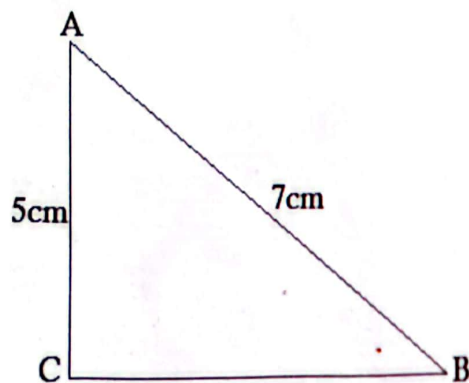
$$= 44_{10}$$

Convert it into base 3

3	44	2
3	14	2
3	4	1
3	1	1
	0	

$$\therefore 134_5 \text{ in base } 3 = 1122_3$$

7. METHOD



$$(BC)^2 = (AB)^2 + (AC)^2$$

$$(BC)^2 = (7 \text{ cm})^2 + (5 \text{ cm})^2$$

$$= 49\text{cm}^2 + 25\text{cm}^2$$

$$(BC)^2 = 74\text{cm}^2$$

$$\sqrt{(BC)^2} = \sqrt{74\text{cm}^2}$$

$$BC = 8.602 \text{ cm}$$

$$BC = 8.6 \text{ cm (1 decimal place)}$$

8. (a) To complete table of values

$$y = 2 - x$$

$$\text{When } x = -3$$

$$y = 2 - (-3)$$

$$y = 2 + 3$$

$$y = 5$$

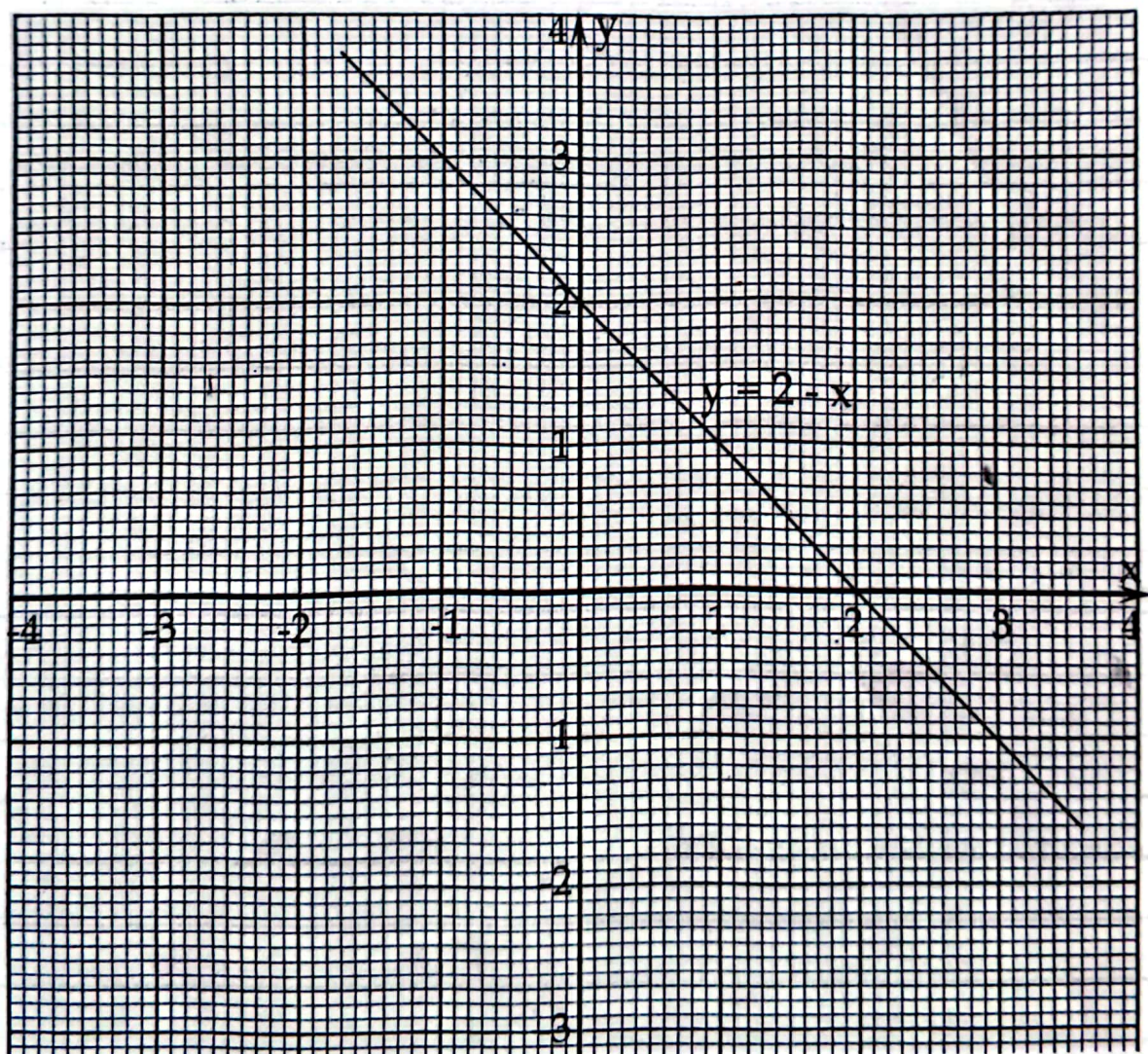
When $x = 2$

$$y = 2 - 2$$

$$y = 0$$

x	-3	0	2
y	5	2	0

(b)



9. (a) To make t the subject $m = \frac{t}{b} - c$

$$m + c = \frac{t}{b}$$

$$b \times (m + c) = \frac{t}{b} \times b$$

$$bm + bc = t$$

$$\therefore t = bc + bm$$

(b). $x(x - 3) = 28$

$$x^2 - 3x - 28 = 0$$

$$(x - 7)(x + 4) = 0$$

If $(x - 7) = 0$

$$\therefore x = 7$$

If $(x + 4) = 0$

$$\therefore x = -4$$

Either $x = -4$ or 7

10. METHOD

12, 23, 34,

$$d = 23 - 12 \text{ or } 34 - 23$$

$$d = 11$$

$$34 + d = 4^{\text{th}} \text{ term}$$

$$4^{\text{th}} \text{ term} = 34 + 11$$

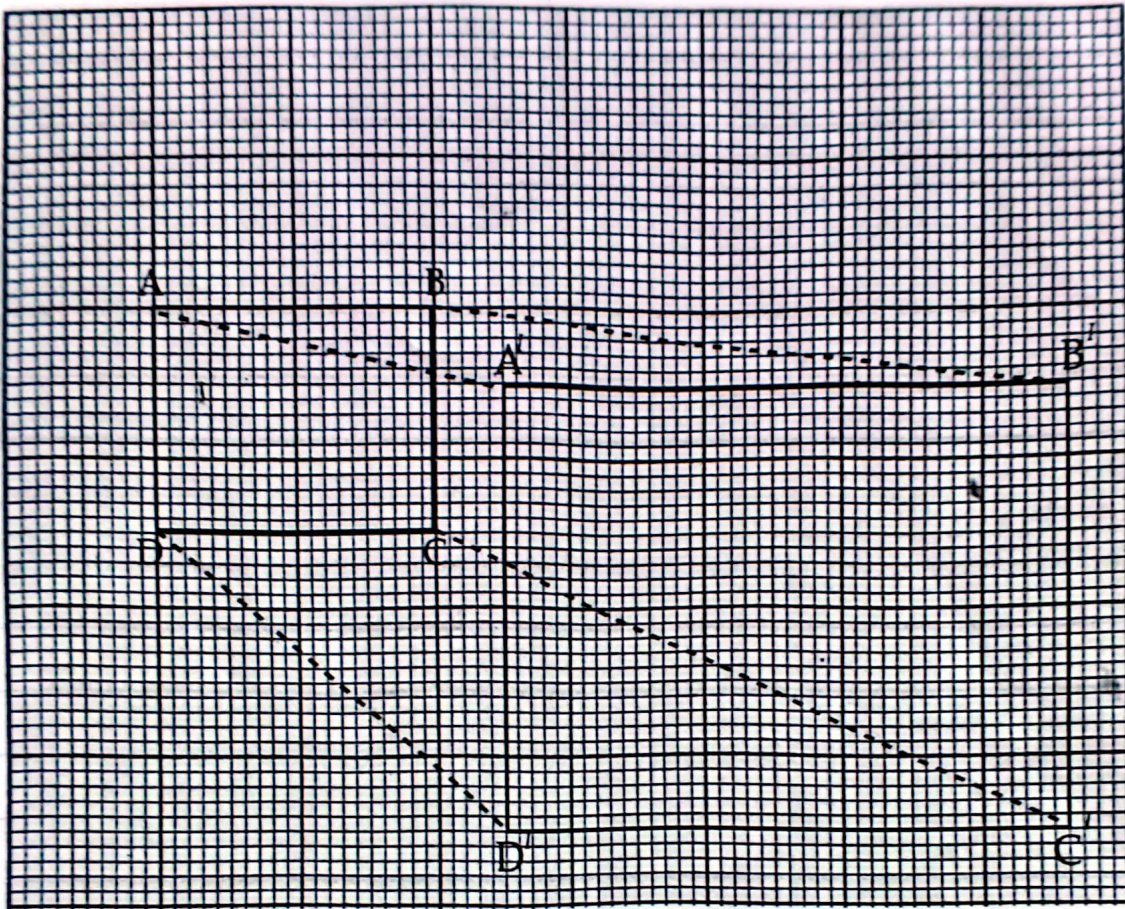
$$= 45$$

$$5^{\text{th}} \text{ term} = 45 + 11$$

$$= 56$$

The next two numbers are 45 and 56.

11. METHOD



$$\begin{aligned}
 12. (a). \quad & 2p - 17 < 5p - 2 \\
 & 2p - 5p < -2 + 17 \\
 & -3p < 15
 \end{aligned}$$

When the coefficient which divides the inequality is negative, the inequality symbol changes direction

$$\frac{-3p}{-3} < \frac{15}{-3}$$

$$p > -5$$

$$(b) \text{ Exterior angle} = y$$

$$\text{Interior angle} = 4y$$

$$y + 4y = 180^\circ \text{ (Adjacent angles)}$$

$$5y = 180^\circ$$

$$\frac{5y}{5} = \frac{180^\circ}{5}$$

$$y = 36^\circ$$

$$n = \frac{360^\circ}{\text{interior } \angle}$$

$$n = \frac{360^\circ}{36^\circ} \times 1 \text{ side}$$

$$n = 10 \text{ sides}$$

The polygon is decagon because it has 10 sides

13. (a) METHOD

To factorise completely

$$m^3 - m$$

$$m(m^2 - 1)$$

$$m[(m + 1)(m - 1)]$$

$$m(m + 1)(m - 1)$$

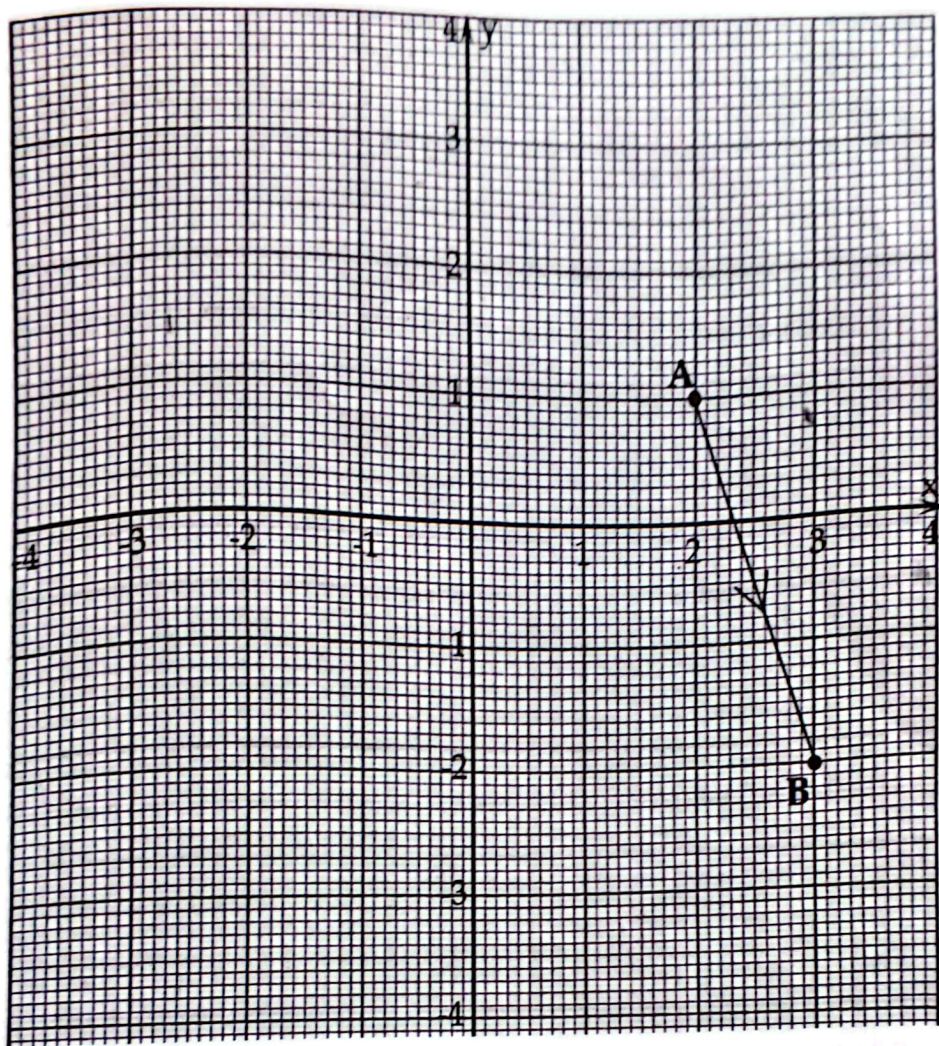
$$(b) \overrightarrow{AB} = (B) - (A)$$

$$= \begin{pmatrix} 3 \\ -2 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} 3 - 2 \\ -2 - 1 \end{pmatrix}$$

$$= \begin{pmatrix} 1 \\ -3 \end{pmatrix}$$

$$\overrightarrow{AB} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$$



14. (a) K1 041/month

Cost/Unit K15.15

Total cost of units that month

$$K15.15 \times 200 = K3\ 030$$

$$\text{Bill} = K3\ 030 - K1\ 041 \text{ (fixed cost)}$$

$$= K1\ 989$$

(b) (i) Arrange the equation in the form of $y = mx + c$ where c is the y -intercept

And m is the gradient of the equation

$$2x - y = 1$$

$$-y = -2x + 1$$

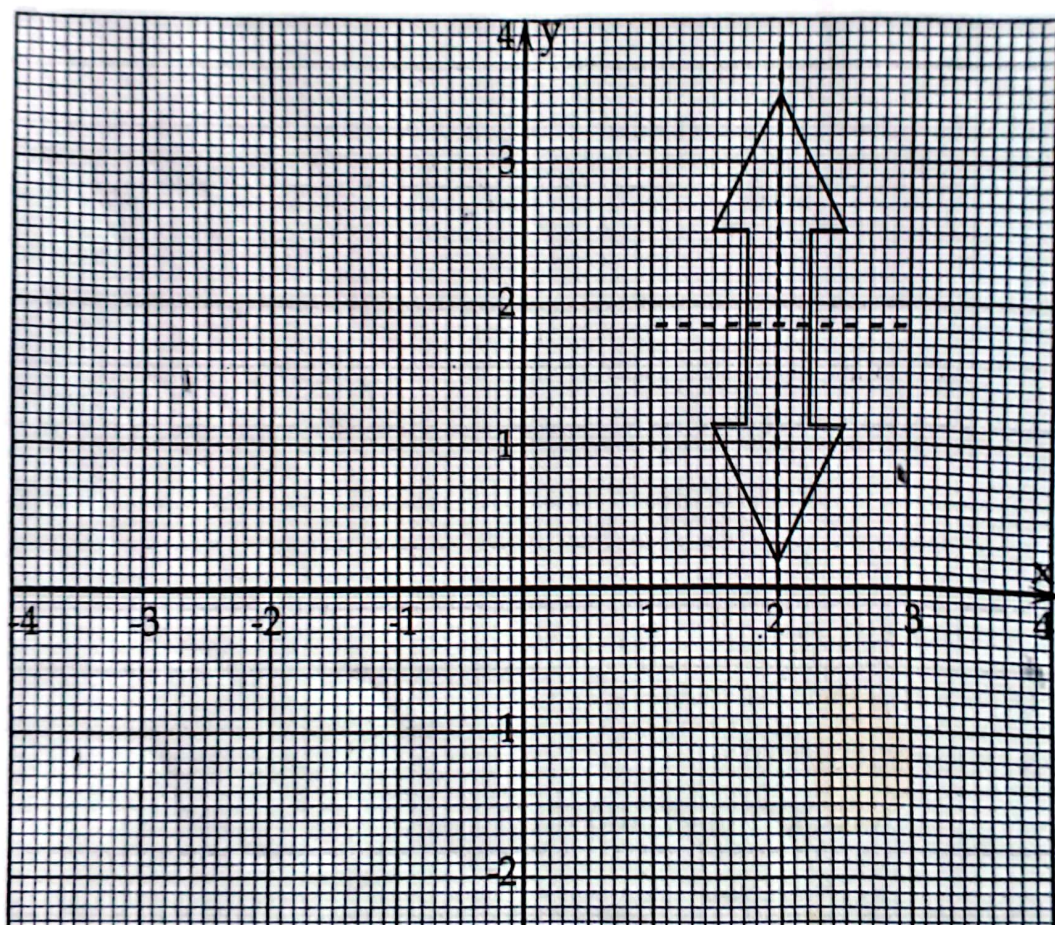
$$\frac{-y}{-1} = \frac{-2x}{-1} + \frac{1}{-1}$$

$$y = 2x - 1$$

$$\therefore y\text{-Intercept} = -1$$

(ii) Gradient of the equation = 2

(a) METHOD



(b) The equations of lines of symmetry are $y = 2.5$ and $x = 1.5$

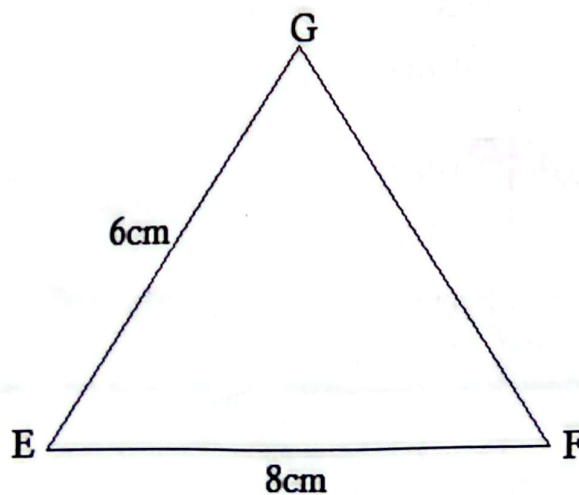
15. (a) METHOD

$$\begin{aligned}
 & \frac{xy-z}{x} \\
 &= \frac{-3(-6)-9}{-3} \\
 &= \frac{18-9}{-3} \\
 &= \frac{9}{-3} \\
 &= -3
 \end{aligned}$$

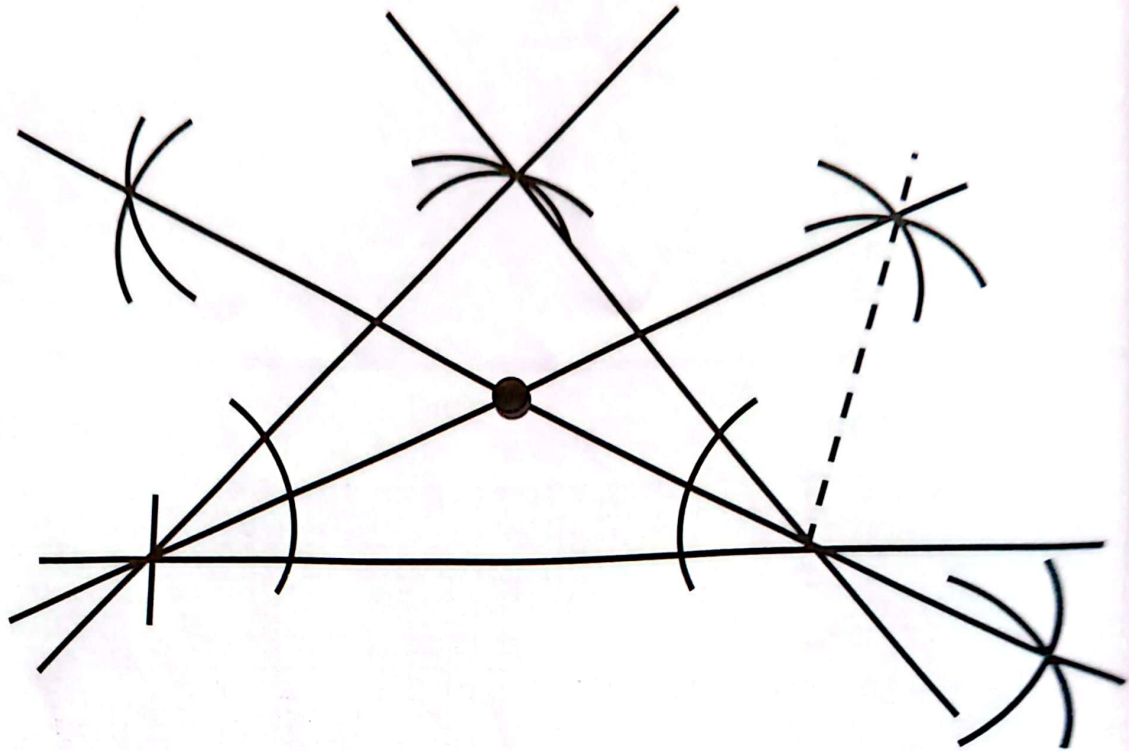
(b) METHOD

$$\begin{aligned}
 & 4, x, 1, 5 \\
 & \frac{4+x+1+5}{4} = 3 \\
 & \frac{x+10}{4} = 3 \\
 & x + 10 = 3 \times 4 \\
 & x + 10 = 12 \\
 & x = 12 - 10 \\
 & x = 2
 \end{aligned}$$

16. Sketch of the construction below



CONSTRUCTION

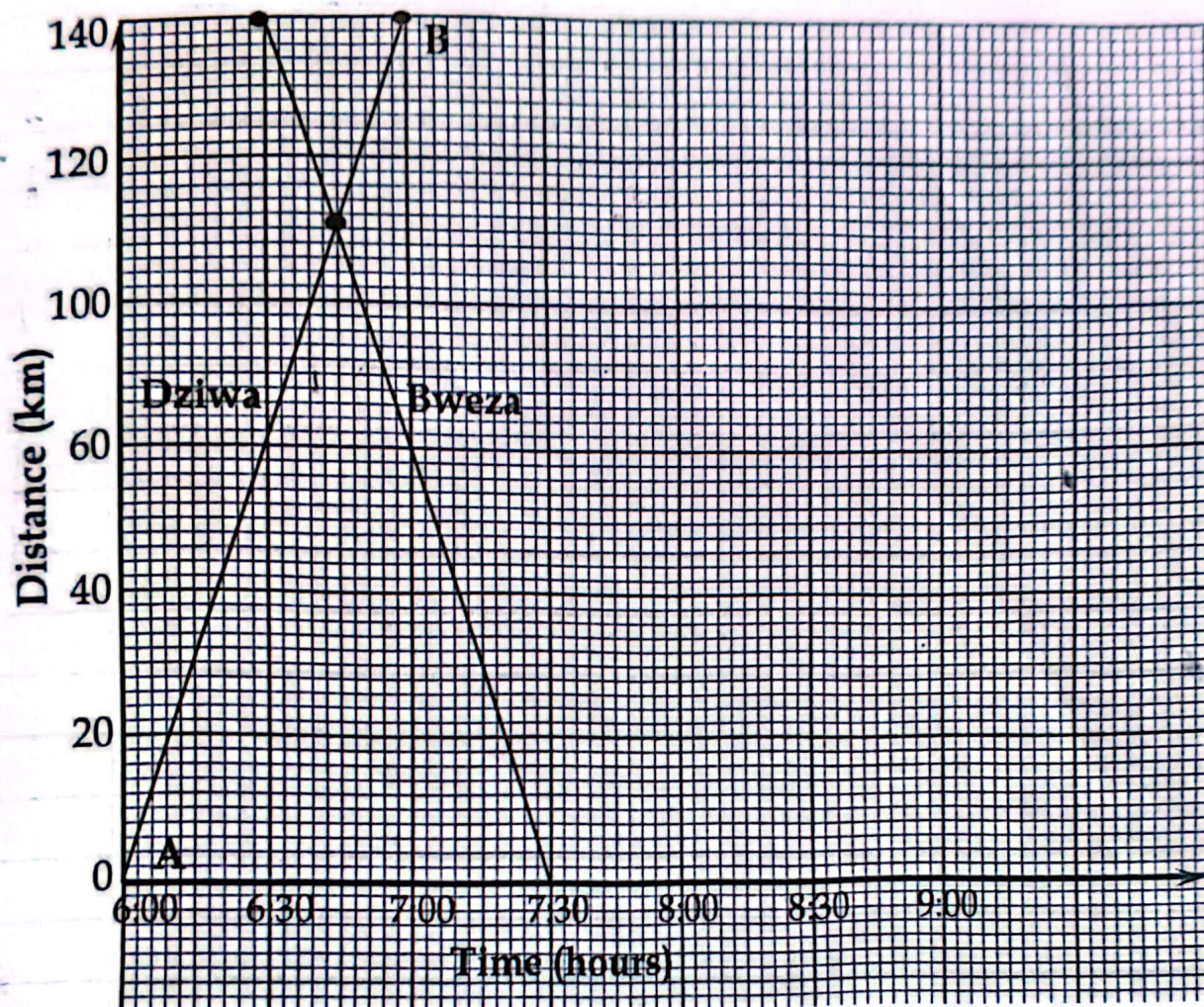


17. METHOD

Number	Standard form	Log
2.01	2.01×10^0	0.3032
		$\times 3$
8.121	8.121×10^0	<u>0.9096</u>

8.12 to significant figures

18. (a) METHOD



(b). Meet at 6:45 am

2014 QUESTIONS

1. Simplify $6(-2) + 4(-5) + 40$

(3 marks)

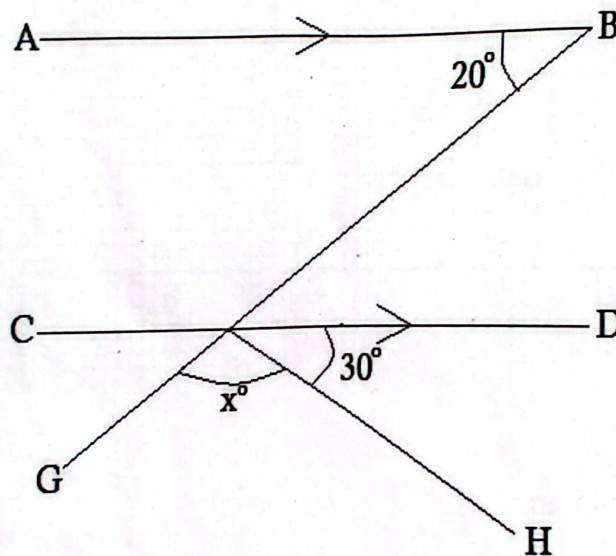
2. Factorise completely $28ef + 7em - mx - 4fx$

(3 marks)

3. Solve the equation $\frac{h}{3} - 4 = 1$

(3 marks)

4. In figure 1, AB is parallel to CFD and BFG is a straight line. Angle ABG = 20° , angle DFH = 30° and angle GFH = x°



Calculate the value of x°

(4 marks)

5. Simplify $3220_4 - 3304_4 + 2034_4$ leaving your answer in base 4

(3 marks)

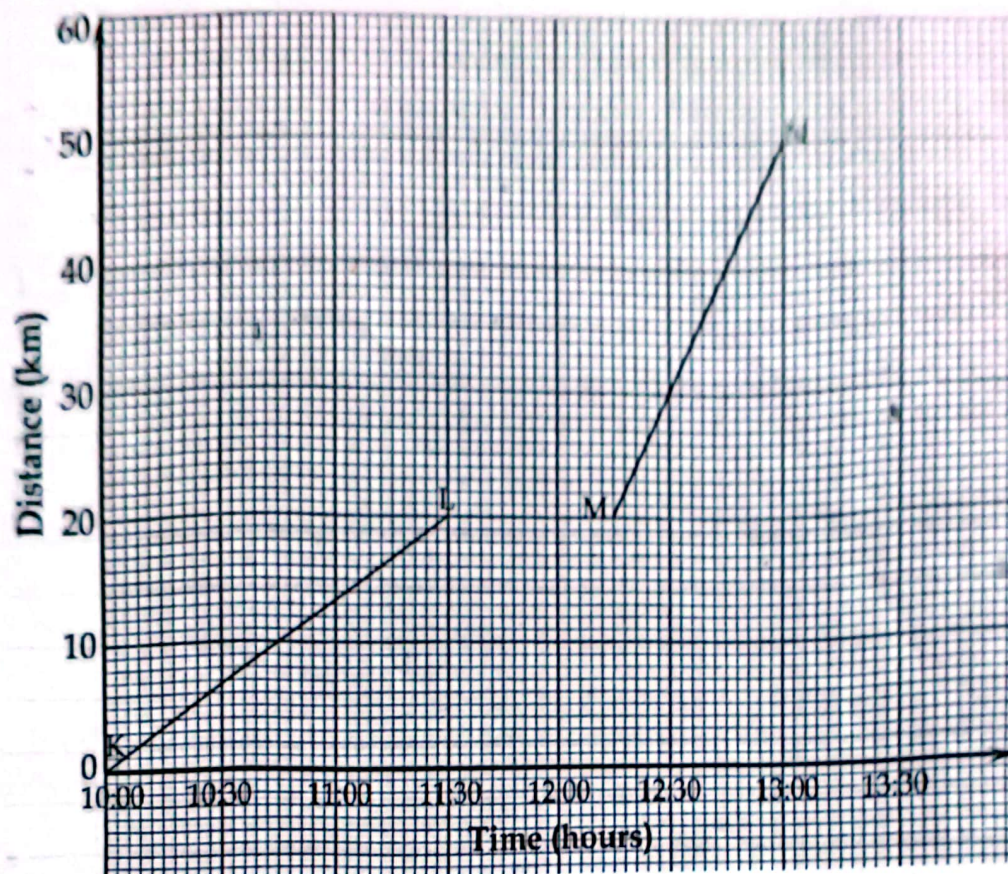
6. Find the n^{th} term of the sequence 4, 9, 14, 19,

(4 marks)

7. Simplify $\frac{2x-6y}{4cd} \div \frac{x-3y}{8cd}$, leaving your answer in its simplest form

(4 marks)

8. Figure 2 shows a graph KLMN of a motorist journey



a. How long did the motorist rest on his journey?

(1 mark)

b. Calculate the speed in km/h of the motorist between M and N

(4 marks)

9. Table 1 is a pictograph representing means of travel used by students at a certain school,

Bus	  
Bicycle	    
Car	
on Foot	      

Key  represents 20 students

a. Find the modal means of travel used by the students

(1 mark)

b. (i) calculate the total number of students at the school

(3 marks)

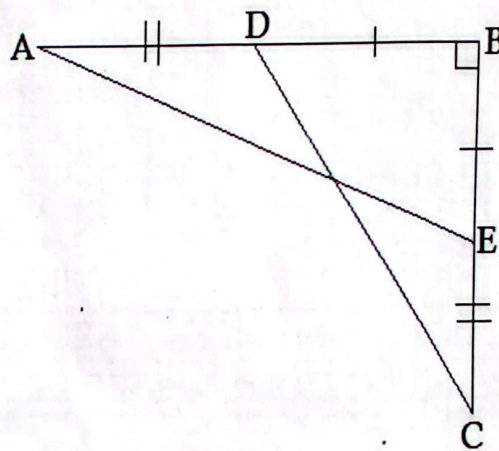
(ii) If a student is picked at a random, calculate the probability that the student's means of travel is bicycle.

(3 marks)

10. (a) Simplify $\frac{M^3n^3}{m^0n^{-3}}$

(4 marks)

(b) In figure 3, $AD = CE$. $BD = BE$ and angle are congruent.



Show that triangle ABE and CBD are congruent.

(4 marks)

11. Chigo is 3 years older than Chima. The sum of their ages is less than or equal to 13 years. Given that Chima's age is m years, formulate an inequality in m and solve it

(5 marks)

12. Table 2 shows monthly income tax rates for Wala company

Table 2

Income per month	Rate of Tax
First K15 000	0%
Next K5 000	15%
Excess of K20 000	30%

Calculate the income tax payable per month by an employee of the company who receives K25 000 per month

(5 marks)

13. a. Given that $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $\overrightarrow{DC} = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$, calculate $\frac{1}{2}(\overrightarrow{AB} + \overrightarrow{DC})$

(4 marks)

b. **Figure 4** is a Venn diagram showing names of students who play volley ball and netball at a certain school

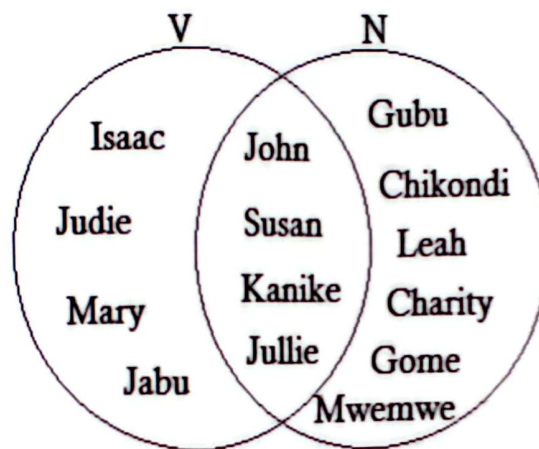


Figure 4

Given that V is a set of students who play volleyball and N is a set of students who play netball,

(i) find the number of students who play netball.

(1 mark)

(ii) list down the names of students who play both volleyball and netball

(2 marks)

14. a. Kidine rice costing K200/kg and Kilombero rice costing K350/kg are mixed in the ratio 7:3 respectively. Calculate the cost of the mixture per kilogram.

b. A polygon has exterior angles: 63° , 50° , $91^\circ 58'$ and e° . Calculate the value of e°

$$360 - 262 = 98^\circ$$

(4 marks)

15. **Figure 5** shows a parallelogram PQRS and a triangle TSP. Line TU is perpendicular to SP.

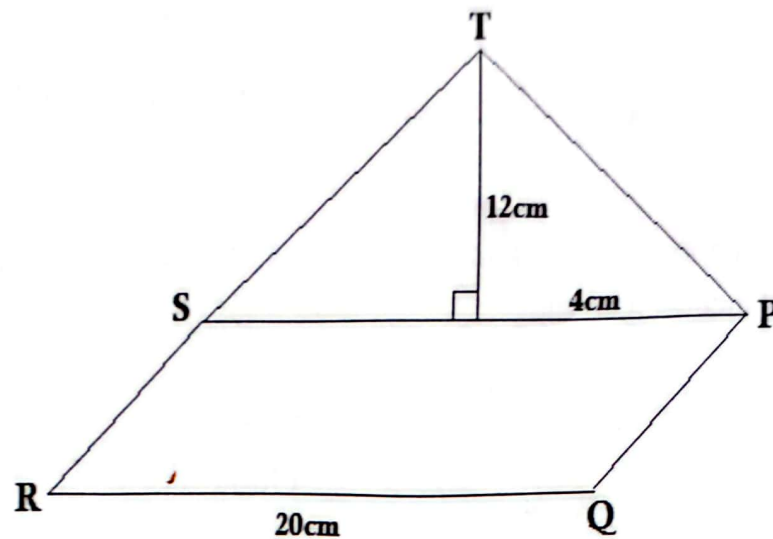


Figure 5

If $RQ = 20$ cm, $TU = 12$ cm and $PU = 4$ cm, calculate the length of ST

(5 marks)

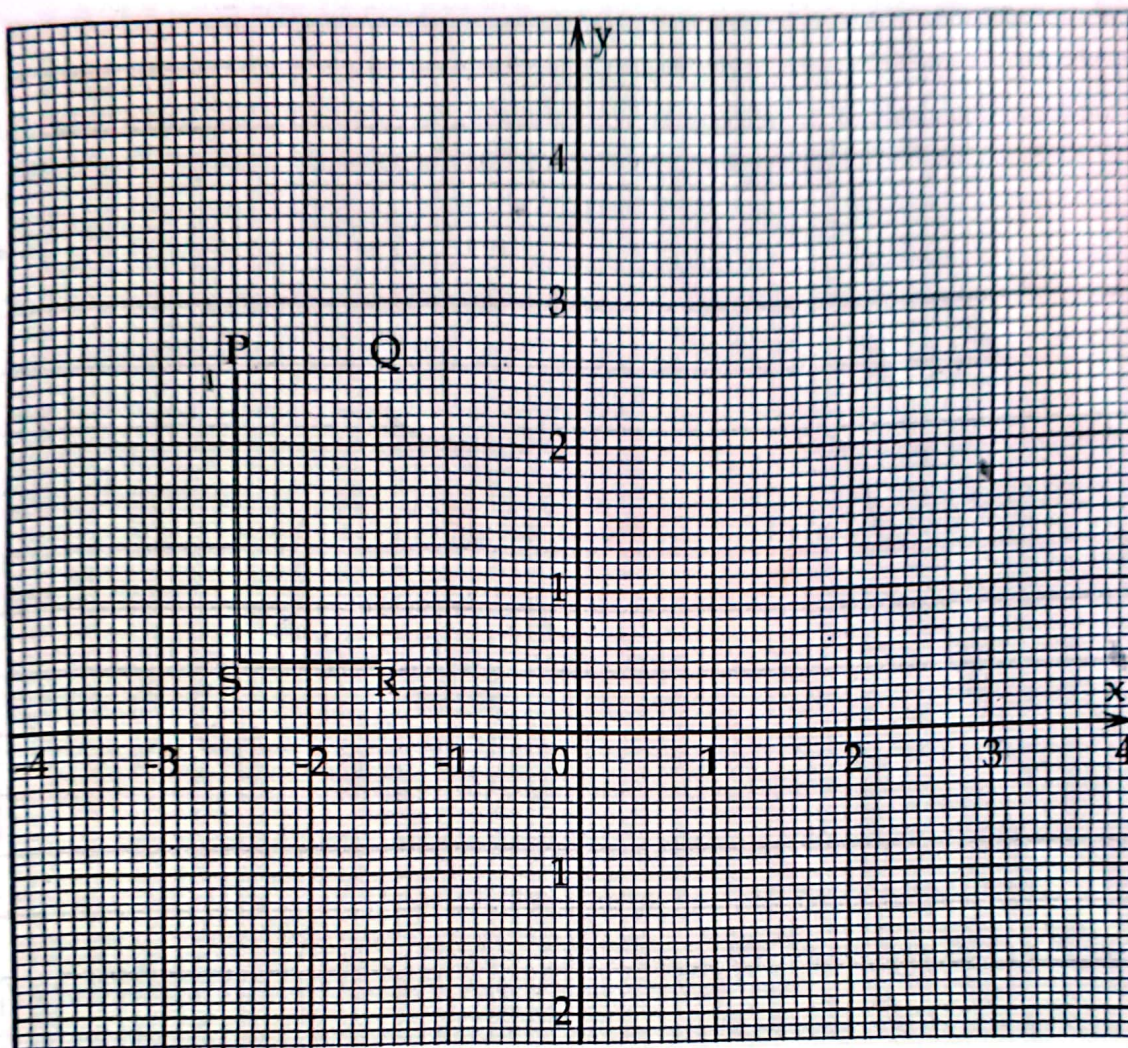
16. a. Use logarithms to evaluate $\frac{7.165 \times 39.2}{35.2}$ and give your answer correct to two decimal places

(5 marks)

- b. The cost of 4 pencils and 3 rubbers is K 120 and the cost of 2 pencils and 5 rubbers is K130. Given that the cost of each pencil is p kwacha and of each rubber is r Kwacha, calculate the cost of one rubber.

(4 marks)

17. **Figure 6** shows a quadrilateral PQRS on a Cartesian plane



Draw in the same figure, the image $P^1Q^1R^1S^1$ of the quadrilateral PQRS rotated through 180° about the point (0,0)

(4 marks)

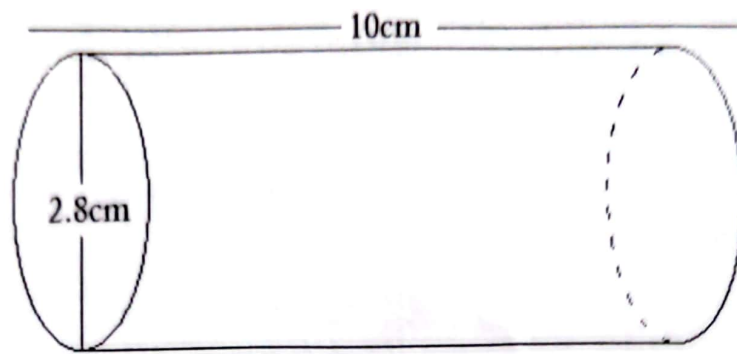
18. Using a ruler and a pair of compasses only, construct a right angled triangle PQR in which $PQ = 7$ cm, $QR = 8$ cm and angle $PQR = 90^\circ$. Measure and state the length of PR

(5 marks)

19. Solve the equation $\frac{25}{4}m^2 - 1 = 0$

(4 marks)

20. **Figure 7** shows a cylindrical pipe on one end with a diameter of 2.8 cm and length 10 cm.

**Figure 7**

Calculate the total external surface area of the pipe. (Take $\pi = \frac{22}{7}$)

(5 marks)

2014 SOLUTIONS

1. METHOD

To simplify

$$\begin{aligned}
 &= 6(-2) + 4(-5) + 40 \\
 &= -12 - 20 + 40 \\
 &= -32 + 40 \\
 &= 40 - 32 \\
 &= 8
 \end{aligned}$$

2. METHOD

To factorise completely

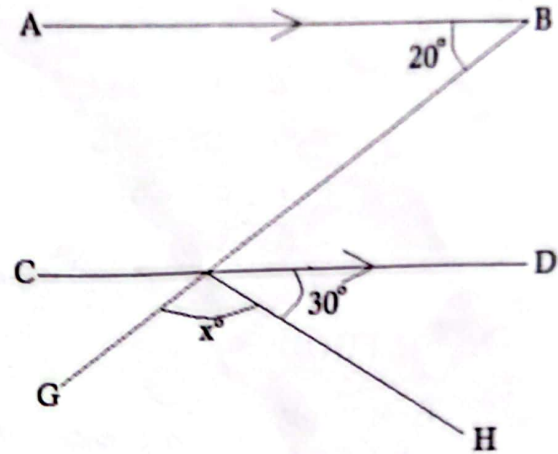
$$\begin{aligned}
 &= 20ef + 7em - mx - 4fx \\
 &= (7em + 28ef)(-mx - fx) \\
 &= 7e(m + 4f) - x(m + 4f) \\
 &= (7e - x)(m + 4f)
 \end{aligned}$$

3. METHOD

To solve the equation

$$\begin{aligned}
 \frac{h}{3} - 4 &= 1 \\
 \frac{h}{3} &= 1 + 4 \\
 3 \times \frac{h}{3} &= 5 \times 3 \\
 h &= 15
 \end{aligned}$$

4. METHOD

To calculate the value of x
from figure belowBFD = 20° (alternate angles) $\therefore$ GFB is a straight line

$$x + 30^\circ + 20^\circ =$$

 180° (Adjacent angles)

$$x + 50^\circ = 180^\circ$$

$$x = 180^\circ - 50^\circ$$

$$x = 130^\circ$$

5. METHOD

To simplify

1st step add like terms

$$3220_4 + 2032_4$$

$$3220_4$$

$$+2032_4$$

$$11\ 312_4$$

$$11\ 312_4$$

$$-3303_4$$

$$2003_4$$

6. METHOD

To find the n^{th} term of

4, 9, 14, 19,

$$a = 4$$

$$d = 9 - 4 = 5 \text{ or } 14 - 9 = 5$$

$$n^{\text{th}} \text{ term} = a + (n - 1)d$$

$$= 4 + (n - 1)5$$

$$= 4 + 5n - 5$$

$$= 5n - 1$$

7. METHOD

To simplify

$$\frac{2x-6y}{4cd} \div \frac{x-3y}{8cd}$$

$$\frac{2x-6y}{4cd} \times \frac{8cd}{x-3y}$$

$$\frac{2(\cancel{x-3y})}{4\cancel{cd}} \times \frac{\cancel{8cd}^2}{\cancel{x-3y}}$$

$$2 \times 2$$

$$= 4$$

8. METHOD

a. L and M points

12:15pm - 11:30 am

45 minutes

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{50\text{km} - 20\text{km}}{\frac{3}{4}\text{hours}}$$

$$= 30\text{km} \div \frac{3}{4}\text{hours}$$

$$= \frac{30 \times 4}{3}$$

$$= 40\text{km/h}$$

9. METHOD

Use table 1 Given

a. On foot is modal means by students

b. (i). 16×20

320 Students at school

$$(ii). P(\text{Bicycle}) = \frac{100}{320}$$

$$= \frac{5}{16}$$

10. (a) METHOD

To simplify .

$$= \frac{M^3 n^3}{n^{-3}}$$

$$= M^3 n^3 \div n^{-3}$$

$$= M^3 n^{3+(-(-3))}$$

$$= M^3 n^{3+3}$$

$$= M^3 n^6$$

(b) METHOD

To prove that

$\Delta s ABE \equiv CBD$

$AB = CB$ (Given)

$BE = BD$ (Given)

$\angle ABE = \angle CBD = 90^\circ$ (Given)

$\therefore \Delta ABE \equiv \Delta CBD$ (RHS)

11. METHOD

Let the age of Chigo be $x + m$

and Chima be m

$$(m + 3) + m \leq 13$$

$$m + m + 3 \leq 13$$

$$2m + 3 \leq 13$$

$$2m + 3 - 3 \leq 13 - 3$$

$$2m \leq 10$$

$$\frac{2m}{2} \leq \frac{10}{2}$$

$$m \leq 5$$

12. METHOD

$$= \text{K}25\,000 - \text{K}15\,000$$

$$= \text{K}10\,000 \text{ at } 0\%$$

$$= \text{K}10\,000 - \text{K}5\,000$$

$$= \text{K}5\,000$$

$$= \frac{15}{100} \times \text{K}5\,000$$

$$= \text{K}750$$

Note: Because is not more than K20 000 then cannot be taxed at 30%

$$\begin{aligned} 13. (a). &= \frac{1}{2}(\overrightarrow{AB} + \overrightarrow{DC}) \\ &= \frac{1}{2}\left(\begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 5 \\ 6 \end{pmatrix}\right) \\ &= \frac{1}{2}\begin{pmatrix} 3+5 \\ 4+6 \end{pmatrix} \\ &= \begin{pmatrix} 8 \times \frac{1}{2} \\ 10 \times \frac{1}{2} \end{pmatrix} \\ \frac{1}{2}(\overrightarrow{AB} + \overrightarrow{DC}) &= \begin{pmatrix} 4 \\ 5 \end{pmatrix} \end{aligned}$$

(b) METHOD

(i) There are 10 students who play netball

(ii). Students name who play both volleyball and netball are: Jullie, John, Kanike and Susan

$$\begin{aligned} 14. (a). \text{ Total ratio} &= 7:3 \\ &= 7+3 \\ &= 10 \end{aligned}$$

Kidine + Kilombero

$$\text{K } 200/\text{kg} + \text{K}550/\text{kg}$$

$$\text{K } 550/2\text{kg}$$

$$\text{If } 10 = \text{K}550/2\text{kg}$$

$$\therefore 7 = \text{Less}$$

$$\frac{7}{10} \times \text{K}550/2\text{kg}$$

$$\text{K } 385/2\text{kg}$$

$$\text{If } 10 = \text{K}550/2\text{kg}$$

$$\therefore 3 = \text{Less}$$

$$\frac{3}{10} \times \text{K}550/2\text{kg}$$

$$\text{K } 165/2\text{kg}$$

$$\text{K } 385/2\text{kg}$$

$$+ \text{K}165/2\text{kg}$$

$$\text{K}550/4\text{kgs}$$

$$\frac{\text{K}550}{4\text{kgs}}$$

$$\text{K}137.50/\text{kg}$$

(b). Angle sum of any exterior polygon is equal to 360°

$$\therefore 63^\circ + 50^\circ + 91^\circ + 58^\circ + e = 360^\circ$$

$$262^\circ + e = 360^\circ$$

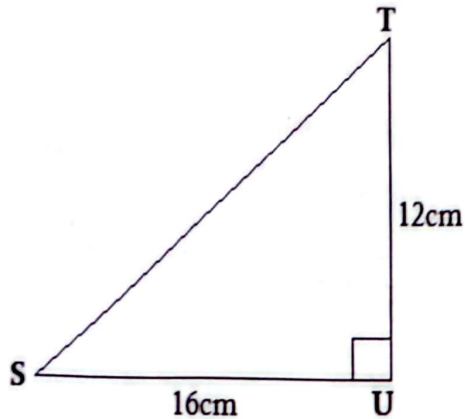
$$e = 360^\circ - 262^\circ$$

$$\therefore e = 98^\circ$$

15. METHOD

$$\begin{aligned} SU &= RQ - UP \\ &= 20 \text{ cm} - 4 \text{ cm} \\ &= 16 \text{ cm} \end{aligned}$$

ΔTSU is right angled



$$\begin{aligned} (TS)^2 &= (TU)^2 + (SU)^2 \\ (\text{Pythagoras theorem}) \\ &= (12 \text{ cm})^2 + (16 \text{ cm})^2 \\ &= 144 \text{ cm}^2 + 256 \text{ cm}^2 \end{aligned}$$

$$(TS)^2 = \sqrt{400 \text{ cm}^2}$$

$$TS = 20 \text{ cm}$$

$$\therefore TS = 20 \text{ cm}$$

16. (a) $\frac{7.165 \times 39.2}{35.2}$

Number	Standard form	Log
7.165	7.165×10^0	0.8552
39.2	3.92×10	<u>+1.5932</u>
		<u>2.4484</u>
35.2	3.52×10^1	1.5465
		2.4484
		<u>-1.5465</u>
7.9792	7.9792×10^0	<u>0.9038</u>

7.98 to 2 decimal places

(b). $4p + 3r = 120 \dots \dots (i)$

$2p + 5r = 130 \dots \dots (ii)$

By eliminating p

$$\begin{array}{l} 2(4p + 3r = 120) \\ 4(2p + 5r = 130) \end{array}$$

$$8p + 6r = 240$$

$$-8p + 20r = 520$$

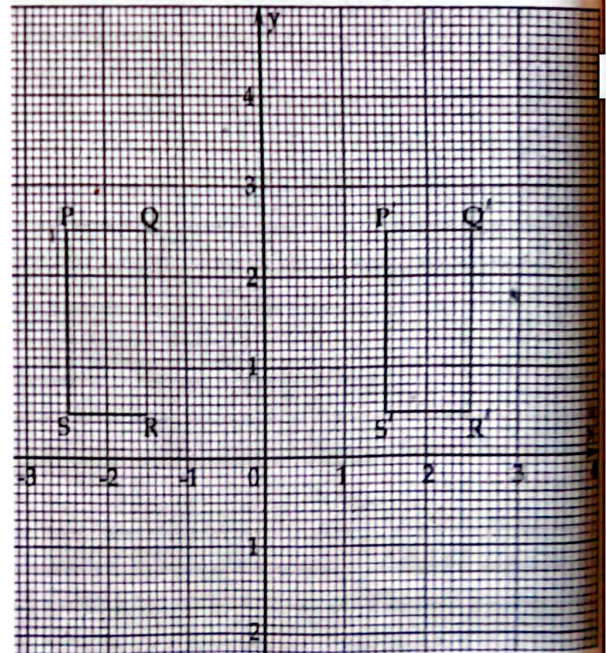
$$0 - 14r = -280$$

$$\frac{-14r}{-14} = \frac{-280}{-14}$$

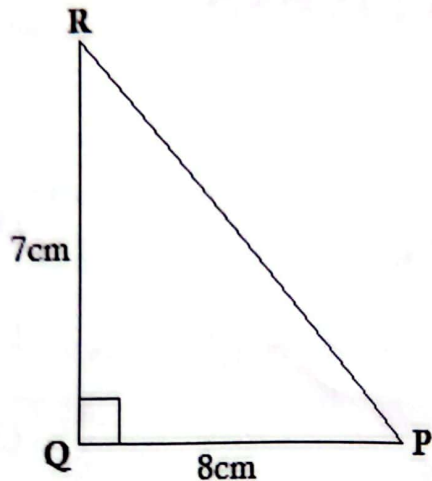
$$r = 20$$

Therefore one rubber costs K20

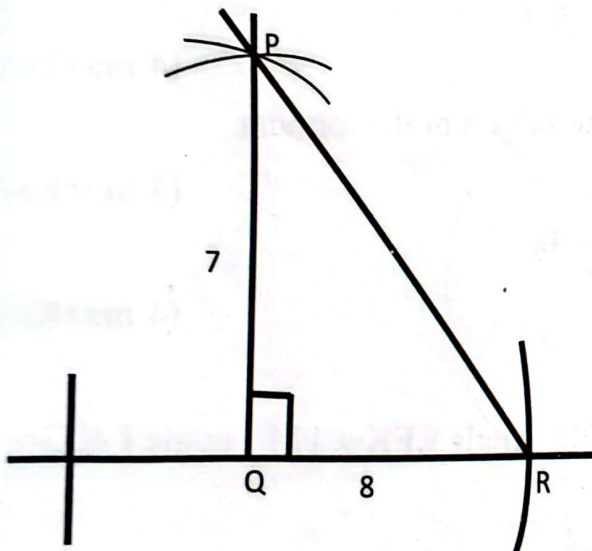
17. METHOD



18. Sketch of the construction



Construction



The length of PR = 10.6 cm

19. METHOD

$$\frac{25}{4}m^2 - 1 = 0$$

$$\left(\frac{5m}{2} + 1\right)\left(\frac{5m}{2} - 1\right) = 0$$

$$\text{If } \left(\frac{5m}{2} + 1\right) = 0$$

$$\therefore \frac{5m}{2} = -1$$

$$2 \times \frac{5m}{2} = -1 \times 2$$

$$5m = -2$$

$$m = -\frac{2}{5}$$

$$\text{If } \left(\frac{5m}{2} - 1\right) = 0$$

$$\therefore \frac{5m}{2} = 1$$

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

$$\frac{5m}{5} = \frac{2}{5}$$

$$m = \frac{2}{5}$$

$$\therefore m = \pm \frac{2}{5}$$

20. METHOD

Area of cylinder open at one end

$$= \pi r^2 + 2\pi rh$$

$$= \pi r(r + 2h)$$

$$= \frac{22}{7} \times 1.4 \text{ cm} (1.4 \text{ cm} + 2 \times 10 \text{ cm})$$

$$= 4.4 \text{ cm} \times 21.4 \text{ cm}$$

$$= 94.16 \text{ cm}^2$$

2015 QUESTIONS

1. Simplify $4 + (-2) - (4)$ (3 marks)
2. Factorise completely $3g^2 - 3$ (3 marks)
3. Simplify $d^2 \times d^{-2}$ (3 marks)
4. Convert 111_2 to base 5 (4 marks)
5. Find the LCM of $2pqr^2$, $12p^2qr$ and $9pq^2r^3$ (4 marks)
6. (a). Given that $t = \frac{n}{2}(a + b)$, make **b** the subject of the formula (3 marks)
- (b). Solve the equation $3x - 13 = 29 - 4x$ (4 marks)
7. In figure 1, EF is parallel to GH and LKJ. Angle EFK = 114° , angle FKG = 36° and $GKH = d^\circ$

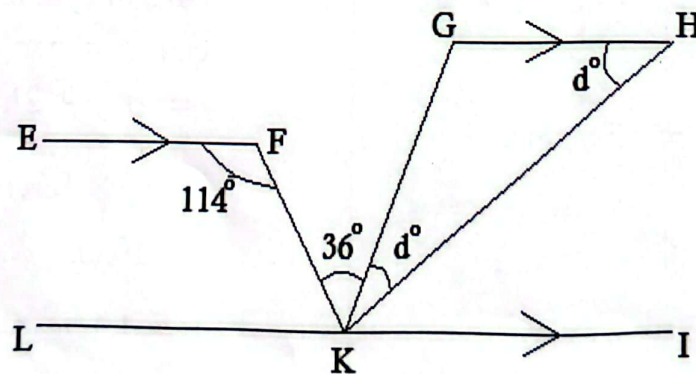


Figure 1

Calculate the value of d°

(5 marks)

8. (a). An insurance company charges premium of K15 per K1 000 per annum of the sum insured. If a house is insured for K250 000, find the premium per annum.

(3 marks)

- (b). Express $\frac{x-y}{4} - \frac{x+y}{5}$ as a single fraction in its lowest form.

(5 marks)

9. (a). A regular polygon has interior angles of 156° each. How many sides has the polygon.

(4 marks)

- (b). Figure 2 is a Venn diagram showing elements of sets X and Y

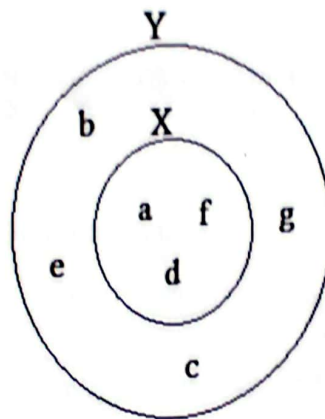


Figure 2

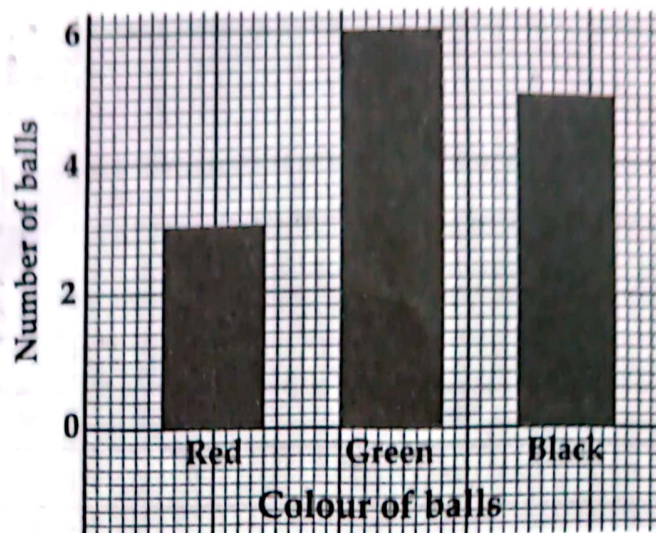
Write down:

- (i) Elements of set Y
- (ii) $n(X \cap Y)$

(4 marks)

10. (a). Solve the inequality $2 - \frac{5m}{3} < 17$

- (b). Figure 3 is a bar chart showing the number of balls of different colours in a box.



If one ball is picked at random from the box, find the probability that it is red
(3 marks)

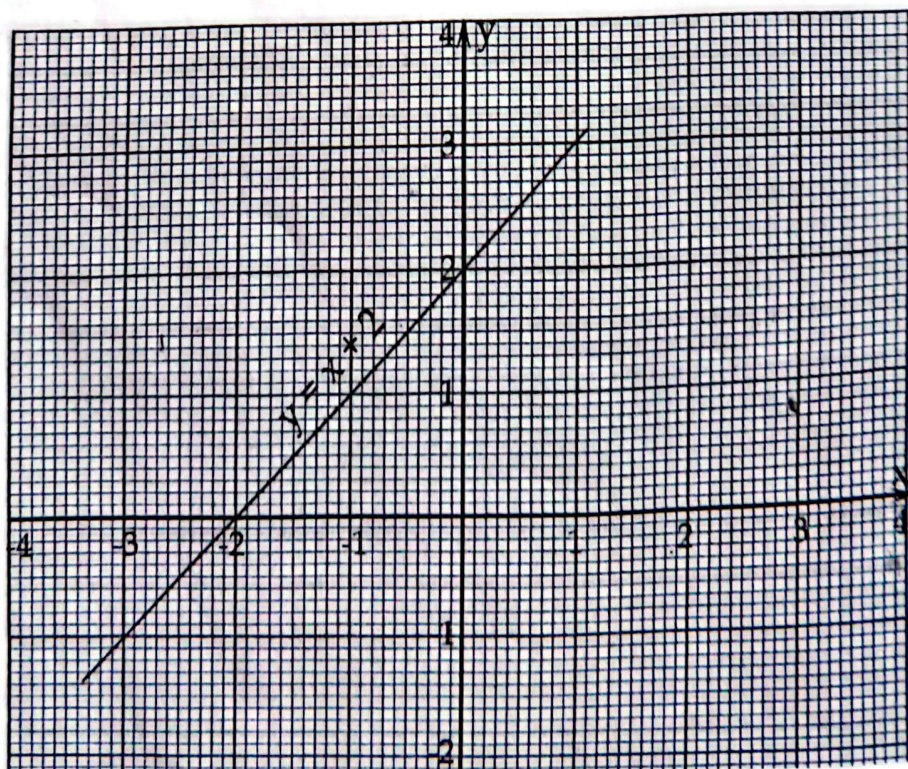
11. Given that triangles **FEJ** and **GHJ** are similar and that **FJ** = 5 cm, **GJ** = 15 cm and **GH** = 27 cm, calculate the length of **FE**.

(4 marks)

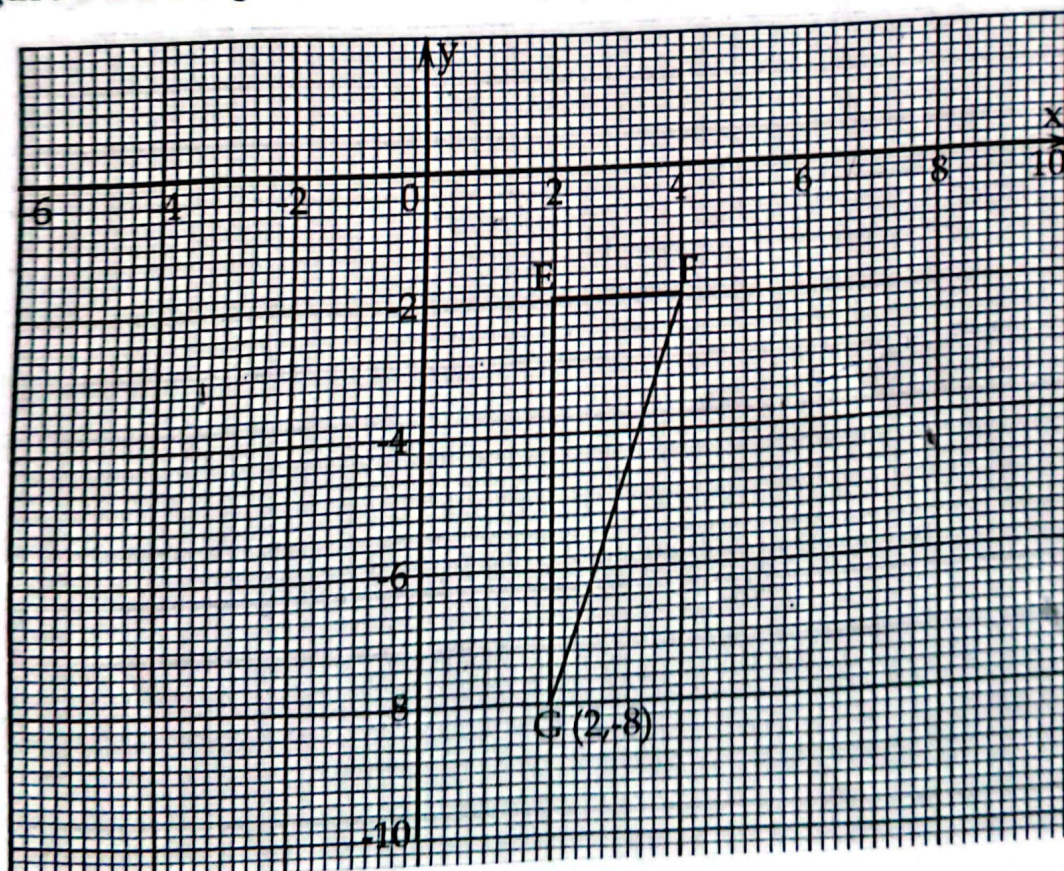
12. The n^{th} term of a sequence is $\frac{1}{n+2}$ and the last term is 0.1. Find the number of terms of the sequence.

(5 marks)

13. Figure 4 shows a graph of the equation $y = x + 2$



- a. On the same graph paper and using the same axes, draw the graph of $y = -x$ from -2 to 0 (3 marks)
- b. Using the graphs, solve the simultaneous equations:
 $y = x + 2$
 $y = -x$ (2 marks)
4. Use logarithms to evaluate $(70.85)^{\frac{1}{3}}$, leaving your answer correct to one decimal place. (4 marks)
5. Three types of beans costing K90/kg, K100/kg and y kwacha/kg are mixed in the ratio 2:3:4 respectively. If the mixture costs K104/kg, find the value of y . (6 marks)
6. Given that $\overrightarrow{PQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$ and $\overrightarrow{RS} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$, find $\overrightarrow{PQ} - 2\overrightarrow{RS}$. (4 marks)
7. Figure 5 is a triangle EFG drawn on a graph paper.



On the same graph paper taking $G(2, -8)$ as a centre of enlargement, draw the image $E^1F^1G^1$ of the triangle EFG after it has been rotated 90° clockwise.

(3 marks)

18. A motorist drove from home to town at a speed of 40 km/h from $8:00\text{ am}$ to $9:30\text{ am}$. She stopped for 30 minutes and then returned home arriving at $12:00\text{ noon}$.

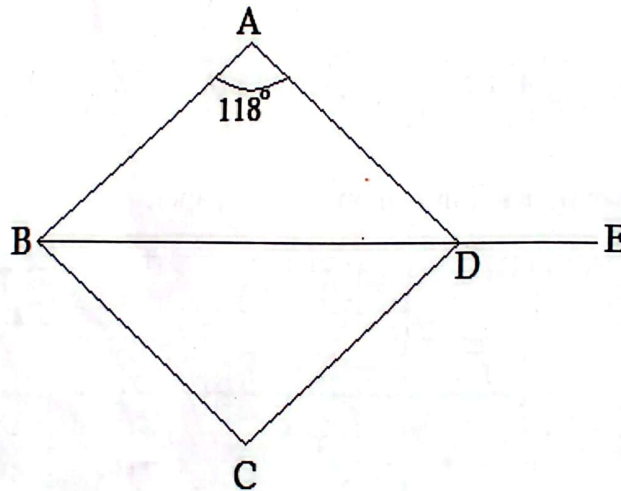
a. Using a scale of 4 cm to represent 1 hour on the horizontal axis and 2 cm to represent 10 km on the vertical axis, draw a distance-time graph of the motorist.

(4 marks)

b. Calculate the speed of the car in km/h on the return journey.

(3 marks)

19. Figure 6 shows a rhombus $ABCD$ and a straight line BDE . Angle $BAD = 118^\circ$



Calculate angle ADE

(5 marks)

20. (a) Using a ruler and a pair of compasses only, construct in the same diagram:

- (i) An equilateral triangle PQR with sides 6 cm each
- (ii) Circumscribed circle of the triangle

(5 marks)

(b) Measure and state the radius of the circle

(1 mark)

2015 SOLUTIONS

1. METHOD

$$4 + (-2) - (-4)$$

$$4 - 2 + 4$$

$$8 - 2$$

$$6$$

2. METHOD

$$3g^2 - 3$$

$$3(g^2 - 1)$$

$$3[(g + 1)(g - 1)]$$

$$3(g + 1)(g - 1)$$

3. METHOD

$$d^2 \times d^{-2}$$

$$d^{2+(-2)}$$

$$d^{2-2}$$

$$d^0$$

$$1$$

4. METHOD

First convert it to base 10

$$1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$1 \times 4 + 2 + 1 \times 1$$

$$4 + 2 + 1$$

$$\therefore 111_2 = 7_{10}$$

Then convert it to the required base in this case base 5

5	7	Remainder
5	1	2
5	0	1

$$\therefore 111_2 \text{ in base } 5 = 12_5$$

5. METHOD

2	$2pqr^2$	$12p^2qr$	$9pq^2r^3$
2	pqr^2	$6p^2qr$	$9pq^2r^3$
3	pqr^2	$3p^2qr$	$9pq^2r^3$
3	pqr^2	p^2qr	$3pq^2r^3$
p	pqr^2	p^2qr	pq^2r^3
p	qr^2	pqr	q^2r^3
q	qr^2	qr	q^2r^3
q	r^2	r	qr^3
r	r^2	r	r^3
r	r	1	r^2
r	1	1	r
	1	1	1

$$\therefore \text{The LCM} = 2 \times 2 \times 3 \times 3 \times p \times p \times q \times q \times r \times r \times r$$

$$= 36p^2q^2r^3$$

6. (a) METHOD

$$t = \frac{n}{2}(a + b)$$

$$2 \times t = 2 \times \frac{n}{2}(a + b)$$

$$2t = n(a + b)$$

$$\frac{2t}{n} = \frac{n}{n}(a + b)$$

$$\frac{2t}{n} = a + b$$

$$\therefore b = \frac{2t}{n} - a$$

(b) METHOD

$$3x - 13 = 29 - 4x$$

$$3x + 4x = 29 + 13$$

$$7x = 42$$

$$\frac{7x}{7} = \frac{42}{7}$$

$$x = 6$$

7. METHOD

$$\text{LKF} = 180^\circ - 114^\circ \text{ (Allied angles)}$$

$$= 66^\circ$$

$$\text{LKG} = \text{LKF} + \text{FKG} \text{ (Given)}$$

$$= 66^\circ + 36^\circ$$

$$= 102^\circ$$

$$\text{HGK} = 102^\circ \text{ (alternate angles)}$$

$$\text{GH//LKJ}$$

$$\text{In } \Delta \text{GKH}$$

$$\text{HGK} + d^\circ + d^\circ = 180^\circ \text{ (Sum of } \Delta \text{)}$$

$$102^\circ + 2d^\circ = 180^\circ$$

$$2d = 180^\circ - 102^\circ$$

$$2d = 78^\circ$$

$$\frac{2d}{2} = \frac{78^\circ}{2}$$

$$d = 39^\circ$$

8. (a) METHOD

$$\text{If K1 000} = \text{K15}$$

$$\therefore \text{K250 000} = \text{more}$$

$$\frac{\text{K250 000}}{\text{K1 000}} \times \text{K15}$$

$$\text{K15} \times 250$$

$$\text{K3 750.00}$$

The premium changed per annum

$$= \text{K3 750.00}$$

(b) METHOD

$$\frac{x-y}{4} - \frac{x+y}{5}$$

$$\frac{5(x-y) - 4(x+y)}{20}$$

$$\frac{5x - 5y - 4x - 4y}{20}$$

$$\frac{5x - 4x - 5y - 4y}{20}$$

$$\frac{x - 9y}{20}$$

9. (a) METHOD

$$180^\circ - 156^\circ \text{ (Adjacent angles)}$$

$$\text{Exterior angle} = 24^\circ$$

$$n = \frac{360^\circ}{\text{exterior angle}}$$

$$n = \frac{360^\circ}{24^\circ}$$

$$n = 15$$

The polygon has 15 sides

(b) (i) METHOD

$$y = \{a, b, c, d, e, f, g\}$$

$$(ii) n(X \cap Y) = 3$$

10. (a). METHOD

$$2 - \frac{5m}{3} < 17$$

$$-\frac{5m}{3} < 17 - 2$$

$$3 \times -\frac{5m}{3} < 15 \times 3$$

$$-5m < 45$$

$$\frac{-5m}{-5} < \frac{45}{-5}$$

$$m > -9$$

(c) METHOD

Red (3), Green (6), Black (5)

$$3 + 6 + 5 = 14$$

$$P(\text{Red}) = \frac{3}{14}$$

11. METHOD

$$\Delta S \frac{FEJ}{GHJ} = \frac{EJ}{HJ} = \frac{FJ}{GJ}$$

$$\frac{FE}{27 \text{ cm}} = \frac{5 \text{ cm}}{15 \text{ cm}}$$

Cross multiplication

$$FE \times 15 \text{ cm} = 5 \text{ cm} \times 27 \text{ cm}$$

$$15FE \text{ cm} = 135 \text{ cm}^2$$

$$\frac{5FE \text{ cm}}{15 \text{ cm}} = \frac{135 \text{ cm}^2}{15 \text{ cm}}$$

$$FE = 9 \text{ cm}$$

12. METHOD

$$\frac{1}{n+2} = 0.1$$

$$\frac{1}{n+2} = \frac{1}{10}$$

Cross multiplication

$$10 = n + 2$$

$$n + 2 = 10$$

$$n = 10 - 2$$

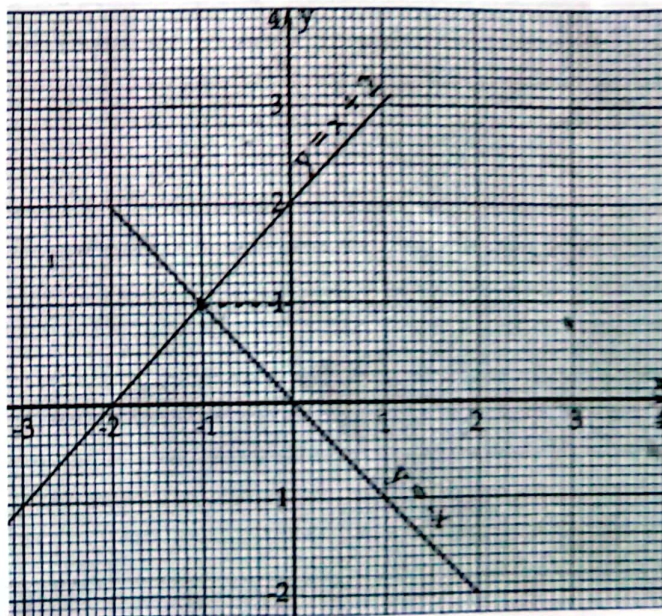
$$\therefore n = 8$$

$$13. (a). y = -x$$

$$y = -(-2)$$

$$y = 2$$

x	-2	-1	0
y	2	1	0



(b). From the graph above,
when $x = -1, y = 1$

14. METHOD

Number	Standard form	Log
$(70.85)^{\frac{1}{3}}$	7.085	1.8503
$\sqrt[3]{70.85}$	$\times 10^1$	3
4.138	4.138	0.6168
	$\times 10^0$	

4.1 (to 1 decimal places)

15. METHOD

$$\begin{aligned} \text{Total ratio} &= 2 + 3 + 4 \\ &= 9 \end{aligned}$$

Total cost of the mixture = K104/kg

Given the 3 types of beans costing K90/kg, K100/kg and y kwacha

Find y

$$\left(\frac{2}{9} \times 90\right) + \left(\frac{3}{9} \times 100\right) +$$

$$\left(\frac{4}{9} \times y\right) = 104$$

$$20 + \frac{100}{3} + \frac{4y}{9} = 104$$

$$\frac{180 + 300 + 4y}{9} = 104$$

$$\frac{480 + 4y}{9} = 104$$

Cross multiplication

$$480 + 4y = 936$$

$$4y = 936 - 480$$

$$4y = 456$$

$$\frac{4y}{4} = \frac{456}{4}$$

$$y = 114$$

$$\therefore y = \text{K114/kg}$$

16. METHOD

$$\vec{PQ} - 2\vec{RS}$$

$$\begin{pmatrix} -1 \\ 8 \end{pmatrix} - 2 \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

$$\begin{pmatrix} -1 \\ 8 \end{pmatrix} - \begin{pmatrix} 2 \times 1 \\ 2 \times 3 \end{pmatrix}$$

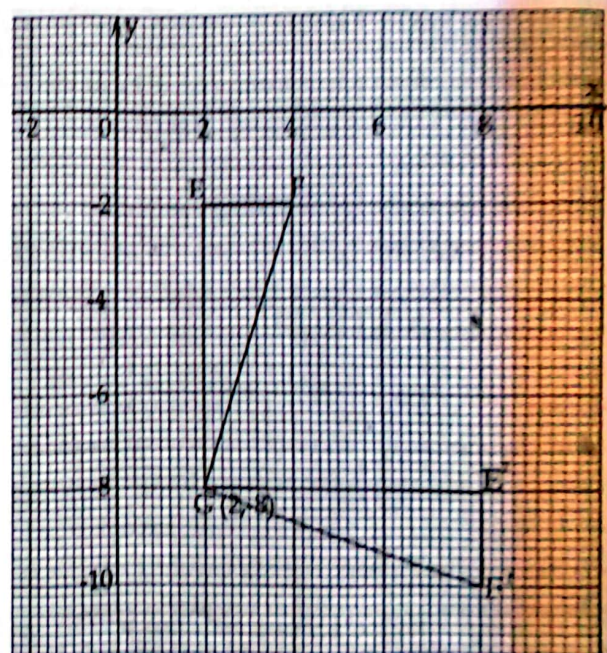
$$\begin{pmatrix} -1 \\ 8 \end{pmatrix} - \begin{pmatrix} 2 \\ 6 \end{pmatrix}$$

$$\begin{pmatrix} -1 - 2 \\ 8 - 6 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$\vec{PQ} - 2\vec{RS} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

17. METHOD



2016 QUESTIONS

1. Simplify $\frac{6+3(-8)-4}{-11}$

(3 marks)

2. (a) A certain substance has a mass of 210g. If its density is 0.7 g/cm^3

(3 marks)

(b) Add 2302_5 to 1423_5 , leaving your answer in base 5.

(2 marks)

3. (a) A liquid at a temperature of 14°C was put in a refrigerator. If the refrigerator cooled the liquid down by 20°C . Find the new temperature of the liquid.

(2 marks)

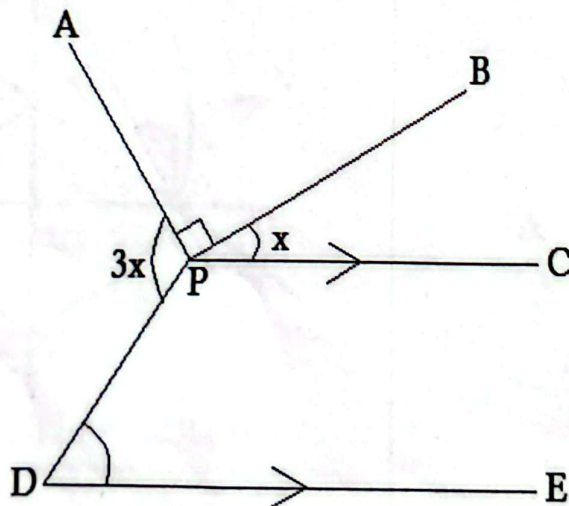
(b) Given that $b + \frac{x}{a} = c$. Make x the subject of the formula

(3 marks)

4. Twelve bottles of the same size contain a total of 8 litres of milk. Calculate the number of litres that could be contained in 9 such bottles

(3 marks)

5. In figure 1, PC is parallel to DE. Angle PDE = 70° , angle APB = 90° , angle APD = $3x^\circ$ and BPC = x° .



Calculate the value of x .

(3 marks)

6. Given that $\vec{EF} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\vec{BC} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$, find $4\vec{EF} + \vec{BC}$

(4 marks)

7. Given that $D = \{\text{beetles, locusts, mosquitoes, houseflies}\}$ and

$P = \{\text{termites, houseflies, ants, locusts, mosquitoes}\}$

a. Draw a Venn diagram to represent the given information

(4 marks)

b. Using the Venn diagram in (a), find $n(D \cup P)$

(1 mark)

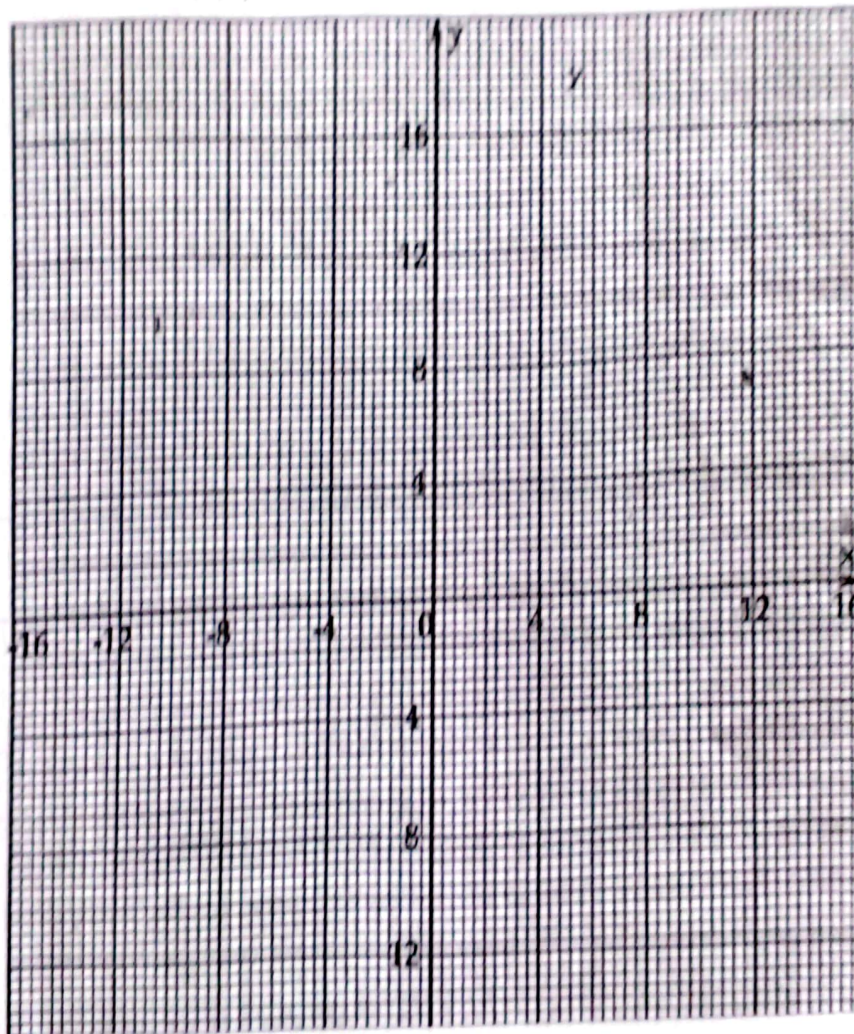
8. (a) Simplify $2^3 a^2 c^0 \times 3a^2 c$

(1 mark)

(b) (i) Plot the following on the Cartesian plane given below: J(2,4), K(4, 2)

L(2,-2)

and M(0,2)



(ii) Use straight lines to join the points JKLM in order to form a quadrilateral JKLM

(iii) Name the type of quadrilateral JKLM

(5 marks)

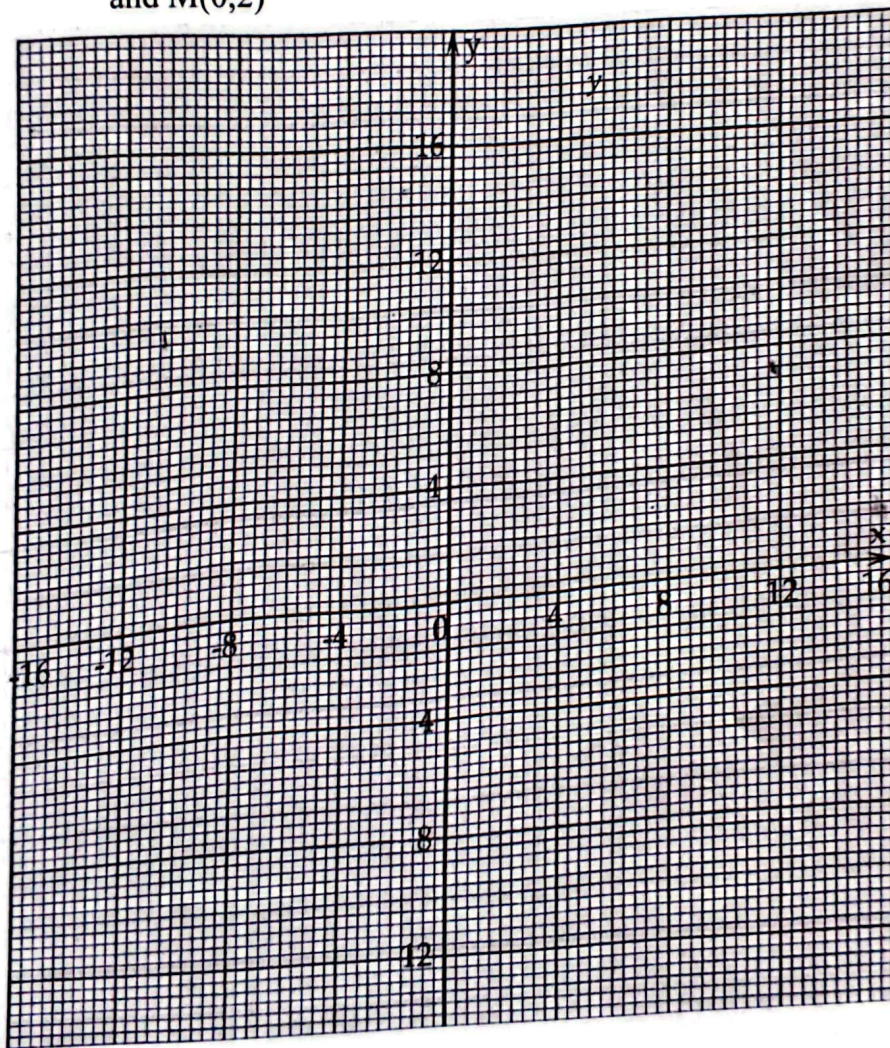
$P = \{\text{termites, houseflies, ants, locusts, mosquitoes}\}$

a. Draw a Venn diagram to represent the given information (4 marks)

b. Using the Venn diagram in (a), find $n(D \cup P)$ (1 marks)

8. (a) Simplify $2^3 a^2 c^0 \times 3a^2 c$ (1 mark)

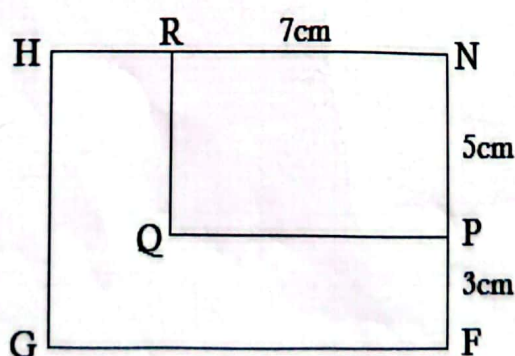
(b) (i) Plot the following on the Cartesian plane given below: J(2,4), K(4, 2)
L(2,-2)
and M(0,2)



(ii) Use straight lines to join the points JKLM in order to form a quadrilateral JKLM

(iii) Name the type of quadrilateral JKLM (5 marks)

9. (a) Solve the equation $3n + 3 - 5(n - 1) = 16$ (3 marks)
- (b) An item costs K2 875. If this amount includes 15% tax. How much tax does the government receive? (4 marks)
10. A student has K500 in her pocket. She decides to spend $9w$ kwacha on exercise books, $4w$ kwacha on pens and remains with less than 110 kwacha. Formulate an equality and solve it to find the value of w (4 marks)
11. Solve the simultaneous equations $5a - b - 3 = 3a - 2b = 22$ (6 marks)
12. Use logarithms to evaluate $(3.851)^2$, giving your answer correct to the nearest whole number (4 marks)
13. Given the sequence 11, 21, 31, 41,, 201. Calculate the number of terms (5 marks)
14. Express $\frac{k-2e}{6} - \frac{k-3e}{8}$ as a single fraction in the simplest form. (4 marks)
15. The exterior angle of a regular convex polygon is x° and its interior angle $(x + 36)^\circ$. Calculate the number of sides of the polygon. (4 marks)
16. **Figure 2** shows a rectangle NPQR which has been enlarged to a rectangle NFGH where N is the centre of enlargement.



If $NP = 5\text{ cm}$, $PF = 3\text{ cm}$ and $NR = 7\text{ cm}$, calculate the length of NH

17. A family has 6 goats, 4 sheep and 2 cattle. Present this information in a pie chart. (5 marks)

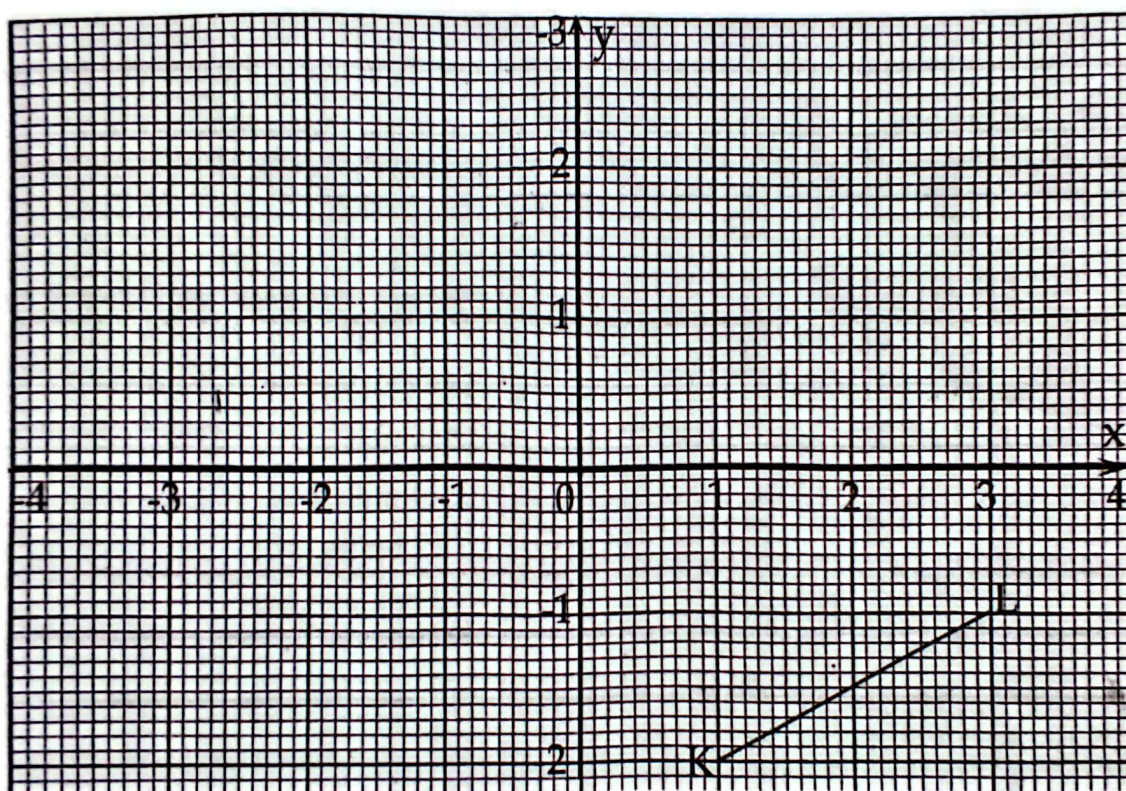
18. A girl has r guavas and a boy has $(r - 4)$ guavas. Given that the product of their number of guavas is 21, form an equation in r and then solve it to find the value of r .

(6 marks)

19. The area of a rhombus is 120cm^2 . Given that one of its diagonals is 24 cm. Find the length of the other diagonals.

(4 marks)

20. (a). figure 3 shows a line KL on a Cartesian plane



If the line **KL** is reflected on the line $y = 1$, on the same Cartesian plane, draw

- Line $y = 1$
- Image K^1L^1

(4 marks)

(b) Using a ruler and a pair of compasses only:

- Construct a triangle **XYZ** in which $XY = YZ = 8\text{cm}$ and angle $XYZ = 120^\circ$
- Measure and state the length of **XZ**

(4 marks)

2016 SOLUTIONS

1. METHOD

$$\begin{array}{r}
 6 + 3(-8) - 4 \\
 \hline
 -11 \\
 6 - 24 - 4 \\
 \hline
 -11 \\
 6 - 28 \\
 \hline
 -11 \\
 -22 \\
 \hline
 -11 \\
 2
 \end{array}$$

2. (a) METHOD

Mass of substance 210g

Density = 0.7 g/cm^3 If $0.7 \text{ g/cm}^3 = 1 \text{ cm}^3$ $\therefore 210 \text{ g} = \text{More}$

$$\frac{210 \text{ g} \times 1 \text{ cm}^3}{0.7 \text{ g} \times 1}$$

$$\underline{\underline{300 \text{ cm}^3}}$$

(b) METHOD

 2302_5 to 1423_5 2302_5 $+1423_5$ $\underline{\underline{4225_5}}$ 3. (a) 14°C

Cooled means minus

$$= -20$$

$$\therefore 14^\circ\text{C} + (-20^\circ\text{C})$$

$$14^\circ\text{C} - 20^\circ\text{C}$$

$$\underline{\underline{-6^\circ\text{C (Frozen)}}}$$

(b) METHOD

$$b + \frac{x}{a} = c$$

To make x the subject formula

$$\frac{x}{a} = c - b$$

$$a \times \frac{x}{a} = (c - b) \times a$$

$$\therefore x = ac - ba$$

4. METHOD

12 bottles

8l of milk total

If 12 bottles = 8l

 $\therefore 9$ bottles = less

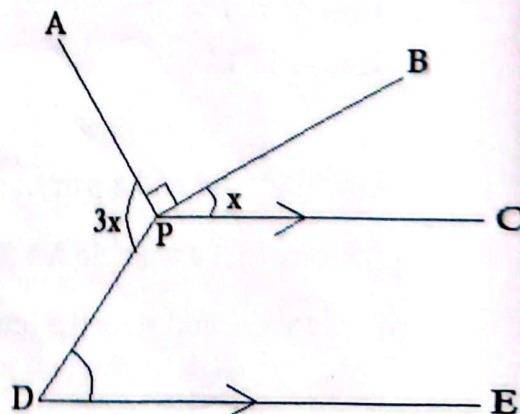
$$\frac{9 \text{ bottles} \times 8 \text{ l}}{12 \text{ bottles} \times 1}$$

$$\frac{72 \text{ l}}{12}$$

$$12$$

 $\underline{\underline{6 \text{ l Contained in 9 bottles}}}$

5. METHOD



With notations from the figure
 $DPC = 180^\circ - 70^\circ$ (Allied angles)

$$DPC = 110^\circ$$

$$3x^\circ + 90^\circ + x^\circ + 110^\circ = 360^\circ \text{ (Angles at point)}$$

$$4x^\circ + 200^\circ = 360^\circ$$

$$4x^\circ + 200 - 200 = 360^\circ - 200^\circ$$

$$4x = 160^\circ$$

$$\frac{4x}{4} = \frac{160^\circ}{4}$$

$$x = 40^\circ$$

6. METHOD

$$\overrightarrow{EF} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}, \overrightarrow{BC} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

$$4\overrightarrow{EF} + \overrightarrow{BC}$$

$$4\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 4 \times 3 \\ 4 \times 2 \end{pmatrix} + \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 12 \\ 8 \end{pmatrix} + \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

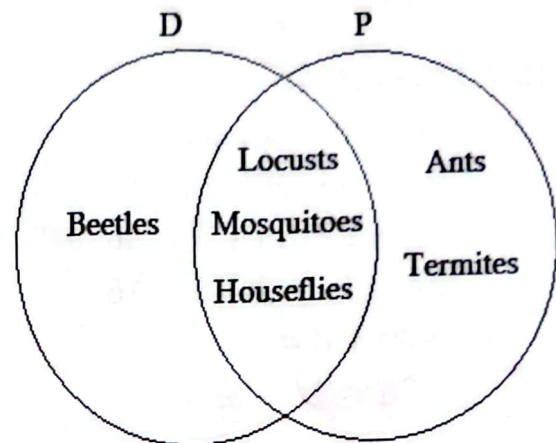
$$\begin{pmatrix} 12 + 6 \\ 8 + 4 \end{pmatrix}$$

$$\begin{pmatrix} 18 \\ 12 \end{pmatrix}$$

$$7. D = \left\{ \begin{array}{l} \text{Beetles, locust, mosquitoes,} \\ \text{houseflies} \end{array} \right\}$$

$$P = \left\{ \begin{array}{l} \text{terminates, houseflies,} \\ \text{ants, locust, mosquitoes} \end{array} \right\}$$

8. (a) Below is the Venn diagram



$$(b) n(D \cup P) = \left\{ \begin{array}{l} \text{Locusts, Mosquitoes,} \\ \text{Houseflies} \end{array} \right\}$$

$$= 3$$

9. (a) To simplify

$$2^3 a^2 c^0 \times 3a^{-2} c$$

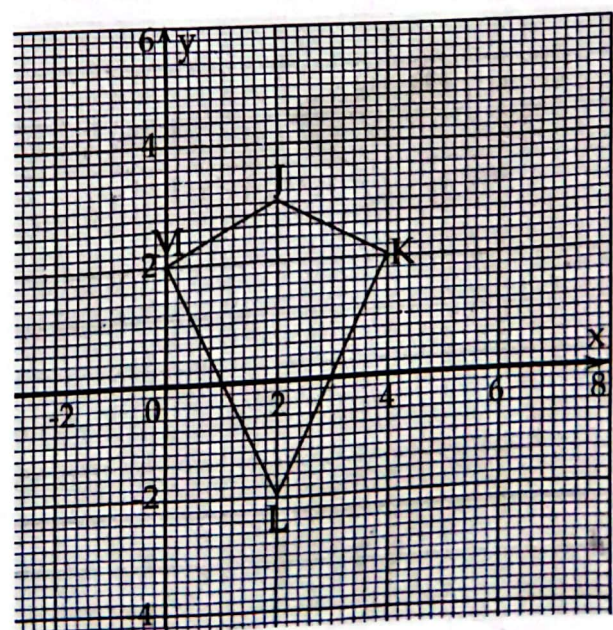
$$2 \times 2 \times 2 \times 3 \times a^2 \times a^{-2} \times c$$

$$24a^{2-2} c$$

$$24a^0 c$$

$$24c$$

(b) (i) METHOD



(ii). The quadrilateral is a Kite

10. (a) METHOD

To solve the equation

$$3n + 3 - 5(n - 1) = 16$$

$$3n + 3 - 5n + 5 = 16$$

$$3n - 5n + 3 + 5 = 16$$

$$-2n + 8 = 16$$

$$-2n = 16 - 8$$

$$2n = 8$$

$$\frac{-2n}{-2} = \frac{8}{-2}$$

$$n = -4$$

(b) METHOD

$$CP = K2875$$

$$VAT = 15\%$$

$$\text{If } 100\% = K2\ 875$$

$$\therefore 15\% \text{ tax} = \text{Less}$$

$$\frac{15\%}{100\%} \times K2\ 875$$

$$0.15 \times K2\ 875$$

$$K431.25 \text{ goes to government}$$

11. METHOD

$$500 - 9w - 4w < 110$$

$$500 - 13w < 110 \text{ is the}$$

inequality

$$-13w < 110 - 500$$

$$-13w < -390$$

Note when the inequality is divided by a negative number it changes the direction

$$\frac{-13w}{-13} < \frac{-390}{-13}$$

$$\therefore w > 30$$

12. METHOD

To solve the simultaneous equations below

$$(5a - b - 3) = (3a - 2b) = 22$$

$$x = y = z$$

$$x = y \dots \dots \dots (i)$$

$$y = z \dots \dots \dots (ii)$$

$$5a - b - 3 = 3a -$$

$$b \dots \dots \dots (iii)$$

$$3a - 2b = 22 \dots \dots \dots (ii)$$

$$5a - 3a - b - 2b = 3$$

$$2a + b = 3 \dots \dots \dots (iv)$$

$$3a - 2b = 22 \dots \dots \dots (v)$$

$$b = 3 - 2a \dots \dots \dots (vi)$$

Substitute (vi) into (ii)

$$3a - 2(3 - 2a) = 22$$

$$3a - 6 + 4a = 22$$

$$3a + 4a = 22 + 6$$

$$7a = 28$$

$$\frac{7a}{7} = \frac{28}{7}$$

$$a = 4$$

$$b = 3 - 2a$$

$$b = 3 - 2(4)$$

$$b = 3 - 8$$

$$b = -5$$

$$\text{When } a = 4, b = -5$$

13. METHOD

To evaluate by logarithms

$$(3.851)^2$$

Number	Standard form	Log
3.851	3.851	0.5856
	$\times 10^0$	$\times 2$
14.84		<u>1.1712</u>
	1.484	
	$\times 10^1$	

15 to the nearest whole number

14. METHOD

11, 21, 31, 41, 201

$$a = 11$$

$$d = 21 - 11$$

$$d = 10$$

$$a + (n - 1)d = \text{Last term}$$

$$11 + (n - 1)10 = 201$$

$$11 + 10n - 10 = 201$$

$$10n + 1 = 201$$

$$10n = 201 - 1$$

$$10n = 200$$

$$\frac{10n}{10} = \frac{200}{10}$$

$$n = 20$$

There are 20 terms

15. To express as a single fraction

$$\begin{aligned} \frac{k-2e}{6} - \frac{k-3e}{8} \\ \frac{4(k-2e) - 3(k-3e)}{24} \\ \frac{4k-8e-3k+9e}{24} \\ \frac{k+e}{24} \\ \frac{e+k}{24} \end{aligned}$$

$$16. \text{Exterior angle} = x^\circ$$

$$\text{Interior angle} = (x + 36)^\circ$$

$$x + x + 36^\circ = 180^\circ \text{ (Adjacent angles)}$$

$$2x = 180^\circ - 36^\circ$$

$$2x = 144$$

$$\frac{2x}{2} = \frac{144}{2}$$

$$x = 72^\circ$$

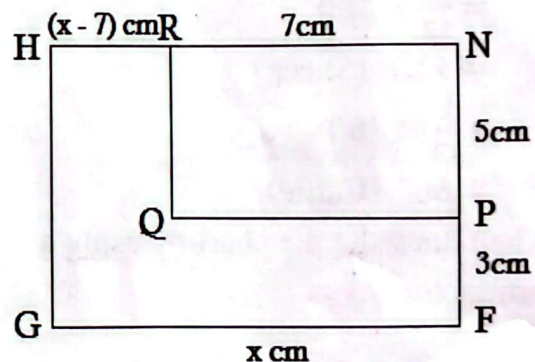
$$n = \frac{360^\circ}{\text{Exterior angle}}$$

$$n = \frac{360^\circ}{72^\circ}$$

$$n = 5$$

The polygon has 5 sides which means it is a pentagon

17. METHOD



Let FG be x and $FG = NH$ (Given)

In rectangles

$$\frac{NFGH}{NPQR} = \frac{NF}{NP} = \frac{FG}{PQ} = \frac{GH}{QR} = \frac{NH}{NR}$$

$$\frac{8\text{ cm}}{5\text{ cm}} = \frac{x\text{ cm}}{7\text{ cm}} = \frac{8\text{ cm}}{5\text{ cm}} = \frac{x}{7} \cdot \frac{8\text{ cm}}{5\text{ cm}} = \frac{x\text{ cm}}{7\text{ cm}}$$

Cross multiplication

$$5 \times x = 8\text{ cm} \times 7$$

$$5x = 56\text{ cm}$$

$$\frac{5x}{5} = \frac{56 \text{ cm}}{5}$$

$$x = 11.2 \text{ cm}$$

$$\therefore \text{NH} = 11.2 \text{ cm}$$

18. METHOD

6 goats, 4 sheep, 2 cattle

Total number of animals

$$= 6 + 4 + 2$$

$$= 12$$

$$\text{If } 12 = 360^\circ$$

$$\therefore 6 \text{ goats} = \text{Less}$$

$$\frac{6}{12} \times 360^\circ$$

$$= 180^\circ \text{ (Goats)}$$

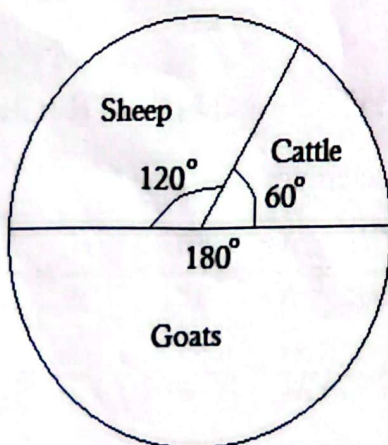
$$= \frac{4}{12} \times 360^\circ$$

$$= 120^\circ \text{ (Sheep)}$$

$$= \frac{2}{12} \times 360^\circ$$

$$= 60^\circ \text{ (Cattle)}$$

Then draw the pie chart by using a protractor



19. METHOD

$$r \times (r - 4) = 21$$

$$r(r - 4) = 21$$

$$r^2 - 4r = 21$$

$$r^2 - 4r - 21 = 0$$

$$(r - 7)(r + 3) = 0$$

$$\text{If } (r - 7) = 0$$

$$\therefore r = 7$$

$$\text{If } (r + 3) = 0$$

$$\therefore r = -3$$

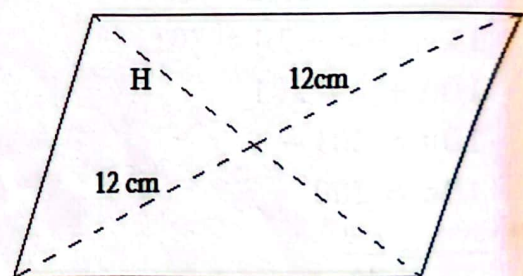
$$\text{Either } r = -3 \text{ or } r = 7$$

20. METHOD

Given: Area of Rhombus 120 cm^2

Each diagonal = 24 cm

R.T.F: Length of other diagonal



Area of Rhombus = Base $\times$ Height

$$120 \text{ cm}^2 = 24 \text{ cm} \times H$$

$$24H \text{ cm} = 120 \text{ cm}^2$$

$$\frac{24H \text{ cm}}{24 \text{ cm}} = \frac{120 \text{ cm}^2}{24 \text{ cm}}$$

$$H = 5 \text{ cm}$$

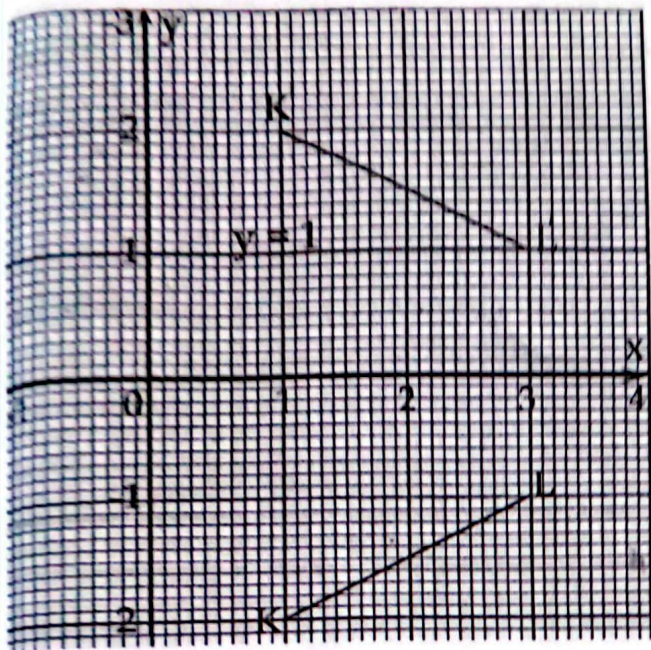
$$H \times 2 = \text{other diagonal}$$

$$\text{But } H = 5 \text{ cm}$$

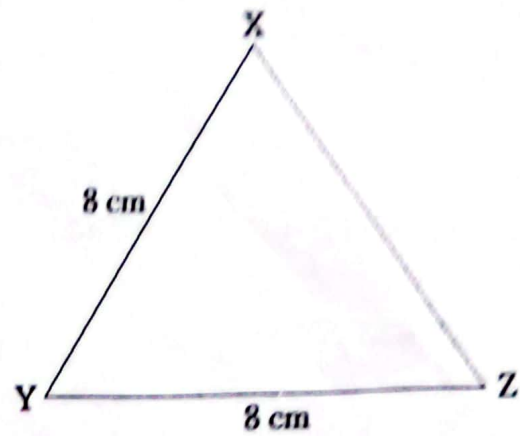
$$\text{Other diagonal} = 5 \text{ cm} \times 2$$

$$= 10 \text{ cm}$$

21. (a)



(b) (i) Sketching



(ii). $XZ = 14 \text{ cm}$

Pink like left
a beautiful
Smile

2021 QUESTIONS

SECTION A (70 MARKS)

Answer all questions

1. Given that $p = -1$, $r = 2$ and $t = 4$ evaluate $prt - \frac{3}{4}tr$.
(3 marks)
2. a. Simplify $2305_6 + 692_{10}$, giving the answer in base 6.
(4 marks)
b. Simplify $-2[(3y - 2x)(y + 6x)]$.
(3 marks)
3. a. Simplify $2y^0 - 27^{\frac{1}{3}}$.
(4 marks)
b. Find the n th term of the sequence 39, 33, 27, 21, 15...
(4 marks)
4. Make r subject of the formula $\frac{1}{3} = \frac{a}{b-xr}$.
(3 marks)
5. Mrs Tembo wants to buy the following items: 4kg of rice at K550 per Kg, 2 units of soap at K100 each and 15 bananas and 3 bananas for K200. Prepare a budget for Mrs Tembo.
(5 marks)
6. Solve the equation $18r^2 - 8 = 0$
(6 marks)
7. A box contains 10 red pens, 15 black pens and 5 green pens. Calculate the probability of picking a red pen at random.
(3 marks)
8. In Figure 1, MN is parallel to PR, angle QPR = 63° and angle MNP = 40° .
Diagram to be drawn

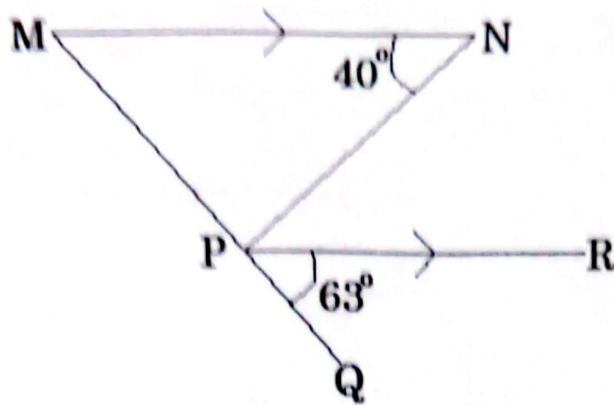
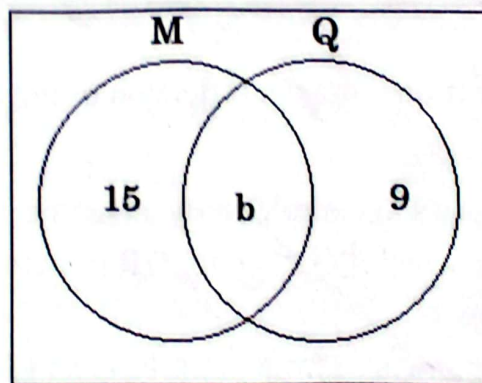


Figure 1

Calculate the size of angle MPN.

(4 marks)

9. Figure 2 is a Venn diagram showing number of elements for sets M and Q.



Given that $n(M \cup Q) = 34$, find $n(M \cap Q)$.

(4 marks)

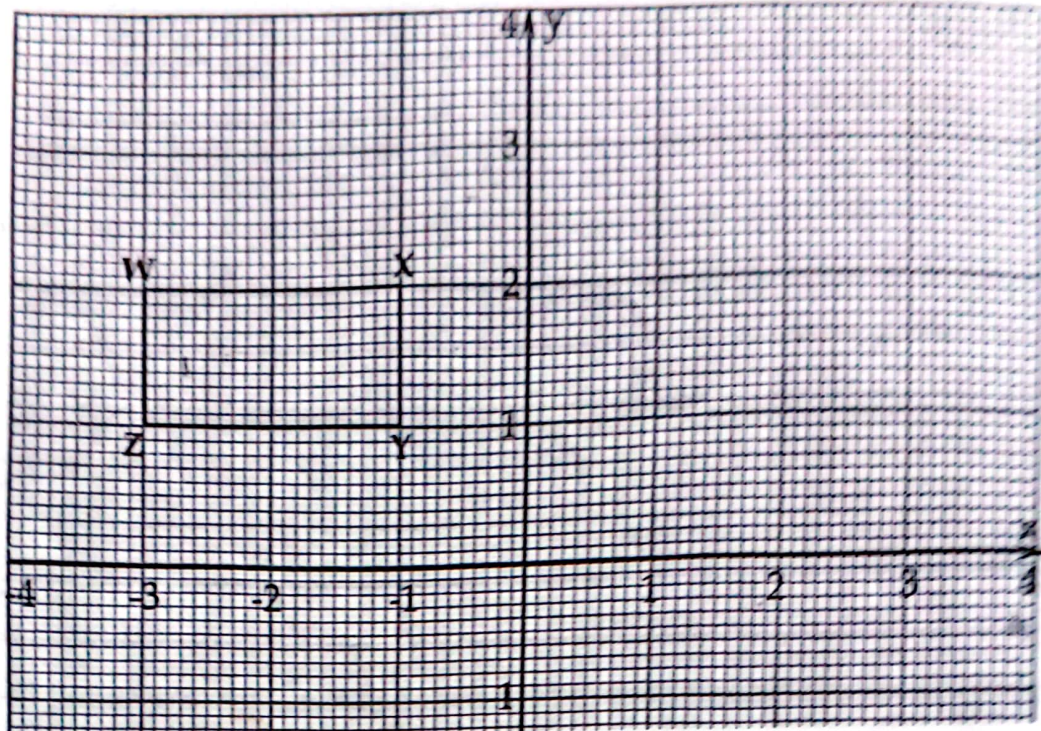
10. A business lady mixed 8 bags of red beans costing K600 per Kg with y bags of white beans costing K450 per Kg. Given that the mixture cost K550 per Kg calculate the value of y .

(5 marks)

11. Use logarithms to simplify 96.42×9.147 , giving the answer correct to three significant figures.

(4 marks)

12. Figure 3 shows a rectangle WXYZ drawn on the graph paper.



Using $x = 1$ as a mirror line, draw a reflection of the rectangle WXYZ

(3 marks)

13. Using a pair of compasses and a ruler only, construct in the same diagram:

a. A triangle PQR in which $PQ = 3 \text{ cm}$, $QR = 5 \text{ cm}$ and $PR = 7 \text{ cm}$

(2 marks)

b. A point which is equidistant from point P, Q and R.

(2 marks)

14. In Figure 4, MN is parallel to PQ.

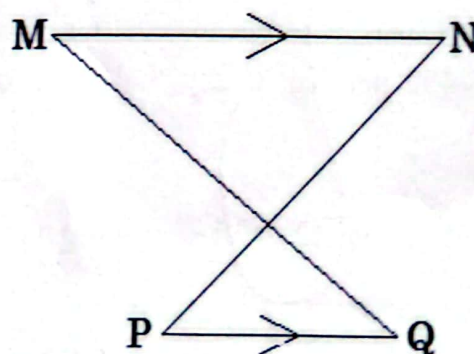


Figure 4

Show that triangle MNR is similar to triangle QPR.

(5 marks)

15. A cylinder open on one end has a diameter of 14 cm and a total surface area of 1232cm. Calculate the height of the cylinder. (Take $= \frac{22}{7}$)
(7 marks)

SECTION B (30 marks)

Answer all the five question

16. Solve the following inequality 16 and present the answer on a number line.
(5 marks)
17. The table below shows values of x and y for the equation $y = 2x + 5$.
a. Complete the table.
(2 marks)
- b. Using a scale of $y = 2x + 5$ on the graph paper provided on page 11.
(3 marks)
- c. Use the graph to solve the equation $y = 2x + 5$ and $y = 2$ simultaneously.
(2 marks)
18. A student has x K50 notes and y K250, calculate the values of x and y .
(7 marks)
19. Figure 5 shows size of form two boys at Takhonza secondary school.

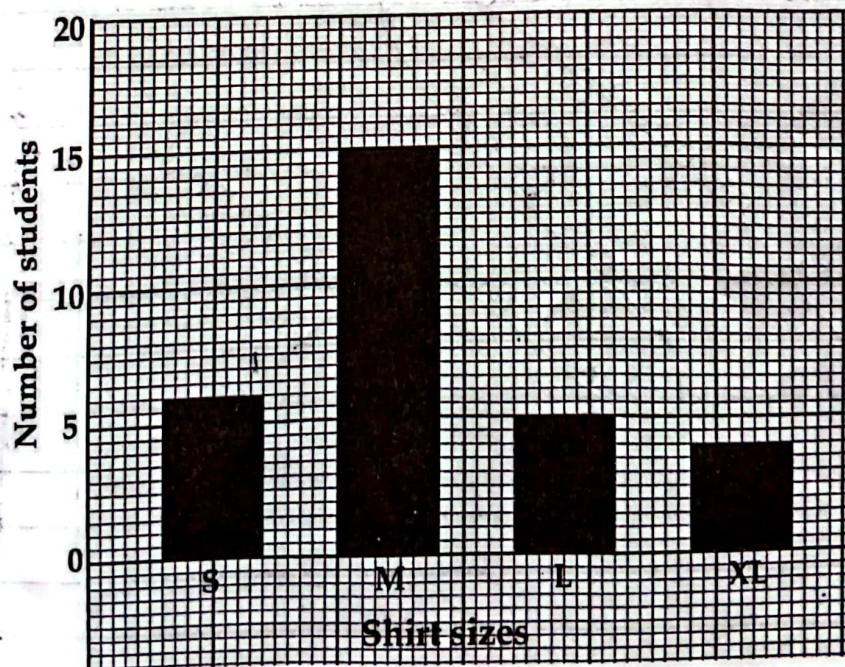


Figure 5

- a. Find the model shirt size.
(1 marks)
- b. Find the number of boys who wear the model shirt size.
(1 marks)

c. Calculate the total number of form two boys at Takhonza Secondary School
(3 marks)

20. Figure 6 is a rhombus PQRS in which PR and QS meet at N.
If $PQ = 480\text{cm}$, calculate the length of PR

(7 marks)

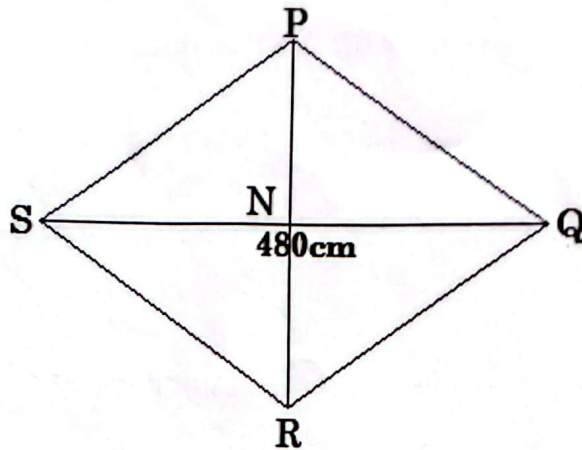


Figure 6

Li mannana was
here before you
fake love
cute nannah
left
a

2021 SOLUTIONS

SECTION A (70 MARKS)

1. METHOD

$$p = -1, r = 2, t = 4$$

$$prt - \frac{3}{4}tr$$

Let's factorise rt or tr

$$rt\left(p - \frac{3}{4}\right)$$

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

$$8\left(-1\frac{3}{4}\right)$$

$$8 \times -\frac{7}{8}$$

$$-14$$

2. a. METHOD

$2305_6 + 692_{10}$ Into base 6

Since 2305_6 is already in base 6,
so let's convert 692_{10} into base 6.

6	692	2
6	115	5
6	19	1
6	3	3
	0	

$$692_{10} = 3152_6$$

Let's add up the numbers

$$3152_6$$

$$2305_6$$

$$5502_6$$

b. METHOD

$$-2[(3y - 2x)(y + 6x)]$$

$$-2[3y(y + 6x) - 2x(y + 6x)]$$

$$-2[3y^2 + 18xy - 2xy - 12x^2]$$

$$-2[3y^2 + 16xy - 12x^2]$$

$$-6y^2 - 32xy + 24x^2$$

$$24x^2 - 32xy - 6y^2$$

3. a. METHOD

$$2y^0 - 27^{\frac{1}{3}}$$

Any number raised to power
zero is same as one

$$y^0 = 1$$

$$2 \times 1 - \sqrt[3]{27}$$

$$2 - 3$$

$$-1$$

b. METHOD

39, 33, 27, 21, 15, AP

1st number = $a = 39$

Common difference = d

$d = 2^{\text{nd}} \text{ number} - 1^{\text{st}} \text{ number}$

(Vice versa)

$$= 33 - 39$$

$$= -6$$

$n^{\text{th}} \text{ term} = a + (n - 1)d$

$$= 39 + (n - 1)(-6)$$

$$= 39 - 6n + 6$$

$$= 45 - 6n$$

4. METHOD

$$\frac{1}{3} = \frac{a}{b-xr}$$

By cross multiplication

$$1 \times (b - xr) = a \times 3$$

$$b - xr = 3a$$

$$b - 3a = xr$$

$$xr = b - 3a$$

$$\frac{xr}{x} = \frac{b-3a}{x}$$

$$r = \frac{b-3a}{x}$$

5. METHOD

Prepare a budget for Mrs Tembo

$$4 \text{ kg of rice at K550 per kg} = 4 \times 550 = 2200$$

$$2 \text{ units of soap at K100 each} = 2 \times 100 = 200$$

15 bananas at 3 bananas for K200
which means 3 bananas at K200

$$\frac{15}{3} = 5, = 5 \times 200 = 1000$$

Item	Amount
4 kg rice	2200
2 units of soap	200
15 bananas at 3 bananas	<u>1000</u>
Total budget	<u>K3 400</u>

6. METHOD

$$18r^2 - 8 = 0$$

Factor out the HCF

$$2(9r^2 - 4) = 0$$

Divide by 2 both sides

$$\frac{2(9r^2 - 4)}{2} = \frac{0}{2}$$

$$9r^2 - 4 = 0$$

$$9r^2 = 4$$

Divide by 9 both sides of the expressions

$$\frac{9r^2}{9} = \frac{4}{9}$$

$$r^2 = \frac{4}{9}$$

Take out the square of r

$$\sqrt{r^2} = \pm \sqrt{\frac{4}{9}}$$

$$r = \pm \frac{2}{3}$$

7. METHOD

Total probability

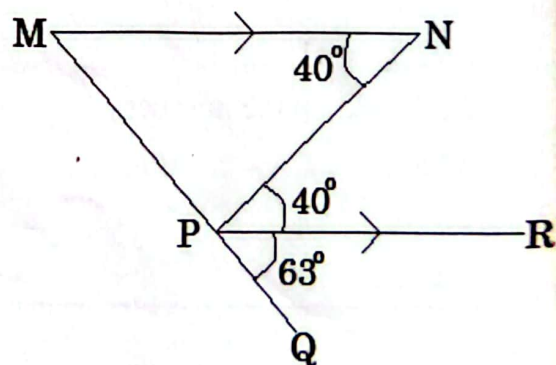
$$10 \text{ red} + 15 \text{ black} + 5 \text{ green} = 10 \text{ pens}$$

$$P(\text{red}) = \frac{\text{Number of red pens}}{\text{Total number of pens}}$$

$$= \frac{10}{30}$$

$$\therefore P(r) = \frac{1}{3}$$

8. METHOD



With notations from given figure.

$\angle NPR = \angle MNP = 40^\circ$ (alternate angles)

MPQ is a straight line

$\angle MPN = 180^\circ - (\angle NPR + \angle RPQ)$

(Adjacent angles on straight line)

$= 180^\circ - (40^\circ + 63^\circ)$

$= 180^\circ - 103^\circ$

$= 77^\circ$

9. METHOD

$$n(M) + n(Q) + n(M \cap Q) = n(M \cup Q)$$

$$15 + 9 + b = 34$$

$$24 + b = 34$$

$$b = 34 - 24$$

$$\therefore b = 10$$

10. METHOD

Let's multiply 8 bags of red beans with K600 and y bags with K450 and then equate to $(8 + y) \times 550$

$$(8 \times 600) + (y \times 450) = (8 + y) \times 550$$

$$4800 + 450y = 4400 + 550y$$

Grouping like terms together

$$550y - 450y = 4800 - 4400$$

$$100y = 400$$

Divide by 100 both sides

$$\frac{100y}{100} = \frac{400}{100}$$

$$\therefore y = 4$$

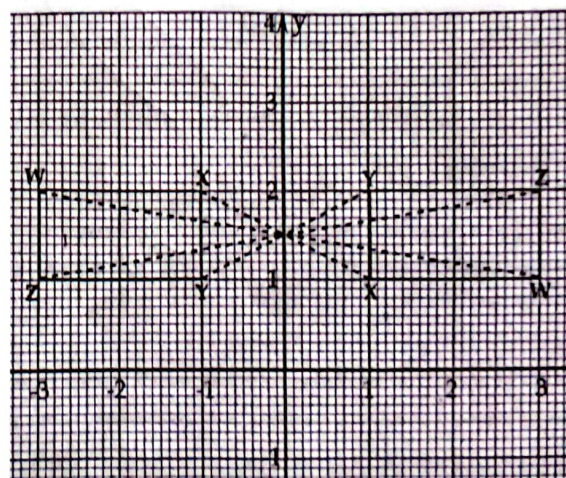
11. METHOD

$$96.42 \times 9.147$$

Number	STF	Log
96.42	96.42×10^1	1.9842
9.147	9.147×10^0	0.9613
882.06	8.8206×10^2	2.9455

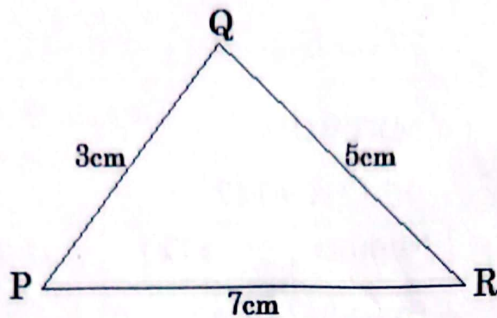
To 3 significant figures = 882.

12. METHOD

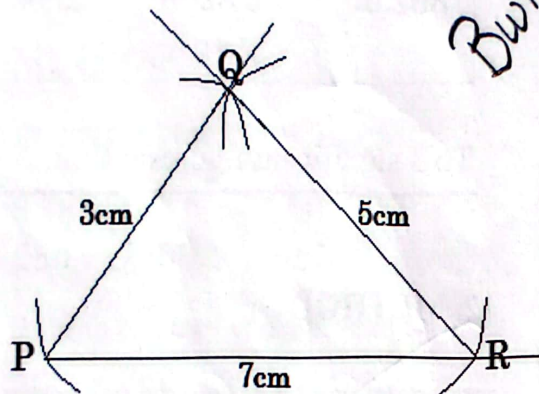


13. METHOD

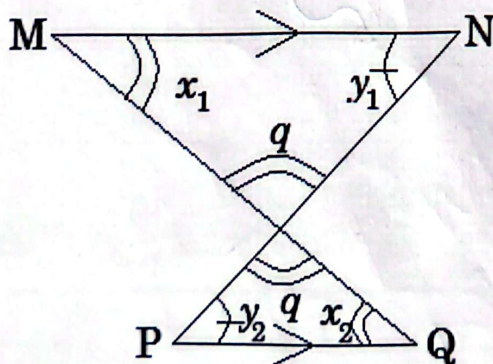
Sketching



Construction



14. METHOD



In Δ s MNR and QPR

With notations from figure above

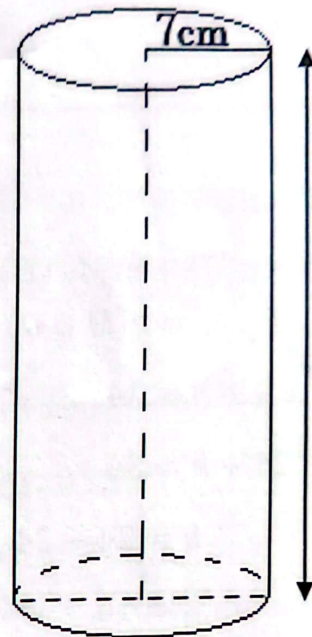
$x_1 = x_2$ (Alternate angles)

$$y_1 = y_2 \text{ (Alternate angles)}$$

$$q = q \text{ (Common)}$$

$$\therefore \Delta MNR \parallel \Delta QPR \text{ (AAA)}$$

15. METHOD



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

$$r = \frac{14\text{cm}}{2} = 7\text{cm}$$

Let the height be h

$$\text{Area} = \pi r^2 + 2\pi r h$$

$$\text{Area} = \pi r(r + 2h)$$

$$1232\text{cm}^2 = \frac{22}{7} \times 7\text{cm}(7\text{cm} + 2h)$$

$$1232\text{cm}^2 = 22(7\text{cm} + 2h)$$

$$\frac{22\text{cm}(7\text{cm} + 2h)}{22\text{cm}} = \frac{1232\text{cm}^2}{22\text{cm}}$$

$$7\text{cm} + 2h = 56\text{cm}$$

$$2h = 56\text{cm} - 7\text{cm}$$

$$2h = 49\text{cm}$$

$$\frac{2h}{2} = \frac{49\text{cm}}{2}$$

$$\therefore h = 24.5\text{ cm}$$

SECTION B (30 MARKS)

16. METHOD

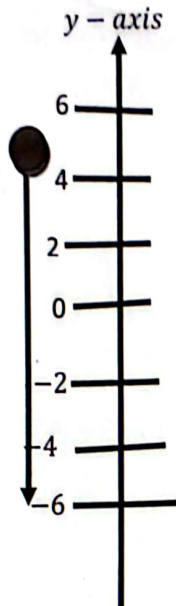
$$\frac{y+28}{2} \leq 16$$

$$2 \times \frac{y+28}{2} \leq 16 \times 2$$

$$y + 28 \leq 32$$

$$y \leq 32 - 28$$

$$y \leq 4$$



17. METHOD

To complete the table of values

$$y = 2x + 5$$

$$y = 2(2) + 5$$

$$y = 4 + 5$$

$$y = 9$$

x	-3	0	2
y	-1	5	9

Check at the end

18. METHOD

$$x + y = 8 \dots \dots \dots \text{(i)}$$

$$50x + 20y = 250 \dots \dots \dots \text{(ii)}$$

By using substitution method

$$x = 8 - y \dots \dots \dots \text{(iii)}$$

Substitute x in equation (ii)

$$50(8 - y) + 20y = 250$$

Grouping like terms

$$-50y + 20y = 250 - 400$$

$$-30y = -150$$

To find y divide by -30 both sides

$$\frac{-30y}{-30} = \frac{-150}{-30}$$

$$y = 5$$

Substitute y in equation (iii)

$$x = 8 - 5$$

$$x = 3$$

$$\therefore x = 3 \text{ and } y = 5$$

19. METHOD

a. Modal is the most frequently number. In this case the modal = M

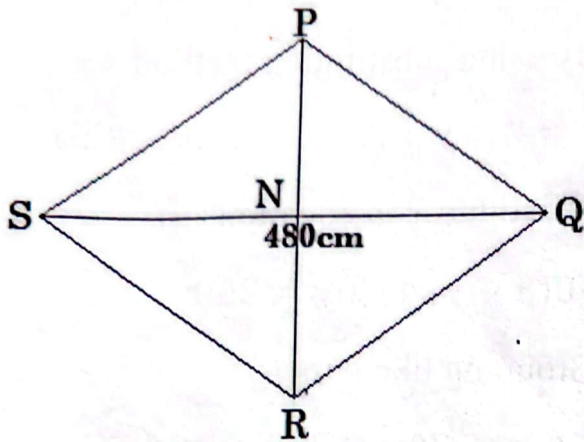
b. Number of boys = 15

c. Total number = S + M + L + XL

$$= 6 + 15 + 5 + 4$$

$$= 30$$

20. METHOD



Given that $PQ = 250\text{cm}$ and $QS = 480\text{cm}$

Note that the diagonals of a rhombus intersect at a right angle.

$$\therefore SN = NQ \text{ (given)}$$

$$NQ = \frac{SQ}{2} = \frac{480\text{cm}}{2} = 240\text{cm}$$

$$PN = \frac{PR}{2}$$

Let PR be x

So if $PR = x$

$$\therefore PN = \frac{x}{2}$$

To find PN , use Pythagoras theorem

$$(PN)^2 = (PQ)^2 - (NQ)^2$$

Cute n Lia left a heart

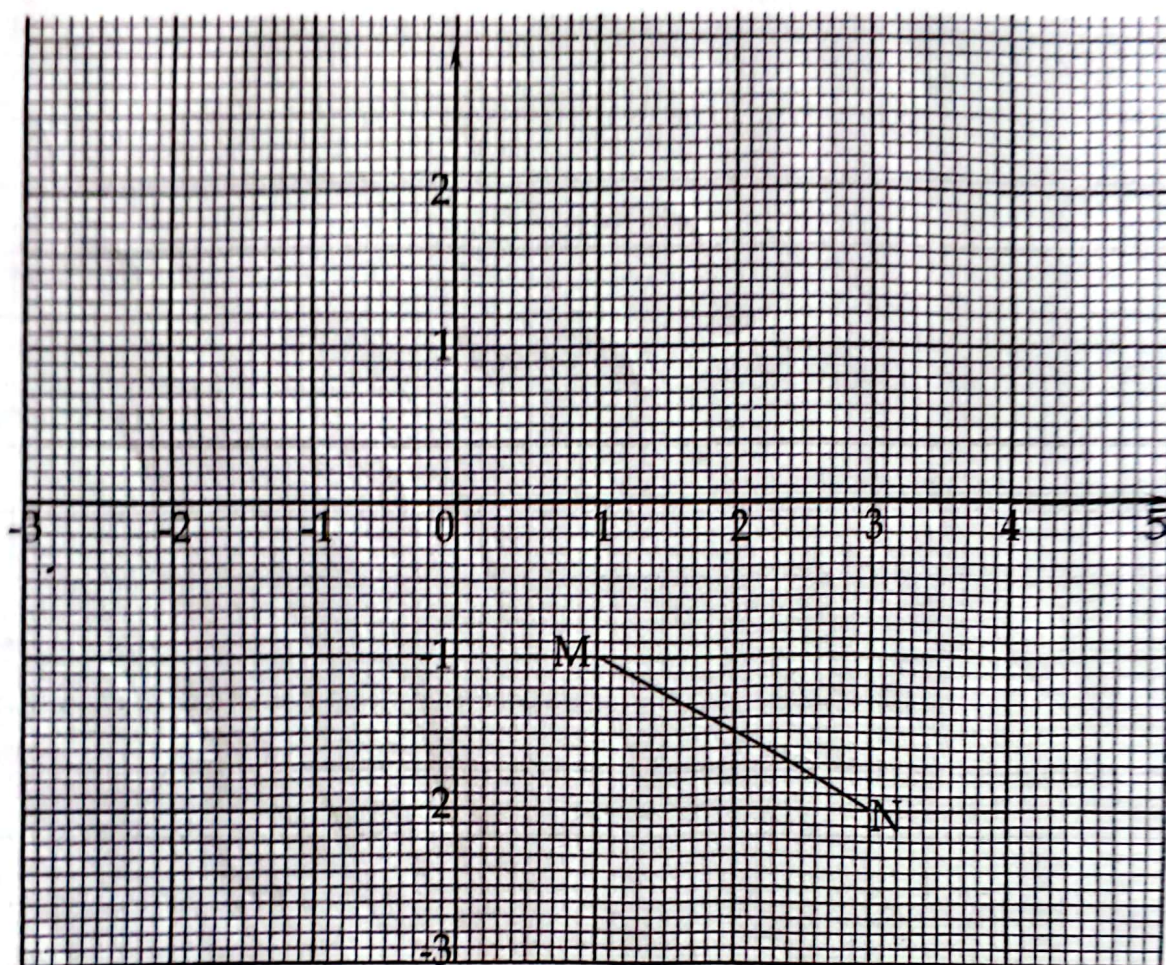
BWIGHANE
MWAHTOBE

2022 QUESTIONS

Answer all the twenty questions

1. a. Given that $p = -3$, $q = 2$ and $r = 4$, evaluate $qr - p$
(3 marks)
b. Simplify $3122_4 + 1203_4$, giving the answer in base 10
(4 marks)
2. a. Simplify $(8 - x)^2$
(3 marks)
b. Simplify $\frac{m-n}{3} + \frac{m+n}{5}$
(4 marks)
3. a. Make n subject of the formula $T = a + (n - 1)d$
(3 marks)
b. Simplify $8^{\frac{2}{3}} \times 4^2$
(3 marks)
4. Given that $P = \{q, r, s, t, u\}$ and $Q = \{q, r, u, v, w, x, y, z\}$ present the information in a Venn diagram.
(4 marks)
5. Triangles UVW and XYW are similar. If $UW = 6$ cm, $UV = 9$ cm and $XW = 3.6$ cm, calculate the length of XY

6. Figure 1 shows graph of a line MN.



On the same axes and using $x = 3$ as the mirror line, draw a reflection of the line MN.

(3 marks)

7. The sum of the interior angles of a regular convex polygon is 2340° . Calculate the value of each exterior angle of the polygon.

(5 marks)

8. Given the coordinates for points U(4,6) and V(8,16), calculate the gradient of a line drawn through the points.

(3 marks)

9. Solve the equation $n^2 + 3n = 10$

(5 marks)

0. Use logarithms to simplify $\sqrt{382.1} \div 5.67$, giving the answer correct to three decimal places.

(5 marks)

1. A choir is composed of members who sing different voices. 16 members sing alto, 10 members sing soprano, 14 sing tenor while 10 sing bass. If a member is selected at random to be a choir master, find the probability that the choir master selected sings tenor.

(3 marks)

2. In figure 2, ABC is parallel to DH and EF

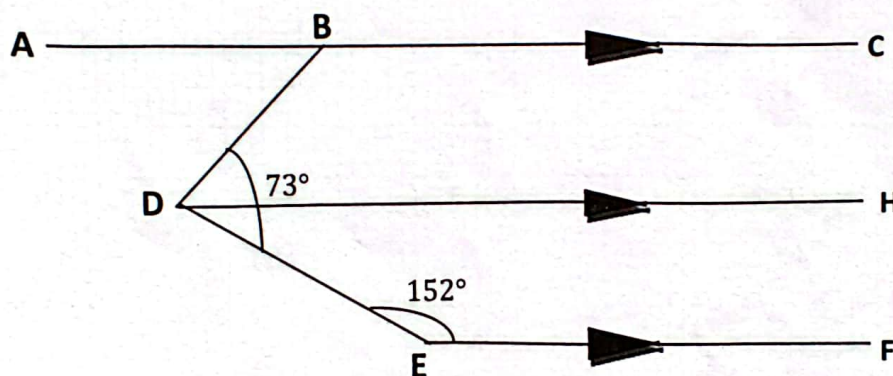


Figure 2

If angle DEF = 152° and angle BDE = 73° , calculate the value of angle ABD.

(3 marks)

13. A woman insured her goods at K60, 000 for every K240, 000 worth of goods. If she paid an annual premium of K10 000 000, calculate the value of the goods.

(3 marks)

14. Table 1 shows number of chickens kept by three farmers in a certain village.

Table 1

Farmer	A	B	C
Number of chicken	150	100	50

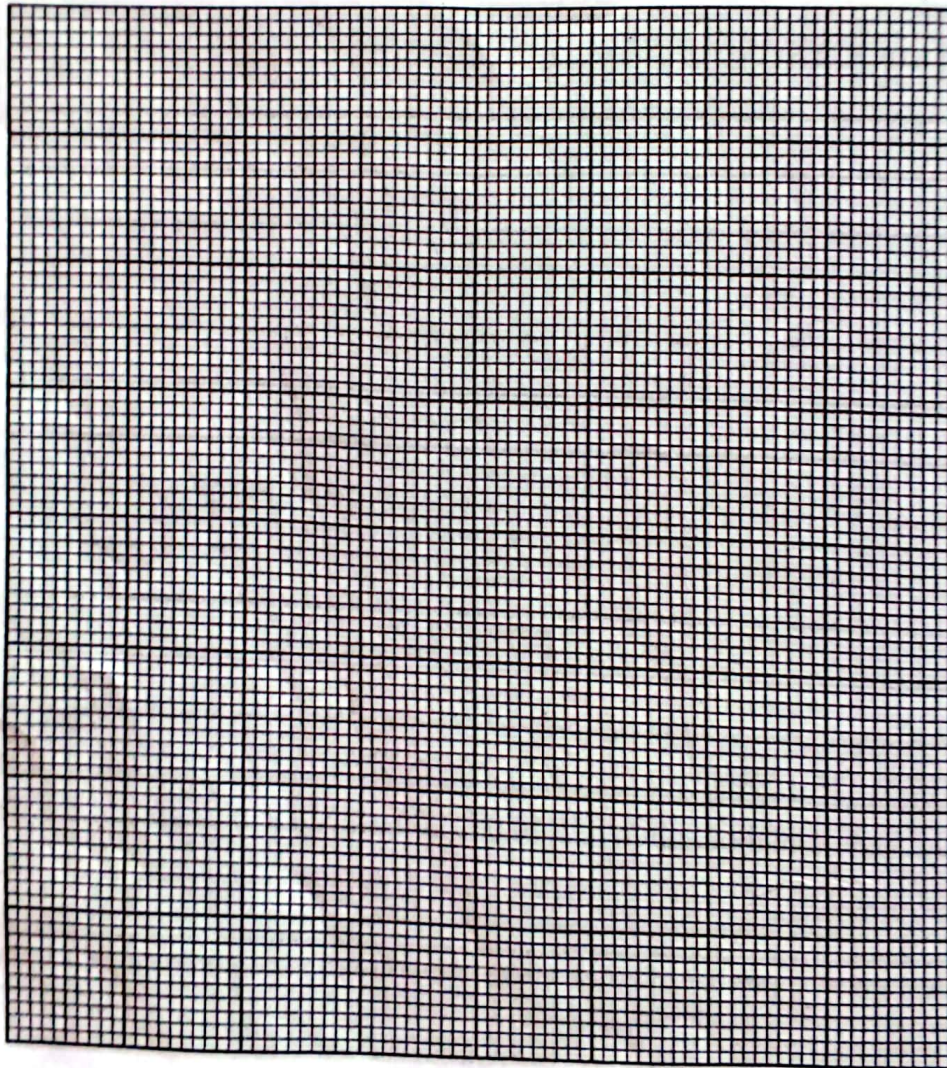
Draw a pie chart to represent the information in Table 1.

(5 marks)

15. A motorist left point **A** at 7:00 am to point **R**, a distance of 200km. At 8:00 am, after travelling for 80 km, she had a breakdown for 30 minutes at point **Q**. She continued travelling at 40 km per hour and reached point **R**.

- a. Using a scale of 2 cm to represent 40 km on the vertical axis and 2 cm to represent 1 hour on the horizontal axis, draw a distance-time graph for the motorist.

(5 marks)



- b. Use the graph to find the time the motorist took to reach point **R**.

(1 mark)

16. The cost of 4 loaves of bread and 3 cakes is K3 100 while the cost of 2 loaves of bread and 5 cakes is K 2 250. If the cost of a loaf of bread is x kwacha and the cost of a cake is y kwacha, calculate the values of x and y .

(7 marks)

7. Table 2 and 3 show values of x and y for the equation $4x + y = 6$ and $x - y = 4$ respectively.

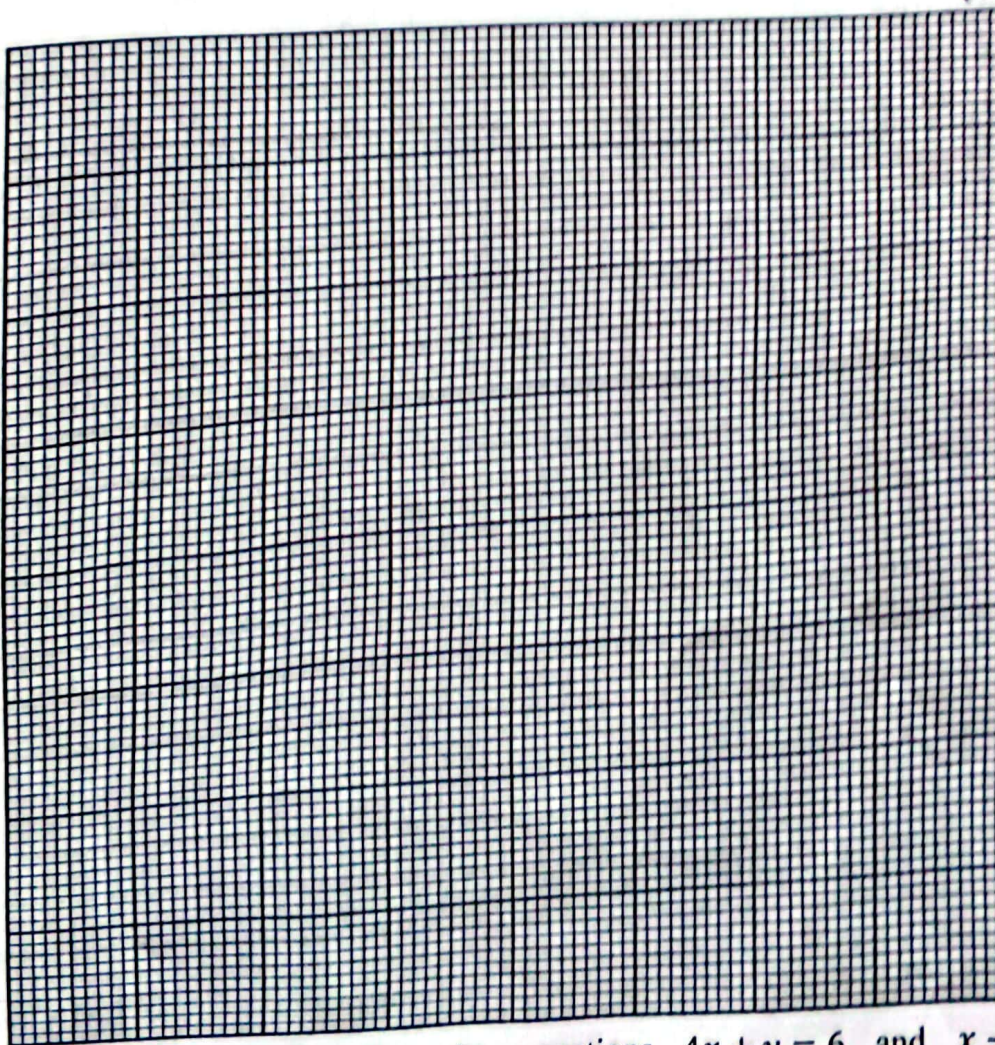
Table 2

x	0	3
y	6	0

Table 3

x	0	4
y		0

- a. Calculate the missing value of y in Table 3. (1 mark)
- b. Using a scale of 2 cm to represent 1 unit on both axes and using the same axes, draw the graphs of $4x + y = 6$ and $x - y = 4$ on the graph paper on page 12. (4 marks)



- c. Use the graph to solve the equations $4x + y = 6$ and $x - y = 4$ simultaneously. (1 mark)

18. Figure 3 shows a rectangle ABCD and a rhombus ABEF.

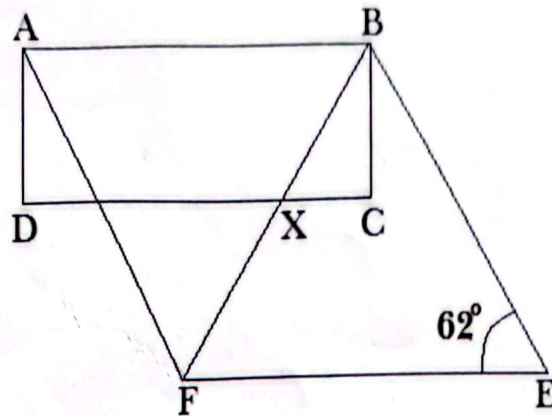
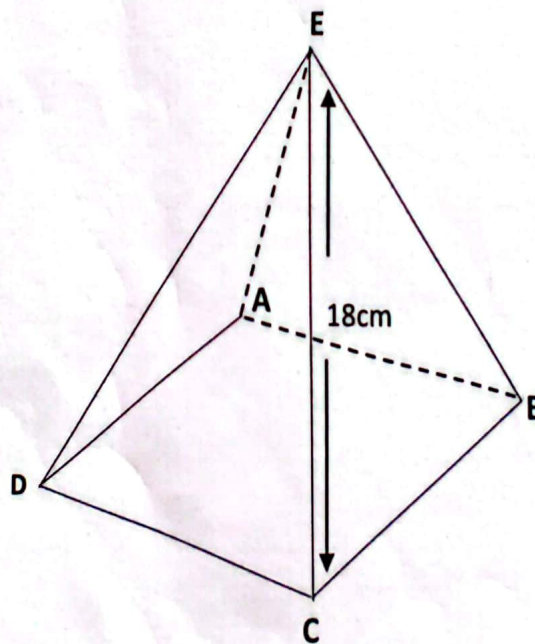


Figure 3

If angle $BEF = 62^\circ$, calculate the size of angle BXC

(5 marks)

19. Figure 4 shows square based pyramid ABCDE in which $BC = 15$ cm and $CE = 15$ cm



Calculate the total surface area of the pyramid

(5 marks)

20. Using a ruler and a pair of compasses only, construct triangle LMN in which $MN = 6$ cm, $LM = 7.5$ cm and angle $MNL = 45^\circ$. In the same diagram, construct a circumscribed circle of triangle LMN.

(7 marks)

2022 ANSWERS

1. (a) Method

$$qr - p$$

$$\text{But } q = 2, r = 4 \text{ and } p = -3$$

$$(2 \times 4) - (-3)$$

$$8 + 3$$

$$11$$

(b) Method

Firstly, add then convert to

base 10

$$3122_4$$

$$+1203_4$$

$$10\,331_4$$

Convert it to base 10

$$1 \times 4^4 + 0 \times 4^3 + 3 \times 4^2 + 3 \times 4^1 + 1 \times 4^0$$

$$1 \times 256 + 0 \times 64 + 3 \times 16 + 3 \times 4 + 1 \times 1$$

$$256 + 48 + 12 + 1$$

$$317_{10}$$

(a) Method

$$(8 - x)^2$$

$$(8 - x)(8 - x)$$

$$8(8 - x) - x(8 - x)$$

$$64 - 8x - 8x + x^2$$

$$64 - 16x + x^2$$

$$x^2 - 16x + 64$$

(b) Method

$$\frac{m-n}{3} + \frac{m+n}{5}$$

$$\frac{5(m-n)+3(m+n)}{15}$$

$$\frac{5m-5n+3m+3n}{15}$$

$$\frac{8m-2n}{15}$$

3. (a) Method

$$T = a + (n - 1)d$$

$$a + (n - 1)d = T$$

$$(n - 1)d = T - a$$

$$\frac{(n-1)d}{d} = \frac{T-a}{d}$$

$$n - 1 = \frac{T-a}{d}$$

$$\therefore n = \frac{T-a}{d} + 1$$

(b) Method

$$8^{\frac{2}{3}} \times 4^2$$

$$(\sqrt[3]{8})^2 \times (4 \times 4)$$

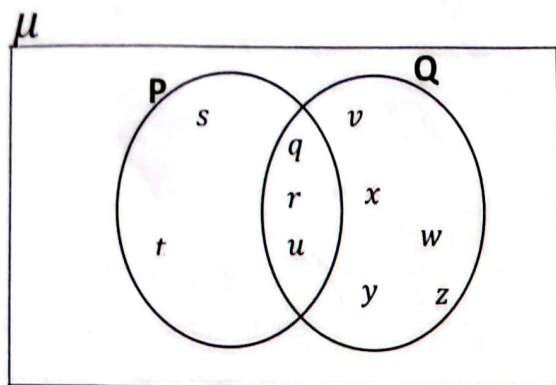
$$(2)^2 \times (16)$$

$$4 \times 16$$

$$64$$

4. Method

Below is the Venn diagram



5. Method

Similar Δ s given:

$$\Delta s \frac{UVW}{XYW}$$

$$\frac{UV}{XY} = \frac{VW}{YW} = \frac{UW}{XW}$$

$$\therefore \frac{UV}{XY} = \frac{UW}{XW}$$

$$\frac{9 \text{ cm}}{XY} = \frac{6 \text{ cm}}{3.6 \text{ cm}}$$

$$XY \times 6 \text{ cm} = 9 \text{ cm} \times 3.6 \text{ cm}$$

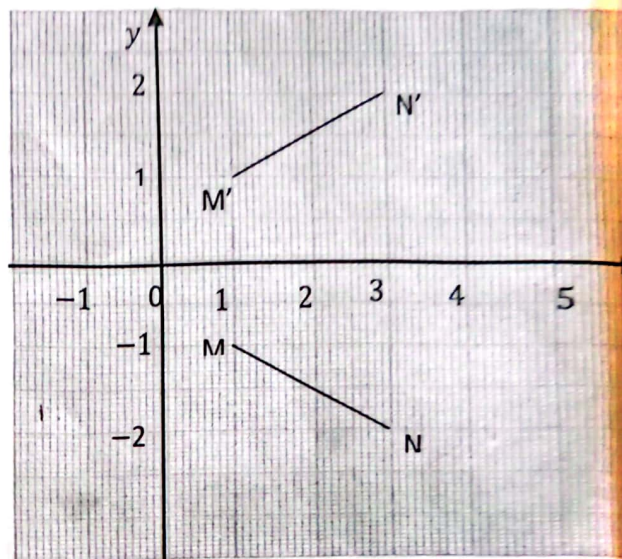
Cross multiplication

$$\frac{6XY \text{ cm}}{6 \text{ cm}} = \frac{32.4 \text{ cm}}{6 \text{ cm}}$$

$$XY = 5.4 \text{ cm}$$

6. Method

Use the graph given to draw a reflection of MN below.



7. Method

First, find the number of sides of polygon

$180^\circ(n - 2)$ This is the sum of interior angles of polygon

$$180^\circ(n - 2) = 2340^\circ$$

$$\frac{180^\circ(n - 2)}{180^\circ} = \frac{2340^\circ}{180^\circ}$$

$$n - 2 = 13$$

$$n = 13 + 2$$

$$n = 15$$

The polygon has 15 sides.

Then find the value of each interior angle

$$\frac{2340^\circ}{15} = 156^\circ$$

$\therefore$ the value of each exterior angle will be $180^\circ - 156^\circ = 24^\circ$

Number	Standard form	Log
$\sqrt{382.1}$	3.821×10^2	$\frac{2.582}{2}$
		1.291
5.67	5.67×10^0	0.754
3.448	3.448×10^0	0.538

8. Method

U(4,6) and V(8,16)

(x_1, x_2) (y_1, y_2)

$$\begin{aligned} \text{Gradient (m)} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{16 - 6}{8 - 4} \\ &= \frac{10}{4} \\ &= 2.5 \end{aligned}$$

Gradient of UV is 2.5

9. Method

To solve the equation

$$n^2 + 3n = 10$$

$$n^2 + 3n - 10 = 0$$

$$(n + 5)(n - 2) = 0$$

Either

$$n + 5 = 0 \text{ or } n - 2 = 0$$

$$n = -5 \text{ or } n = 2$$

10. Method

$$\sqrt{382.1} \times 5.67$$

11. Method

Member of choir

Acto = 16

Soprano = 10

Tenor = 14

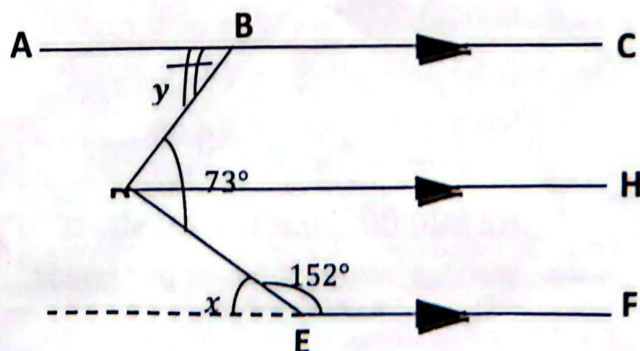
Bass = 10

$$\begin{aligned} \text{Total singing} &= 16 + 10 + 14 + 10 \\ &= 50 \end{aligned}$$

$$\begin{aligned} \text{Probability Tenor} &= \frac{\text{Tenor}}{\text{Total singing}} \\ &= \frac{14}{50} \\ &= \frac{7}{25} \end{aligned}$$

$$P(\text{Tenor}) = \frac{7}{25}$$

12. Method



Constructions produce FE to any point out side.

Let angle ABD be y while produced angle be x

Check with notations from figure above:

Take note we are given there parallel lines

$x + 152^\circ = 180^\circ$ (Adjacent angles)

$$x = 180^\circ - 152^\circ$$

$$x = 28^\circ$$

$$\widehat{EDH} = x = 28^\circ \text{ (Adjacent angles)}$$

$$\widehat{BDH} = \widehat{BDE} - \widehat{EDH} \text{ (Given)}$$

$$= 73^\circ - 28^\circ$$

$$= 45^\circ$$

$$\widehat{BDH} = \widehat{ABD} = y^\circ = 45^\circ$$

(Alternate angles)

$$\therefore \widehat{ABD} = 45^\circ$$

13. Method

Insurance by simple proportion

If K240 000 = K60 000 (value of goods)

$\therefore$ K10 000 000 = more

$$\frac{\text{K10 000 000}}{\text{K240 000}} \times \text{K60 000}$$

K2 500 000 this is what she is insured on the value of her goods.

14. Method

Farmer	A	B	C
Number of chicken	150	100	50

To draw pie chart

First, find the total number of chickens.

$$A + B + C$$

$$150 + 100 + 50 = 300$$

$\therefore$ 300 chickens represent 360°

Let's find degree of A, B and C.

$$A = \frac{150}{300} \times 360^\circ$$

$$= 180^\circ \text{ for A.}$$

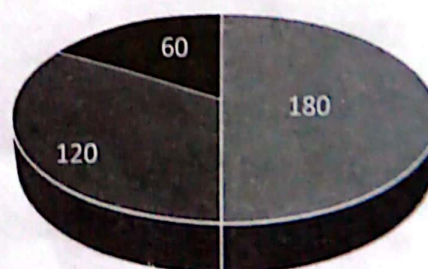
$$B = \frac{100}{300} \times 360^\circ$$

$$= 120^\circ \text{ for B.}$$

$$C = \frac{50}{300} \times 360^\circ$$

$$= 60^\circ \text{ for C.}$$

Pie chart means circular chart



■ A ■ B ■ C

15. (a) Method

Check at the end for the graph

(b) The time is 1 hr 30mins or $1\frac{1}{2}$ hours.

16. Method

This is word simultaneous equation

$$4l + 3c = 3100 \dots\dots\dots(i)$$

$$2l + 5c = 2250 \dots\dots\dots(ii)$$

Substitute l be x and c be y

$$4x + 3y = 3100 \dots\dots\dots(i)$$

$$2x + 5y = 2250 \dots\dots\dots(ii)$$

Eliminate x 's

$$\begin{array}{l} 2\{4x + 3y = 3100\} \\ 4\{2x + 5y = 2250\} \end{array}$$

$$8x + 6y = 6200$$

$$\underline{-8x + 20y = 90000}$$

$$\underline{0 - 14y = -2800}$$

$$-14y = -2800$$

$$\frac{-14y}{-14} = \frac{-2800}{-14}$$

$$y = 200$$

To find value of x take any equation either (i) or (ii)

$$4x + 3y = 3100$$

$$4x + 3(200) = 3100$$

$$4x + 600 = 3100$$

$$4x = 3100 - 600$$

$$4x = 2500$$

$$\frac{4x}{4} = \frac{2500}{4}$$

$$x = 625$$

$$\therefore \text{When } x = 625, y = 200$$

17. Method

$$4x + y = 6$$

x	0	3
y	6	0

$$x - y = 4$$

x	0	4
y	-4	0

(a) Missing value

$$x - y = 4$$

$$0 - y = 4$$

$$-y = 4$$

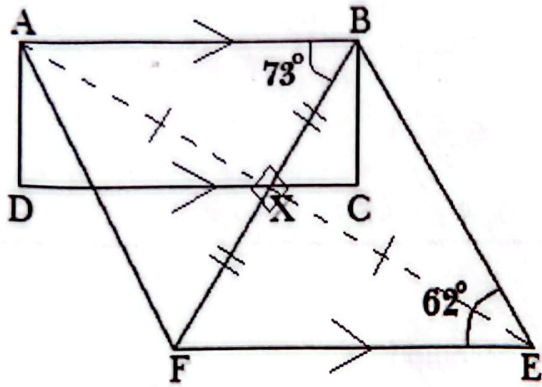
$$y = -4$$

(b) Check at the end of the answers

(c) The solutions of the equations are found at the point of intersections

$$\text{When } x = 2, y = -2$$

18. Method



Construction joins chords of rhombus AE. Remember chords of rhombus bisect at right angles and each angle of rectangle is 90° also.

In $\triangle EXB$ is isosceles

$\angle XBE = \angle XEB$ (base angles of isosceles)

$$\frac{180^\circ - 90^\circ}{2} = \frac{90^\circ}{2} = 45^\circ$$

$$\angle FEX = 62^\circ - 45^\circ = 17^\circ$$

$\angle BAX = \angle FEX$ (Alternate angles)

$$\angle BAX = 17^\circ$$

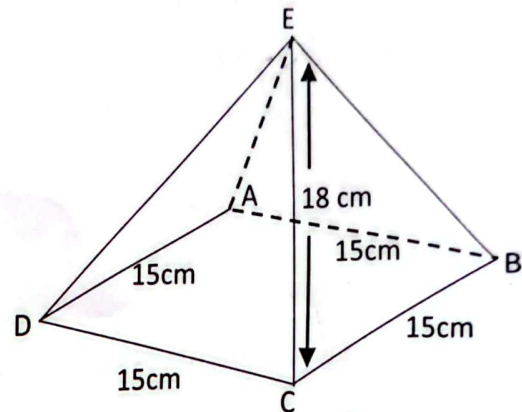
$$\begin{aligned} \angle XBC &= 90^\circ - 73^\circ \text{ (Right angles)} \\ &= 17^\circ \end{aligned}$$

$$\begin{aligned} \angle BXC &= 180^\circ - (\angle XBC + \angle BCX) \text{ (Sum of } \triangle) \\ &= 180^\circ - (17^\circ + 90^\circ) \\ &= 180^\circ - 107^\circ \end{aligned}$$

$$\angle BXC = 73^\circ$$

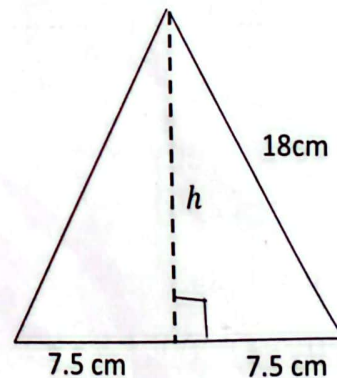
19. Method

Checking



$$\begin{aligned} 1^{\text{st}} \text{ area of base: } L^2 &= 15\text{cm} \times 15\text{cm} \\ &= 225\text{ cm}^2 \end{aligned}$$

Note each slanting face is an isosceles



$$= \sqrt{267.75}$$

$$= 16.36\text{ cm}$$

Then the area of each slanting face

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

$$= \frac{1}{2} \times 15\text{cm} \times 16.36\text{cm}$$

$$= 122.7\text{ cm}^2$$

After getting the solution multiply by 4

Total area of slanting faces =

$$122.7\text{cm}^2 \times 4$$

$$= 490.8\text{cm}^2$$

$$\text{Total surface area} = 225\text{cm}^2 +$$

$$490.8\text{cm}^2$$

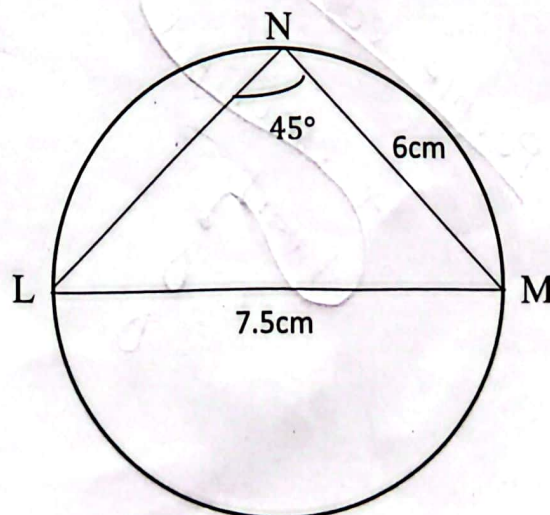
$$= 715.8\text{cm}^2$$

20. Method

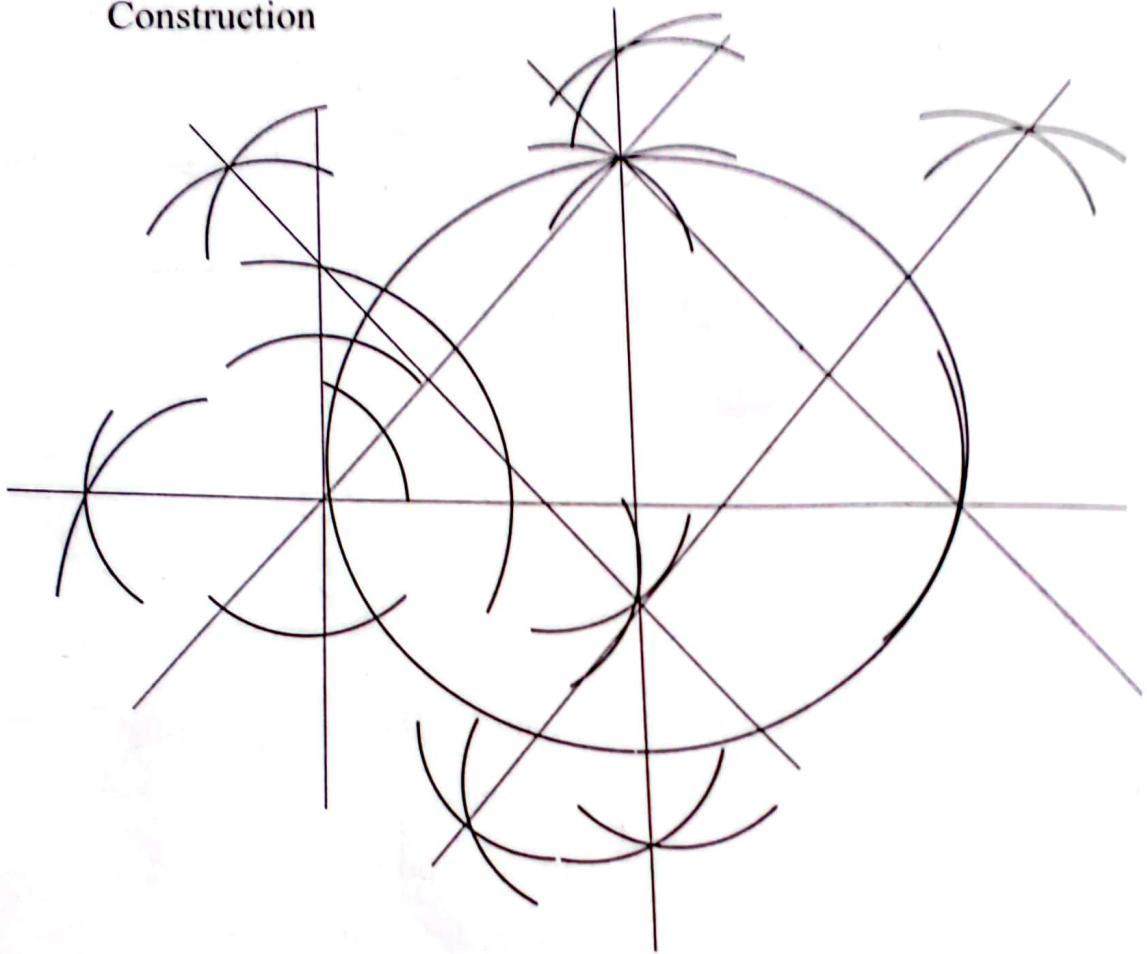
Steps

- (i) Construct an angle of 90° at N by using pair of compass only.
- (ii) Bisect an angle of 90° by pair of compass
- (iii) Take 6cm from ruler by compass to draw point M.
- (iv) Take 7.5 cm from ruler by pair of compass to draw point L.
- (v) Finally bisect the sides of triangle NML to get the circumscribed circle.

Sketching

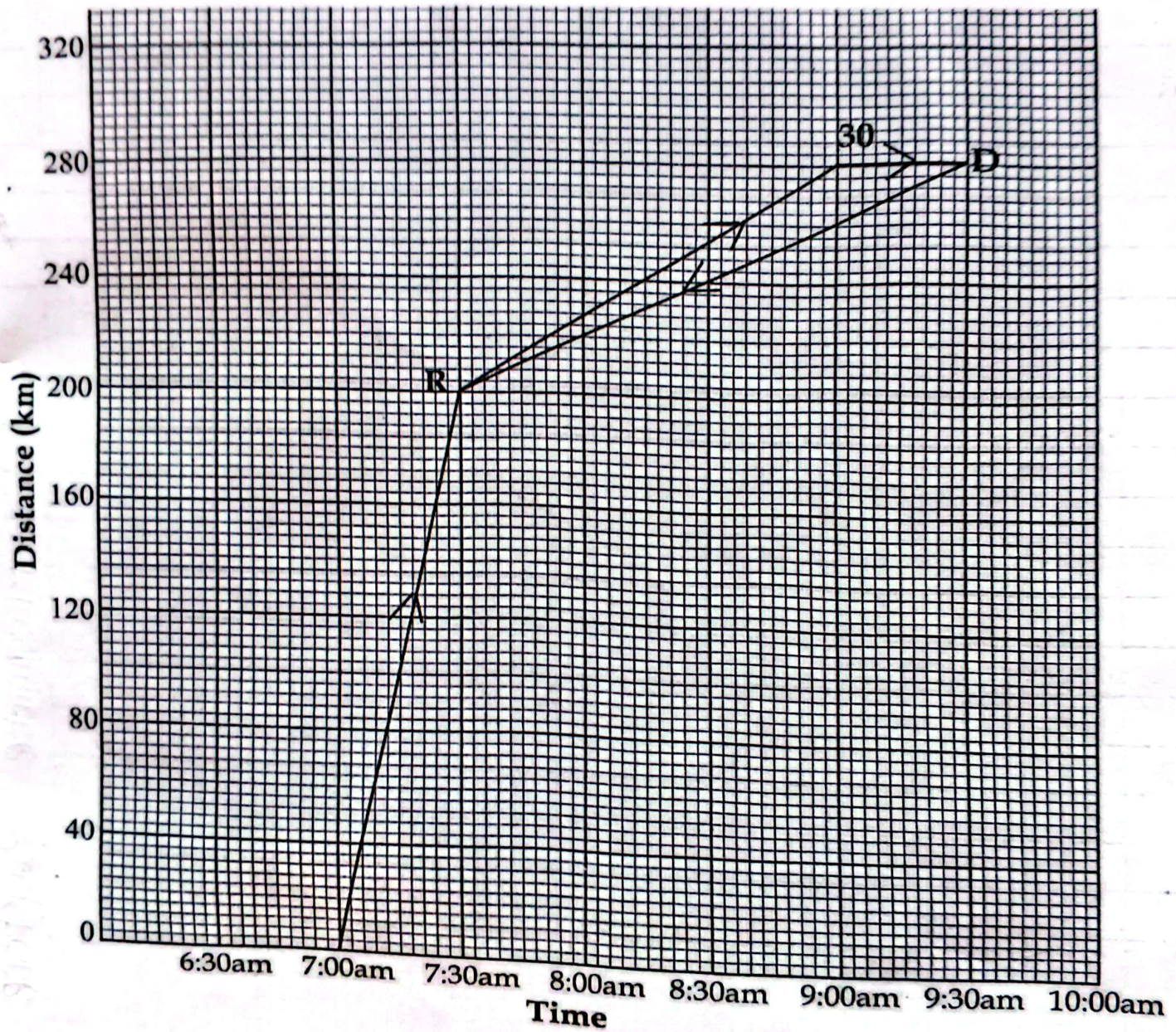


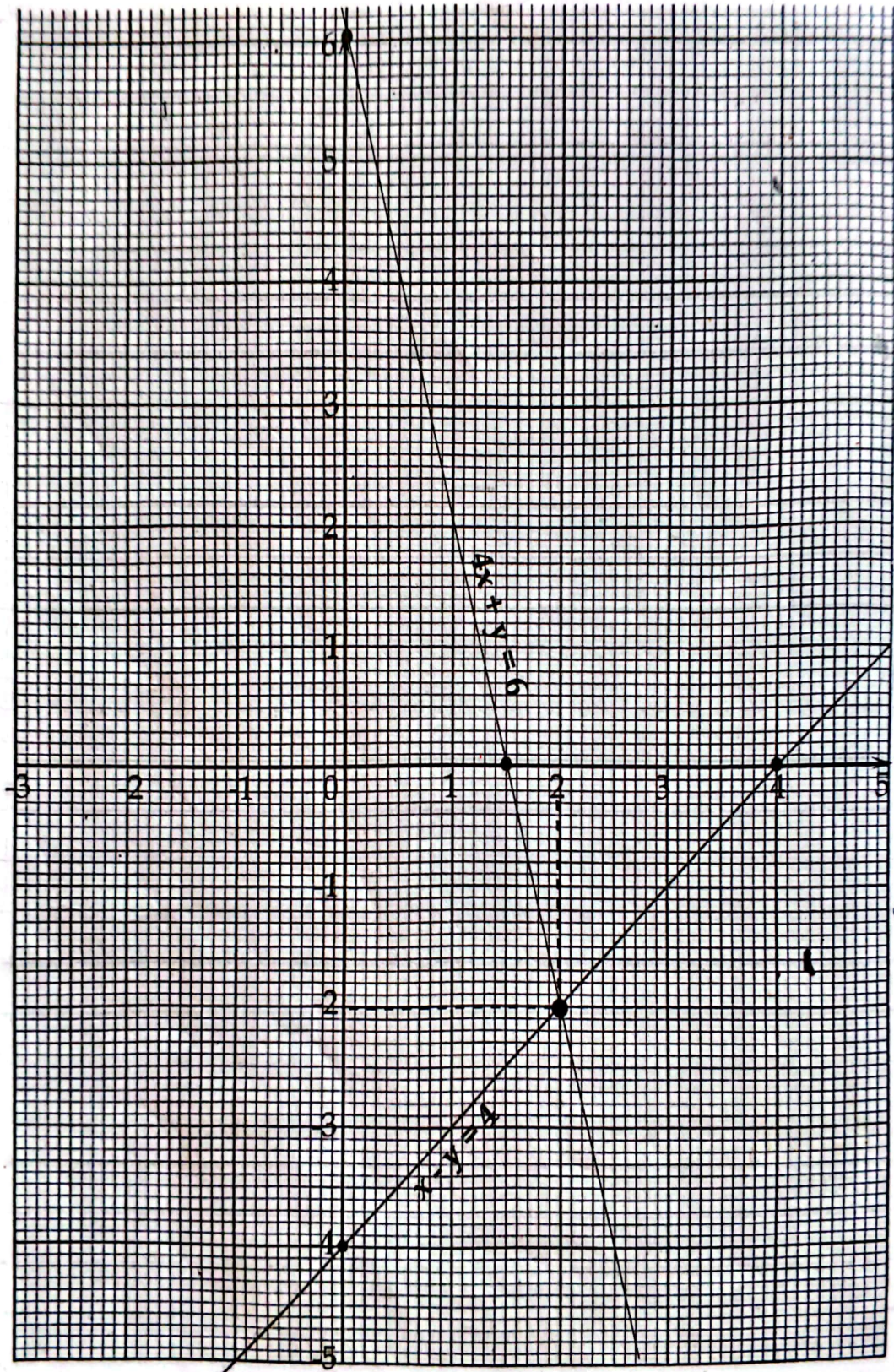
Construction



Purple cune Left
A beautiful
heart

JCE MATHEMATICS QUESTIONS AND MODEL ANSWERS





Don't

Mwamtobe Buighane

Answer **all** the **twenty** questions in the spaces provided under each question.

1.

a. Given that $a = -3$, $b = 2$ and $c = 5$, evaluate $\frac{2a^2}{c-b}$. (3 marks)

b.

Given that set $F = \{5, 10, 15, 20, 25\}$ and $G = \{\text{multiples of 3 between 5 and 20}\}$, write down $n(F \cap G)$. (3 marks)

Continued/...

2. a. Subtract 1434_6 from 2243_6 , giving the answer in base ten. (4 marks)

- b. Make m subject of the formula $q = \frac{cm}{t} - 2b$. (3 marks)

Continued/

- (3.) a. Simplify $\frac{2a+b}{3} - \frac{a+b}{4}$. (4 marks)

- b. Simplify $\left(\frac{2}{3x}\right)^{-1} \times \frac{6}{x}$. (3 marks)

4. Given that the n^{th} term of a sequence is $3n^2 - 1$, find the first three terms of the sequence. (3 marks)



5. Solve the equation $r - 2\frac{1}{2} = -\frac{1}{r}$. (6 marks)

6. The old price of bread was K2 000. If the price increased in the ratio 6:5, calculate the new weekly expenditure of a family that takes 3 loaves of bread per day. (4 marks)

Continued/

7. In figure 1, FG is parallel to HJ , angle $IFG = 51^\circ$ and angle $JKI = 75^\circ$.

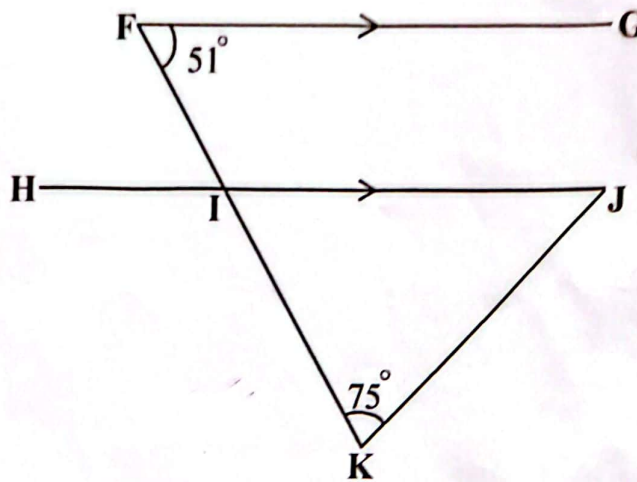


Figure 1

Calculate the value of angle IJK .

(4 marks)

8. Solve the inequality $8 - 4x < 2(1 - x)$.

(5 marks)

9.

Figure 2 is a triangle PQR in which angle $RPQ = 90^\circ$, $RP = 8$ cm and $QR = 13$ cm.

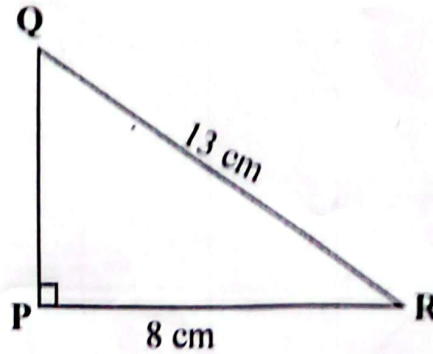


Figure 2

Calculate the length of PQ , giving the answer correct to 2 decimal places. (4 marks)

10. Given that a letter R is picked at random from the word **DIRECTOR**, find the probability of picking the letter R . (3 marks)

11. Figure 3 shows a quadrilateral LMNP drawn on the graph paper.

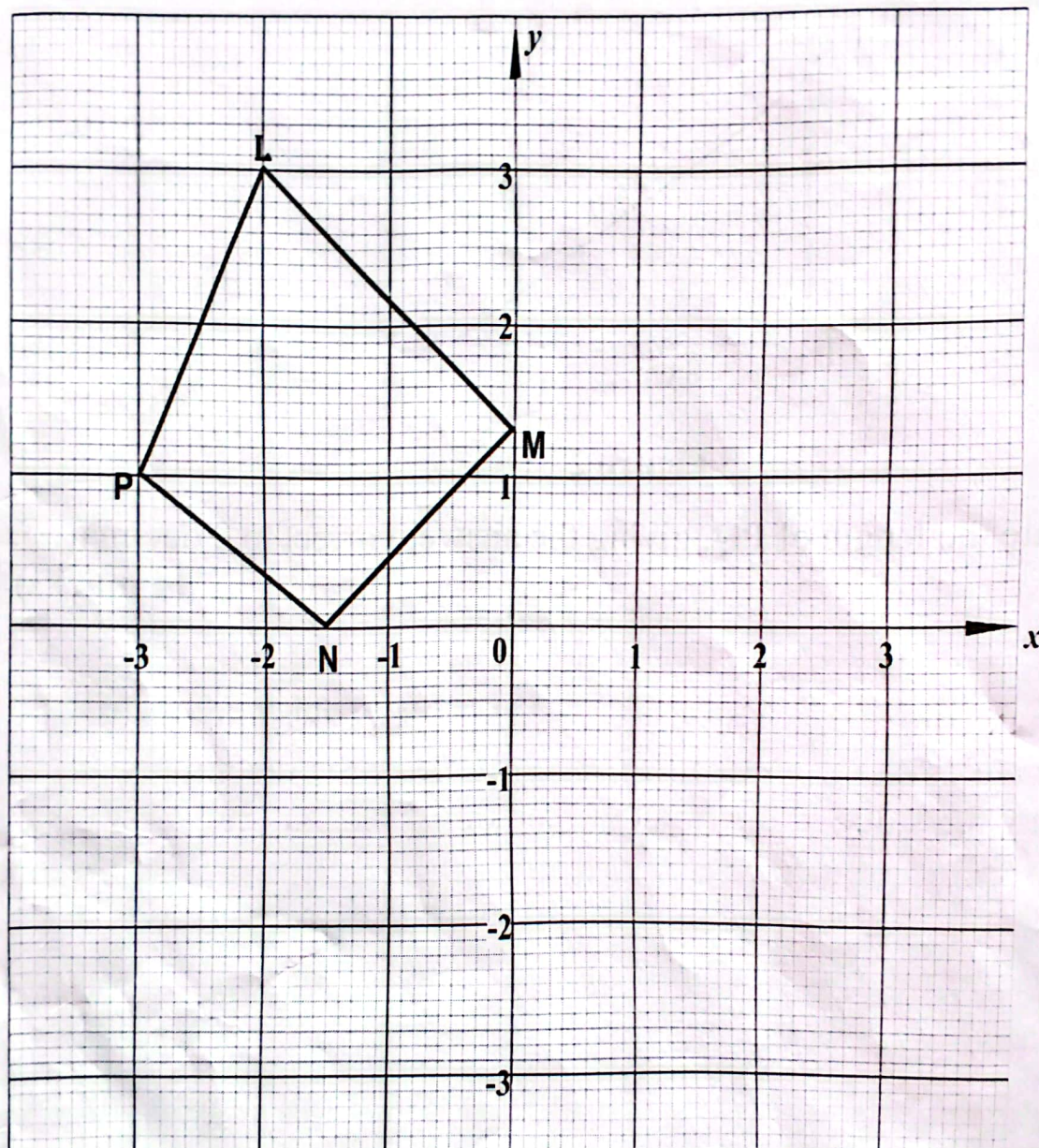


Figure 3

Using y – axis as the mirror line, draw a reflection of the quadrilateral LMNP. (3 marks)

12. The total surface area of a square based pyramid is 144 cm^2 . If the base is of length 8 cm, calculate the height of the triangle. (5 marks)

13. Mrs Shati bought a car for K5 000 000. If the value of the car depreciated by 15% in the first year and 25% in the second year, calculate the value of the car at the end of the second year. (5 marks)

14. Use logarithms to simplify $\frac{4731 \times 31.5}{68.9}$, giving the answer correct to 3 significant figures. (5 marks)

15. A trader can buy either white (w) or brown (b) beans. Three white beans and two brown beans weigh 1 300 mg, while five white beans and four brown beans weigh 2 400 mg. Find the mass of a white bean. (6 marks)

16. In figure 4, $\triangle ABD$ and $\triangle ECD$ are similar triangles in which $AB = 6$ cm, $EC = 2$ cm and $DE = 7$ cm.

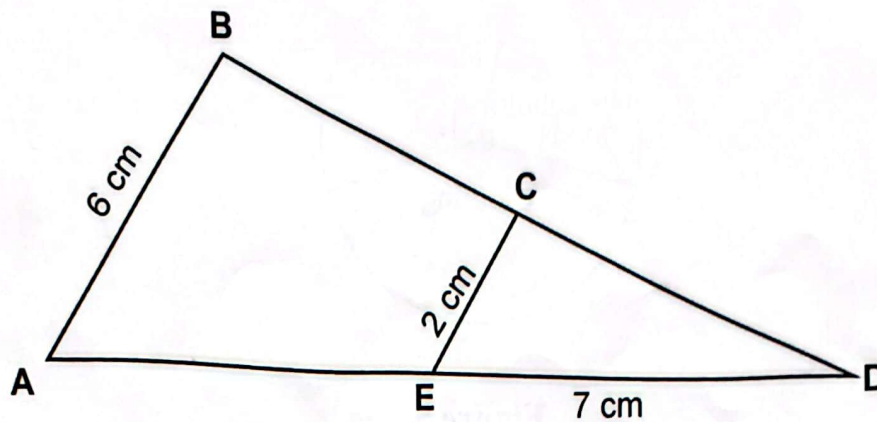


Figure 4

Calculate the length of DA .

(4 marks)

19. Figure 6 shows a diagram of a trapezium $ABCD$ in which AB is parallel to DC and $AD = BC$.

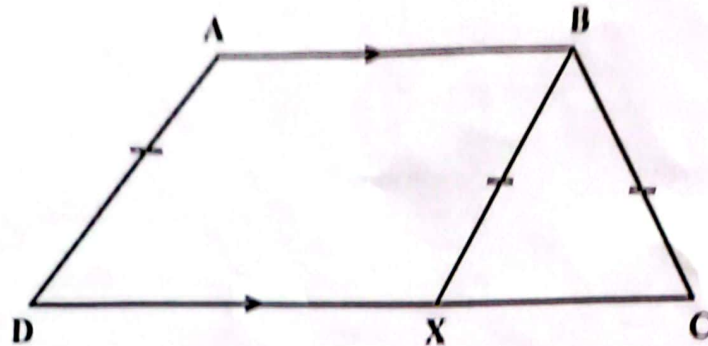


Figure 6

If X is a point on CD such that $BC = BX$, show that $ABXD$ is a parallelogram. (5 marks)

20. Figure 7 is a line graph whose equation is $y + 2x = -6$.

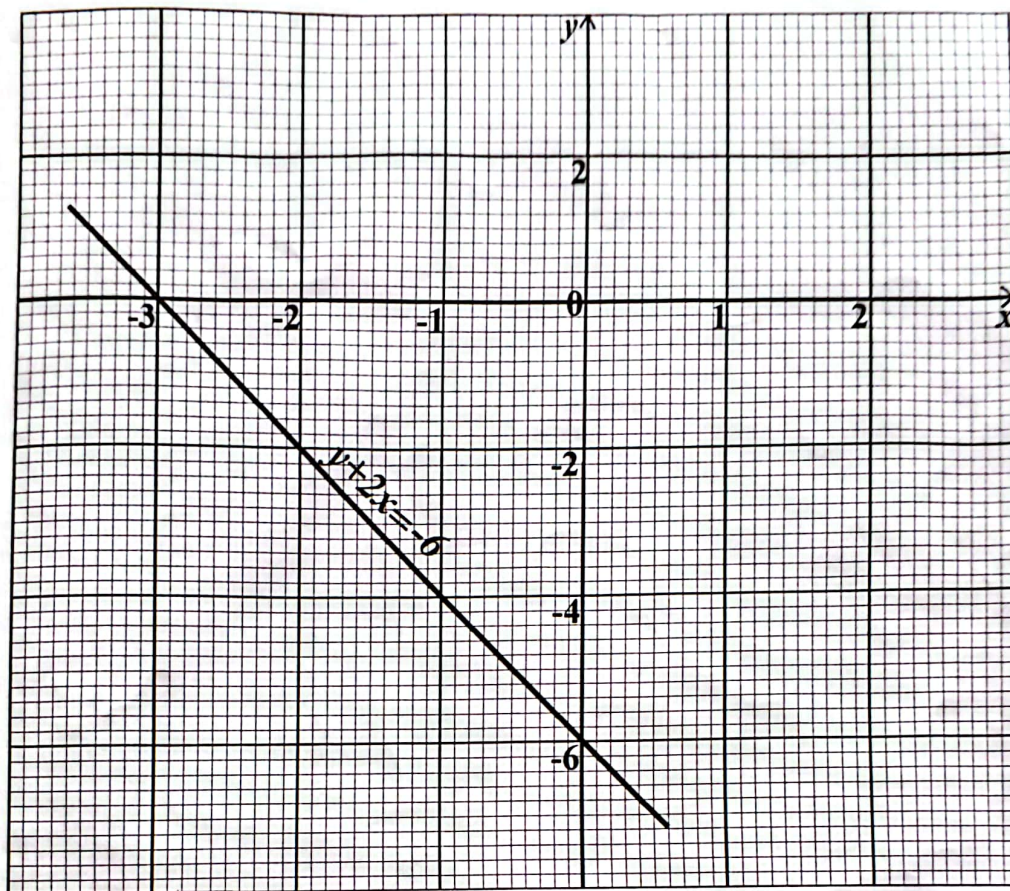


Figure 7

- a. Complete the table of values for x and y for the equation $y = 2x + 2$.

x	- 3	-1	
y	- 4		2

(2 marks)

- b. On the same graph and using the same axes, draw a graph of the line $y = 2x + 2$. (2 marks)
- c. Use the graph to solve the following equations simultaneously $y + 2x = -6$ and $y = 2x + 2$. (2 marks)

END OF QUESTION PAPER

NB: This paper contains 15 printed pages.