

Centre Number										Examination Number									



EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level



Mathematics

4024/2

Paper 2

Monday

13 JULY 2026

Additional materials
Silent Electronic Calculator (non programmable)
Geometrical instruments

Time: 2 hours 30 minutes

Marks: 100

Instructions to Candidates

- Write the **centre number** and your **examination number** in the spaces provided on this page.
- Write your **examination number** in the spaces provided on **every page** of this question paper.
- Write your answers in the spaces provided in this question paper.
- Omission of essential working will result in loss of marks.
- There are **twelve** questions in this paper.

(i) Section A

Answer **all** questions.

(ii) Section B

Answer any **four** questions. Enter the numbers of the questions you have answered on the Grid under the column '**For Candidate's Use**'.

Information for Candidates

- The number of marks is given in brackets [] at the end of each question or part question.
- If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
- Cell phones are **not allowed** in the examination room.

For Candidate's Use		For Examiners' Use	
Section	Question	Mark obtained	Examiner's Initials
A	1		
	2		
	3		
	4		
	5		
	6		
B			
Total			

1 ALGEBRA

Quadratic Equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2 SERIES

Geometric Progression

$$S_n = \frac{a(1-r^n)}{1-r}, (r < 1)$$

$$S_n = \frac{a(r^n - 1)}{r - 1}, (r > 1)$$

$$S_{\infty} = \frac{a}{1-r} \text{ for } |r| < 1$$

3 TRIGONOMETRYFormula for ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

4 STATISTICS

Mean and standard deviation

Ungrouped data

$$\text{Mean } (\bar{x}) = \frac{\sum x}{n}, \text{SD} = \sqrt{\left\{ \frac{\sum (x - \bar{x})^2}{n} \right\}} = \sqrt{\left\{ \frac{\sum x^2}{n} - (\bar{x})^2 \right\}}$$

Grouped data

$$\text{Mean } (\bar{x}) = \frac{\sum fx}{\sum f}, \text{SD} = \sqrt{\left\{ \frac{\sum f(x - \bar{x})^2}{\sum f} \right\}} = \sqrt{\left\{ \frac{\sum fx^2}{\sum f} - (\bar{x})^2 \right\}}$$

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SECTION A: (52 MARKS)

Answer all questions in this section. Write your answers in the spaces provided after each question.

- 1 (a) Express $\frac{7}{x-3} - \frac{8}{1-2x}$ as a single fraction in its simplest form.

[3]

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- 1 (b) A box contains 2 green balls and 3 blue balls. A ball is selected at random from the box and not replaced. A second ball is then selected.
- (i) Draw a tree diagram to illustrate the outcomes.

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[2]

- (ii) What is the probability of selecting two balls of different colours?

[3]

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- 2 (a) In a group of 40 girls, 25 like mangoes, 20 like bananas, 15 like guavas, 9 like mangoes and bananas, 10 like mangoes and guavas, 7 like bananas and guavas and 4 like all the three types of fruits.

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- (i) Illustrate this information in a Venn diagram.

[2]

- (ii) How many girls

- (a) like guavas only,

[1]

- (b) like two types of fruits,

[1]

- (c) do not like bananas?

[1]

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- 2 (b) Given that the determinant of matrix $M = \begin{pmatrix} x-3 & -1 \\ x+2 & 3 \end{pmatrix}$ is 5, find the

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(i) value of x ,

[2]

(ii) inverse of matrix M .

[2]

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3 (a) The second and fourth terms of a geometric progression are 6 and 1.5 respectively.

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Find the

[3]

(i) common ratio and the first term,

[2]

(ii) 8th term,

[2]

(iii) sum to infinity of the progression.

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3 (b) Evaluate $\int_{-1}^1 (3 - 4x + 9x^2 - 4x^3) dx$.

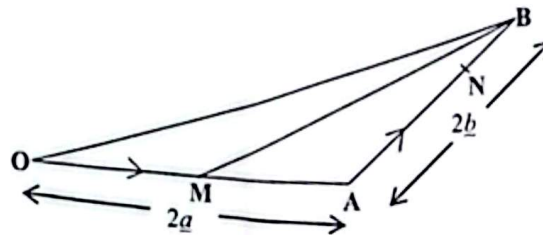
[3] For Examiner's use

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- 4 (a) (i) Construct a triangle PQR in which $PQ = 10\text{cm}$, $QR = 7\text{cm}$ and angle $PQR = 50^\circ$. [1] For Examiner's use
- (ii) Measure and write the length PR. [1]
- (b) Within triangle PQR, construct the locus of points which are
- (i) 6cm from Q, [1]
- (ii) 2cm from QR, [1]
- (iii) equidistant from PR and PQ. [2]
- (c) A point T, within the triangle PQR is such that it is less than or equal to 6cm from Q, more than 2cm from QR and nearer to PR than PQ. Indicate clearly by shading, the region in which T must lie. [2]

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- 5 (a) In the diagram, $\vec{OA} = 2\vec{a}$, $\vec{AB} = 2\vec{b}$, M is the midpoint of OA and $AN = 2NB$.



Express in terms of $\vec{a}$ and/or $\vec{b}$

(i) $\vec{OB}$,

[1]

(ii) $\vec{MB}$,

[1]

(iii) $\vec{ON}$,

[1]

(iv) $\vec{MN}$.

[2]

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- 5 (b) Solve the equation $x^2 + 6x + 1 = 0$, giving your answers correct to 2 decimal places. [5]

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- 6 (a) Simplify

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+ 1 = 0, giving your answers correct to 2 decimal places. [5] For Examiner's use

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6 (a) Simplify $\frac{2x^2 - 50}{x + 5}$.

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[2] For Examiner's use

2 6

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2 0 2 6

[Turn over]

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- 6 (b) Study the following pseudocode.

Start

Enter h, A_1, A_2

IF $A_1 \cdot A_2 < 0$ THEN

Display error message " $A_1 \cdot A_2$ must be positive"

Else $V = h/3 \cdot [A_1 + A_2 + \text{square root of } (A_1 \cdot A_2)]$

ENDIF

Display V

Stop

Draw a flowchart corresponding to the pseudocode above.

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[5]

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SECTION B: [48 MARKS]

Answer any four questions in this section. Write your answers in the spaces provided after each question.

Each question in this section carries 12 marks.

- 7 (a)** The variables x and y are connected by the equation $y = x^3 - 5x^2 - x + 5$ as shown in the table.

x	-2	-1	0	1	2	3	4	5.2
y	-21	0	5	0	-9	-16	q	5.2

- (i)** Calculate the value of q .

[1]

Answer part (ii) and (iii) of question 7(a) on the grid on page 16.

- (ii)** Using a scale of 2cm to represent 1 unit on the x -axis for $-2 \leq x \leq 6$ and 2cm to represent 5 units on the y -axis for $-25 \leq y \leq 10$, draw the graph of $y = x^3 - 5x^2 - x + 5$.

[3]

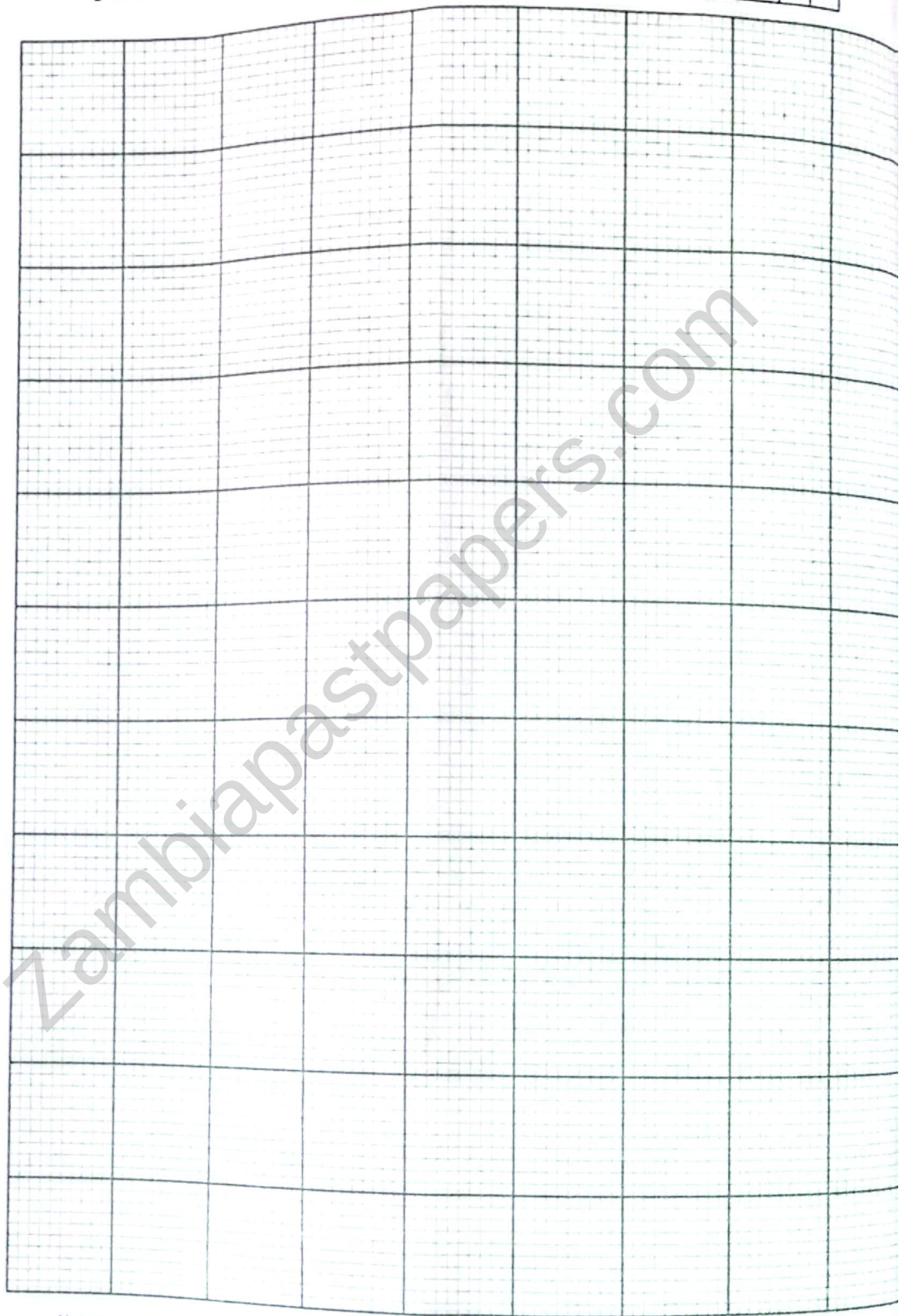
- (iii)** Use your graph to solve the equations

(a) $x^3 - 5x^2 - x + 5 = 0$,

[2]

(b) $x^3 - 5x^2 - x + 5 = 2x - 15$.

[3]

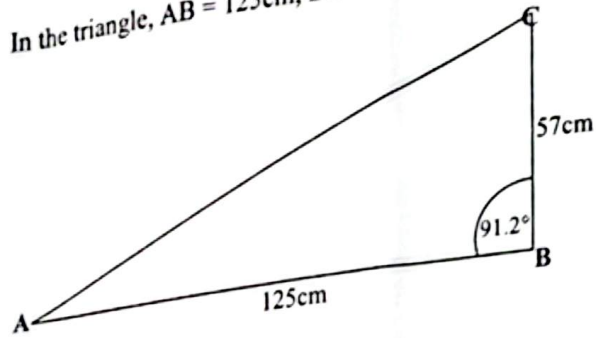


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- 7 (b) Find the equation of a tangent to the curve $y = x^3 - x^2 - 15x + 3$ at the point $(1, -12)$.

[3] For
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- 8 (a) In the triangle, $AB = 125\text{cm}$, $BC = 57\text{cm}$ and angle $ABC = 91.2^\circ$.



Calculate

- (i) AC ,
- (ii) the area of triangle ABC ,
- (iii) the shortest distance from B to AC .

[5]

[2]

[2]

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- 8 (b) Solve the equation $\tan \theta = 0.7$ for $180^\circ \leq \theta \leq 360^\circ$.

[1] For Examiner's use

(c) Simplify $\frac{52x^2y^2}{5a^2b^2} \div \frac{13x^2y^3}{10a^3b^2}$.

[2]

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- 9 The frequency table shows the distribution by age of 70 people in a town.

Age (years)	$0 < x \leq 10$	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$
Frequency	4	16	18	20	10	2

- (a) Calculate the standard deviation.

[6]

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- 9 (b) (i) Using the information in the frequency table, complete the following relative cumulative frequency table.

Age (years)	≤ 0	≤ 10	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60
Cumulative frequency	0	4	20	38	58	68	70
Relative cumulative frequency	0.00	0.06	0.29	0.54			

[1]

Answer part (ii) and (iii) of question 9(b) on the grid on page 25.

- (ii) Using a scale of 2cm to represent 10 units on the x-axis for $0 \leq x \leq 60$ and 2cm to represent 0.1 unit on the y-axis for $0 \leq y \leq 1$, draw a smooth relative cumulative frequency curve. [3]
- (iii) Showing your method clearly, use your graph to estimate the interquartile range. [2]

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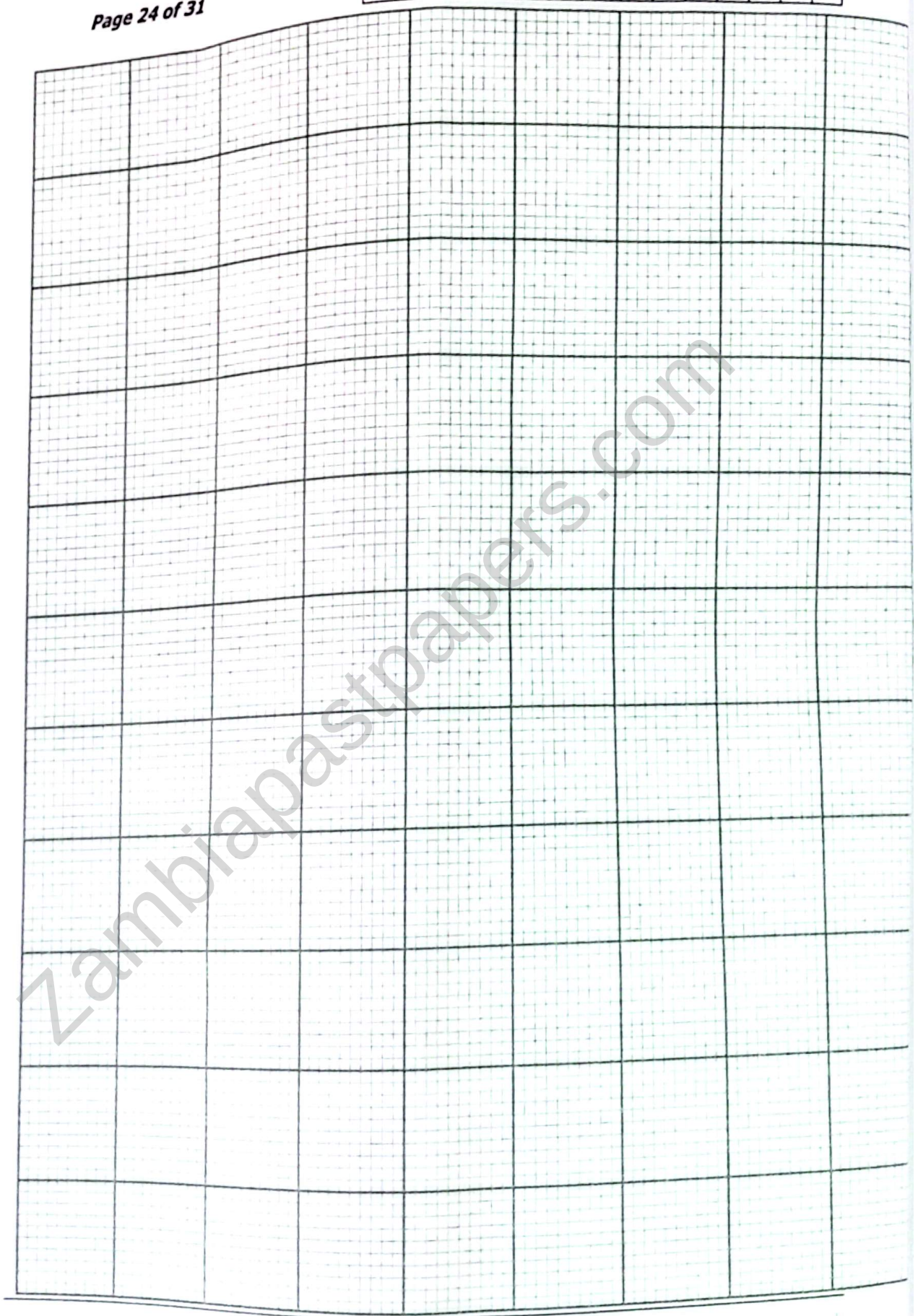
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- 10 A man intends to make two types of bricks, type A and type B for sale. He intends to make at least 100 type A bricks and at least 50 type B bricks. He wants to make at most 600 bricks altogether. The number of type B bricks must not be more than two times the number of type A bricks.

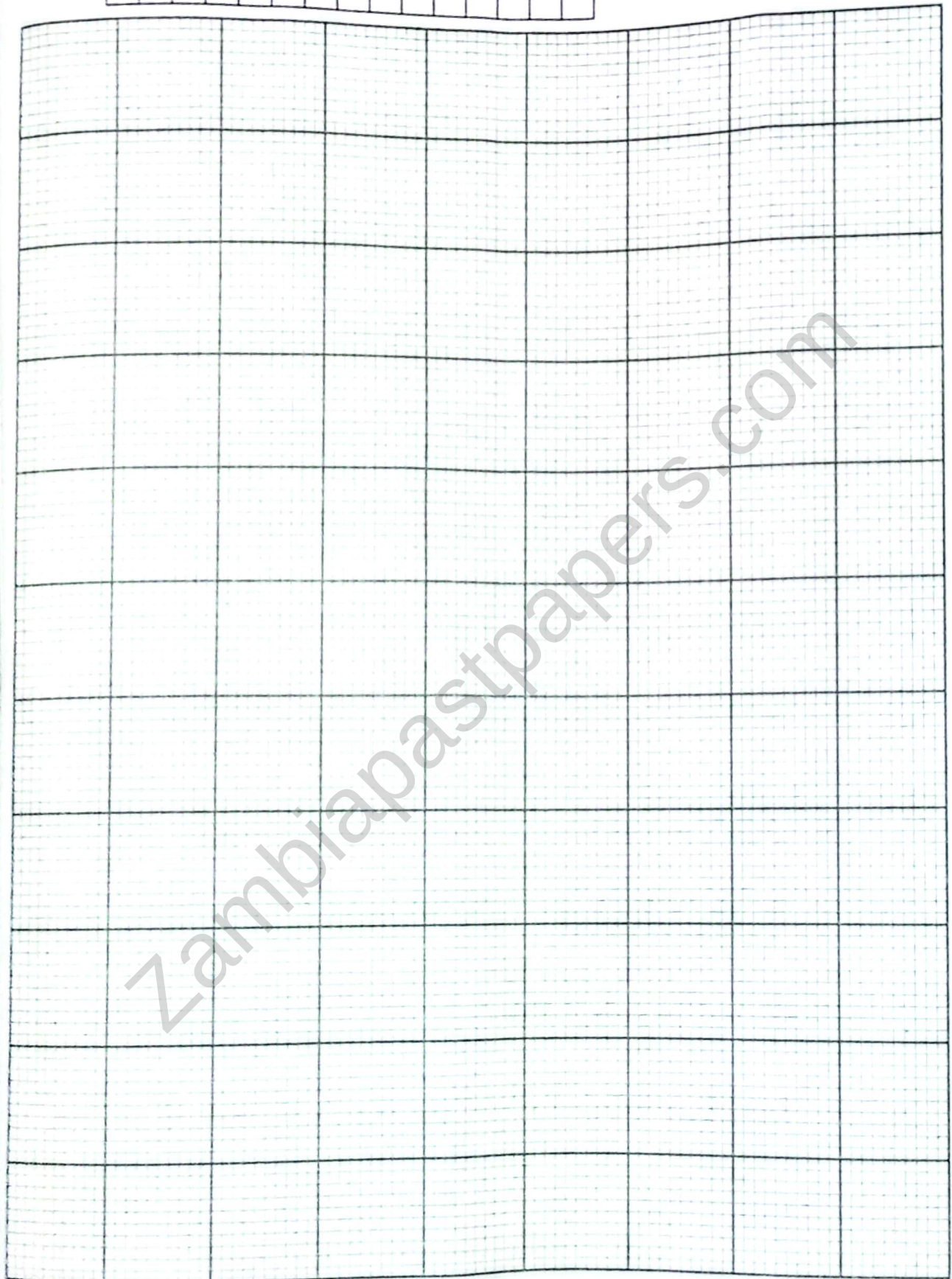
- (a) Let x be the number of type A bricks and y the number of type B bricks. Write four inequalities which satisfy the above conditions. [4]

Answer part (b), (c) and (d) of question 10 on the grid on page 24.

- (b) Using a scale of 2cm to represent 100 bricks on each axis, draw the x-axis for $0 \leq x \leq 700$ and y-axis for $0 \leq y \leq 700$ respectively and shade the unwanted region to show clearly the region in which the solution of the inequalities lie. [4]
- (c) Given that the profit on the sale of a type A brick is K10.00 and on a type B brick is K15.00, how many bricks of each type should he make to maximise profit? [2]
- (d) Calculate the maximum profit. [2]

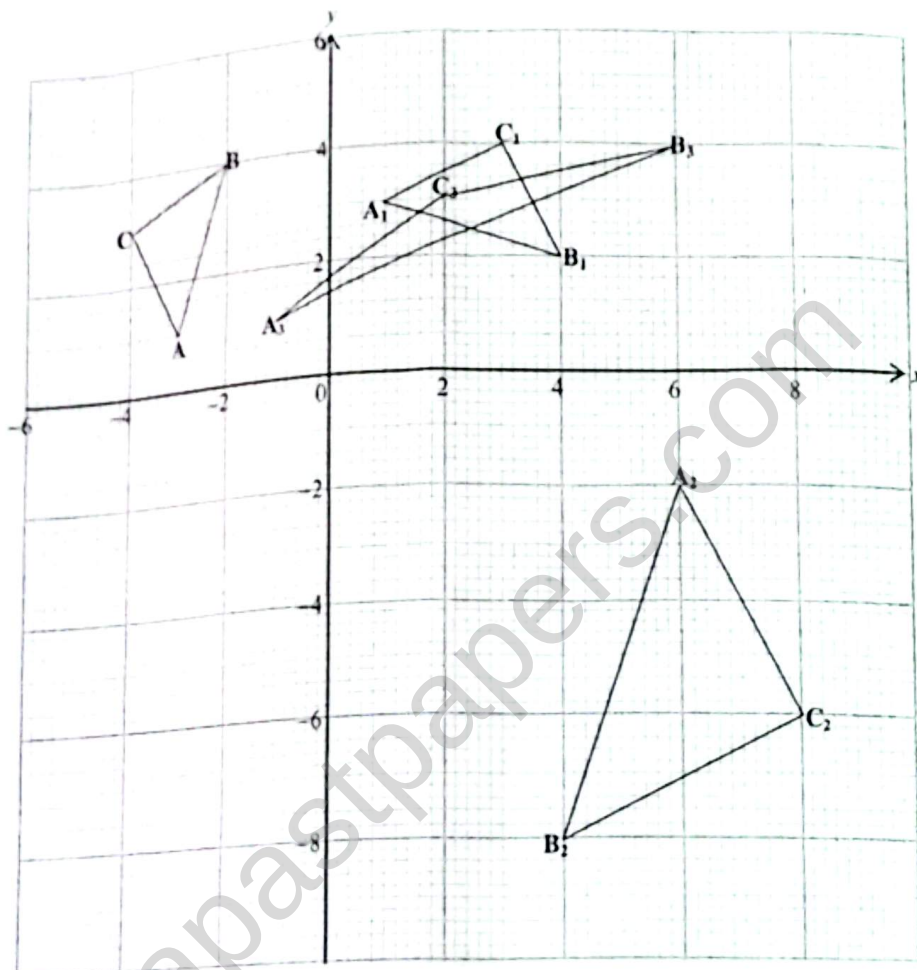


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11 Study the diagram below and answer the questions that follow.

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use



- (a) Triangle ABC is mapped onto triangle $A_1B_1C_1$ by a single transformation. Describe fully this transformation. [3]
- (b) An enlargement maps triangle ABC onto triangle $A_2B_2C_2$. Find the centre of the enlargement and scale factor. [3]
- (c) Triangle ABC is mapped onto triangle $A_3B_3C_3$ by a shear. Find the
 (i) matrix of this transformation, [2]
 (ii) shear factor. [1]
- (d) A transformation with the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ maps triangle ABC onto triangle $A_4B_4C_4$, not on the diagram. Find the coordinates of A_4 , B_4 , and C_4 . [3]

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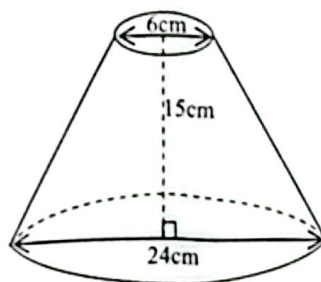
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- 12 (a) The diagram shows a frustum of a cone with base diameter and top diameter of 24cm and 6cm respectively. The height of the frustum is 15cm. [Take π as 3.142]

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Calculate the

- (i) height of the cone,
- (ii) volume of the frustum.

[2]

[4]

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- 12 (b) P, Q and R are three points on the surface of the earth such that P(5°N , 41°E), Q(75°S , 41°E) and R(75°S , 19°W). [$\pi = 3.142$ and $R = 3\,437\text{nm}$]

(i) Draw a sketch of the surface of the earth showing the positions of P, Q and R.

[2]

(ii) Calculate the distance, in nautical miles, of

(a) PQ,

[2]

(b) QR.

[2]

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