00014349

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Mathematics 4024/2

PAPER 2

Thursday 13 AUGUST 2015

Additional materials:

Answer Booklet
Silent Electronic Calculator (non programmable)
Geometrical instruments
Graph paper (3 sheets)
Mathematical tables (optional)
Plain paper (1 sheet)

TIME: 2 hours 30 minutes

Instructions to candidates

Write your name, centre number and candidate number in the spaces provided on the Answer Booklet.

Write your answers and working in the Answer Booklet provided.

If you use more than one Answer Booklet, fasten the Answer Booklets together.

Omission of essential working will result in loss of marks.

There are twelve (12) questions in this paper.

Section A

Answer all questions.

Section B

Answer any four questions.

Silent non programmable Calculators or Mathematical tables may be used.

Cell phones are not allowed in the examination room.

Information for candidates

The number of marks is given in brackets [ ] at the end of each question or part question.

The total marks for this paper is 100.

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.

Section A [52 marks]

Answer **all** questions in this section

1 **(a)** Evaluate $2\frac{1}{4}+4\frac{1}{2}\div\frac{2}{9}$. [2]

(b) Solve the equation $\frac{x+4}{2}=\frac{2x-1}{3}$. [2]

(c) Simplify $\frac{h^2-k^2}{h+k}$. [2]

(d) Express K75.00 as a percentage of K50.00. [2]

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2 **(a)** Given that $B=\begin{pmatrix}0 & -2\\ 2 & -8\end{pmatrix}$, find

(i) $\frac{-3}{2}B$, [1]

(ii) the determinant of B, [1]

(iii) B^2. [2]

(b) Solve the equation $m^2 - m - 5 = 0$, giving your answer correct to 2 decimal places. [5]

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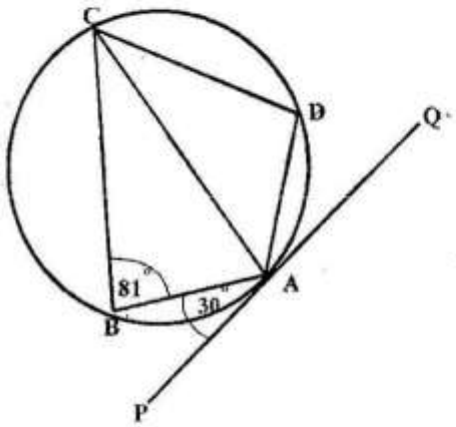
3 **(a)** In the diagram below, PAQ is a tangent to the circle at point A. AC bisects $\hat{BCD}$. $\hat{ABC} = 81^\circ$ and $\hat{PAB} = 30^\circ$.



Calculate;

(i) $\hat{ACB}$, [1]

(ii) $\hat{ADC}$, [1]

(iii) $\hat{DAQ}$, [1]

(iv) $\hat{CAQ}$. [2]

(b) Express $\frac{2}{b-2}-\frac{3}{1-2b}$ as a single fraction its simplest form. [3]

(c) Solve the inequation $4(1 - 2x) > 32$. [2]

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4 **Answer the whole of this question on a sheet of plain paper.**

(a) Construct ΔABC in which AB = 10cm, AC = 8cm and BC = 5cm [1]

(b) Measure and write $A\hat{C}B$. [1]

(c) On your diagram, draw the locus of points which are

(i) 7cm from A, [1]

(ii) equidistant from AC and BC. [1]

(d) **T** is a point inside ΔABC such that it is 7cm from A and is equidistant from AC and BC. Label point **T**. [2]

(e) Another point **Q**, inside ΔABC, is such that it is nearer to BC than to AC and is less than 7cm from A. Shade the region in which point **Q** lies. [2]

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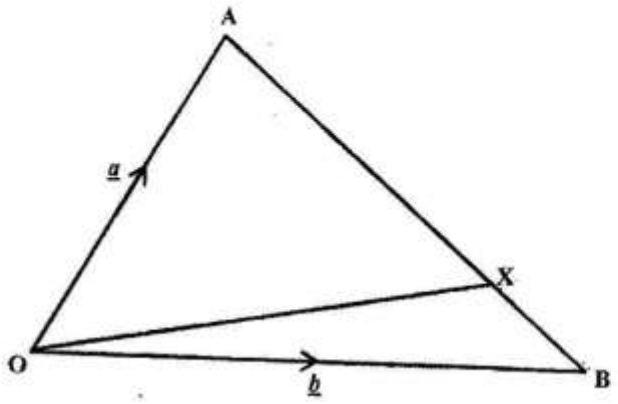
5 **(a)** In the diagram below, OAB is a triangle in which $\overrightarrow{OA} = \underline{a}$ and $\overrightarrow{OB} = \underline{b}$.
The point X on AB is such that AX : XB = 3 : 1.



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

(i) $\overrightarrow{BO}$ [1]

(ii) $\overrightarrow{AB}$ [1]

(iii) $\overrightarrow{AX}$ [1]

(iv) $\overrightarrow{OX}$ [2]

(b) Gevara paid K100.00 for electricity. He was given 237 units for K66.50 and the remaining amount was deducted for TV levy and other taxes.

Calculate

(i) the amount for TV levy and other taxes, [1]

(ii) the cost of 1 unit of electricity. [2]

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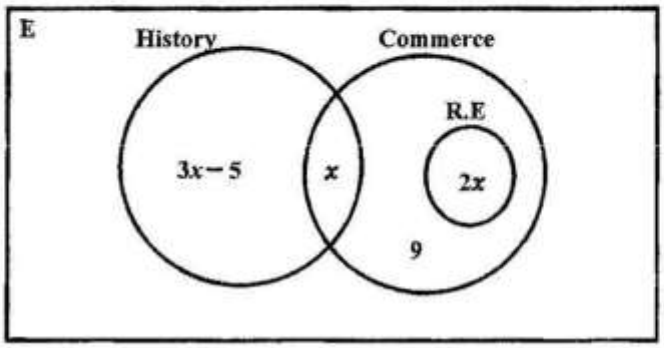
6 **(a)** At Gender Technical Secondary School, a group of 70 girls take optional subjects as illustrated in the Venn diagram below.



(i) Calculate the value of x. [2]

(ii) Find the number of girls who take

(a) History only, [1]

(b) Commerce. [1]

(b) A box has 14 identical balls, three of which are blue. Two balls are drawn at random from the box, one after the other without replacement.

Calculate the probability that

(i) the two balls are both blue, [2]

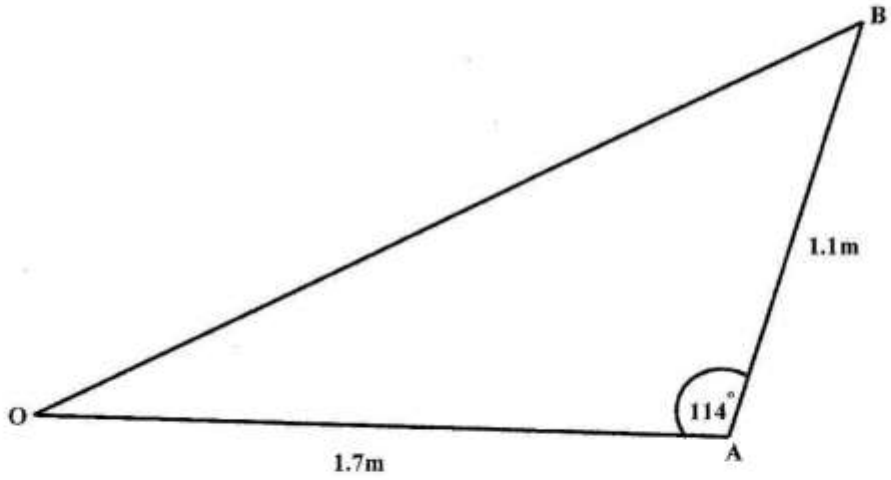
(ii) at least one ball drawn is blue. [3]

SECTION B [48 marks]

Answer any **four** questions in this section.

Each question in this section carries 12 marks.

7 **(a)** The diagram below shows a triangular garden OAB where OA = 1.7m, AB = 1.1m and angle OAB = 114°.



Calculate

(i) the area of triangle OAB correct to 1 decimal place, [3]

(ii) the distance OB, [5]

(iii) the shortest distance from A to OB. [2]

(b) A rectangular maize field has a length of 1.5km and a width of 1.1km. Calculate the length of its diagonal. [2]

8 Answer the whole of this question on graph paper.

(a) The variables x and y are connected by the equation $y = \frac{x^2}{6} + \frac{12}{x} - 6$.

The table below shows some corresponding values of x and y. The values of y are given correct to one decimal place.

x	1	1.5	2	3	4	5	6	6.5
y	6.2	2.4	0.7	-0.5	-0.3	0.6	2.0	p

(i) Calculate the value of p, correct to 1 decimal place. [1]

(ii) Using a scale of 2cm to represent 1 unit on each axis, draw the graph of $y = \frac{x^2}{6} + \frac{12}{x} - 6$, [3]

(iii) By drawing a tangent, find the gradient of the curve at the point (6, 2). [2]

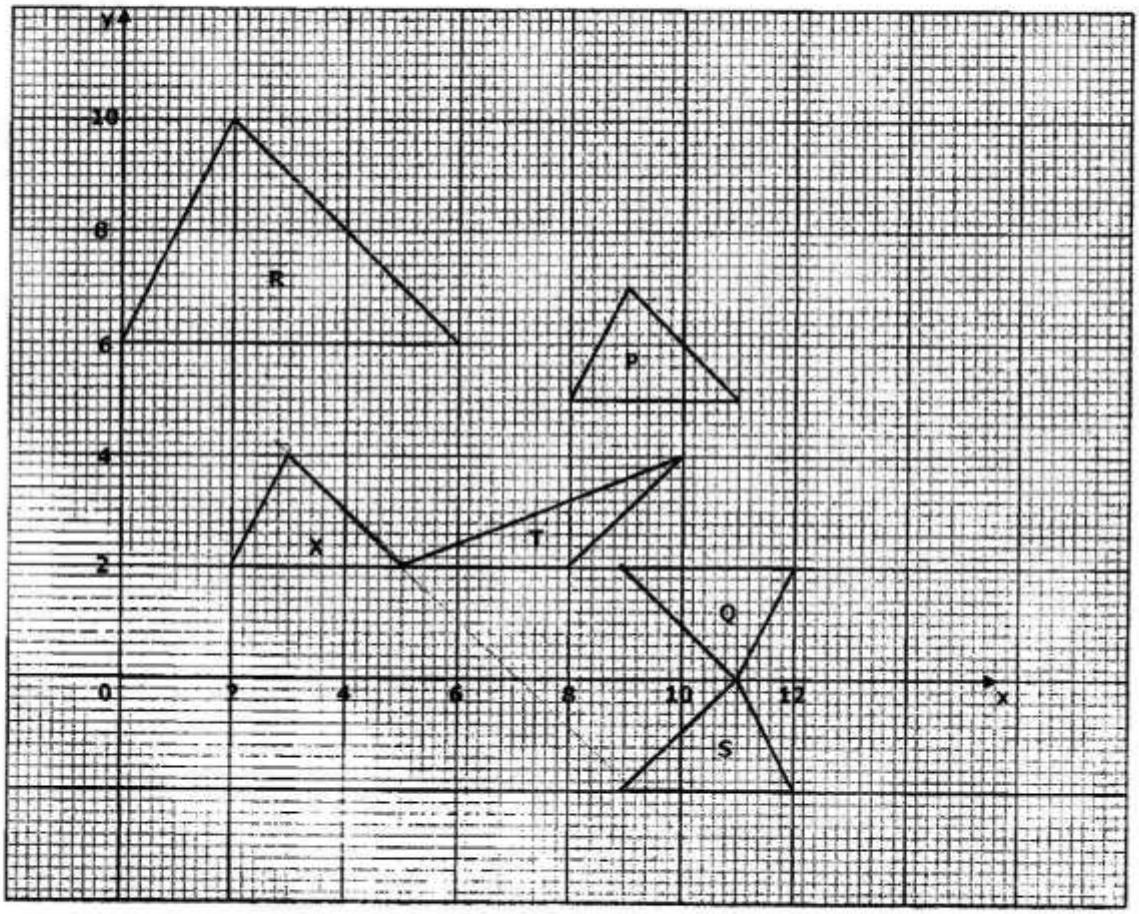
(iv) On the same axes, draw the graph of the straight line $y = \frac{x}{4}$, hence solve the equation $\frac{x^2}{6} + \frac{12}{x} - 6 = \frac{x}{4}$. [3]

(b) Mofu, Kopa and Nora are partners in business. Mofu owns 50% of the shares while Kopa and Nora own the remaining shares equally. Given that Mofu's shares are valued at K1 800.00,

(i) calculate the sum of all the shares, [1]

(ii) express the shares of Mofu, Kopa and Nora as a ratio in its simplest form. [2]

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



(i) Write the column vector representing the translation which maps Triangle P onto Triangle X, [1]

(ii) Triangle Q can be mapped onto X by a rotation. Find the coordinates of its centre and the angle of rotation. [3]

(iii) Triangle R can be mapped onto Triangle X by an enlargement. Write the coordinates of the centre and the scale factor. [3]

(iv) Triangle Q is mapped onto Triangle S by a single transformation. Find the matrix of this transformation. [3]

(v) Triangle X is mapped onto Triangle T by a shear. Find the invariant line and the shear factor. [2]

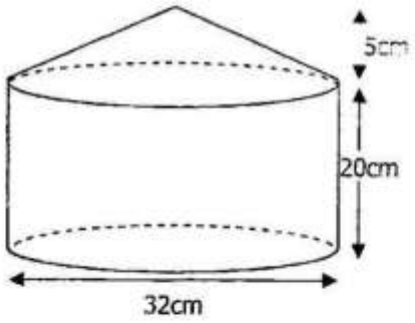
10 **(a)** Two towns K and M are on latitude 12°S. Town K is on longitude 58.4°W while town M is on longitude 25.6°E.

(i) Show the positions of towns K and M on a sketch of the earth. [2]

(ii) Taking $\pi = 3.142$ and R = 6 370km, calculate the distance KM. [3]

(iii) Given that the time at town K is 13 00 hours what is the time at town M? [1]

(b) Chakudya has a food warmer made up of a cylindrical bowl and a conical lid, as shown in the diagram below. The bowl has a height of 20cm and a diameter of 32cm. The height of the lid is 5cm.



Taking $\pi = 3.142$, Calculate

(i) the surface area of the cylindrical bowl, [4]

(ii) the volume of the lid (volume of cone = $\frac{1}{3}\pi r^2 h$). [2]

11 Answer the whole of this question on graph paper.

(a) Mrs Kawena bakes two types of cakes for sale; type A and type B.

(i) To satisfy her regular customers daily, she must bake;

(a) at least 10 cakes of type A,

(b) at least 20 cakes of type B.

Taking x to represent the number of cakes of type A and y to represent cakes of type B, write two inequalities which satisfy the above conditions. [2]

(ii) To avoid wastage, the total number of cakes she should bake per day must not exceed 70. Write another inequality which satisfies this condition. [1]

(iii) The point (x, y) represents x cakes of type A and y cakes of type B. Using a scale of 2cm to represent 10 cakes on each axis, draw x and y axes for $O \leq x \leq 80$ and $O \leq y \leq 80$. Present the three inequalities above on your graph, and shade the unwanted region to indicate clearly the region where (x, y) must lie. [4]

(b) Factorise completely $2x^2 - 3x + 2cx - 3c$. [2]

(c) Evaluate $\frac{2.04}{\sqrt{0.25} + 1.5}$. [3]

12 Answer the whole of this question on graph paper.

The heights of 56 plants, grown under experimental conditions, are given in the table below.

Height in cm	$x \leq 10$	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$
Number of plants	1	2	4	6	13	22	8

(a) Copy and complete the cumulative frequency table below. [1]

Height in cm	≤ 10	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70
Number of plants	1	3	7	13			56

(b) Using a horizontal scale of 2cm to represent a height of 10cm and a vertical scale of 2cm to represent 10 plants, draw a smooth cumulative frequency curve for these results. [3]

(c) Showing your method clearly, use your graph to estimate

(i) the median, [2]

(ii) the interquartile range, [2]

(iii) the 60^{th} percentile. [1]

(d) Plants with height 45cm or more were classified as healthy. How many plants were healthy? [3]