EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate and General Certificate of Education Ordinary Level

MATHEMATICS (SYLLABUS D) 4024/2

PAPER 2

Thursday **9 OCTOBER 2014**

Additional materials:
Answer Booklet
Silent Electronic Calculator (non programmable)
Geometrical Instruments
Graph paper (2 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 should not be brought into 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.

For Examiner Use

Section A [52 marks]

Answer **all** questions in this section

1 **(a)** Evaluate $1\frac{2}{3} - 1\frac{2}{3} \times \frac{1}{4}$. [2]

(b) Solve the equation $5x - 8 - 3(x + 1) = -7$. [2]

(c) Simplify $5(2y - 3) - 2(5 - 2y)$. [2]

(d) Mataya's digital camera stores images on a memory card of capacity 512 units. Given that two thirds of the memory card is used, calculate the number of unused units, giving your answer correct to 2 decimal places. [2]

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2 **(a)** Given that $A = \begin{pmatrix} 5 & 2 \\ 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$, find

(i) the inverse of matrix A, [2]

(ii) $3A - B$, [2]

(iii) AB. [2]

(b) Express $\frac{5}{2y-1} - \frac{6}{3y-1}$ as a single fraction in its simplest form. [3]

(c) Solve the inequation $9t - 4 < 12t - 10$. [2]

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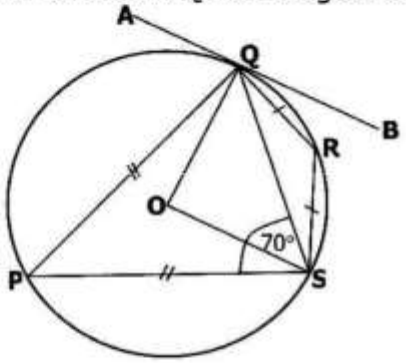
3 **(a)** In the diagram below, P, Q, R and S are points on the circumference of a circle with centre O. AQB is a tangent to the circle at Q.



Given that PS = PQ, QR = RS and $P\hat{S}Q = 70°$, calculate

(i) $Q\hat{P}S$, [1]

(ii) $Q\hat{R}S$, [1]

(iii) $A\hat{Q}P$, [1]

(iv) $S\hat{O}Q$. [1]

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

For Examiner's Use

4 **(a)** **(i)** Construct triangle ABC in which AC = 11.5cm, BC = 7cm and AB = 9.5cm. [1]

(ii) Measure and write the size of $A\hat{B}C$. [1]

(b) On the same diagram and within triangle ABC, construct the locus of points

(i) equidistant from AC and BC, [1]

(ii) 7.5cm from A, [1]

(iii) 2.5cm from AC. [2]

(c) Given that N is a point within triangle ABC such that it is greater than or equal to 7.5cm from A, nearer to AC than BC and less than or equal to 2.5cm from AC, shade clearly the region in which N must lie. [2]

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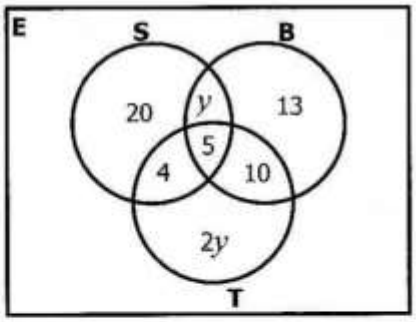
5 **(a)** Tokhozani Sports Club offers Squash (S), Badminton (B) and Tennis (T). The Venn diagram below shows choices of the 73 members of the club.



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

(ii) Find the number of members who played Squash or Tennis but not Badminton. [1]

(iii) How many members played two different sports only? [1]

(iv) Find the number of members who played one sport only. [1]

(b) To write an examination, a candidate is required to pay an entry fee of K38.50 and K25.00 for each subject.

(i) If Mary intends to write 4 subjects, how much is she expected to pay? [1]

(ii) Given that Martin paid a total of K188.50, how many subjects did he write? [2]

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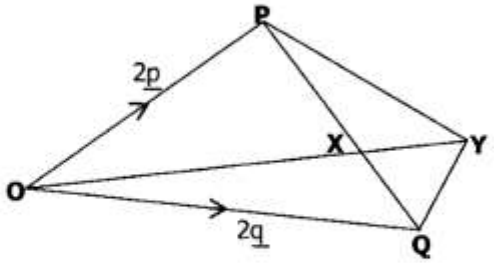
6 **(a)** In the diagram below, $\overrightarrow{OP} = 2\underline{p}$ and $\overrightarrow{OQ} = 2\underline{q}$. X is a point on PQ such that $\frac{PX}{PQ} = \frac{2}{3}$.



(i) Express in terms of $\underline{p}$ and/or $\underline{q}$

(a) $\overrightarrow{PQ}$, [1]

(b) $\overrightarrow{QX}$. [1]

(ii) Given also that $\overrightarrow{OY} = h\overrightarrow{OX}$, express $\overrightarrow{OY}$ in terms of $\underline{p}$, $\underline{q}$ and h. [2]

(b) The diagonals of a rhombus are 20cm and 16cm long. Calculate the length of the side of the rhombus, giving your answer correct to 2 decimal places. [2]

(c) Factorise completely $2xy + 8x - 3y - 12$. [2]

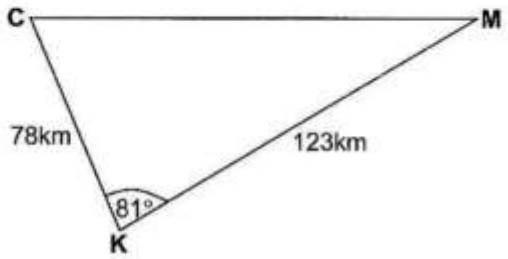
For Examiner's Use

Section B [48 marks]

Answer any **four** questions in this section

Each question in this section carries 12 marks.

7 **(a)** Positions of Kabwela (K), Chapa (C) and Muzi (M) are as shown in the diagram below. Chapa is 78km from Kabwela and Muzi is 123km from Kabwela.



(i) Given that $C\hat{K}M = 81°$, calculate the area of triangle CMK. [3]

(ii) Calculate the distance CM. [5]

(iii) A company has been contracted to construct a road from Muzi (M) to Chapa (C). Find the total cost of constructing this road, if the company charges K215 000.00 per kilometre. [2]

(b) Mrs Mwasona invested K800 000.00 for 4 years at 5% per annum simple interest with a certain bank. How much money will be in her account at the end of the period? [2]

8 **Answer the whole of this question on a sheet of graph paper.**

A bag containing 250 potatoes was supplied to a supermarket. Each of the potatoes was weighed to the nearest gram and the results were as shown in the table below.

Mass (g)	$50 < x \leq 100$	$100 < x \leq 150$	$150 < x \leq 200$	$200 < x \leq 250$	$250 < x \leq 300$	$300 < x \leq 350$
No. of potatoes	5	30	65	105	40	5

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

Mass (g)	≤50	≤100	≤150	≤200	≤250	≤300	≤350
No. of potatoes	0	5	35				250

(b) Using a scale of 2cm to represent 50 grams on the x-axis and 4cm to represent 50 potatoes on the y-axis, draw a smooth cumulative frequency curve. [3]

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

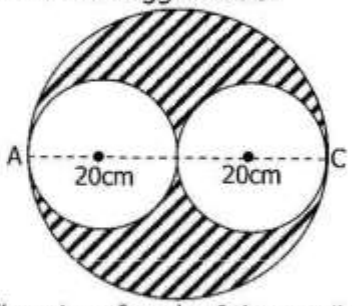
(i) the median mass, [1]

(ii) the interquartile range, [2]

(iii) the 60th percentile. [2]

(d) Potatoes weighing between 180g and 290g are graded '**B**'. Use your graph to estimate the number of grade '**B**' potatoes. [3]

9 **(a)** A pattern on a chitenge material consists of three circles as shown in the diagram below. AC is the diameter of the bigger circle.

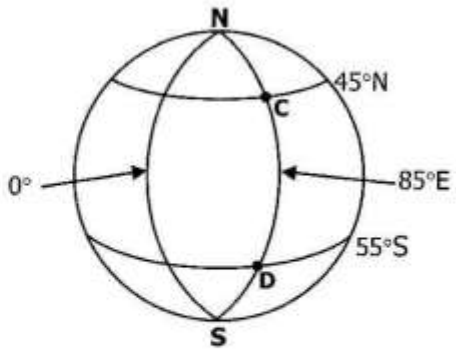


Given that the diameter of each of the small circles is 20cm and taking $\pi = 3.142$, calculate the

(i) total perimeter of the two small circles, [3]

(ii) area of the shaded part. [3]

(b) The diagram below shows a model of the earth. The points C and D are on the same longitude. The latitudes of C and D are 45°N and 55°s respectively.
(Take $\pi = 3.142$ and R = 3 437nm)



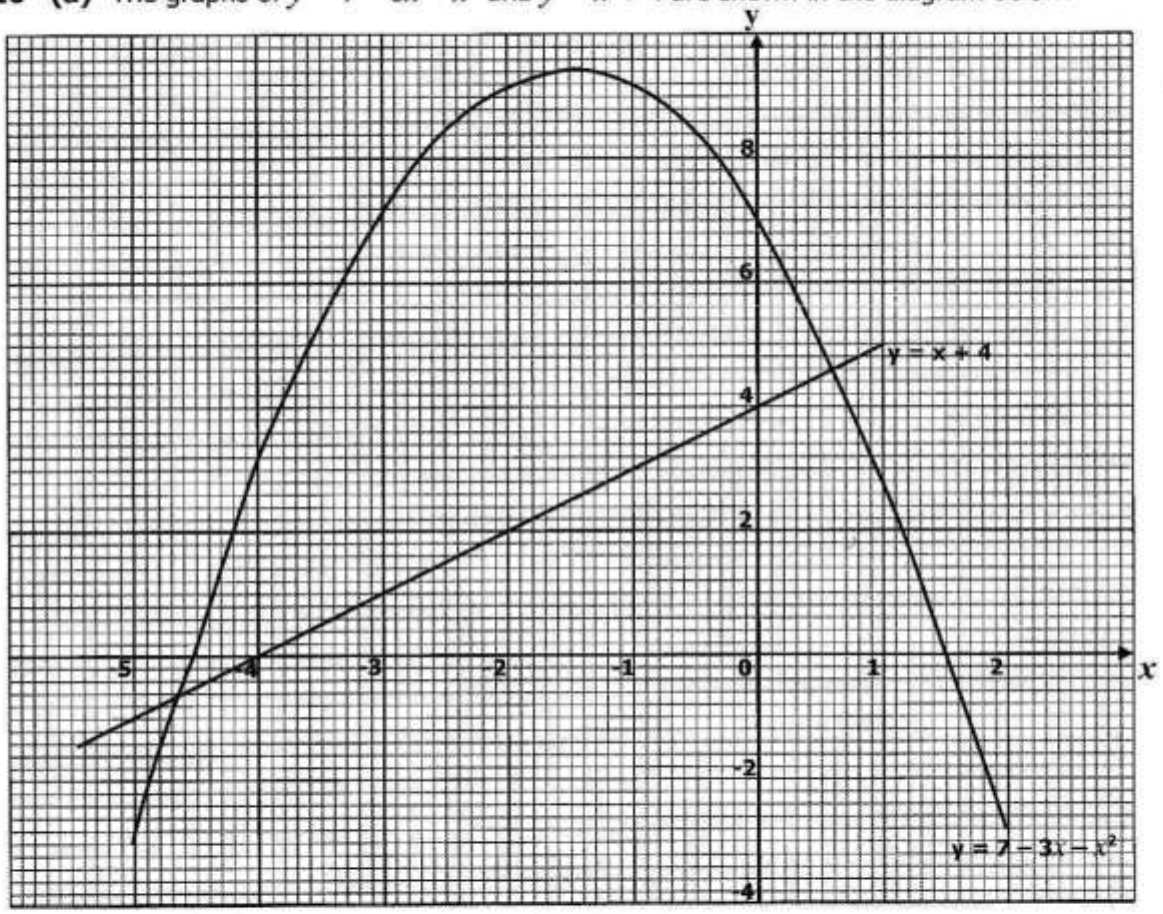
(i) Write the position of the point C. [1]

(ii) Calculate the difference in latitude between C and D. [1]

(iii) Find the distance CD in nautical miles. [2]

(iv) Calculate the circumference of the latitude 45°N in nautical miles. [2]

10 **(a)** The graphs of $y = 7 - 3x - x^2$ and $y = x + 4$ are shown in the diagram below.



(i) Use the graph above to solve the following equations;

(a) $9 - 3x - x^2 = 0$, [3]

(b) $7 - 3x - x^2 = x + 4$. [2]

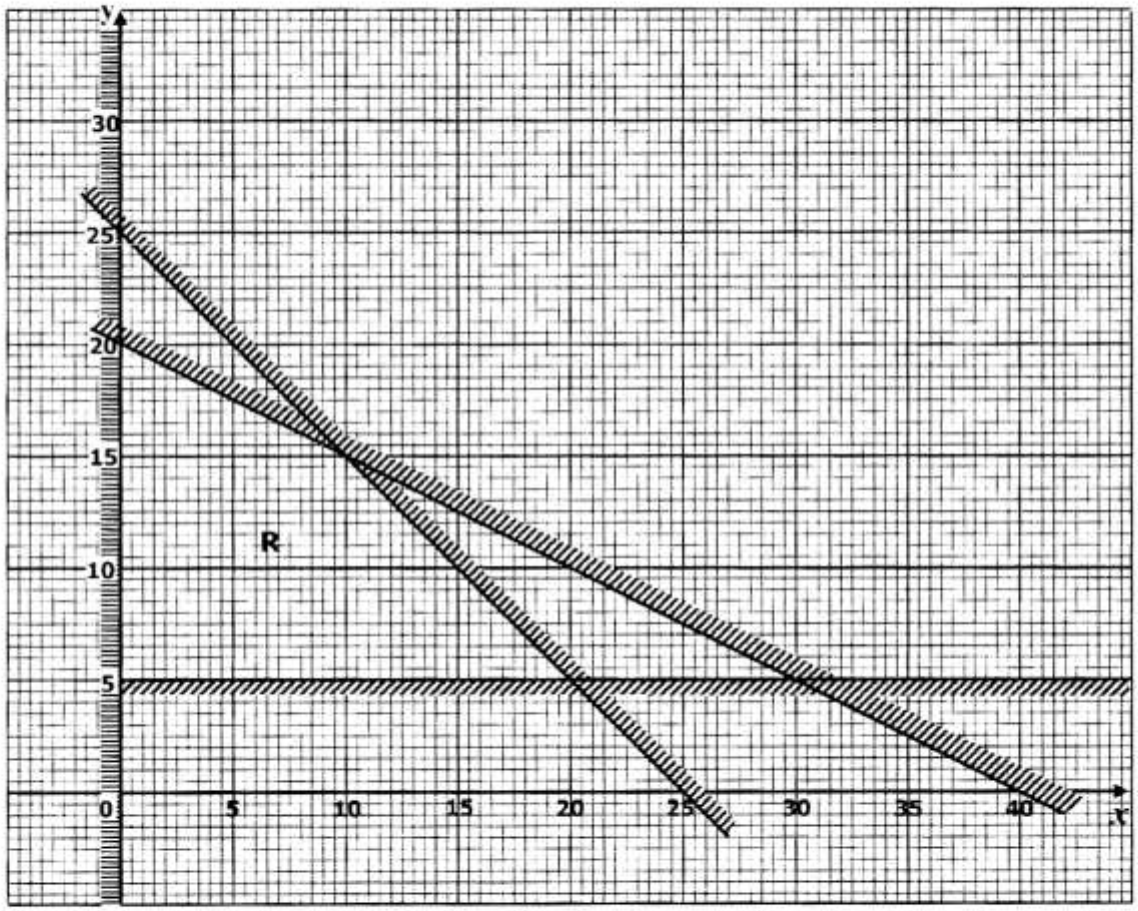
(ii) Estimate the area bounded by the curve, $x = -3$, $x = -1$ and $y = x + 4$. [3]

(iii) Find the maximum value of $y = 7 - 3x - x^2$. [1]

(b) In a certain school, the ratio of boys to girls is 3 : 5. Given that there are 600 girls, calculate the total number of pupils in the school. [3]

For Examiner's Use

11 (a) The graph below shows four inequalities that satisfy the intentions of a businessman to purchase two types of soft drinks, A and B.



(i) Given that x represents the number of type A soft drinks and y the number of type B, write the four inequalities that represent the unshaded region R. [4]

(ii) If the profit on type A soft drinks is K2.00 per bottle and profit on type B is K3.00 per bottle, find the number of each type of soft drinks he must buy in order to make maximum profit. [1]

(iii) Find this maximum profit. [2]

(b) Two pupils are to represent a school at a Human Rights Conference. If the two are chosen at random from a group of 8 girls and 6 boys, calculate the probability that the two pupils picked

(i) are both girls, [2]

(ii) at least one is a boy. [3]

For Examiner's Use

12 Answer the whole of this question on a sheet of graph paper.

Using a scale of 2cm to represent 1 unit on each axis, draw x and y axes for $-3 \leq x \leq 7$ and $-3 \leq y \leq 7$.

(a) ΔABC has vertices A(3, 6), B(3, 7) and C(1, 7). $\Delta A_1B_1C_1$ has vertices $A_1(-1, 4)$, $B_1(-2, 4)$ and $C_1(-2, 2)$.

(i) Draw and label ΔABC and $\Delta A_1B_1C_1$. [2]

(ii) Describe fully a single transformation which maps ΔABC onto $\Delta A_1B_1C_1$. [2]

(b) The matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ maps ΔABC onto $\Delta A_2B_2C_2$.

(i) Find the coordinates of $\Delta A_2B_2C_2$. [2]

(ii) Draw and label $\Delta A_2B_2C_2$. [1]

(c) $\Delta A_1B_1C_1$ can be mapped onto $\Delta A_3B_3C_3$ by a translation. Given that A_3 is the point $(3, -1)$,

(i) find the column vector representing this translation, [1]

(ii) draw and label $\Delta A_3B_3C_3$. [1]

(d) $\Delta A_4B_4C_4$ has vertices $A_4(0, 3)$, $B_4(0, 1)$ and $C_4(4, 1)$.

(i) Draw and label $\Delta A_4B_4C_4$. [1]

(ii) Describe fully the transformation which maps ΔABC onto $\Delta A_4B_4C_4$. [2]