

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

Mathematics

4024/2

PAPER 2

Thursday

8 OCTOBER 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.

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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.

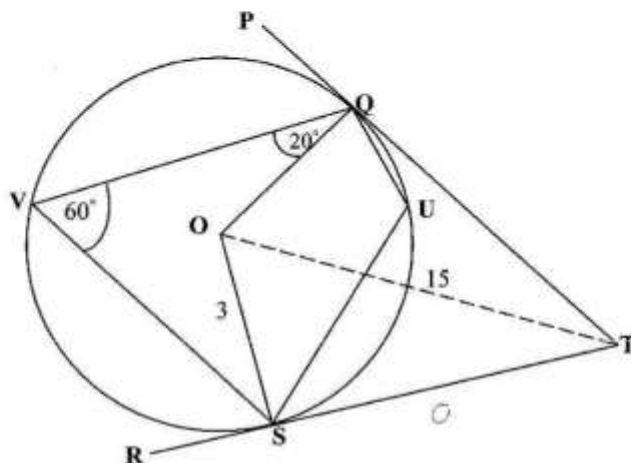
Section A [52 marks]

Answer **all** questions in this section

- 1 (a) Evaluate $(1.3)^2 + 1.3 \times 0.3$. [2]
 (b) Factorise completely $5px - 5py + 3qx - 3qy$. [2]
 (c) Bana Makwebo bought a display cabinet at K2 500.00 and later sold it at K2 000.00. What was the percentage loss? [2]
 (d) Simplify $\frac{2y^2 - 3y - 5}{y^2 - 1}$. [3]

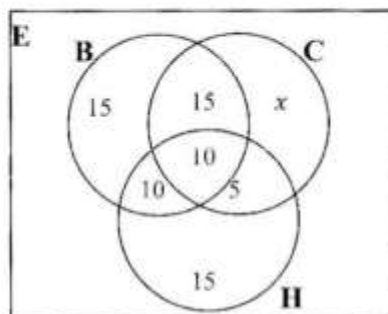
- 2 (a) Solve the equation $2y^2 + 6y - 1 = 0$, giving your answers correct to 2 decimal places. [5]
 (b) Given that matrix $Q = \begin{pmatrix} a & 2 \\ 3 & -2 \end{pmatrix}$,
 (i) write an expression in terms of a for the determinant of Q , [1]
 (ii) find the value of a , given that the determinant of Q is 2, [2]
 (iii) write Q^{-1} . [1]

- 3 (a) In the diagram below, a circle with centre O passes through the points Q , U , S and V . TP and TR are tangents to the circle at the points Q and S respectively. Angle $VQO = 20^\circ$ and angle $QVS = 60^\circ$.



- Find (i) $\hat{QUS}$, [1]
 (ii) $\hat{VQP}$, [1]
 (iii) $\hat{PTR}$, [2]
 (iv) reflex $\hat{SOQ}$, [1]
 (v) the length ST , given that $OS = 3\text{cm}$ and $OT = 15\text{cm}$. [2]
 (b) Express $\frac{4}{x-2} - \frac{2}{x+3}$ as a single fraction in its simplest form. [3]

- 4 The Venn diagram below shows the number of students who took Business Studies (B), Human Resources (H) and Community Development (C) at Mafundisho College. 100 students took these three courses.



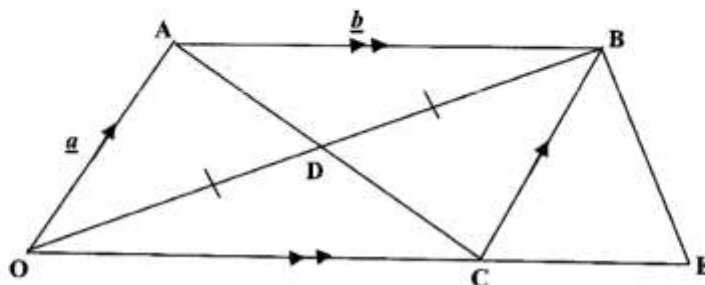
- (a) Find
- (i) the value of x , [2]
 - (ii) the number of students who took Human Resources, [1]
 - (iii) $n(B \cap C) \cap H'$, [1]
 - (iv) $n(B \cup C) \cap H'$. [1]
- (b) If a student is chosen at random, what is the probability that the student took
- (i) one course, [2]
 - (ii) at least two courses? [3]

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

- (a) Construct triangle **ABC** in which **AB** = 11cm, angle **BAC** = 60° and **AC** = 6cm. [1]
- (b) Measure and write the length **BC**. [1]
- (c) On your diagram, draw the locus of points within triangle **ABC** which are
- (i) equidistant from **AB** and **AC**, [1]
 - (ii) equidistant from **A** and **B**. [1]
- (d) **R** is a point inside the triangle **ABC** such that it is equidistant from **AB** and **AC** and equidistant from **A** and **B**. Label point **R**. [2]
- (e) Another point **S** within triangle **ABC** is such that it is nearer to **AB** than **AC** and nearer to **A** than **B**. Indicate clearly, by shading, the region in which **S** must lie. [2]

- 6 (a) Solve the inequation $-2(x-4) \leq 2-4x$. [2]
- (b) In the diagram below, $OABC$ is a parallelogram in which $\vec{OA} = \underline{a}$ and $\vec{AB} = \underline{b}$. AC and OB meet at D such that $OD = DB$. OC is produced to E , such that $CE = \frac{1}{2}OC$.



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

- (i) $\vec{OB}$, [1]
- (ii) $\vec{AD}$, [2]
- (iii) $\vec{BE}$. [1]

SECTION B [48 marks]

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

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Each question in this section carries 12 marks.

- 7 (a) **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation $y = x^2 - 2x + 1$.

Some of the corresponding values of x and y correct to 1 decimal place are given in the table below.

x	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3
y	p	4	2.3	1	0.3	0	0.3	1	2.3	4

- (i) Calculate the value of p , [1]
- (ii) Using a scale of 2cm to represent 1 unit on both axes, draw the graph of $y = x^2 - 2x + 1$ for $-2 \leq x \leq 3$ and $0 \leq y \leq 10$. [3]
- (iii) Calculate an estimate of the gradient of the curve at the point (0,1). [2]
- (iv) Showing your method clearly, use your graph to solve the equation $x^2 - 2x + 1 = 1.5$. [3]
- (b) Given that Kachinja uses K46.90 to buy \$7,
- (i) calculate the cost of buying \$1, [1]
- (ii) how much Kwacha will be required to buy \$3? [2]

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

Triangle **P** has vertices (2, 2), (3, 1) and (3, 2). Triangle **Q** has vertices (−2, 2), (−3, 1) and (−3, 2).

- (a) Using a scale of 2cm to represent 1 unit on each axis, draw axes for values of x and y in the range $-4 \leq x \leq 4$ and $-4 \leq y \leq 6$.
Draw and label triangles **P** and **Q**. [2]
- (b) Describe fully a single transformation that maps triangle **P** onto triangle **Q**. [2]
- (c) Triangle **R** is the image of triangle **P** after a rotation of 180° about the origin.
Draw triangle **R**. [2]
- (d) Triangle **P** is mapped onto triangle **S** with coordinates (1, −2), (2, −2) and (2, −3). Describe fully a single transformation that maps triangle **P** onto triangle **S**. [3]
- (e) A transformation with matrix $\begin{pmatrix} 1 & 0 \\ 0 & 2.5 \end{pmatrix}$ maps triangle **P** onto triangle **T**.
Draw and label triangle **T** and name this transformation. [3]

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

On a particular day, a tuck shop owner recorded the expenditure of 350 boys and the results were as shown in the table below.

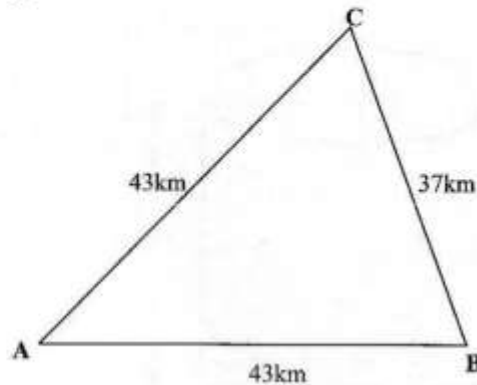
Amount (K)	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$	$70 < x \leq 80$	$80 < x \leq 90$	$90 < x \leq 100$
No. of boys	20	50	55	70	60	45	35	10	5

- (a) Calculate the mean amount of money spent. [3]
- (b) Copy and complete the cumulative frequency distribution. [1]

Amount (K)	≤ 10	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80	≤ 90	≤ 100
No. of boys	0	20	70	125	195	255	300			350

- (c) Using a horizontal scale of 2cm to represent K10.00 and a vertical scale of 2cm to represent 50 boys, draw a smooth cumulative frequency curve. [3]
- (d) Showing your method clearly, use your graph to estimate
- (i) the median, [1]
- (ii) the semi-interquartile range. [2]
- (e) Given that those who spent K75.00 or more qualified for a draw in a competition to win a prize, find the number of boys who qualified for the draw. [2]

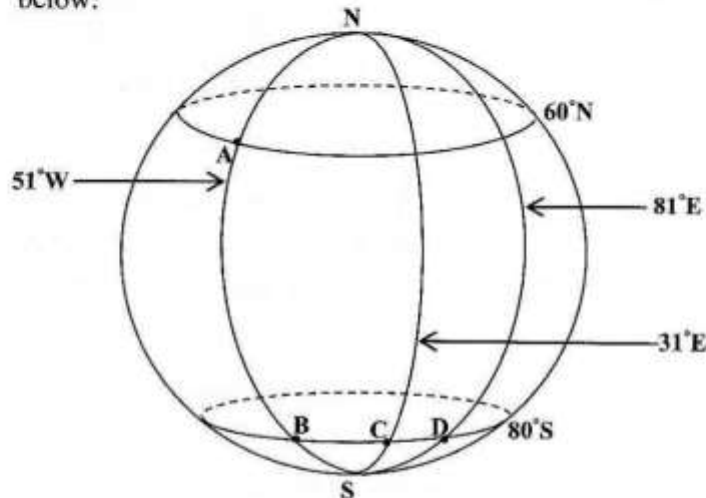
- 10 (a) In Votani Constituency, A, B and C are polling stations as shown on the diagram below.



Calculate

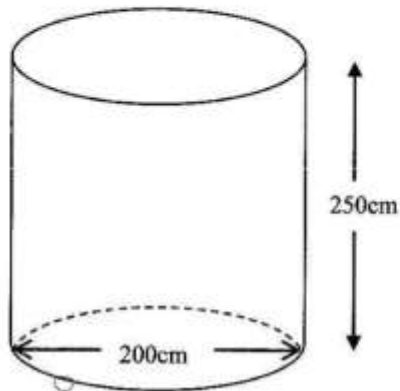
- (i) angle BAC, [5]
 - (ii) angle ACB, [1]
 - (iii) the area of triangle ABC correct to 1 decimal place, [2]
 - (iv) the shortest distance from C to AB. [2]
- (b) Solve the equation $3(t - 5) - 2 = -1 + t$. [2]

- 11 (a) A, B, C and D are points on the surface of the earth as shown in the diagram below.



- (i) Using latitudes and longitudes, write the positions of the points A and B. [2]
- (ii) Find the difference in longitude between points C and D. [1]
- (iii) Calculate the distance CD in nautical miles [$\pi = 3.142$ and $R = 3437\text{nm}$]. [2]
- (iv) Given that the local time at D is 13 05 hours, find the time at C. [1]

- (b) A cylindrical water tank at Mwaiseni Lodge has diameter of 200cm and height 250cm as shown below.

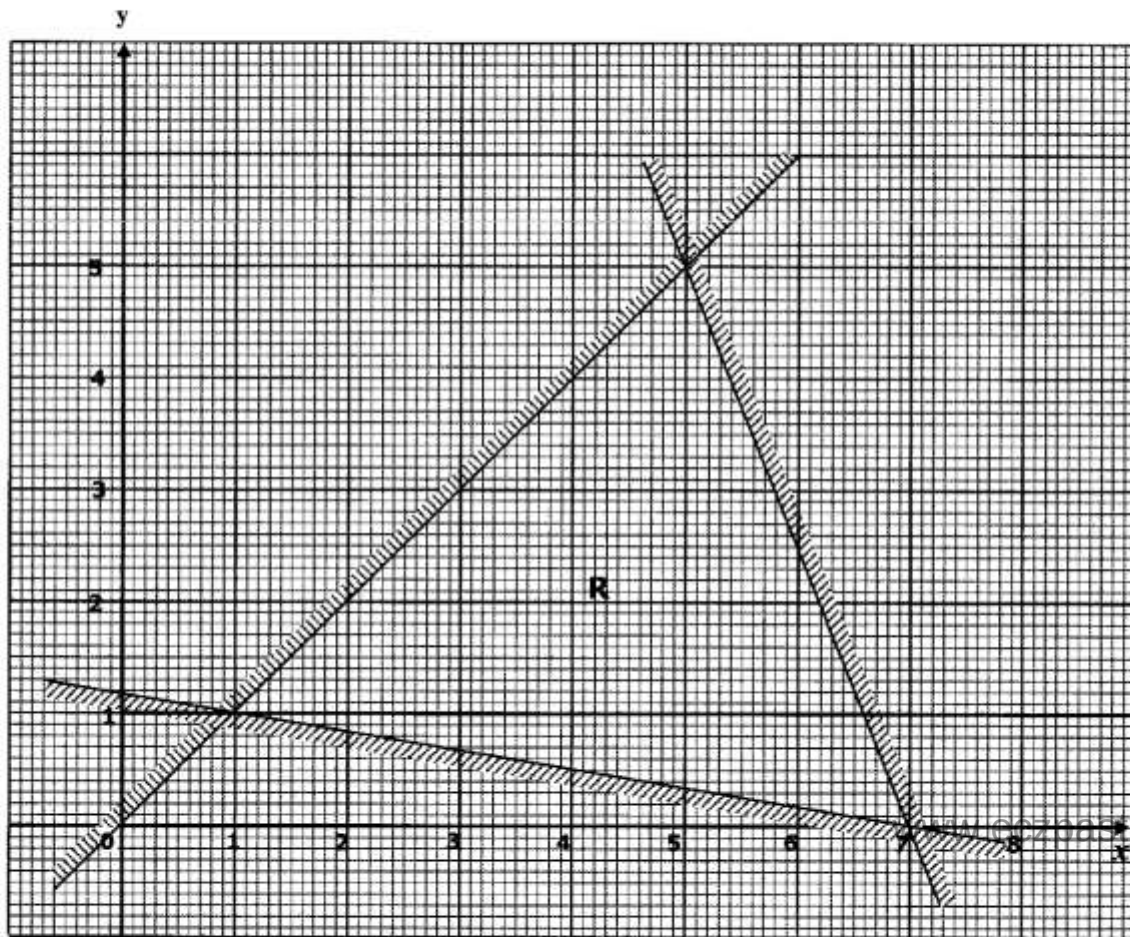


Taking π to be 3.142, find

- | | | |
|------|---|-----|
| (i) | the total surface area of the tank if it is closed, | [3] |
| (ii) | the number of litres of water the tank can hold. | [3] |

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- 12 (a) The graph below shows three inequalities that satisfy region R.



- (i) Write the three inequalities that define the unshaded region R. [6]
- (ii) Find the largest value of $4x - 5y$ within region R. [1]
- (b) Before the ZESCO prepaid meters were installed in Mr Malaiti's house, his electricity bill used to consist of a fixed charge of K20.00 and 20 ngwee for every unit of electricity used.
- (i) Given that in a particular month, he used 387.3 units, calculate the amount he paid to ZESCO. [2]
- (ii) In another month, he was given a bill of K120.40. Find the number of units he used in this month. [3]