ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS **4004/2**

PAPER 2 2 hours 30 minutes

JUNE 2024 SESSION

Additional materials:
Mathematical Instruments
Mathematical Tables
Non programmable Electronic Calculator
Answer booklet

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces provided on the answer booklet.
Answer **all questions** in Section A and **any four questions** from Section B.
If you use more than one booklet, fasten them together.
All working must be clearly shown on the same sheet as the rest of the answer.
Omission of essential working will result in loss of marks.
If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given correct to three significant figures. Answers in degrees should be given correct to one decimal place.
Mathematical tables and Non-programmable electronic calculators may be used to evaluate explicit numerical expressions.

INFORMATION FOR CANDIDATES

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

This question paper consists of 10 printed pages and 2 blank pages.

Section A [52 Marks]

Answer **all** questions in this section

1 **(a)** Mr Moyo's basic monthly salary is \$205. He receives a commission of 2% for any sales above \$500.

(i) Calculate his gross salary for the month if his sales were \$1550. [3]

(ii) In a certain month the following deductions were made

Pension	\$3,90
Medical aid	\$1,65
Income tax	\$4,50

Calculate his net salary for the month he made sales of \$1550. [3]

(b) The sum of the interior angles of a polygon is double the sum of the exterior angles.

Find the number of sides of the polygon. [2]

2 **(a)** Solve the equation $6x - 2 = 2x + 8$. [2]

(b) Factorise completely

(i) $5h^2 - 20k^2$ [3]

(ii) $2mp - m - 6np + 3n$ [2]

(c) Express $\frac{3}{x-y} - \frac{2}{x+y}$ as a single fraction in its simplest form. [3]

3 **(a)** Mr Dube had an appointment with a doctor at 1400. Mr Dube arrived 14 minutes earlier and the doctor was 15 minutes late.

Find how long Mr Dube had to wait before the doctor arrived. [2]

(b) Find the difference between 4 weeks 3 days and 2 weeks 5 days, giving the answer in weeks and days. [1]

(c) Mary cycles to and from a school 5 times. The school is 5km away, to the nearest km.

Calculate the smallest possible distance she cycles. [3]

(d) The population of a town A is $4{,}52 \times 10^7$ and that of town B is $8{,}7 \times 10^6$.

(i) Calculate the difference between the populations of town A and town B, giving the answer in standard form. [2]

(ii) Given that 40% of the population of town B are adults, calculate the number of adults in town B. Give the answer in ordinary form. [2]

4 (a) Simplify $\dfrac{0,35+0,25}{0,3\times 0,04}$ [2]

(b) Evaluate $43_5 + 1001_2$, giving the answer in base two. [3]

(c) A rectangular garden measures 15m by 12m to the nearest metre. Calculate the least possible area of the garden. [3]

(d) Given that $a = 3{,}12 \times 10^{-3}$ and $b = 4{,}5 \times 10^{-4}$ find, giving the answer in standard form, the value of

(i) $a+b$, [2]

(ii) ab. [2]

5 **Answer the whole of this question on sheet of plain paper.**
Use ruler and compasses only for all constructions and show all construction lines and arcs.

(a) On a single diagram, construct.

(i) a quadrilateral $ABCD$ with AD parallel to BC, AB =8cm. BC =10cm, $A\hat{B}C$ =90° and $B\hat{C}D$ =60°. [5]

(ii) the locus of points equidistant from A and B. [1]

(iii) the locus of points equidistant from B and C. [1]

(b) (i) Mark and label point P, which is equidistant from A and B, and also equidistant from B and C. [1]

(ii) Construct a circle passing through A, B and C. [1]

(c) Region T is such that it is nearer B than C and nearer B than A and lies inside the quadrilateral $ABCD$.

Shade region T. [2]

(d) Measure and write down the radius of the circle **(b)(ii)**. [1]

Section B [48 Marks]

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

Each question carries 12 marks.

6 (a) $\xi = \{x : 1 < x \leq 20,\ x \text{ is an integer}\}$
$X = \{x : x \text{ is a prime number}\}$
$Y = \{x : x \text{ is an even number}\}$
$Z = \{x : x \text{ is a multiple of } 5\}$

(i) List all the elements of set X. [2]

(ii) Find $n(Z)$. [1]

(iii) Find $n(Y \cup Z)$. [1]

(iv) Set P is a subset of ξ such that $P = \{10; 20\}$.
Express set P in set notation, using the sets X, Y and Z. [2]

(b) (i) Solve the inequality $-3 < 2x + 1 \leq 7$. [4]

(ii) Give the integral values which satisfy the inequality in **(i)**. [2]

7 (a) Given that $A = \begin{pmatrix} x & 3 \\ 1 & 2 \end{pmatrix}$,

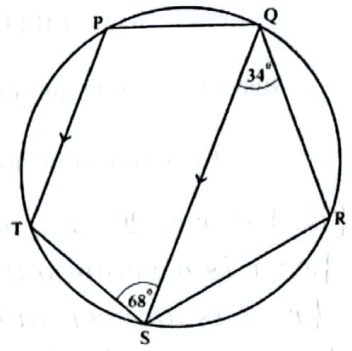
(i) find the value of x if the determinant of A is 5. [2]

(ii) find the inverse of A. [2]

(b) Solve the following simultaneous equations:

$$4x + 3y = 6$$
$$x + 2y = -1$$ [3]

(c)



In the diagram points P, Q, R, S and T lie on the circumference of a circle. QS is the diameter of the circle. PT is parallel to QS.
$Q\hat{S}T = 68°$ and $S\hat{Q}R = 34°$.

(i) State briefly why $Q\hat{R}S = 90°$. [1]

(ii) Find $Q\hat{S}R$. [2]

(iii) Find $ST\hat{P}$. [2]

8 The following is an incomplete table of values for the function $y = x^2 + x - 3$

x	-4	-3	-2	-1	0	1	2	3
y	9	p	-1	-3	q	-1	3	9

(a) **(i)** Find the value of p. [1]

(ii) Find the value of q. [1]

(b) **(i)** Draw the graph of $y = x^2 + x - 3$ on the a sheet of graph paper. Use a scale of 2cm to 1 unit on the x axis and 2cm to 2 units on the y axis. [4]

(ii) Draw the line of symmetry of the curve. [1]

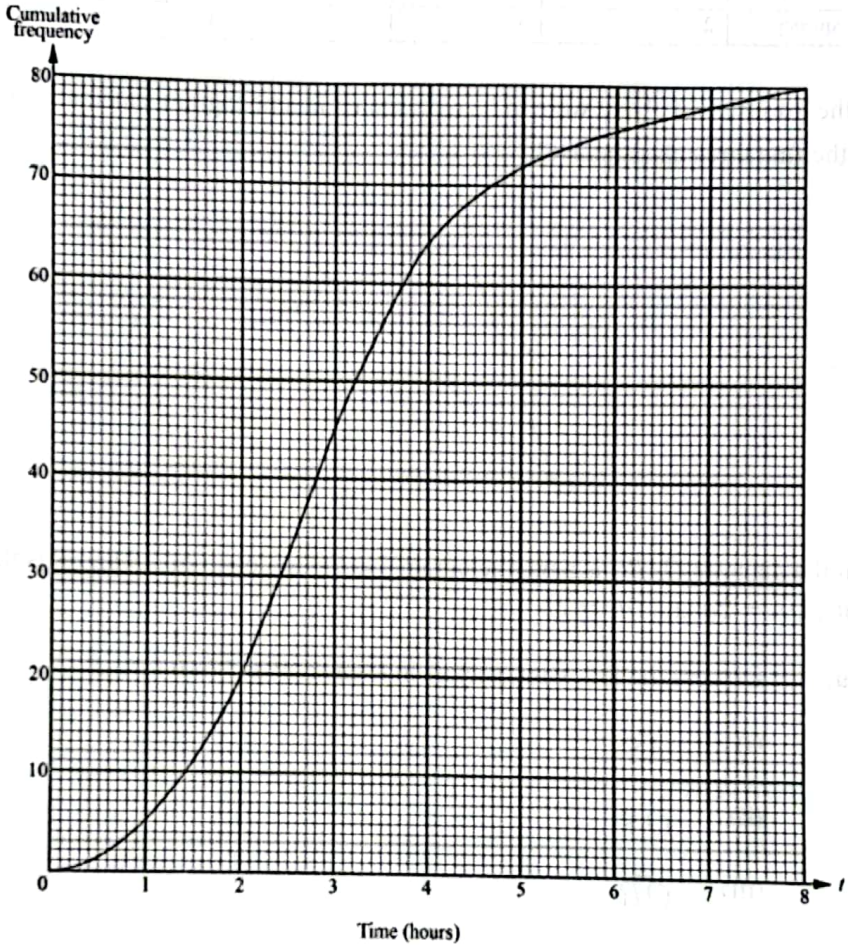
(c) Use the graph to

(i) find the equation of the line of symmetry, [1]

(ii) find the coordinates of the minimum point of the curve, [2]

(iii) solve the equation $x^2 + x - 3 = -2$. [2]

9 In a survey 80 motorists were each asked the number of hours their journey took. The results were used to draw a cumulative frequency curve.



Use the graph to answer the following questions.

(a) **(i)** Complete the frequency distribution table below.

Time in hrs (t)	$0 < t \leq 2$	$2 < t \leq 3$	$3 < t \leq 4$	$4 < t \leq 5$	$5 < t \leq 6$	$6 < t \leq 8$
Frequency	20	25	19			

[2]

(ii) Calculate an estimate mean of the number of hours the 80 motorists took giving your answer to the nearest hour. [3]

(iii) Find the median. [2]

(iv) Find the probability that two motorists chosen at random took more than 5 hours but less or equal to 7 hours. [2]

(b)

Marks (m)	$17 < m \leq 21$	$21 < m \leq 24$	$24 < m \leq 27$	$27 < m \leq 30$	$30 < m \leq 32$	$32 < m \leq 40$
Frequency	2	3	9	15	9	2

If the information above were to be represented in a histogram, calculate the heights of the first three class intervals. [3]

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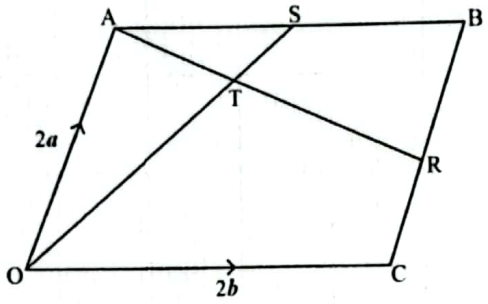

In the diagram $OABC$ is a parallelogram S is the midpoint of AB and R is the midpoint of BC. $\overrightarrow{OA} = 2a$ and $\overrightarrow{OC} = 2b$

(a) Express the following vectors in terms of a and/or b

(i) $\vec{AS}$, [1]

(ii) $\vec{OS}$, [1]

(iii) $\vec{OR}$, [1]

(iv) $\vec{AR}$. [1]

(b) OS and AR intersect at T. Given that $\vec{AT} = h\vec{AR}$, show that $\vec{OT} = (2-h)\,a + 2b$. [2]

(c) Given that $\vec{OT} = k\vec{OS}$, express $\vec{OT}$ in terms of a, b and k. [1]

(d) Using these two expressions for $\vec{OT}$, find the value of h and the value of k. [4]

(e) Find the ratio $\dfrac{TR}{AR}$. [1]

11 **Answer the whole of this question on a sheet of graph paper.**
Use a scale of 2cm to 2 units on both axes.
Triangle *XYZ* has vertices at X(1;1), Y(4;1) and Z(2;3).

(a) Draw and label triangle *XYZ*. [1]

(b) Triangle *XYZ* is mapped onto triangle $X_1Y_1Z_1$ by a transformation *M* which is represented by matrix $\begin{pmatrix} 1 & -1 \\ 1 & 2 \end{pmatrix}$

Draw and label triangle $X_1Y_1Z_1$. [3]

(c) Triangle $X_1Y_1Z_1$ is mapped onto triangle $X_2Y_2Z_2$ by a 90° anticlockwise rotation about $(-2; 0)$.

Draw and label triangle $X_2Y_2Z_2$. [3]

(d) Triangle $X_3Y_3Z_3$ has vertices at $X_3\,(-3; -3)$, $Y_3\,(-12; -3)$ and $Z_3\,(-6; -9)$.

Draw and label triangle $X_3Y_3Z_3$. [1]

(e) Describe fully the single formation that maps triangle *XYZ* onto triangle $X_3Y_3Z_3$. [3]

(f) Write down the matrix which represents the transformation in (e). [1]

12 **(a)** Find the LCM of $2^3 \times 3^2 \times 7^2$
$2^4 \times 3^3 \times 5 \times 7^3$
$2^5 \times 3 \times 5^2 \times 7$.
Give the answer in index form. [1]

(b) Simplify

(i) $6u \times 5 - 3 \times 4u - 12u$. [2]

(ii) $4\frac{1}{8} \times \frac{4}{11} \div 6\frac{2}{3}$. [2]

(c) **(i)** During a one hour radio programme there were 12 minutes of talking ; the rest was music.
Calculate the percentage of radio programme that was music. [2]

(ii) Given that $y = 2,9 \times 10^2$.
Evaluate $\sqrt{y-1}$, giving the answer in standard form. [2]

(d) Evaluate $38_9 + 1001_4$, giving the answer in base 5. [3]

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