ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4028/2

PAPER 2

NOVEMBER 2014 SESSION 2 hours 30 minutes

Additional materials:
- Answer paper
- Geometrical instruments
- Graph paper (2 sheets)
- Mathematical tables
- Plain paper (2 sheet)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions in Section **A** and any **three** questions from Section **B**.

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.

All working must be clearly shown. It should be done 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 to three significant figures. Answers in degrees should be given to one decimal place.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question. Mathematical tables or electronic calculators may be used to evaluate explicit numerical expressions.

This question paper consists of 11 printed pages and 1 blank page.

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[Turn over

Section A [64 marks]

*Answer **all** the questions in this section.*

1 **(a)** Simplify $3{,}27 \times 0{,}59$ giving your answer correct to three significant figures. [2]

(b) Find the Lowest Common Multiple (L.C.M) of 72 and 96. [3]

(c) Express 10111_2 as a number in base 5. [3]

(d) A train that is scheduled to arrive in Bulawayo at 0027 is delayed by 3 hours 47minutes.

Find the time at which it arrives in Bulawayo. [2]

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2 **(a)** Solve the equation

$$\frac{2}{x} - \frac{1}{4} = \frac{3}{5x}.$$ [3]

(b) Factorise completely

(i) $7x^3 - 28x$,

(ii) $3y^2 - 5y + 2$. [5]

(c) Express $\frac{x+2}{2x-3} - \frac{1}{x}$ as a single fraction in its simplest form. [4]

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3 **(a)** A rectangle measures 8 cm by 6 cm to the nearest centimetre. Calculate the least possible value of the area of the rectangle. [3]

(b) It is given that

$\xi = [x : 8 < x \leq 16, x \text{ is an integer}]$,

A = {x: x is a square number} and

B = {x: x is an even number}.

(i) List all the elements of A.

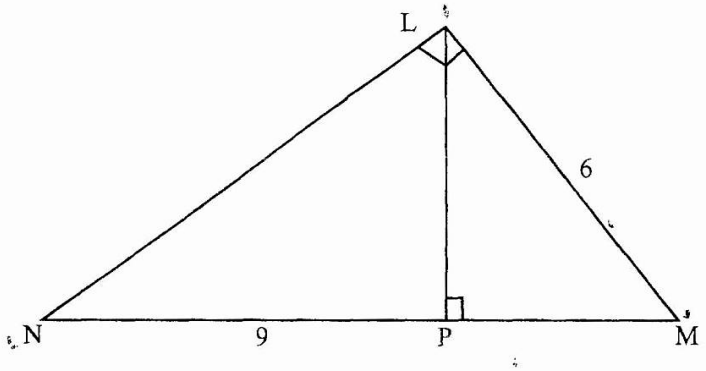
(ii) Find n(B).

(iii) Show this information on a fully labelled Venn diagram.

[7]

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4 **(a)**



In the diagram, ΔLMN is right-angled at L and LP is an altitude.
PN = 9 cm and LM = 6 cm.

(i) Name two triangles which are similar to ΔLMN.

(ii) Find PM.

[5]

(b) The annual premium, $\$P$, for a funeral insurance scheme varies jointly as the square-root of the age, Y, years and the number of dependants, D, of the applicant.

If a 25 year old applicant with 6 dependants pays \$150,00, calculate the **monthly** premium for a 49 year-old applicant with 4 dependants. [5]

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5 Mrs Shoko decides to erect a durawall around her rectangular stand measuring 20 m by 11 m. Three metres are to be left for a gate.

(a) Find the perimeter of the durawall. [3]

She has two options, A or B, to consider for erecting the durawall.

Option A

She could engage a contractor who charges \$12 per metre on a fix-and-supply basis.

(b) Calculate the total cost of erecting the durawall using option A. [2]

Option B

She could buy the following materials as shown in the table below and engage a builder who charges \$100 for the job.

item	quantity	cost per unit
bricks	5 000	\$80,00 for 1 000
cement	10 × 50 kg bag	\$10 per bag
brick force	5 bundles	\$5 per bundle
pit sand	2 loads	\$30 per load

(c) Calculate the total cost of erecting the durawall using option B. [3]

(d) Mrs Shoko decides to use the cheaper option. Calculate the amount she saves by using that option. [2]

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

Use ruler and compasses only for all constructions and show clearly all the construction lines and arcs.

A triangular field PQR has dimensions PQ = 30 m, $P\hat{Q}R = 60°$ and $R\hat{P}Q = 45°$.

(a) Using a scale of 1 cm to represent 3 m, construct the triangle PQR. [6]

(b) A well is to be dug in the field such that it is equidistant from PQ and PR and 15 m from R.

Construct the locus of points which are

(i) equidistant from PQ and PR,

(ii) 15 m from R.

[3]

(c) Mark and label the point W, the position of the well. [1]

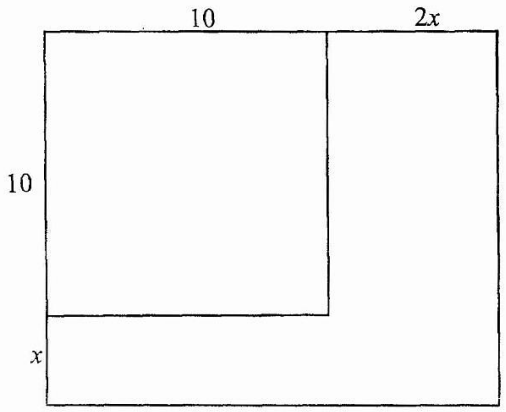
(d) Find the actual distance of the well from Q. [2]

Section B [36 marks]

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

Each question carries 12 marks.

7 A farmer has a square orchard of side 10 m. He decides to extend it by increasing the length of one side by x metres and the other by $2x$ metres as shown in the diagram below.



(a) Write down an expression for the total area of the extended orchard and show that it simplifies to $2x^2 + 30x + 100$. [2]

(b) Write down and simplify an expression for the area of the extension. [2]

(c) Given that the area has increased by 87,5 m^2, form an equation in x and show that it reduces to $2x^2 + 30x - 87{,}5 = 0$. [2]

(d) Solve the equation

$$2x^2 + 30x - 87{,}5 = 0.$$ [4]

(e) Write down the actual length of the extended orchard. [2]

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

A triangle PQR has vertices at P(1; 1), Q(3; 4) and R(4; 0).

Using a scale of 2 cm to represent 2 units on both axes, draw the x and y axes for $-10 \leq x \leq 10$ and $-6 \leq y \leq 6$.

(a) Draw and label triangle PQR. [1]

(b) Triangle PQR is mapped onto triangle $P_1Q_1R_1$ by a transformation, **N**, where **N** is represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$.

(i) Draw and label triangle $P_1Q_1R_1$.

(ii) Describe **fully** the **single** transformation represented by matrix **N**. [6]

(c) Triangle PQR is mapped onto triangle $P_2Q_2R_2$ by a translation **T** which is represented by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and then followed by the transformation **N**.

(i) Calculate the coordinates of the vertices of $\Delta P_2Q_2R_2$.

(ii) Draw and label $\Delta P_2Q_2R_2$. [5]

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

The table shows the number of books borrowed from a University library in one week.

subject	Geography	Science	Maths	Shona	Theory of Education
number of books	30	45	25	20	60

(a) Find the total number of books borrowed in that week. [2]

(b) Express the number of Theory of Education books as a fraction of all the books borrowed in its lowest terms. [2]

(c) Show this information on a clearly labelled pie-chart. [6]

(d) Two students borrowed books from the library during that week.

Calculate the probability that the first student borrowed a Science book and the second a Maths book. [2]

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

The velocity, v m/s, of a moving body, at time t seconds, is given by the formula $v = t^2 - 3t + 5$.

Below is an incomplete table of values for v.

t(sec)	0	1	2	3	4	5	6	7
v(m/s)	m	3	3	5	n	15	23	33

(a) Find the value of m and the value of n. [2]

(b) Using a scale of 2 cm to represent 1 second on the horizontal axis and 2 cm to represent 5 m/s on the vertical axis, draw the t and v axes for $0 \leq t \leq 7$.

Draw the graph of $v = t^2 - 3t + 5$. [4]

(c) Use your graph to estimate

(i) the values of t when $v = 4$,

(ii) the acceleration when $t = 3$,

(iii) the distance travelled from $t = 4$ to $t = 6$.

[6]

11 **(a)** A regular polygon has an interior angle that is twice the exterior angle.

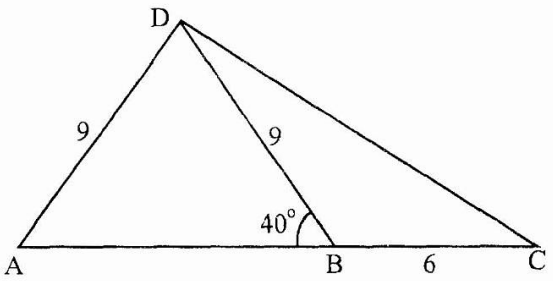
Find

(i) the number of sides of the polygon,

(ii) the sum of the interior angles of the polygon.

[4]

(b)



In the diagram, the points A, B, C and D lie on level ground. ABC is a straight road which runs in a west-east direction. AD = BD = 9 km, $A\hat{B}D = 40°$ and BC = 6 km.

Calculate

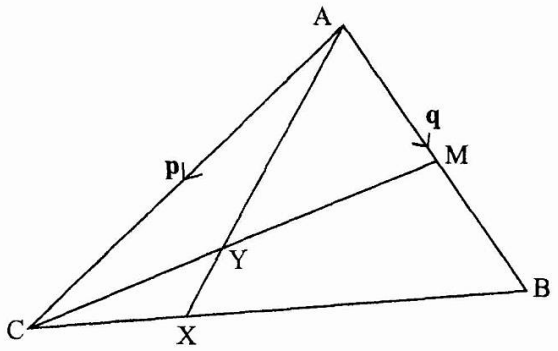
(i) the bearing of A from D,

(ii) the distance CD,

(iii) the area of ΔBCD.

[8]

12



In the diagram, ABC is a triangle in which $\overrightarrow{AB} = \mathbf{q}$ and $\overrightarrow{AC} = \mathbf{p}$. M is the mid-point of AB and X is a point on BC such that BX : XC = 4 : 1. CM and AX intersect at Y.

(a) Express, in terms of **p** and/or **q**

(i) $\overrightarrow{BC}$,

(ii) $\overrightarrow{CX}$,

(iii) $\overrightarrow{CM}$,

(iv) $\overrightarrow{AX}$.

[5]

(b) Given that CY = kCM, express $\overrightarrow{CY}$ in terms of **p**, **q** and k. [1]

(c) Given also that AY = hAX, express $\overrightarrow{CY}$ in terms of **p**, **q** and h. [2]

(d) Using the results of **(b)** and **(c)**, find the value of h and the value of k.

Hence express $\overrightarrow{AY}$ in terms of **p** and **q**. [4]