ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4008/2

PAPER 2

JUNE 2008 SESSION 2 hours 30 minutes

Additional materials:
- Answer paper
- Geometrical instruments
- Graph paper (3 sheets)
- Mathematical tables
- 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 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.

Electronic calculators must not be used.

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 may be used to evaluate explicit numerical expressions.

This question paper consists of 13 printed pages and 3 blank pages.

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Section A [64 marks]

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

1 **(a)** Solve the equation

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

(b) Factorise completely

$$6y^2 - y - 12.$$ [2]

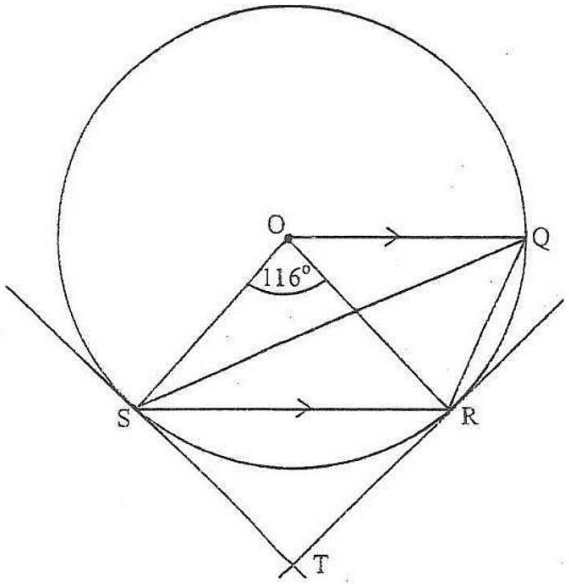
(c) Express $\frac{2}{2x-1} - \frac{3}{x}$ as a single fraction in its lowest terms. [2]

(d) Given that $z = r\sqrt{n-1}$,

(i) find z when $r = 0{,}3$ and $n = 50$. [2]

(ii) express n in terms of z and r. [2]

2 (a)



In the diagram, TR and TS are tangents to the circle centre O.

SR is parallel to OQ and $S\hat{O}R = 116°$.

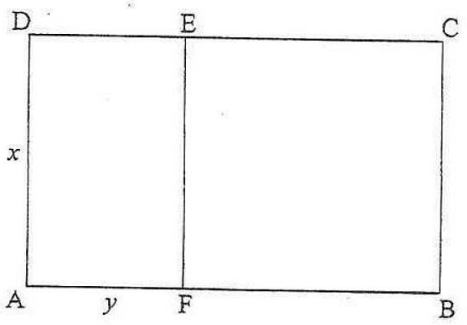
Calculate

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

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

(iii) $R\hat{T}S$. [2]

(b)



In the diagram, ABCD is a rectangle and BCEF is a square.

Given that DA = x cm, AF = y cm, $x + y = 15$ and $x - y = 7$.

Calculate

(i) the value of x, [2]

(ii) the area of ABCD. [1]

(c) Six angles of an octagon are 140° each. The remaining angles are equal. Find the size of each of the remaining angles. [3]

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3 (a) Given that $(x \quad 2)\begin{pmatrix} 3 & 1 \\ 0 & y \end{pmatrix} = (15 \quad -7)$,

find the value of

(i) x, [1]

(ii) y. [2]

(b) It is given that

ξ = {all triangles},

A = {all equilateral triangles},

B = {all isosceles triangles} and

C = {all right angled triangles}.

Draw a clearly labelled Venn diagram to illustrate the relationship between the sets. [3]

(c) Study the number patterns shown in the table.

Column 1	Column 2	Column 3
1	1	1
3	3	9
4	6	36
4	10	100
5		p
6	q	
.	.	.
.	.	.
.	.	.
	66	
r	78	
.	.	.
.	.	.
.	.	.
n	w	v

(i) Write down the numerical value of

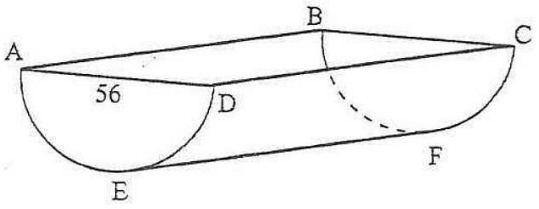
(a) p,

(b) q,

(c) r. [3]

(ii) Express v in terms of w. [1]

4 (a)



In this question take π to be $\frac{22}{7}$.

The diagram ABCDEF represents a metal drinking trough made from a closed cyclindrical drum that was bisected lengthwise.

The trough has a diameter of 56 cm and a capacity of 110 litres.

(i) Calculate

(a) the area of the cross-section ADE, [2]

(b) AB. [2]

(ii) The whole drum was bought for \$25 500 and this represents a 70% increase in price of such a drum in the previous year.

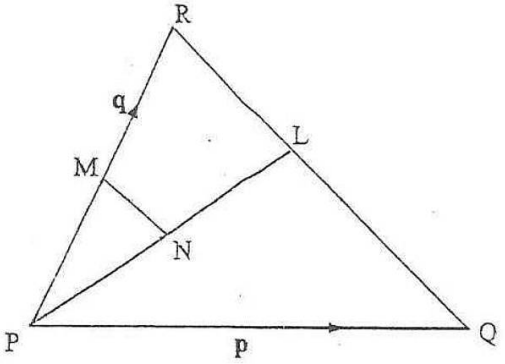
Calculate the price of such a drum in the previous year. [2]

(b) Solve the equation

$$4x^2 - 2x - 3 = 0,$$

giving your answers correct to 2 significant figures. [5]

5 (a)



In the diagram $\overrightarrow{PQ} = \mathbf{p}$ and $\overrightarrow{PR} = \mathbf{q}$. M is a midpoint of PR, QL: LR = 2: 1 and MN is parallel to RQ.

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

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

(b) $\overrightarrow{LR}$, [1]

(c) $\overrightarrow{MR}$. [1]

(ii) Given that $\overrightarrow{NM} = k\overrightarrow{QR}$, find the scalar k. [2]

(b) **In this question take π to be $\frac{22}{7}$.**

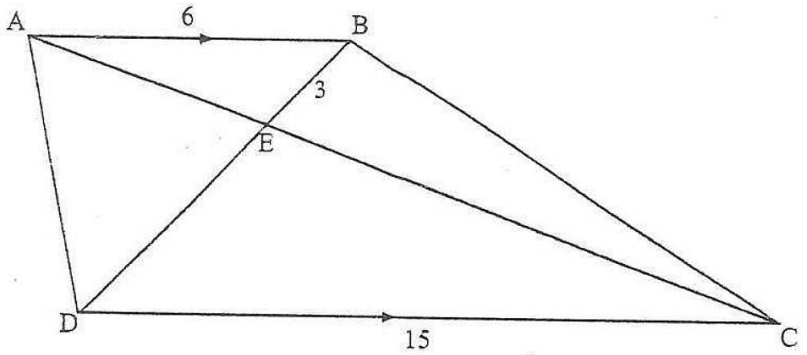
A hemispherical bowl is made of wood 2 cm thick.

(i) Given that the bowl has an internal diameter of 14 cm, calculate the capacity of the bowl in litres. [3]

(ii) Calculate the mass of the bowl given that the density of the wood is 0,8 g/cm^3. [4]

$$\left[\textbf{Volume of a sphere} = \frac{4}{3}\pi r^3\right]$$

6



In the diagram, ABCD is a quadrilateral with AB parallel to DC. Diagonals AC and BD meet at E. AB = 6 cm, BE = 3 cm and DC = 15 cm.

(a) Name, in the correct order, the triangle that is similar to ΔABE. [1]

(b) Calculate DE. [2]

(c) If the area of ΔBEC is 22,5 cm^2, calculate

(i) the area of ΔDEC, [2]

(ii) the ratio $\frac{\text{area of } \Delta ABE}{\text{area of } \Delta ADC}$ in its simplest form. [4]

Section B [36 marks]

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

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

Triangle A has vertices (6; 4), (8; 6) and 4; 6).

Using a scale of 2 cm to represent 2 units on each axis, draw the x and y axes for

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

(b) A reflection in the line $y = x + 2$ maps triangle A onto triangle B.

(i) Draw the line $y = x + 2$. [1]

(ii) Draw and label triangle B. [2]

(c) Triangle C has vertices at

(i) Draw and label triangle C. [1]

(ii) Describe fully the **single** transformation which maps triangle A into triangle C. [2]

(d) A transformation P represented by the matrix $\begin{pmatrix} 1 & 0 \\ -1\frac{1}{2} & 1 \end{pmatrix}$ maps triangle A onto triangle D.

(i) Draw and label triangle D. [2]

(ii) State the name of the transformation represented by P. [1]

(e) A clockwise rotation of 90°, centre (0;10) maps triangle A onto triangle E.

Draw and label triangle E. [2]

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

Use ruler and compasses only. All construction arcs and lines must be clearly shown.

Three schools, P, Q and R are such that the bearing of Q from P is 045° and that of R from P is 300°. The distance between P and R is 18 km and Q is due east of R.

(a) (i) Using a scale of 1 cm to represent 2 km, construct a **single diagram** to show the relative positions of the 3 schools, P, Q and R. [5]

(ii) Use the diagram to find the actual distance between P and Q. [2]

(iii) Construct the perpendicular from R to QP produced. [2]

(b) Calculate the area of the triangular region PQR, giving your answer in km^2. [3]

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

The following is an incomplete table of values for the graph of $y = x^2 + \frac{1}{x}$.

x	0.25	0.5	0.8	1	1.5	2	2.5	3
y	4.1	2.3	1.9	p	2.9	4.5	q	9.3

(a) Calculate the value of p and the value of q. [2]

(b) Taking 4 cm to represent 1 unit on the x-axis and 2 cm to represent 1 unit on the y-axis, draw the graph of

$$y = x^2 + \frac{1}{x} \text{ for } 0.25 \leq x \leq 3.$$ [4]

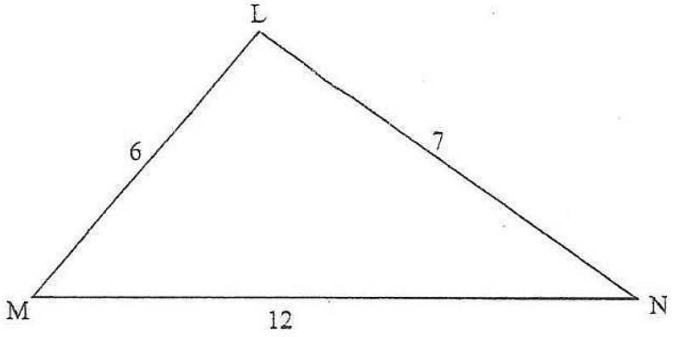
(c) On the same axes draw the graph of $2y = 5x + 2$. [2]

(d) (i) Write down the coordinates of their points of intersection of the graph of $y = x^2 + \frac{1}{x}$ and graph of $2y = 5x + 2$. [2]

(ii) Estimate the area bounded by $y = x^2 + \frac{1}{x}$ and $2y = 5x + 2$ and the lines $x = 1$ and $x = 2$. [2]

10 (a) A vertical aerial mast is 20.5 m high. Calculate, to the nearest degree, the angle of elevation of the top of the mast from a point on horizontal ground which is 32,6 m from the foot of the mast. [2]

(b)



The diagram shows ΔLMN in which LM = 6 cm, LN = 7 cm and MN = 12 cm.

Calculate $M\hat{L}N$. [5]

(c) A co-operative deposited \$60 million into a bank for $1\frac{1}{2}$ years at the rate of 20% per annum simple interest.

After $1\frac{1}{2}$ years the co-operative was charged 15% tax on the total interest they made and \$4,32 million as bank charges.

Calculate

(i) the interest the co-operative made, [2]

(ii) the tax deducted, [1]

(iii) the net profit they made. [2]

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

A group of 70 students were involved in a 50 km sponsored walk.

The distances covered by the students are shown in the table.

Distance x covered (km)	$10 < x \leq 20$	$20 < x \leq 25$	$25 < x \leq 40$	$40 < x \leq 50$
Number of students	30	12	w	13
Frequency density	3	v	1	1,3

(a) Find the value of

(i) v, [1]

(ii) w. [1]

(b) Using a scale of 2 cm to represent 10 km on the horizontal axis and 2 cm to represent 1 unit on the vertical axis, draw a **histogram** to represent the information in the table. [3]

(c) State the modal class. [1]

(d) A sponsor paid at the rate of \$10 000 per km. Calculate an estimate of the total amount paid to those who walked more than 25 km. [3]

(e) Two students were chosen at random from the group. Calculate the probability that one walked at most 20 km and the other walked more than 20 km but less than or equal to 25 km. [3]

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

Mr Hove manufactures tables and chairs using softwood and hardwood.

A table requires 5 metres of softwood and 3 metres of hardwood.

A chair requires 3 metres of softwood and 4 metres of hardwood.

Mr Hove has 45 metres of softwood and 48 metres of hardwood.

Let x be the number of tables made and y be the number of chairs made.

(a) Using the above information, write down two inequalities other than $x > 0$ and $y > 0$ in x and y, which satisfy these conditions. [4]

(b) In order for Mr Hove to make a profit, he should manufacture more than 2 tables and at least 4 chairs. Write down two inequalities, one in x and the other one in y, which satisfy these conditions. [2]

(c) The point $(x; y)$ represents x tables and y chairs manufactured. Using a scale of 2 cm to represent 2 tables on the horizontal axis and 2 cm to 2 chairs on the vertical axis, draw the axes for

$$0 \leq x \leq 16 \text{ and } 0 \leq y \leq 16.$$

Indicate clearly by shading the UNWANTED regions, the region in which $(x; y)$ should lie. [4]

(d) Use your graph to write down all possible combinations which give the maximum number of tables and chairs manufactured. [2]