ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4028/2

PAPER 2

JUNE 2014 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.

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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Section A [64 marks]

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

1 **(a)** Simplify

(i) $0,85 - 0,6$ giving your answer as a common fraction in its lowest terms,

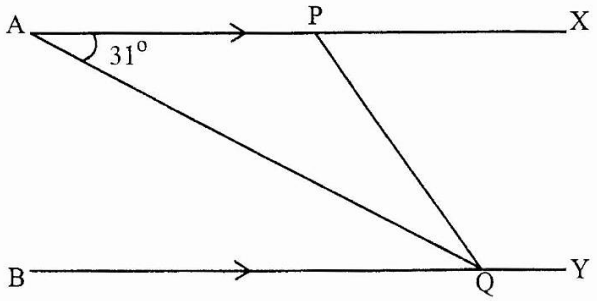
(ii) $1\frac{3}{4} \div 1\frac{2}{5} + 1\frac{5}{8}$.

[4]

(b) Remove the brackets and simplify $(a+2)(a-3) - 3(a-5)$. [3]

(c) Giving your answer in standard form, find 25% of $3,168 \times 10^{-4}$. [2]

(d)



In the diagram, APX and BQY are parallel straight lines and AQ is the bisector of $P\hat{Q}B$.

Given that $P\hat{A}Q = 31°$, calculate $A\hat{P}Q$. [2]

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2 **(a)** Solve the following equations

(i) $0,3x - 1,7 = 1,8 - 0,4x$

(ii) $3x = (-64)^{\frac{1}{3}}$

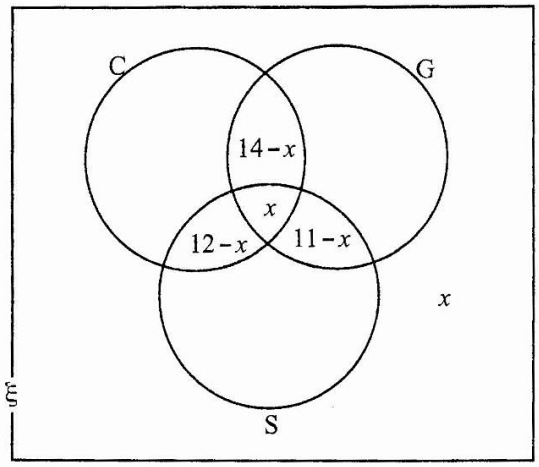
[6]

(b) Factorise completely $6m^2n^2 - mn - 15$. [2]

(c) Express as a single fraction in its simplest form

$$\frac{x-4}{16-x^2} \div \frac{2}{x+4}.$$ [3]

3



The Venn diagram shows some information about all the 52 families in a village. C is a set of 37 families that have cattle, G is a set of 24 families that have goats and S is the set of 20 families that have sheep.

It is also given that 14 families have cattle and goats, 11 families have cattle and sheep, x families have all three types of animals and another x families have no animals.

(a) Find, in terms of x, the number of families with

(i) cattle only,

(ii) goats only,

(iii) sheep only.

[6]

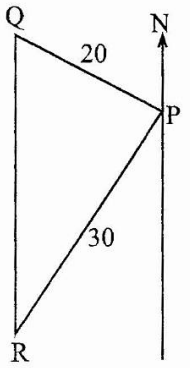
(b) Find

(i) the value of x,

(ii) the number of families with goats but have no cattle.

[4]

4



In the diagram, P, Q and R are three points on level ground. PQ = 20 m, PR = 30 m and $\cos R\hat{P}Q = -\frac{1}{3}$.

If R is due south of Q, calculate

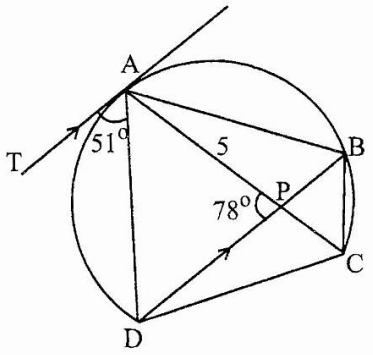
(a) $R\hat{P}Q$, [2]

(b) the length of QR, [4]

(c) $P\hat{R}Q$, [3]

(d) the three-figure bearing of Q from P correct to the nearest degree. [2]

5



In the diagram, ABCD is a cyclic quadrilateral. TA is a tangent at A and is parallel to DB. AC and BD intersect at P such that AP = 5 cm.

(a) Given that $T\hat{A}D = 51°$ and $A\hat{P}D = 78°$, calculate

(i) $A\hat{C}D$,

(ii) $B\hat{A}C$,

(iii) $B\hat{C}A$.

[5]

(b) Write down the reason why ΔAPD is isosceles. [1]

(c) Calculate the length of AD. [2]

(d) Name in the correct order, the triangle which is

(i) similar to ΔAPD,

(ii) congruent to ΔABP.

[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) On a **single** diagram, construct

(i) quadrilateral WXYZ in which WX = 5,3 cm, $W\hat{X}Y = 120°$, XY = 5 cm, YZ = 9,1 cm and WZ = 8,5 cm,

(ii) the locus of points which are equidistant from

1. W and Y,

2. X and Z. [7]

(b) Mark and label clearly, the point O, **inside** the quadrilateral WXYZ, which is equidistant from W, X, Y and Z. [1]

(c) **(i)** Draw a circle centre O and radius OX.

(ii) Measure and write down the radius of the circle. [2]

(d) State the special name given to quadrilateral WXYZ. [1]

Section B [36 marks]

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

Each question carries 12 marks.

7 **(a)** Calculate the volume of a copper ball of radius 3 cm. [2]

(b) The copper ball in **(a)** is melted and recast into cylindrical rods each of diameter 0,3 cm and length 15 cm.

(i) Calculate the volume of each rod.

(ii) Find the number of copper rods that can be made from the copper ball.

[4]

(c) Each of the copper rods in **(b)** is bent to form a circular bangle. Calculate the radius of the bangle. [2]

(d) If each bangle is to be coated with silver paint at a cost of 5c per cm^2, calculate the total cost of coating all the bangles so formed, giving your answer correct to the nearest cent. [4]

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

$$\left[\pi = \frac{22}{7}\right]$$

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

The following is an incomplete table of values for $y = 12 + 2x - x^2$.

x	−3	−2	−1	0	1	2	3	4	5
y	−3	p	9	12	13	12	q	4	−3

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

(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 2 units on the y-axis draw the graph of $y = 12 + 2x - x^2$. [4]

(c) Use your graph to find

(i) the roots of the equation $12 + 2x - x^2 = 0$,

(ii) the gradient of $y = 12 + 2x - x^2$ at $x = 2$,

(iii) the equation whose roots are −1 and 3, giving your answer in the form $12 + 2x - x^2 = k$ where k is an integer. [6]

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9 A salary of \$P, of a saleswoman who sells cars of the same type, is partly constant and her commission partly varies as N, the number of cars that she sells in one month. If she sells 7 cars in one month, her salary is \$675. If she sells 10 cars, her salary is \$900.

(a) Express P in terms of N and constants h and k. [1]

(b) Find the value of h and the value of k. [3]

(c) Write down

(i) the equation connecting P and N,

(ii) the saleswoman's salary when she has not sold any car. [2]

(d) Calculate the saleswoman's salary when she sells 9 cars in one month. [3]

(e) Given that her commission is $2\frac{1}{2}\%$ of the price of one car, calculate the price of each car. [3]

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10 **(a)** Solve the equation $3x^2 - 5x - 15 = 0$, giving your answers correct to 2 decimal places. [5]

(b) **Answer this part of the question on a sheet of graph paper.**

The following is a cumulative frequency table for a survey carried out on the masses of 80 secondary school pupils.

mass (kg)	m ≤ 45	m ≤ 50	m ≤ 55	m ≤ 60	m ≤ 65	m ≤ 70	m ≤ 75	m ≤ 80
cumulative frequency	2	10	21	41	60	72	78	80

(i) Using a scale of 2 cm to represent 5 kg on the horizontal axis and 2 cm to represent 10 pupils on the vertical axis, draw a cumulative frequency curve for the data.

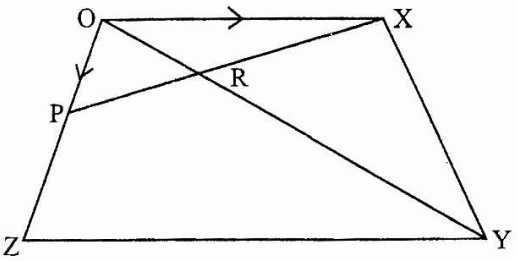
(ii) Use your graph to find

1. the median mass of the pupils,

2. the number of pupils whose masses are more than 72 kg.

[7]

11



In the diagram, OXYZ is a quadrilateral in which P is a point on OZ such that $\overrightarrow{OP} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$ and $\overrightarrow{OX} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$. OY and XP intersect at R.

(a) Find $\overrightarrow{XP}$. [2]

(b) Given that $\overrightarrow{XR} = h\overrightarrow{XP}$,

(i) express $\overrightarrow{XR}$ in terms of h,

(ii) show that $\overrightarrow{OR} = \begin{pmatrix} 5-6h \\ -2h \end{pmatrix}$.

[3]

(c) Given also that $\overrightarrow{OZ} = 3\overrightarrow{OP}$ and $\overrightarrow{ZY} = 2\overrightarrow{OX}$, find $\overrightarrow{OY}$. [1]

(d) If $\overrightarrow{OR} = k\overrightarrow{OY}$

(i) express $\overrightarrow{OR}$ in terms of k,

(ii) use the results of **(b)(ii)** and **(d)(i)** to find the value of h and the value of k.

[5]

(e) Write down the numerical value of the ratio $\frac{XR}{RP}$. [1]

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

Triangle W has vertices at $(1;-1)$, $(7;-1)$ and $(4;4)$. 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 $-10 \leq y \leq 10$.

(a) Draw and label clearly triangle W. [1]

(b) Triangle X is the image of triangle W under a reflection in the line $y = x + 2$.

Draw and label clearly,

(i) the line $y = x + 2$,

(ii) triangle X.

[3]

(c) **(i)** Draw and label clearly triangle Y, the image of triangle W under an enlargement of scale factor $-\frac{1}{2}$ with the origin as centre.

(ii) Write down the matrix which represents this transformation.

[4]

(d) Triangle Z with vertices at $(1;-3),(1;-9)$ and $(6;-6)$, is the image of triangle W under a certain transformation.

(i) Draw and label clearly triangle Z.

(ii) Describe **fully** the **single** transformation which maps triangle W onto triangle Z.

[4]