ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

006739

MATHEMATICS
PAPER 2

4008/2

| Monday | 14 JUNE 2004 | Morning | 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 12 printed pages.

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[Turn over

Section A [64 marks]

Answer **all** questions in this section.

1   **(a)**   Factorise completely

      (i) $5x^2 - 5x$,

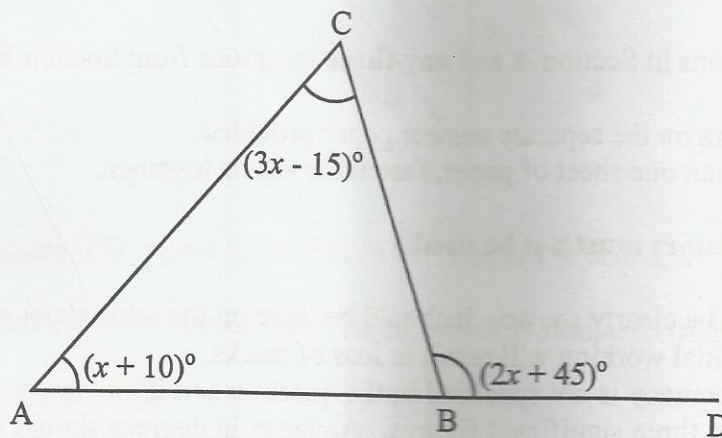   **(ii)** $a^2 - 3a + 3b - ab$.   [3]

  (b)   Given that $p = \dfrac{2x}{x-4}$,

      (i)   express x in terms of p,

      (ii)   find the numerical value of x when $p = \dfrac{2}{3}$.   [4]

  (c)
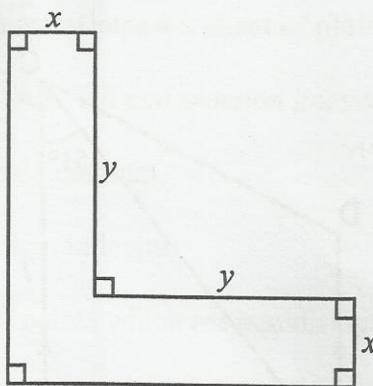

In the diagram, ABC is a triangle in which AB is produced to D. $B\hat{A}C = (x+10)°$, $A\hat{C}B = (3x-15)°$ and $C\hat{B}D = (2x+45)°$.

      (i)   Form an equation in x and solve it.

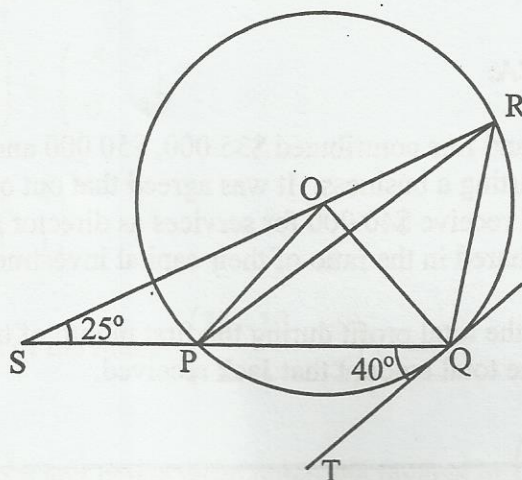   **(ii)**   Hence calculate the size of $A\hat{B}C$.   [4]

2   **(a)**

The diagram above represents an L-shaped flower bed. The dimensions are in metres. Write down and simplify, in terms of x and y, the expression for

(i)   the perimeter of the flower bed,

(ii)   the area of the flower bed.   [3]

(b)

In the diagram, P, Q and R are three points on a circle centre O. SPQ and SOR are straight lines and TQ is a tangent to the circle at Q. Calculate
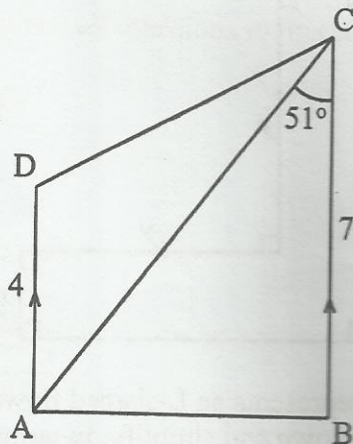
(i) $P\hat{R}Q$,

(ii) $S\hat{O}P$,

(iii) $P\hat{R}O$.   [4]

(c)   Triangle XYZ is such that XY = 5cm, YZ = 6,4cm and $X\hat{Y}Z$ = 112°. Calculate the area of the triangle XYZ.   [3]

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[Turn over

3   (a)

In the diagram, ABCD is a trapezium in which AD is parallel to BC, AD = 4cm, BC = 7cm, $A\hat{C}B = 51°$ and $A\hat{B}C = 90°$. Calculate

(i)   AB,

(ii)   AC,

(iii) $D\hat{C}A$.   [7]

(b)   Jack, Dan and Lee contributed $35 000, $50 000 and $80 000 respectively towards starting a business. It was agreed that out of the total profits, Jack would receive $40 000 for services as director and the remainder would be shared in the ratio of their capital investments.

Given that the total profit during the first month of trading was $172 000, calculate the total amount that Jack received.   [4]

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

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

(a)   Construct, on a single diagram

    (i)   a line XY, 8cm in length,   [1]

    (ii)   the locus of points which are equidistant from X and Y,   [2]

    (iii)   the locus of a point P, such that the area of triangle PXY = 20cm², [4]

    (iv)   the locus of points 5cm from X.   [1]

(b)   Mark and label Q_1 and Q_2, the two possible positions of Q which are 5cm from X and equidistant from X and Y.   [2]

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5   (a)   Express as a single matrix in its simplest form

    (i) $3\begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix} - \begin{pmatrix} -5 & 2 \\ 0 & 3 \end{pmatrix}$,

    (ii) $\begin{pmatrix} 3 & 4 \end{pmatrix}\begin{pmatrix} 0 & 4 \\ 3 & 1 \end{pmatrix}$.   [4]

(b)   The determinant of the matrix $\begin{pmatrix} 3h-10 & -9 \\ h-1 & 2 \end{pmatrix}$ is −14.

Find the value of h and hence write down the inverse of $\begin{pmatrix} 3h-10 & -9 \\ h-1 & 2 \end{pmatrix}$.   [4]

(c)   Given that $\begin{pmatrix} 4 & -3 \\ 3 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 29 \\ 9 \end{pmatrix}$, find the value of x and the value of y.   [3]

[Turn over

6 (a) The mass M of a certain cone varies jointly as the square of its base radius r and its height h.

   (i) Write down an equation connecting M, r, h and a constant k.

   (ii) Calculate the value of k given that $M = 4\frac{1}{2}$ when $r = 2$ and $h = 3$.

   (iii) Calculate the value of r when $M = 9$ and $h = 6$.   [5]

(b)

| Number of eggs collected per day	14-20	21-30	31-40	41-50	a	56-64
Frequency	35	100	130	180	80	18
Class interval	7	10	10	b	5	9
Frequency density	5	10	c	18	16	2

The table above shows a summary of the records of an egg production project.

   (i) Study the table and write down the range represented by a and the values of b and c.

   (ii) Write down the modal class of eggs collected per day.

   (iii) Calculate, to the nearest whole number, the mean number of eggs collected per day.   [6]

Section B [36 marks]

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

7   **(a)**
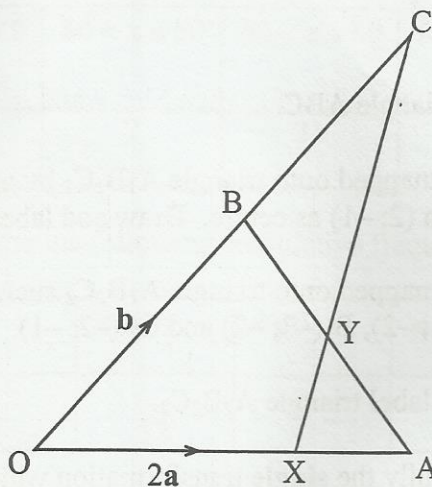
In the diagram X is a point on OA such that OX:XA = 2:1 and Y is the midpoint of AB. The point C on AB produced is such that OB = BC.
$\overrightarrow{OA}$ = 3**a** and $\overrightarrow{OB}$ = **b**.

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

     (a) $\overrightarrow{AB}$,

     (b) $\overrightarrow{OY}$,

     (c) $\overrightarrow{XY}$,

     (d) $\overrightarrow{YC}$.

(ii)   State the ratio XY:YC.   [9]

(b)   Mrs Chinove invests $16 200 in a building society yielding $4\frac{1}{2}$% per annum and $6 480 in a bank yielding $2\frac{3}{4}$% per annum. Calculate the combined interest rate per annum.   [3]

[Turn over

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

8   Triangle ABC has vertices at A(1; 2), B(3; 2) and C(2; 1).

Using a scale of 2cm to represent 1 unit on each axis, draw the x and y axes for $-5 \le x \le 4$ and $-4 \le y \le 5$.

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

  (b)   Triangle ABC is mapped onto triangle $A_1B_1C_1$ by an enlargement of scale factor 2 with (2; −1) as centre. Draw and label triangle $A_1B_1C_1$.   **[2]**

  (c)   Triangle ABC is mapped onto triangle $A_2B_2C_2$ such that the vertices of $A_2B_2C_2$ are A_2(−1; −2), B_2(−3; −2) and C_2 (−2; −1).

      (i)   Draw and label triangle $A_2B_2C_2$.   **[1]**

      (ii)   Describe fully the **single** transformation which maps triangle ABC onto triangle $A_2B_2C_2$.   **[2]**

  (d)   Triangle ABC is mapped onto triangle $A_3B_3C_3$ by a transformation represented by the matrix $\begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$.

      (i)   Draw and label triangle $A_3B_3C_3$.   **[3]**

      (ii)   Describe fully the single transformation which maps triangle ABC onto triangle $A_3B_3C_3$.   **[3]**

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

9   A group of 70 children set for an entrance test at a certain high school. The test scores
they obtained are shown in the table below.

Mark x	$x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 80$	$80 < x \leq 90$	$90 < x \leq 100$
Frequency	0	3	9	21	31	4	2

(a)   Copy and complete the following cumulative frequency table.

Mark x	≤ 30	≤ 40	≤ 50	≤ 60	≤ 80	≤ 90	≤ 100
Cumulative frequency	0	3	12		64		70

[2]

(b)   Using a scale of 2cm to represent 10 marks on the horizontal axis and 2cm to
represent 10 children on the vertical axis, draw a smooth cumulative frequency
curve for this distribution.   [4]

(c)   Use the graph to estimate

    (i)   the median mark,

    (ii)   the number of children who passed given that the pass mark
was 59,

    (iii)   the mark of the last child to be enrolled if the school accepted
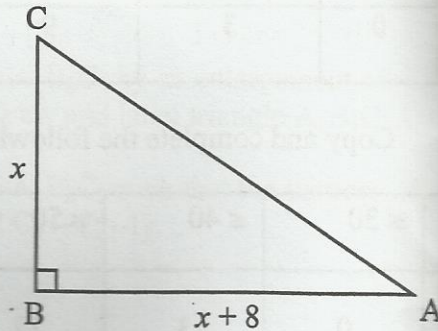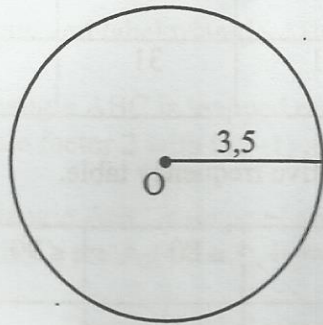the top 30 children only.   [6]

10 **(a)** Simplify as far as possible

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

(b)

In the diagram above, the circle centre O is of radius 3,5cm and the triangle ABC is such that $AB=(x+8)$cm, $AC = x$cm and $A\hat{B}C = 90°$.

(i) Given that the area of the circle is equal to the area of the triangle, form an equation in x and show that it reduces to $x^2 + 8x - 77 = 0$.

(Take π to be $\frac{22}{7}$).

(ii) Solve the equation $x^2 + 8x - 77 = 0$ giving the answers correct to 2 decimal places. [8]
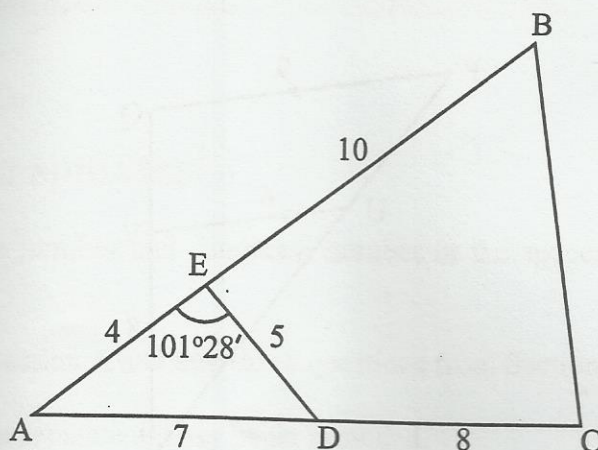
Hence find the length of AB.

11   **(a)**   A bag contains 12 identical balls of which 4 are red, 5 are white and 3 are black. A ball is drawn at random from the bag and its colour is noted. It is replaced and a second is drawn.

Find the probability that

     (i)   both balls are white,

     (ii)   one ball is black and the other is red.   [5]

(b)

In the diagram, ABC is a triangle is which D and E are points on AC and AB respectively. Given that AD = 7cm, DC = 8cm, AE = 4cm, EB = 10cm, DE = 5cm and $A\hat{B}C = 101°28'$, calculate

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

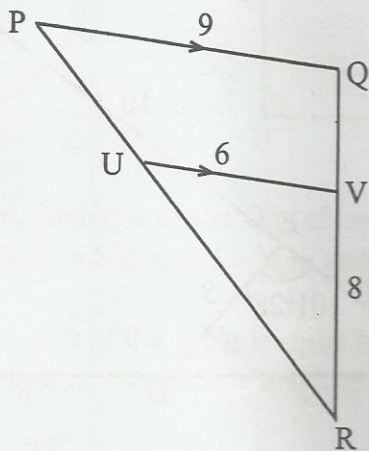   **(ii)**   BC.   [7]

12   (a)   Sets P, Q and R are subsets of the universal set ξ and are such that
$n(P) = 6$, $n(Q) = 5$ and $n(R) = 3$.

(i)   Find the largest possible value of $n(P \cup Q \cup R)$. Hence illustrate the sets P, Q and R on a clearly labelled Venn diagram when $n(P \cup Q \cup R)$ is largest.

(ii)   Find the least possible value of $n(P \cup Q \cup R)$. Hence illustrate the sets P, Q and R on a clearly labelled diagram when $n(P \cup Q \cup R)$ is least.

[5]

(b)

In the diagram, PQ is parallel to UV, PQ = 9cm, UV = 6cm and VR = 8cm.

(i)   Name, in correct order the triangle which is similar to triangle VUR.

(ii)   Calculate VQ.

(iii)   Given that the area of triangle VUR = 32cm^2, calculate the area of the trapezium PUVQ.

[7]