ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

050548

MATHEMATICS 4008/2

PAPER 2

Wednesday 17 NOVEMBER 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 15 printed pages and 1 blank page.

Section A [64 marks]

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

1 **(a)** Factorise completely $5h^2 - 45k^2$. [2]

(b) Solve the equations

(i) $5 + 4m - 3(7 + 2m) = 0$,

(ii) $(x - 1)^2 = \frac{4}{25}$. [6]

(c) Calculate the size of the exterior angle of a regular 15 - sided polygon. [2]

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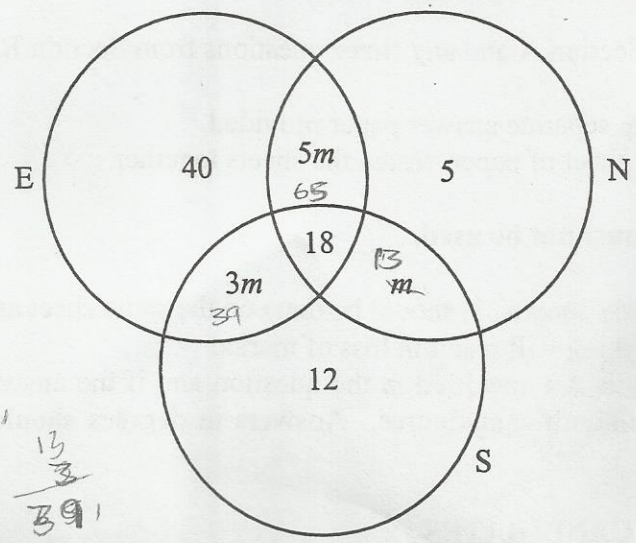
2 **(a)** A factory employs 192 people. The numbers of people who speak English (E), Shona (S) or Ndebele (N), are shown in the Venn diagram below.



(i) Find the value of m.

(ii) Hence find, correct to 1 decimal place, the percentage of those who speak Shona. [5]

(b) Given that $\mathbf{P} = \begin{pmatrix} -3 & 2 \\ 0 & -5 \end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix} 2 & 6 \\ 1 & -4 \end{pmatrix}$,

(i) find $\mathbf{P} + 2\mathbf{Q}$,

(ii) calculate the values of x and y if $\mathbf{P}\begin{pmatrix} x \\ 2 \end{pmatrix} = \begin{pmatrix} 7 \\ 2y \end{pmatrix}$. [6]

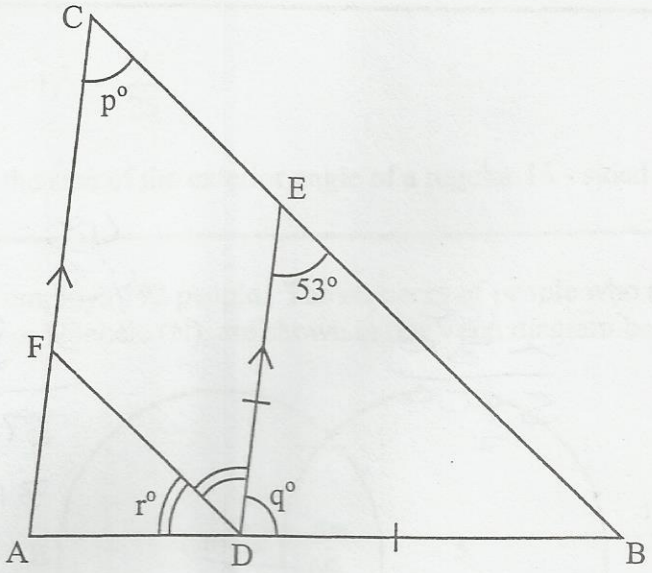
[Turn over

3 **(a)** Given that $S = \frac{n}{2}[2a + (n-1)d]$,

(i) find the value of S when $n = 15$, $a = 2$ and $d = -3$,

(ii) express d in terms of S, a and n. [5]

(b)



In the diagram, AC is parallel to DE, DB = DE and the line DF bisects $A\hat{D}E$. $B\hat{E}D = 53°$.

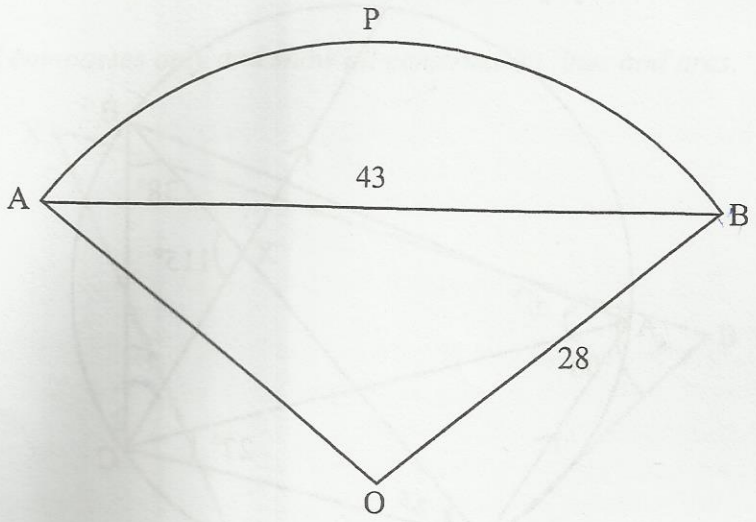
Find the value of

(i) p,

(ii) q,

(iii) r. [5]

4



Take π to be $\frac{22}{7}$.

In the diagram, OAPB is a sector of a circle centre O and radius 28mm. AB = 43mm.

Calculate

(a) the angle AOB, [3]

(b) the area of

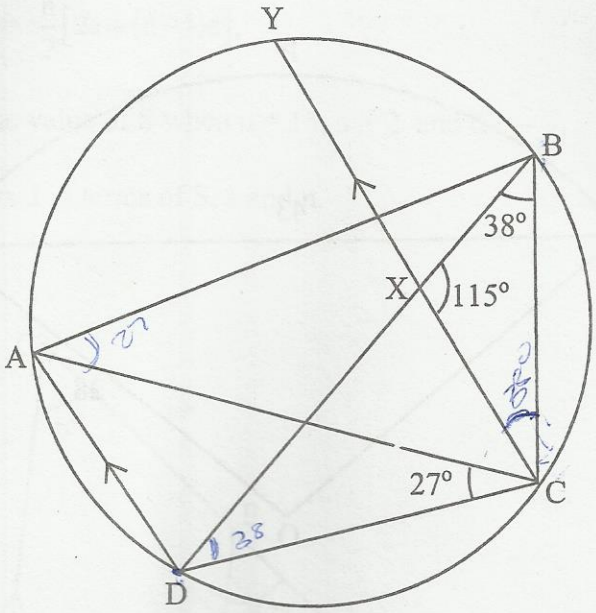
(i) sector OAPB, [3]

(ii) triangle AOB, [3]

(iii) the segment APB. [2]

[Turn over

5



In the diagram, ABCD is a cyclic quadrilateral. The straight line CXY is parallel to DA.

$A\hat{C}D = 27°$, $D\hat{B}C = 38°$ and $B\hat{X}C = 115°$.

(a) Calculate

(i) $B\hat{C}Y$,

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

(iii) $A\hat{D}B$,

(iv) $A\hat{C}Y$,

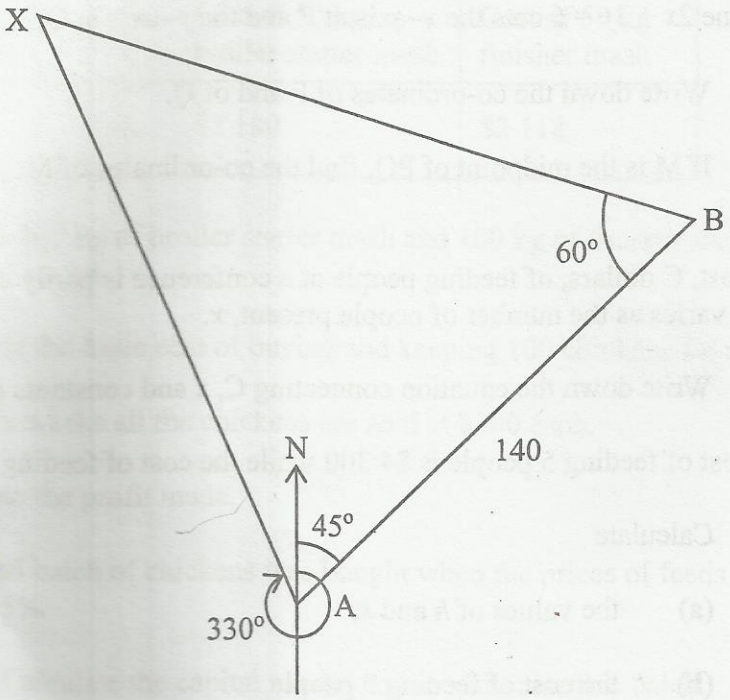
(v) $C\hat{A}B$. [7]

(b) State the reason why arc YB is equal to arc AD. [1]

(c) Name, in correct order, the triangle which is similar to ΔBXC. [2]

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

Use ruler and compasses only and show all construction lines and arcs.



In the diagram, A, B and X are three towns. The distance between A and B is 140 km and $A\hat{B}X = 60°$.

From A, the bearing of B is 045° and that of X is 330°.

(a) Using a scale of 1cm to represent 20 km, construct an accurate scale drawing of triangle ABX. [8]

(b) Measure the length of AX and state the distance between A and X in kilometres. [2]

(c) Construct the locus of points equidistant from X and B. [2]

Section B [36 marks]

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

7 **(a)** The line $2x + 3y = 6$ cuts the x–axis at P and the y–axis at Q.

(i) Write down the co-ordinates of P and of Q.

(ii) If M is the midpoint of PQ, find the co-ordinates of M. [4]

(b) The cost, C dollars, of feeding people at a conference is partly constant and partly varies as the number of people present, x.

(i) Write down the equation connecting C, x and constants h and k.

The cost of feeding 5 people is \$4 300 while the cost of feeding 3 people is \$2 800.

(ii) Calculate

(a) the values of h and k,

(b) the cost of feeding 9 people,

(c) the number of people who were fed if \$12 550 was charged for feeding them. [8]

8 An agriculture class keeps 100 broiler chickens at a time. The basic costs of inputs are shown in the table below.

Cost of 100 chickens	Cost of 50 kg broiler starter mash	Cost of 50 kg finisher mash
\$4 800	\$2 180	\$2 118

The class needs 200 kg of broiler starter mash and 100 kg of finisher mash to feed the chickens for six weeks.

(a) Calculate the basic cost of buying and keeping 100 chickens for six weeks. [3]

(b) After six weeks all the chickens are sold at \$300 each.

Calculate the profit made. [2]

(c) A second batch of chickens was bought when the prices of feeds had gone up by 15%.

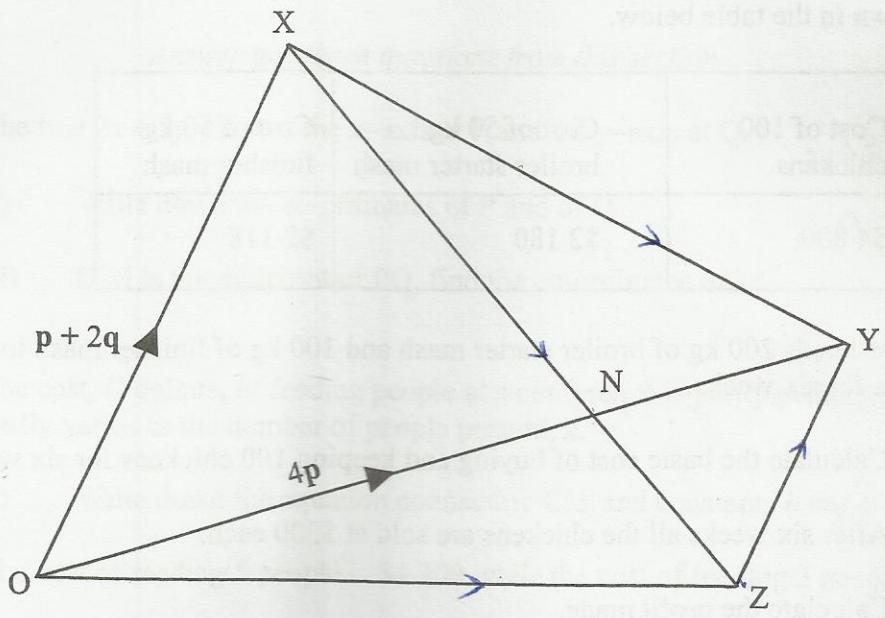
(i) Calculate the capital needed to buy and raise this batch.

(ii) After six weeks 55 of the chickens were stolen and the rest were sold at \$375 each.

Calculate the percentage profit made. [7]

[Turn over

9



In the diagram, OXYZ is a quadrilateral. N is a point on XZ such that XN:NZ = 3:1.

$\overrightarrow{OX} = \mathbf{p} + 2\mathbf{q}$ and $\overrightarrow{ON} = 4\mathbf{p}$.

(a) Express as simply as possible in terms of **p** and/or **q**.

OX + ON

(i) $\overrightarrow{XN}$, $p + 2q + 4p = 5p + 2q$

(ii) $\overrightarrow{XZ}$,

(iii) $\overrightarrow{OZ}$. [4]

(b) Given that ZY is parallel to OX, express $\overrightarrow{OY}$ in terms of **p**, **q** and a constant k. [3]

(c) If $OY = \frac{4}{3}ON$,

(i) find the value of k,

(ii) express $\overrightarrow{ZY}$ in terms of **p** and **q**. [4]

(d) Find the ratio $\frac{area\ of\ \Delta YZN}{area\ of\ \Delta OXN}$. [1]

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

10 The following is an incomplete table of values for $y = 3 - x - 2x^2$.

x	−2	−1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1	$1\frac{1}{2}$
y	−3	2	m	3	2	0	−3

(a) Calculate the value of m. [1]

(b) Using a scale of 2 cm to represent $\frac{1}{2}$ unit on the x–axis and 2 cm to represent 1 unit on the y–axis, draw the graph of $y = 3 - x - 2x^2$ for $-2 \leq x \leq 1\frac{1}{2}$. [4]

(c) Use the graph to estimate

(i) the maximum value of y,

(ii) the gradient of the curve at $x = \frac{1}{2}$,

(iii) the range of values of x for which y is positive. [5]

(d) By drawing a suitable straight line on the same axes, solve the equation

$3 - x - 2x^2 = -1$. [2]

$y = 3 - x - 2x^2$

$y = 3 - (-.95 - 2(.95)^2$

$y = 3 + .95 - 2(1)$

$y = 3 + .95 - 2$

$y = 1 + .95$

$y =$

.5
.6
.7

$y = 3 - 1/2 - 2(1/2)^2$

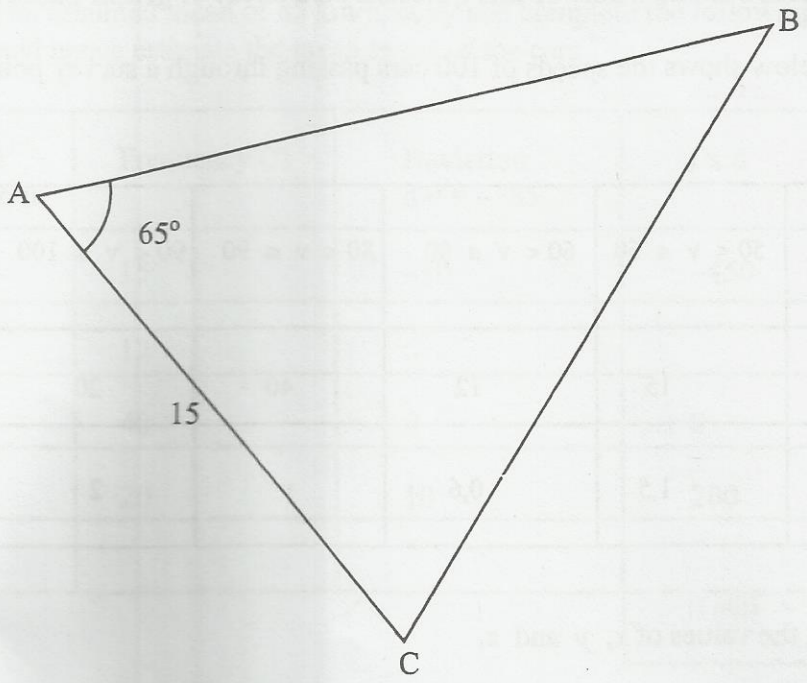
$y = 3 - 1/2 - 2(1/4)$

$y = 3 - 1/2 - 1/2$

$y = 3 - 1$

$y = 3$

11



In the diagram, A, B and C are corners of a triangular playground. AC = 15 m and $B\hat{A}C = 65°$.

A lamp-post TA (not shown in the diagram), 8 m high, stands vertically at A. The angle of elevation of T from B is 20°.

(a) Calculate

(i) AB,

(ii) the area of the playground,

(iii) the shortest distance of C from AB,

(iv) BC. [10]

(b) A mower is used to cut grass in the playground. If the mower cuts 25 m^2 of grass per minute, calculate the time it takes to mow the whole ground, giving the answer to the nearest minute. [2]

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

12 The table below shows the speeds of 100 cars passing through a survey point on a highway.

speed (v) km/h	$50 < v \leq 60$	$60 < v \leq 80$	$80 < v \leq 90$	$90 < v \leq 100$	$100 < v \leq 120$
Number of cars (f)	15	12	40	20	x
Frequency density	1,5	0,6	y	2	z

(a) Find the values of x, y and z. [3]

(b) State the modal class. [1]

(c) Using a scale of 2 cm to represent 10 km/h on the horizontal axis and 2 cm to represent 0,5 units on the vertical axis, draw a histogram to illustrate the information. [5]

(d) Using an assumed mean of 85 km/h, copy and complete the following table and hence estimate the mean speed of the cars.

Speed (v) km/h	Frequency (f)	Deviation d = v – 85	f x d
55	15	–30	–450
70	12		
85	40	0	0
95	20	10	200
110			
			Total =

[3]