Centre No.						Paper Reference								Surname	Initial(s)
Candidate No.						7	3	6	1	/	0	2		Signature	

Paper Reference(s)

7361/02

London Examinations GCE

Mathematics Syllabus B

Ordinary Level

Paper 2

Thursday 15 January 2009 – Morning

Time: 2 hours 30 minutes

Examiner's use only

Team Leader's use only

Materials required for examination	Items included with question papers
Nil	Nil

Candidates are expected to have an electronic calculator when answering this paper.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must write your answer for each question in the spaces following the question.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 100.
There are 24 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers clearly and legibly.

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1. Each edge of a cube is of length 3 m. The edges are increased by 20%.
Calculate the percentage increase in the volume of the cube.

(3)

Q1

(Total 3 marks)

Leave blank

2. The length of a road is 1.2 km. On a map, the length of the road is 3 cm.

(a) Express the scale of the map as a ratio in the form 1 : n, where n is a positive integer.

(2)

The area of a field is 1.6 km^2.

(b) Calculate the area, in cm^2, of the field represented on the map.

(2)

Q2

(Total 4 marks)

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3. A particle P moves in a straight line so that, at time t seconds, it is s metres from a fixed point O on the line, where

$$s = 6t^2 - 3t + 1$$

(a) Calculate the value of t when the velocity of P is 21 m/s.

(3)

(b) Show that the acceleration of P is constant.

(2)

Q3

(Total 5 marks)

Leave blank

4. Solve the equation $\frac{x}{2} + \frac{6x}{x-3} = 1$

(6)

Q4

(Total 6 marks)

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5. In a class of 25 students, each student studies at least one of Biology, Physics and Chemistry.

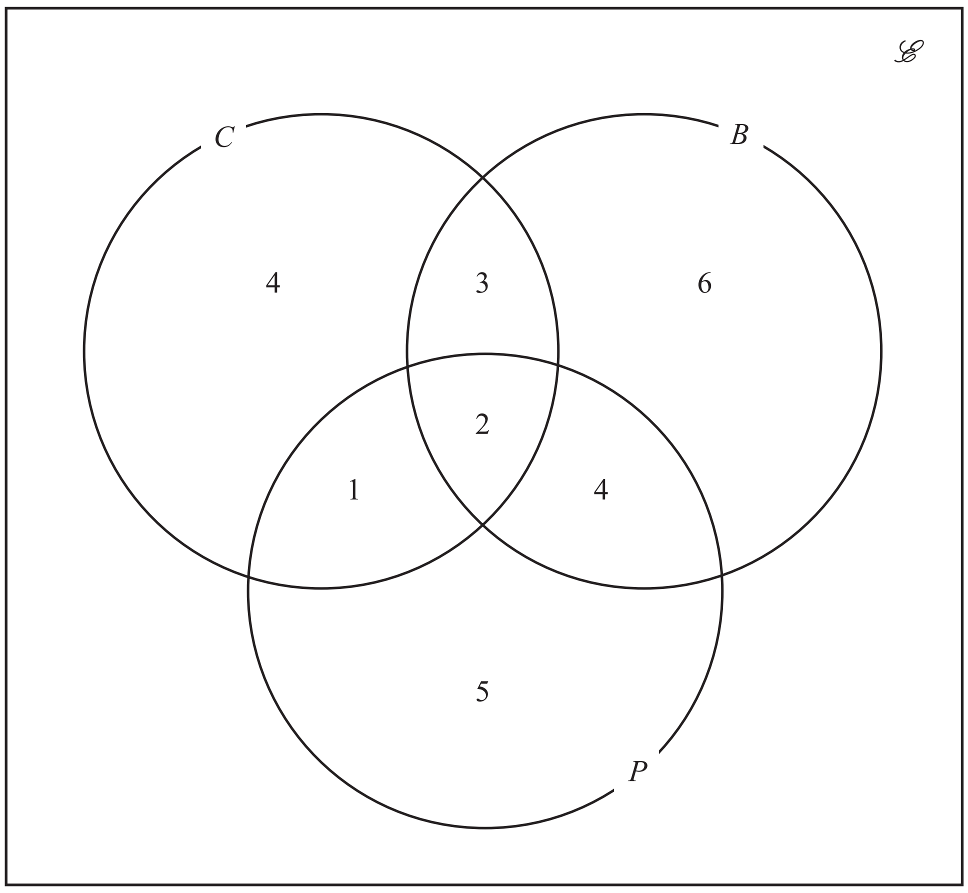

Figure 1

In the Venn diagram, Figure 1,

$\mathscr{E}$ = { students in the class of 25 students },

B = { students studying Biology },

P = { students studying Physics },

C = { students studying Chemistry }.

The numbers shown in the Venn diagram represent the numbers of students who study a subject or combination of subjects.

A student is to be chosen at random from the class. Write down the probability that the student

(a) studies Physics,
(1)

(b) studies Physics and Biology,
(1)

(c) studies Physics and Chemistry but not Biology.
(1)

N 3 3 3 0 4 A 0 6 2 4

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Two students are to be chosen at random from the class.
Calculate the probability that both students

(d) study Physics and Chemistry,

(3)

(e) study Physics, Chemistry and Biology.

(3)

Q5

(Total 9 marks)

Leave blank

6.

$$f: x \mapsto 3(x-1)$$

$$g: x \mapsto \frac{1}{x}, \quad x \neq 0$$

$$h: x \mapsto x^2$$

(a) Find (i) $\text{hg}\left(\frac{1}{2}\right)$, (ii) $\text{fhg}\left(\frac{1}{2}\right)$.

(2)

(b) Find the inverse function f^{-1}. Give your answer in the form $f^{-1}: x \mapsto$ …….

(2)

(c) Solve the equation $\text{hfg}(x) = 36$

(5)

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Question 6 continued

(Total 9 marks)

Q6

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7.

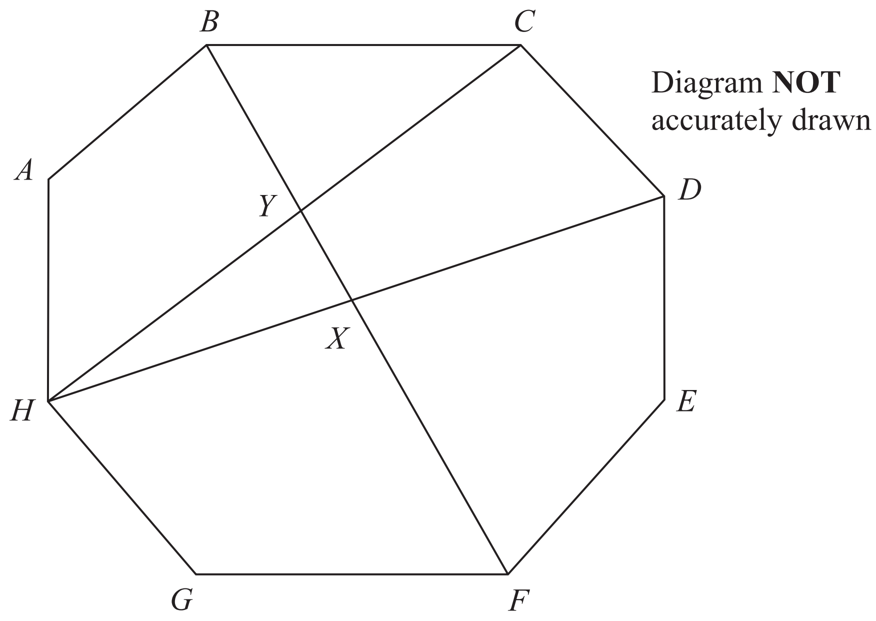

Figure 2

In Figure 2, *ABCDEFGH* is a regular octagon.

(a) Calculate the size, in degrees, of an interior angle of the octagon. **(2)**

(b) Calculate the size, in degrees, of $\angle EFD$. **(2)**

The line *BF* intersects the lines *HC* and *HD* at *Y* and *X* respectively.

Calculate the size, in degrees, of

(c) $\angle XDF$. **(2)**

(d) Show, giving reasons, that triangle *BYC* is isosceles. **(4)**

[Sum of interior angles of polygon = $(2n - 4)$ right angles]

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Question 7 continued

(Total 10 marks)

Q7

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8.

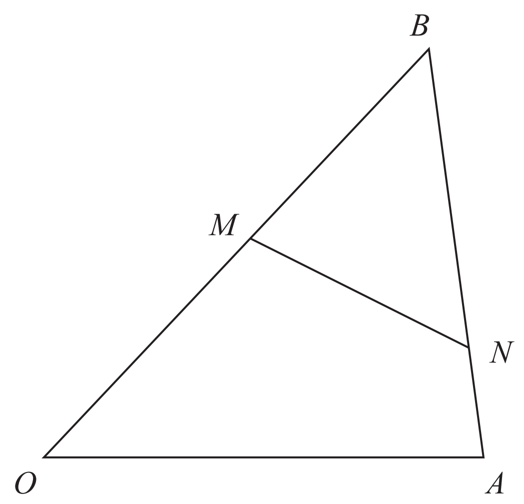

Figure 3

In Figure 3, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$. The midpoint of OB is M and the point N lies on AB such that $BN : NA = 2 : 1$

(a) Express in terms of **a** and **b**, simplifying your answers where possible,

(i) $\overrightarrow{BA}$, (ii) $\overrightarrow{BN}$, (iii) $\overrightarrow{MB}$, (iv) $\overrightarrow{MN}$.

(5)

The point P lies on OA extended so that $OA : OP = 1 : 2$

(b) Show that MNP is a straight line.

(3)

(c) Find the ratio $MN : NP$

(2)

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Question 8 continued

Q8

(Total 10 marks)

N 3 3 3 0 4 A 0 1 3 2 4

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9. The points $A(2, 1)$, $B(4, 2)$ and $C(3, 4)$ are the vertices of ΔABC.

(a) On the graph paper, draw and label ΔABC.

(1)

$$\mathbf{M} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

ΔABC is transformed to $\Delta A_1B_1C_1$, where A_1, B_1 and C_1 are respectively the images of A, B and C, under the transformation with matrix $\mathbf{M}$.

(b) (i) Find the coordinates of A_1, B_1 and C_1.

(ii) Draw and label $\Delta A_1B_1C_1$.

(4)

$\Delta A_2B_2C_2$ is the reflection of $\Delta A_1B_1C_1$ in the line $x = 1$, where A_2, B_2 and C_2 are respectively the images of the points A_1, B_1 and C_1.

(c) Draw and label $\Delta A_2B_2C_2$.

(2)

$$\mathbf{N} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$\Delta A_2B_2C_2$ is transformed to $\Delta A_3B_3C_3$, where A_3, B_3 and C_3 are respectively the images of the points A_2, B_2 and C_2, under the transformation with matrix $\mathbf{N}$.

(d) (i) Describe the transformation defined by matrix $\mathbf{N}$.

(ii) Find the coordinates of A_3, B_3 and C_3.

(iii) Draw and label $\Delta A_3B_3C_3$.

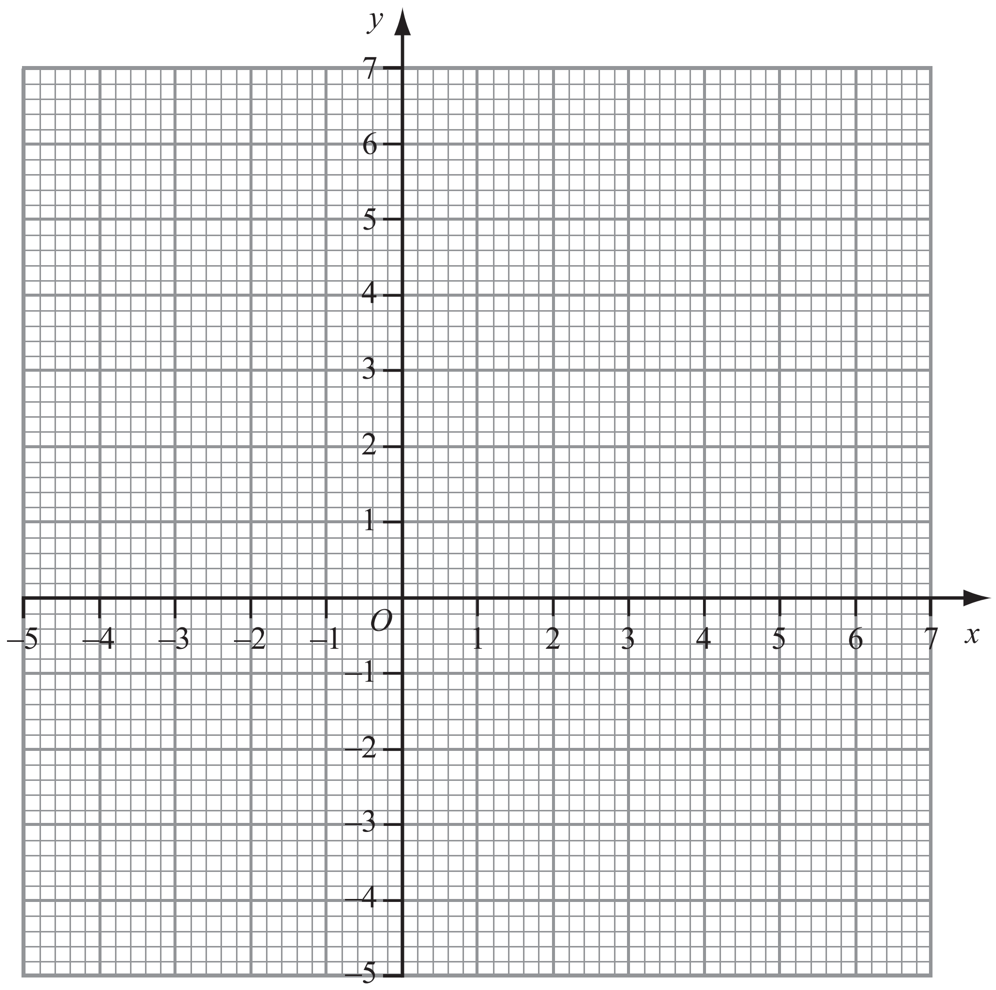
(5)

ΔABC is mapped onto $\Delta A_3B_3C_3$ by a reflection in $x=0$ followed by a translation by a vector $\mathbf{n}$.

(e) Write down the vector $\mathbf{n}$.

(2)

Question 9 continued



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Question 9 continued

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Question 9 continued

(Total 14 marks)

Q9

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10.

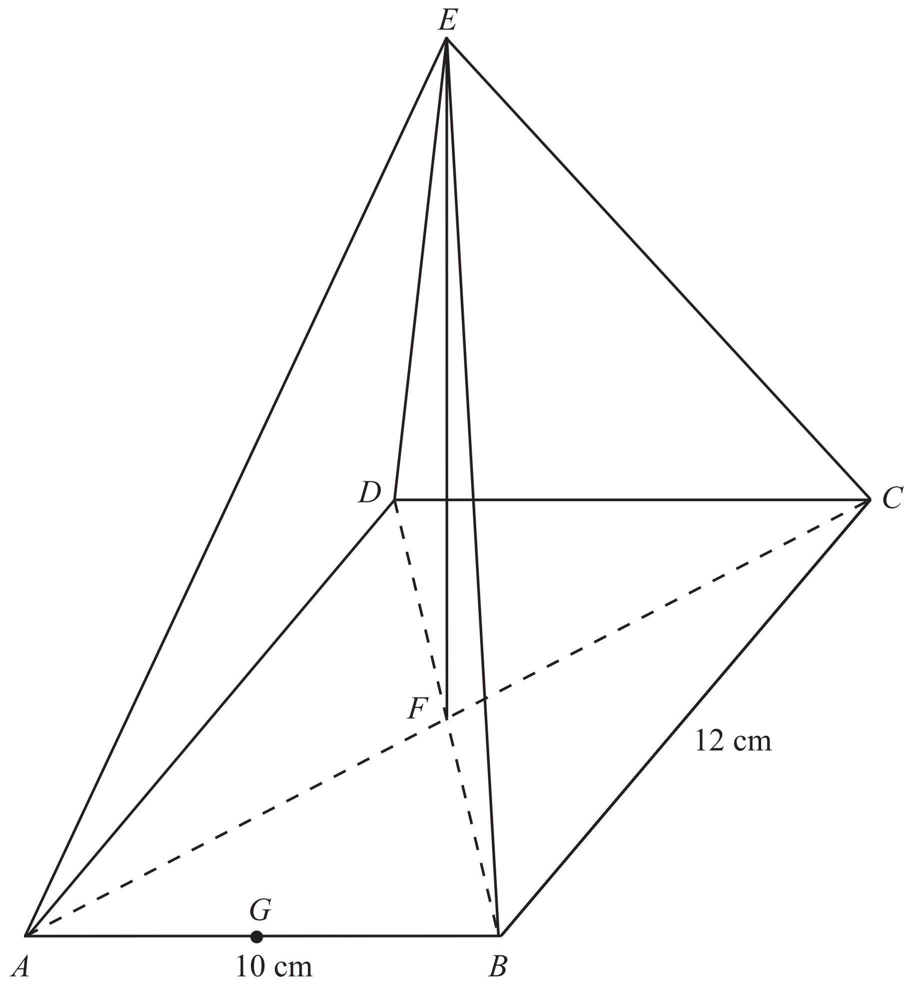

Figure 4

Figure 4 shows a solid pyramid *ABCDE* with a rectangular base *ABCD*, where *AB* = 10 cm and *BC* = 12 cm. The point of intersection of diagonals *AC* and *BD* of the rectangle *ABCD* is *F*, where *EF* = 20 cm. The base of the pyramid is placed on a horizontal table so that *EF* is vertical. The midpoint of the line *AB* is *G*.

Calculate, to 1 decimal place,

(a) the length, in cm, of *EG*, **(3)**

(b) the area, in cm^2, of ΔAEB, **(2)**

(c) the length, in cm, of *EB*, **(2)**

(d) the size, in degrees, of $\angle AEB$, **(3)**

(e) the total surface area, in cm^2, of the pyramid *ABCDE*. **(4)**

$$\left[\text{Area of triangle } = \frac{1}{2}ab\sin C\right]$$

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Question 10 continued

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Question 10 continued

N 3 3 3 0 4 A 0 2 0 2 4

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Question 10 continued

(Total 14 marks)

Q10

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11. The equation of a curve is given by

$$y = x^3 - x^2 - 5x.$$

(a) Complete the table for $y = x^3 - x^2 - 5x$, giving your values of y to 2 decimal places.

x	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2.0	2.5	3.0
y	–2		3		0	–2.63	–5	–6.38	–6		3

(3)

(b) On the graph paper, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) From your graph, estimate the range of values for x for which $x^3 - x^2 - 5x < 1$

(4)

(d) By drawing a suitable straight line on your graph, find estimates of the 3 values of x which satisfy $2x^3 - 2x^2 - 11x - 1 = 0$

(6)

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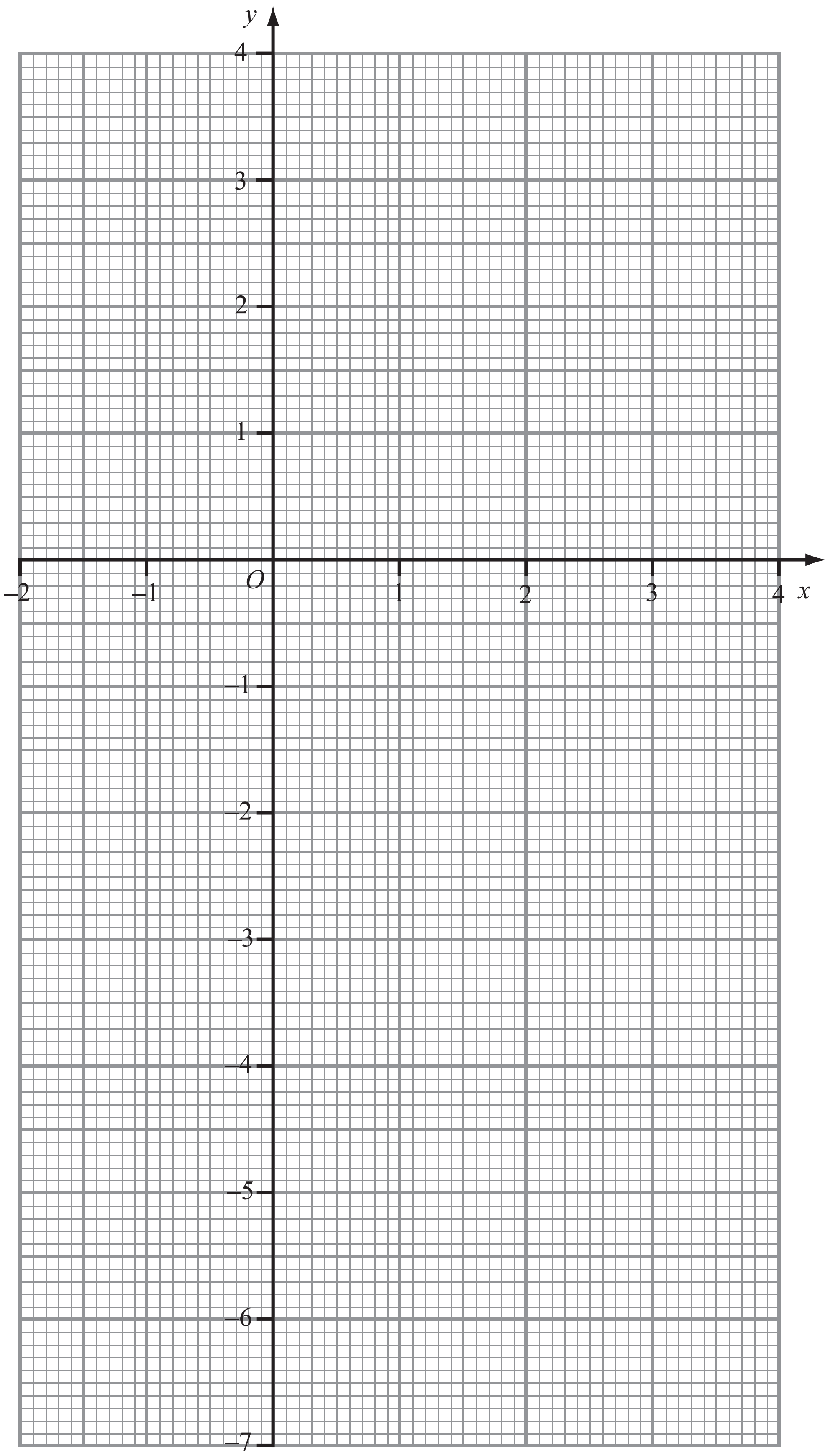
Question 11 continued



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Question 11 continued

Q11

(Total 16 marks)

TOTAL FOR PAPER: 100 MARKS

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