Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Mathematics B

Paper 2

Wednesday 15 January 2014 – Morning
Time: 2 hours 30 minutes

Paper Reference
4MB0/02

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

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P 4 2 9 3 7 A 0 1 2 8

PEARSON

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 (a) Solve the inequalities

$$x + 2 \leqslant 5 + 3x \leqslant 2x + 7$$

(4)

(b) Use your answer to part (a) to write down the integer values of x that satisfy the inequalities

$$x + 2 \leqslant 5 + 3x \leqslant 2x + 7$$

(1)

Question 1 continued

(Total for Question 1 is 5 marks)

2 Pairs of shoes of a certain type are sold in a shop for £80 for each pair.
The shoemaker is paid 65% of this selling price for each of the first 100 pairs sold.
He is paid 55% of the selling price for each of the next 50 pairs sold and 45% of the selling price for each of any other pairs that are sold.
280 pairs of these shoes were sold.

Calculate the total amount, in £, that the shoemaker is paid for these shoes.

(Total for Question 2 is 4 marks)

3 David drove at an average speed of 50 km/h for a distance of 45 km in his car.

(a) Calculate the time, in minutes, taken by David on his journey.

(3)

On a different journey, Marian drove at an average speed of 70 km/h.
The time she took on her journey was 80% more than the time taken by David on his journey.

(b) Calculate the distance, in km, that Marian drove.

(3)

(Total for Question 3 is 6 marks)

4 (a) Find the inverse of the matrix $\begin{pmatrix} 2 & -1 \\ 5 & -2 \end{pmatrix}$

(2)

(b) Hence, or otherwise, find the value of x and the value of y such that

$$\begin{pmatrix} 2 & -1 \\ 5 & -2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

(3)

$$\left[\text{The inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ is } \frac{1}{ad - bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}\right]$$

Question 4 continued

(Total for Question 4 is 5 marks)

5

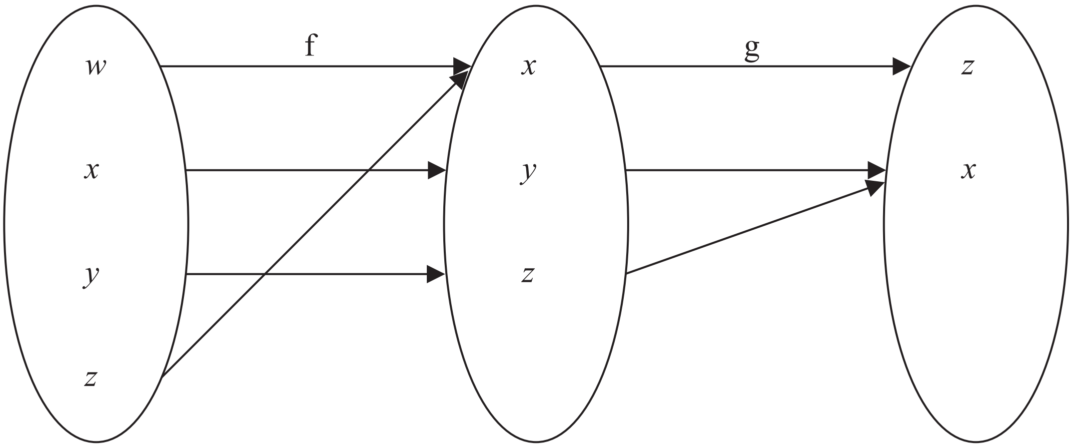


Figure 1

Information about the functions f and g is shown in Figure 1

(a) Find

(i) f(x),

(ii) gf(w),

(iii) fg(x).

(3)

h is the function such that

$$h: x \mapsto \frac{1}{x+2}, \quad x \neq -2$$

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

(2)

(c) Hence, or otherwise, solve $h^{-1}(x) = -x$.

(3)

Question 5 continued

(Total for Question 5 is 8 marks)

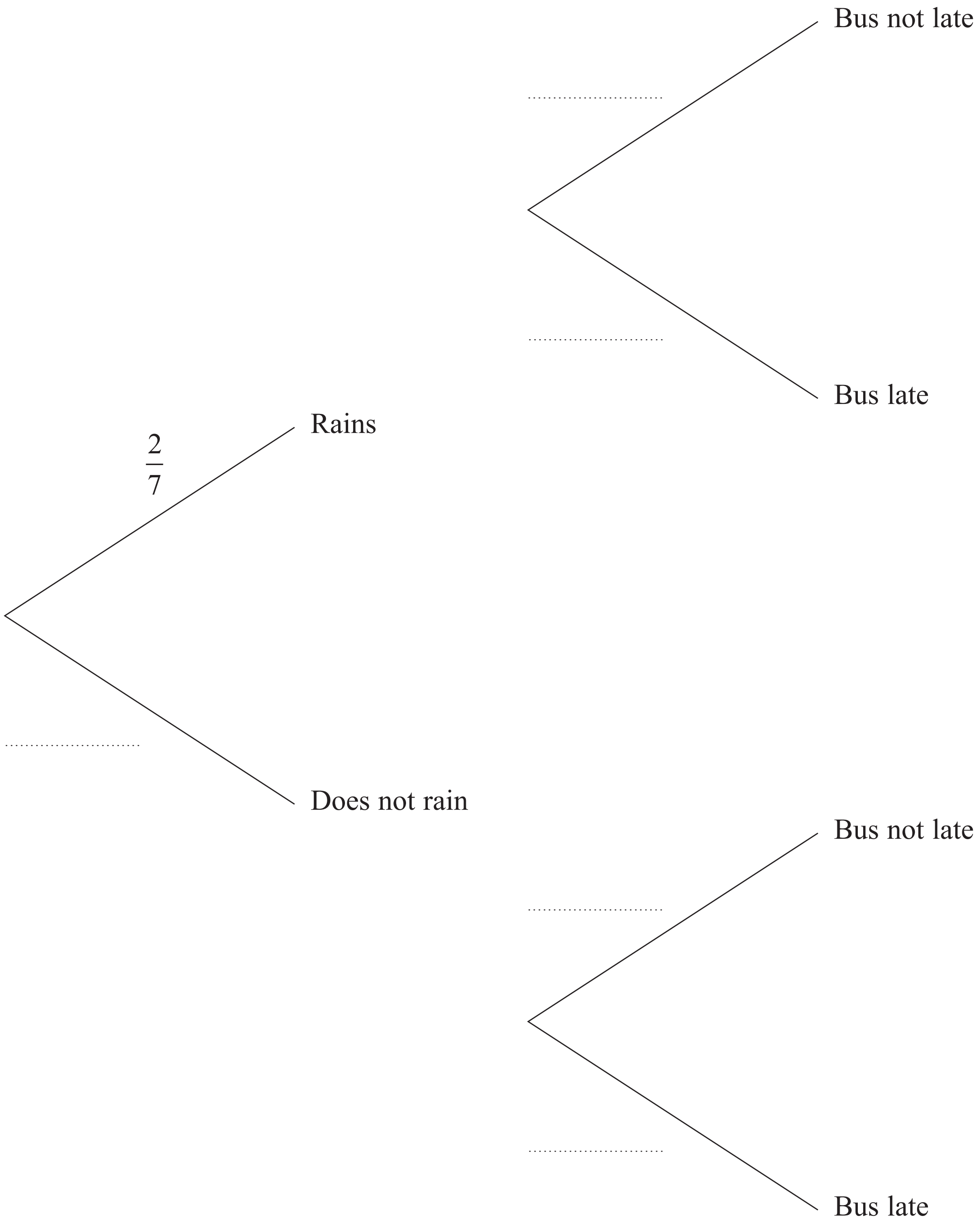
6 On school days, Fatima goes to school by bus.

The probability that it will rain on a school day is $\frac{2}{7}$

When it rains, the probability that the bus will be late is $\frac{1}{5}$

When it does **not** rain, the probability that the bus will **not** be late is $\frac{5}{6}$

(a) Complete the probability tree diagram.



(3)

P 4 2 9 3 7 A 0 1 0 2 8

Question 6 continued

Calculate the probability that on a school day,

(b) it will be raining and the bus will be late,

(2)

(c) the bus will be late.

(3)

(Total for Question 6 is 8 marks)

7 Water flows out of a pipe at a rate of 125 litres per minute.

(a) Calculate how much water, in litres, flows out of the pipe in 2 days.

(2)

A swimming pool, in the shape of a cuboid, is 25 m long, 15 m wide and 1.2 m deep. The pool is empty and is to be filled with water flowing out of the pipe at the same rate of 125 litres per minute.

(b) Calculate the time, in hours, needed to fill the swimming pool completely.

(5)

The owner of the pool decides that the time calculated in part (b) is too long. He wants the pool to be filled completely in 10 hours.

(c) Calculate the rate of the flow of water, in litres per minute, that would fill the empty swimming pool completely in 10 hours.

(2)

[1000 litres = 1 m^3]

Question 7 continued

(Total for Question 7 is 9 marks)

8

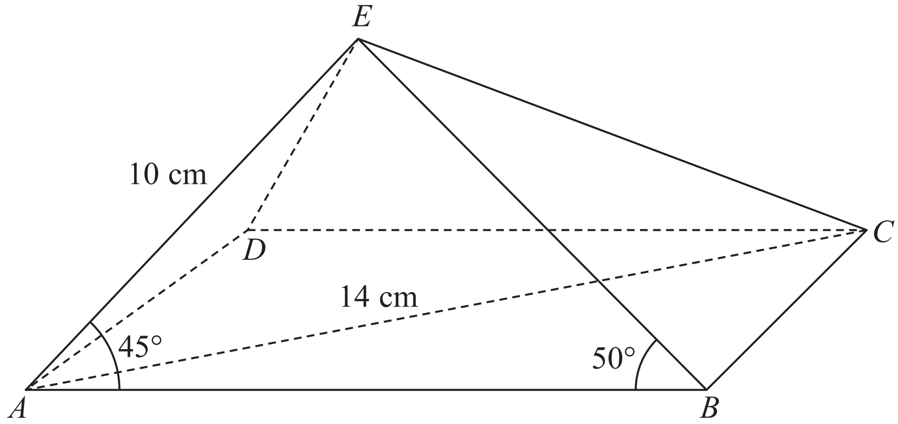


Diagram **NOT** accurately drawn

Figure 2

In Figure 2, *ABCDE* is a rectangular based pyramid with base *ABCD*.
In ΔADE, $AE = DE = 10$ cm.
In ΔBCE, $BE = CE$.

Given that $\angle EAB = 45°$ and $\angle ABE = 50°$

(a) calculate the length, in cm to 3 significant figures, of *BE*.

(3)

(b) Show that, to 3 significant figures, $AB = 13.0$ cm.

(2)

Given also that $AC = 14$ cm,

(c) calculate the length, in cm to 3 significant figures, of *BC*.

(2)

(d) Calculate the size, in degrees to 3 significant figures, of $\angle BEC$.

(3)

The triangular faces of the pyramid are to be painted.

(e) Calculate the total surface area, in cm^2 to 3 significant figures, that is to be painted.

(5)

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of triangle $= \dfrac{1}{2}bc \sin A$

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 15 marks)

9

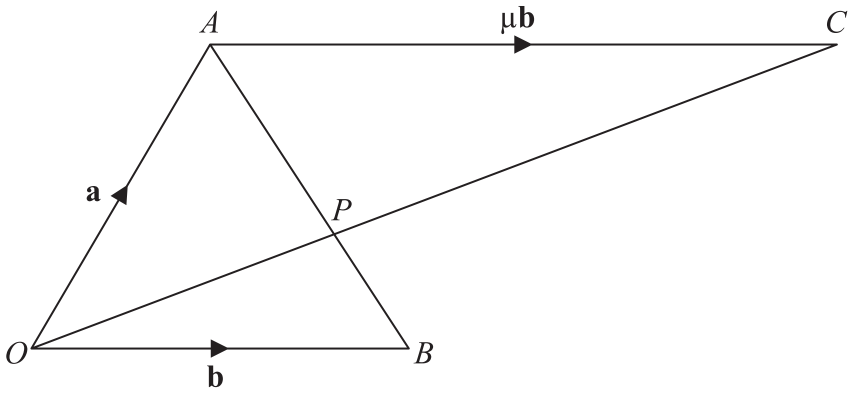


Figure 3

Figure 3 shows $\triangle OAB$ in which $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

P is the point on AB such that $AP : PB = 3 : 1$

(a) Find, in terms of **a** and **b**, simplifying your answers,

(i) $\overrightarrow{AB}$,

(ii) $\overrightarrow{AP}$,

(iii) $\overrightarrow{OP}$.

(4)

The point C is such that OPC is a straight line and $\overrightarrow{AC} = \mu\mathbf{b}$, where μ is a scalar.

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

(i) $\overrightarrow{OC}$,

(ii) $\overrightarrow{PC}$.

(3)

Given that $\overrightarrow{OP} = \lambda\,\overrightarrow{OC}$, where λ is a scalar,

(c) (i) find the value of λ,

(ii) hence use your value of λ to find μ.

(6)

(d) Hence write down the ratio $OP : PC$ in the form $1 : m$ where m is an integer.

(1)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 14 marks)

10

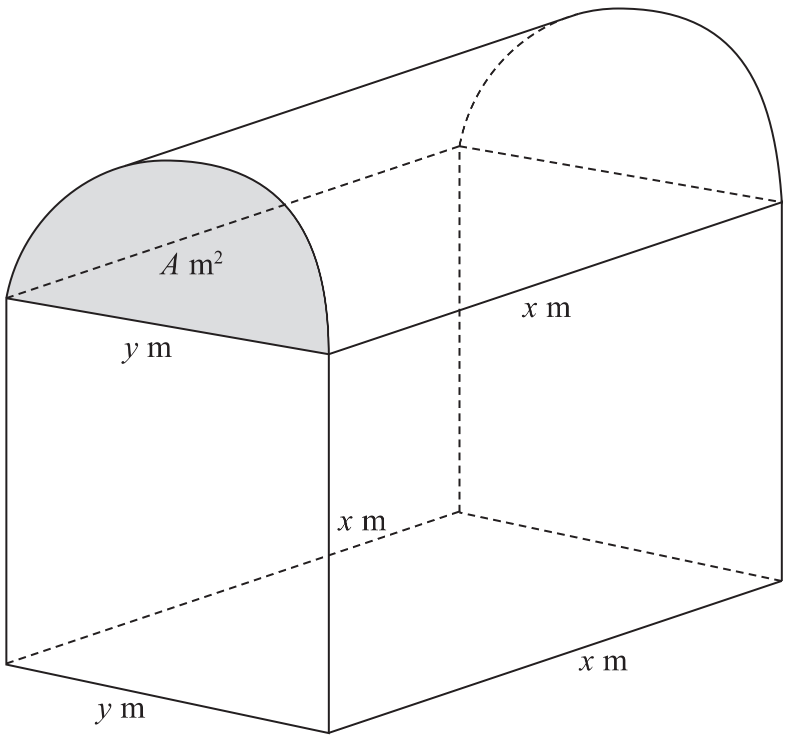


Figure 4

Figure 4 shows a barn whose roof, in the shape of a half cylinder, is on top of a cuboid. The half cylinder is x metres long and the semi-circular ends of the half cylinder each have an area of A m^2 and diameter y metres.
The cuboid is y metres wide, x metres long and x metres high, as shown in Figure 4.
The total external surface area of the barn, excluding the floor of the barn, is S m^2.

(a) Show that

$$S = 2x^2 + xy\left(2 + \frac{\pi}{2}\right) + 2A$$

(3)

Given that the volume of the cuboid is $10x$ m^3,

(b) show that $y = \dfrac{10}{x}$

(2)

(c) Hence show that

$$S = 2x^2 + 10\left(2 + \frac{\pi}{2}\right) + \frac{25\pi}{x^2}$$

(3)

[Area of circle = πr^2
Curved surface area of a right circular cylinder = $2\pi rh$]

Question 10 continued

Question 10 continued

(d) Complete the following table for $S = 2x^2 + 10\left(2 + \frac{\pi}{2}\right) + \frac{25\pi}{x^2}$, giving the values of S to 1 decimal place.

x	1	1.5	2	2.5	3	3.5	4	4.5	5
S	116.2	75.1		60.8	62.4		72.6		88.8

(3)

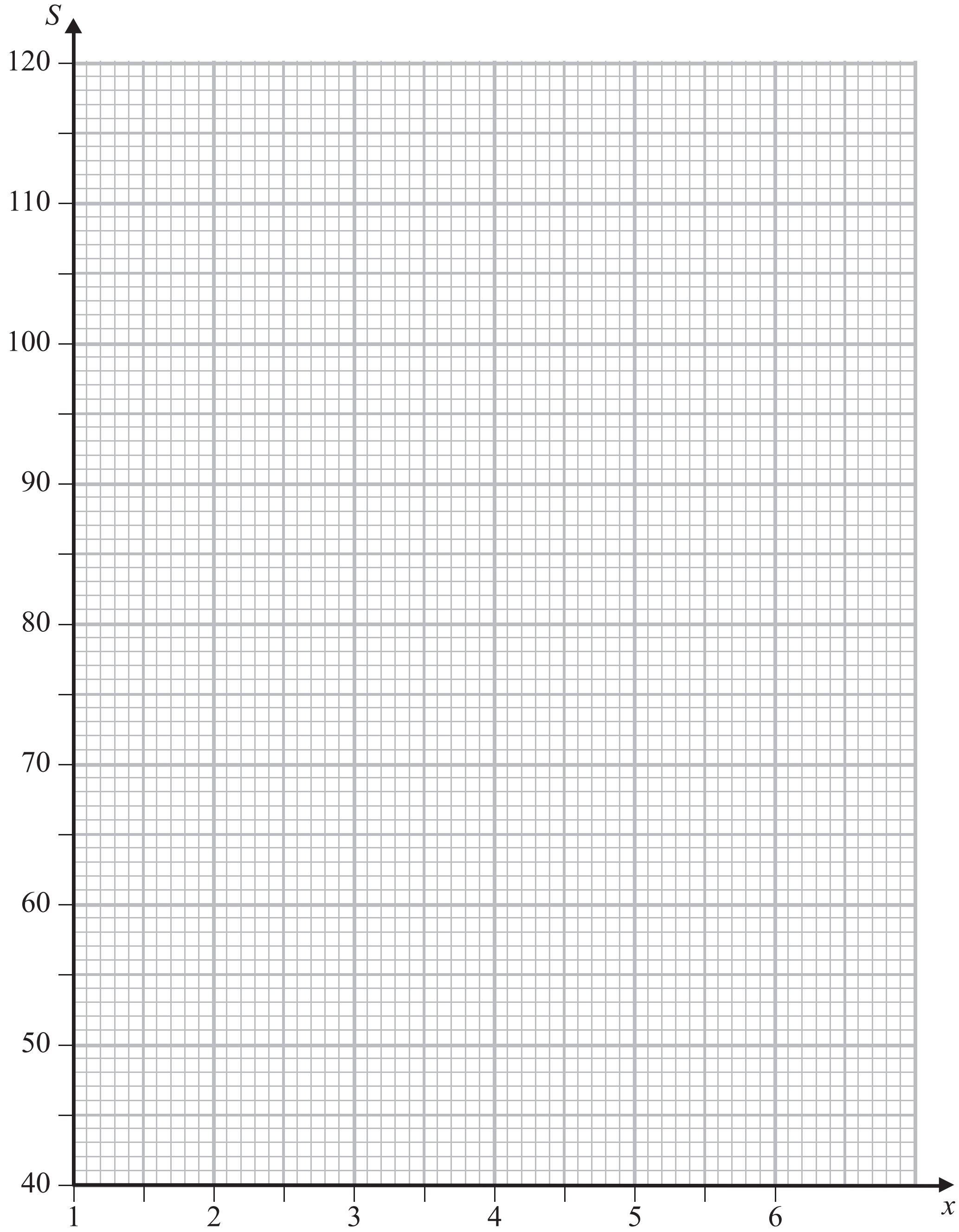
(e) On the grid, plot the points from your completed table and join them to form a smooth curve.

(3)

(f) Use your graph to find the range of values of x, to 1 decimal place, for which $S \leqslant 80$

(2)

Question 10 continued



(Total for Question 10 is 16 marks)

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11 The points (1, 0), (2, 3) and (3, 2) are the vertices of triangle A.

(a) On the grid, draw and label triangle A.

(1)

Triangle A is transformed to triangle B by an enlargement with scale factor 2 and centre (0, 0).

(b) (i) Write down the coordinates of the vertices of triangle B.

(ii) On the grid, draw and label triangle B.

(2)

The matrix $\mathbf{S} = \begin{pmatrix} 0 & -\frac{1}{2} \\ 1 & 0 \end{pmatrix}$

Triangle B is transformed to triangle C under the transformation with matrix **S**.

(c) (i) Find the coordinates of triangle C.

(ii) On the grid, draw and label triangle C.

(3)

The matrix $\mathbf{T} = \begin{pmatrix} 0 & \frac{1}{2} \\ 1 & 0 \end{pmatrix}$

Triangle C is transformed to triangle D under the transformation with matrix **T**.

(d) (i) Find the coordinates of triangle D.

(ii) On the grid, draw and label triangle D.

(3)

(e) Describe fully the single transformation which transforms triangle A to triangle D.

(1)

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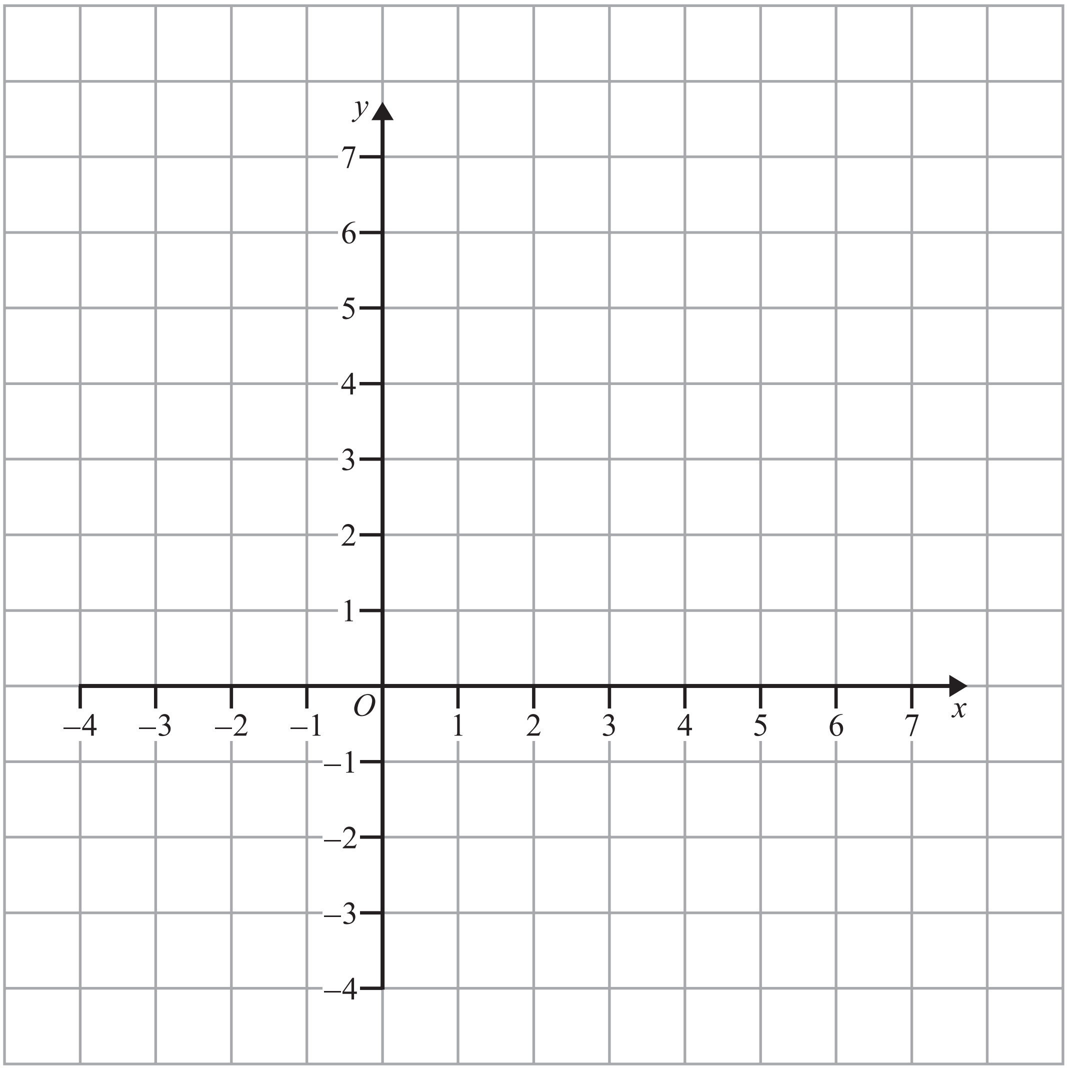
Question 11 continued



Question 11 continued

(Total for Question 11 is 10 marks)

TOTAL FOR PAPER IS 100 MARKS

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