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Surname

Other names

Pearson Edexcel
International GCSE

Centre Number

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Candidate Number

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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



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)



(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)

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



5

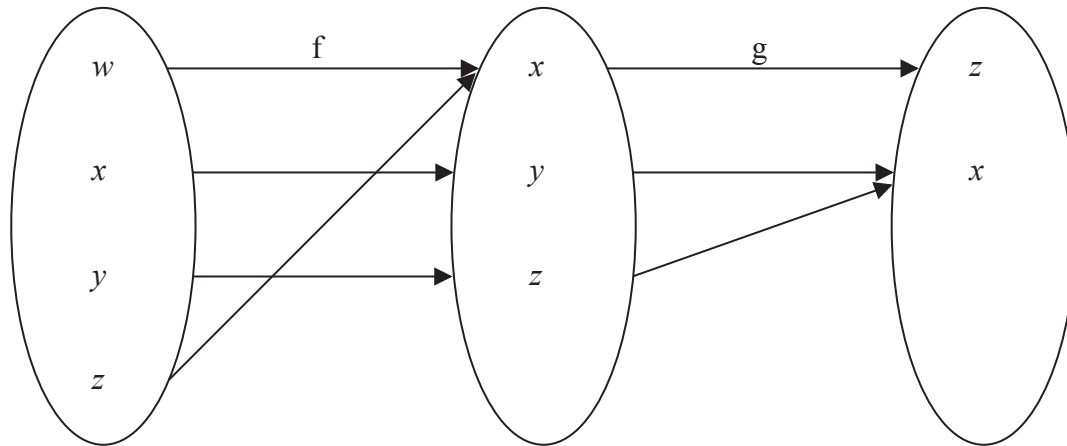


Figure 1

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 $h^{-1}: x \mapsto \dots$

(2)

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

(3)

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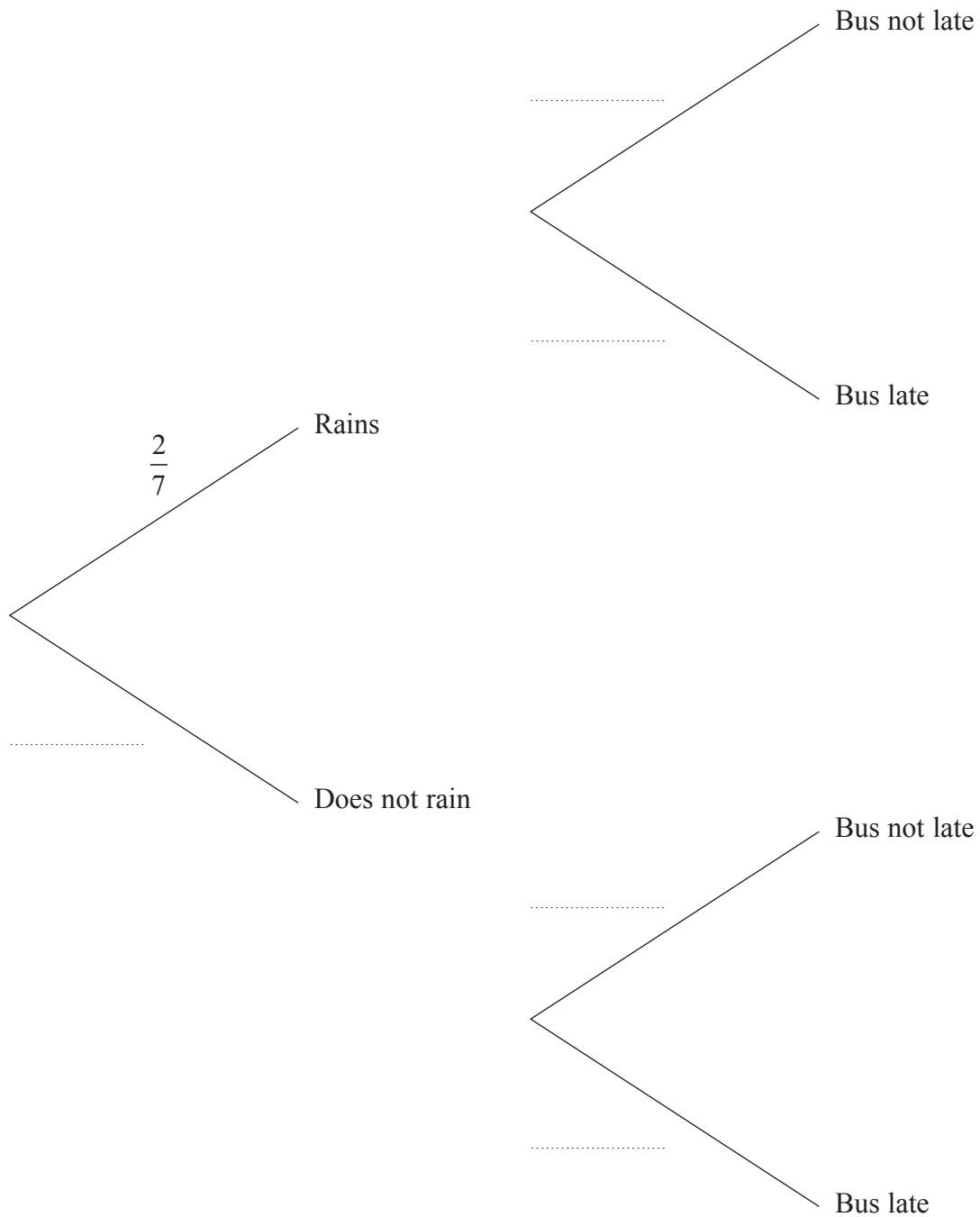
6 On school days, Fatima goes to school by bus.

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)



Question 6 continued

Calculate the probability that on a school day,

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

(2)

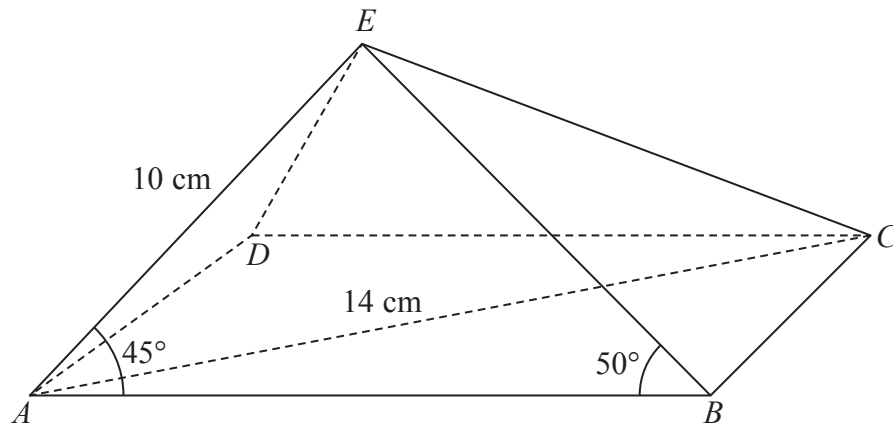
(c) the bus will be late.

(3)

(Total for Question 6 is 8 marks)



8

Diagram **NOT**
accurately drawn**Figure 2**

In Figure 2, $ABCDE$ is a rectangular based pyramid with base $ABCD$.

In $\triangle ADE$, $AE = DE = 10$ cm.

In $\triangle BCE$, $BE = CE$.

Given that $\angle EAB = 45^\circ$ and $\angle ABE = 50^\circ$

(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)

$$\left[\begin{array}{l} \text{Cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A \\ \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Area of triangle} = \frac{1}{2}bc \sin A \end{array} \right]$$



Question 8 continued

Handwriting practice area with 25 horizontal dotted lines.



Question 8 continued

Handwriting practice area with 20 horizontal dotted lines.



9

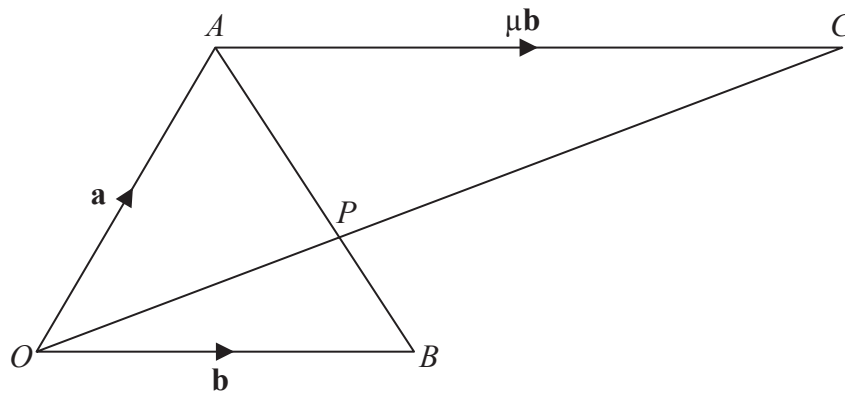
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accurately drawn

Figure 3

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

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

(a) Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, simplifying your answers,

- (i) $\vec{AB}$,
- (ii) $\vec{AP}$,
- (iii) $\vec{OP}$.

(4)

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

(b) Express, in terms of μ , $\mathbf{a}$ and $\mathbf{b}$, simplifying your answers where possible,

- (i) $\vec{OC}$,
- (ii) $\vec{PC}$.

(3)

Given that $\vec{OP} = \lambda \vec{OC}$, 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)

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Question 9 continued

Handwriting practice area with 20 horizontal dotted lines.



Question 9 continued

Handwriting practice area with 20 horizontal dotted lines.



10

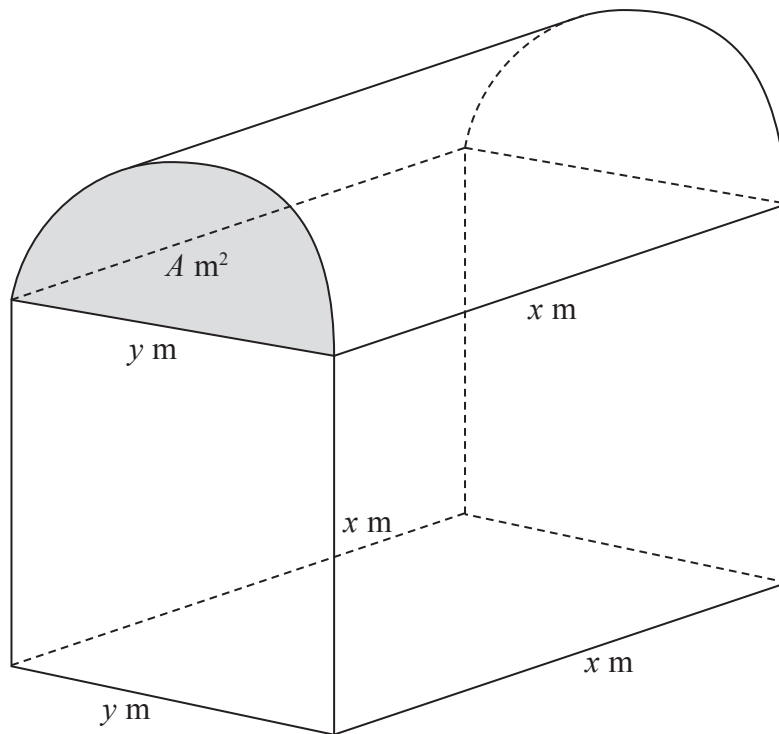
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Figure 4

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 $A \text{ m}^2$ 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 $S \text{ m}^2$.

(a) Show that

$$S = 2x^2 + xy \left(2 + \frac{\pi}{2} \right) + 2A \quad (3)$$

Given that the volume of the cuboid is $10x \text{ m}^3$,

(b) show that $y = \frac{10}{x}$ (2)

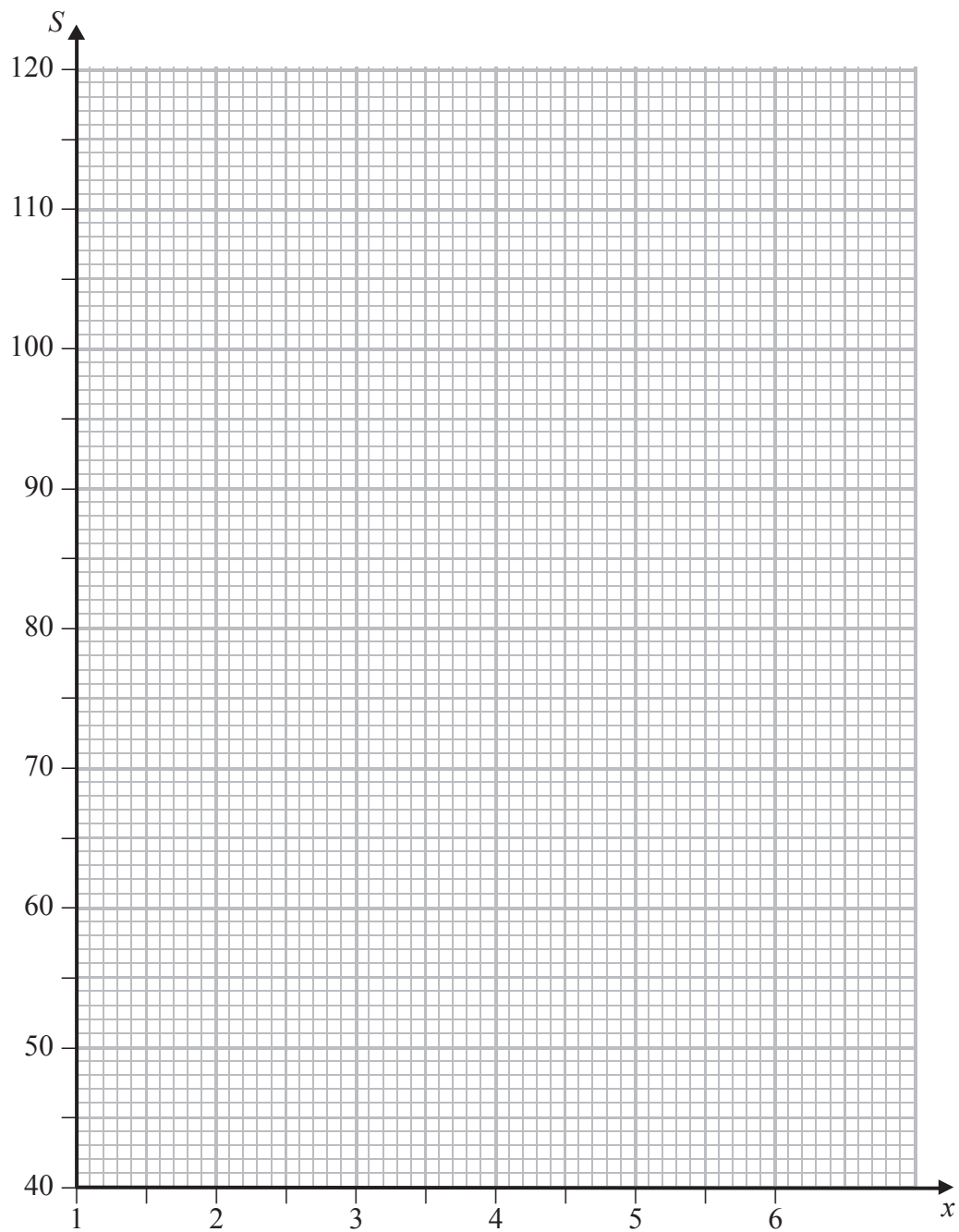
(c) Hence show that

$$S = 2x^2 + 10 \left(2 + \frac{\pi}{2} \right) + \frac{25\pi}{x^2} \quad (3)$$

$$\left[\begin{array}{l} \text{Area of circle} = \pi r^2 \\ \text{Curved surface area of a right circular cylinder} = 2\pi rh \end{array} \right]$$



Question 10 continued



(Total for Question 10 is 16 marks)



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

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

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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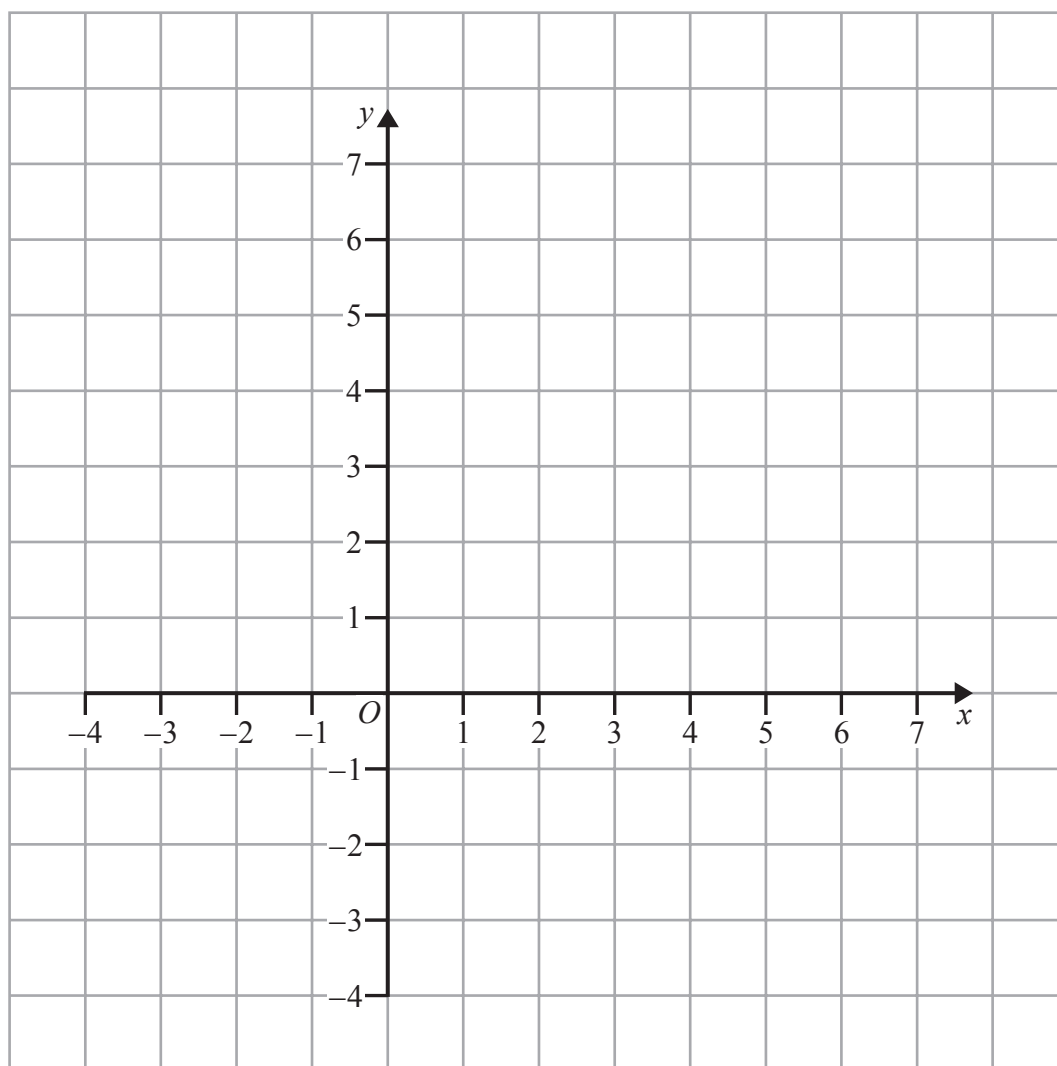
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Question 11 continued



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