

Write your name here

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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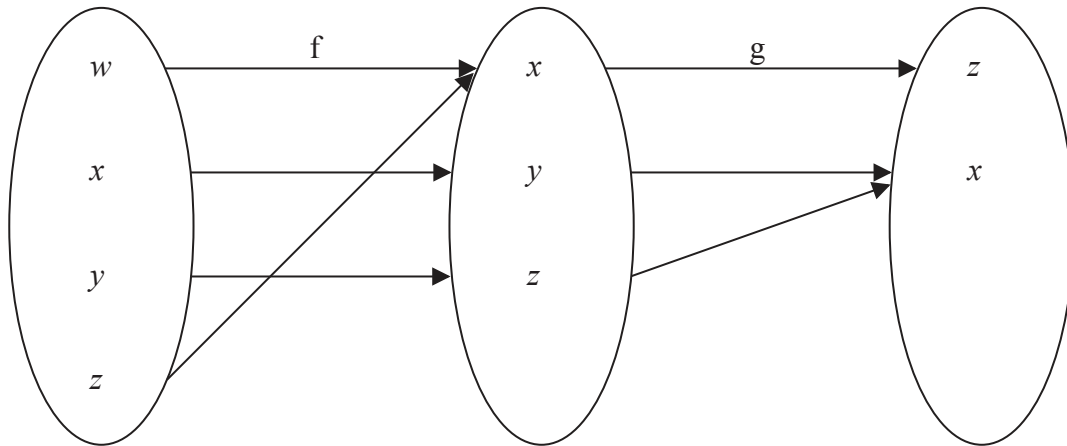


Figure 1

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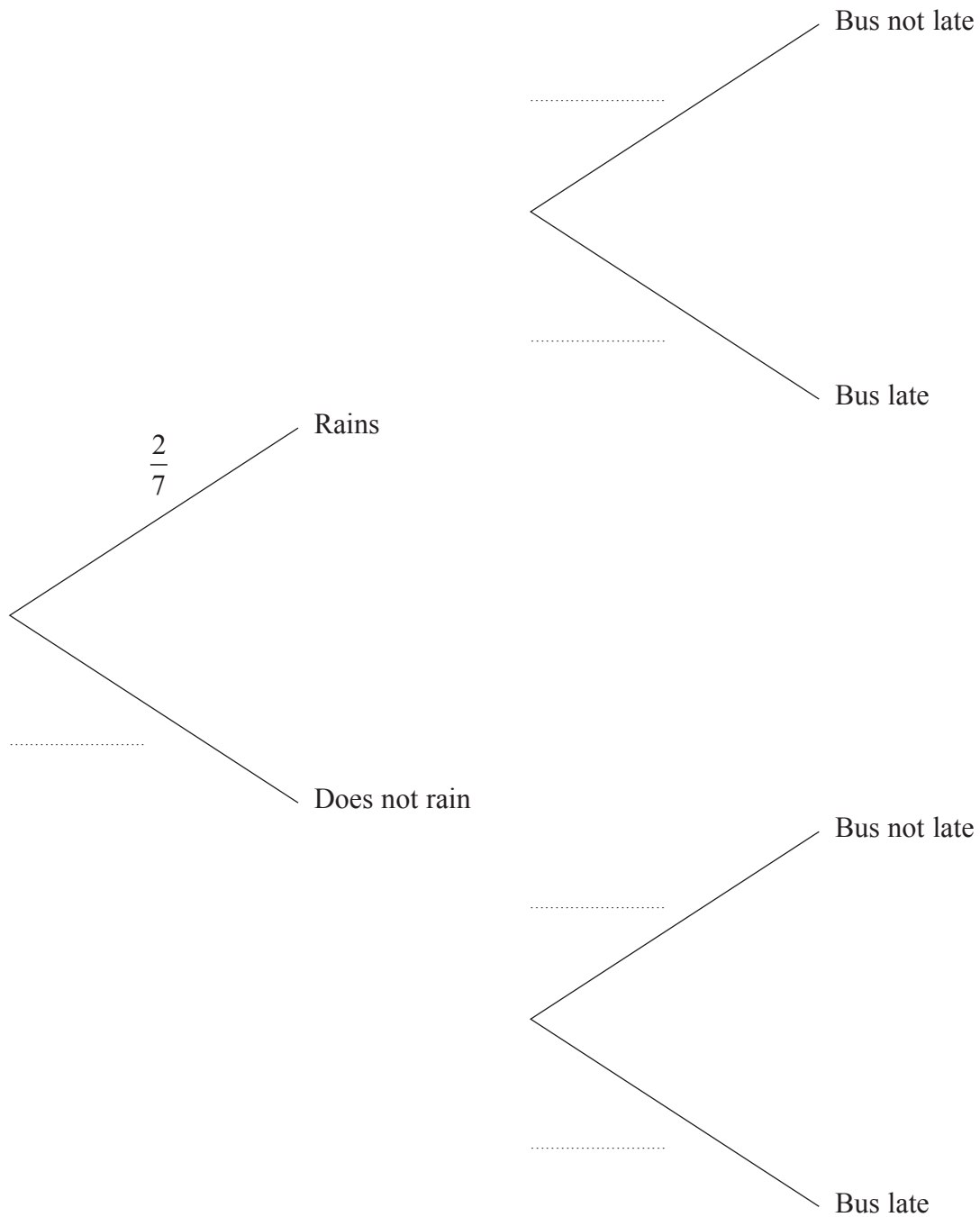
6 On school days, Fatima goes to school by bus.

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)









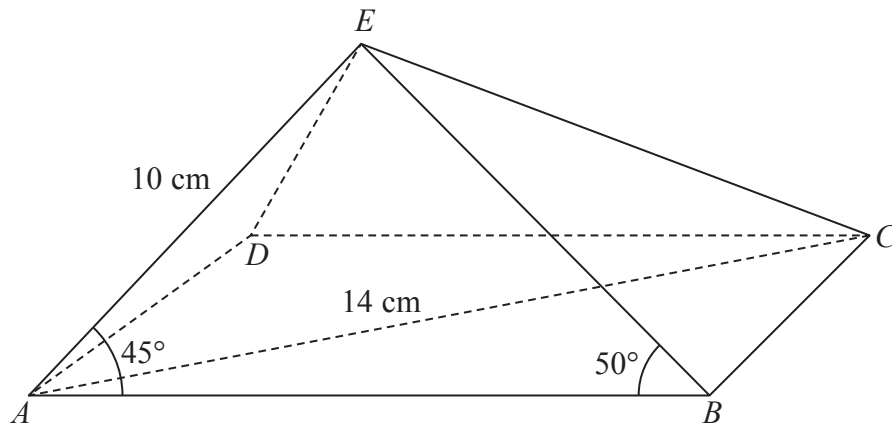


Diagram **NOT**  
accurately drawn

**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  $\text{cm}^2$  to 3 significant figures, that is to be painted. (5)

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











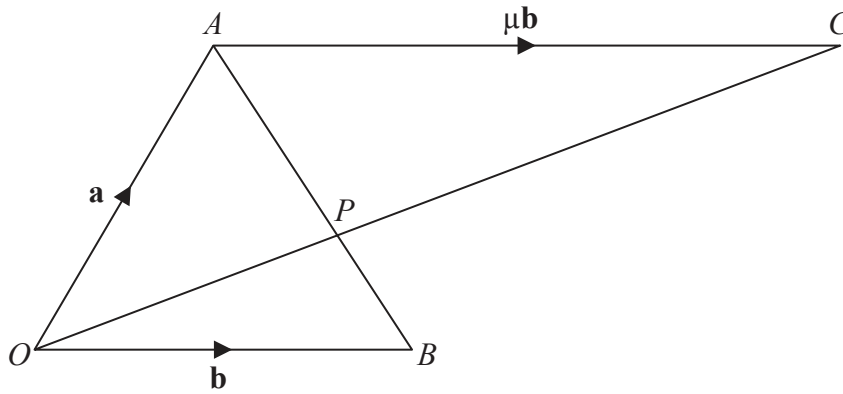


Diagram NOT accurately drawn

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  $\mu$  is a scalar.

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

(i)  $\vec{OC}$ ,

(ii)  $\vec{PC}$ .

(3)

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

(c) (i) find the value of  $\lambda$ ,

(ii) hence use your value of  $\lambda$  to find  $\mu$ .

(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 consisting of 25 horizontal dotted lines.







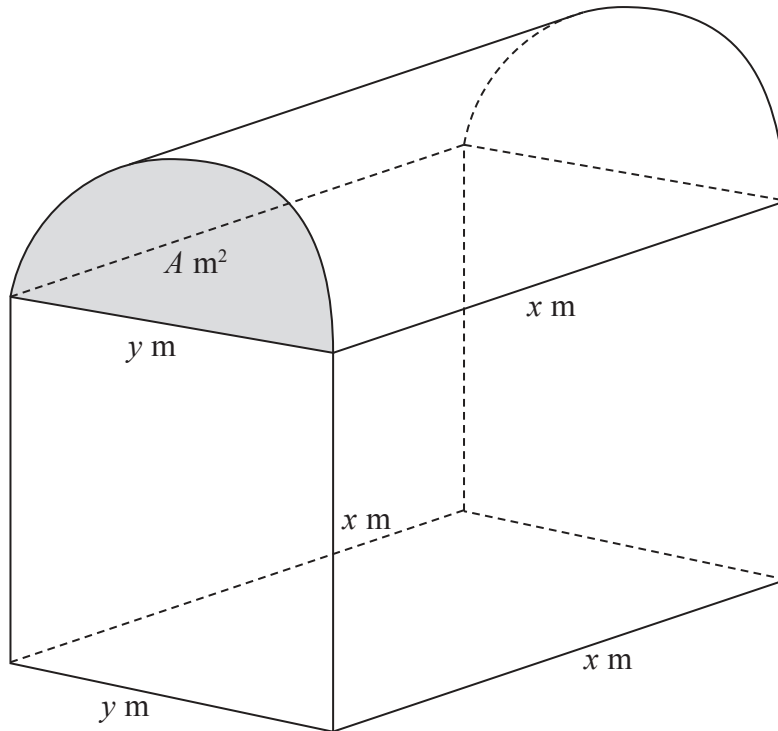
Diagram NOT  
accurately drawn

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

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

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

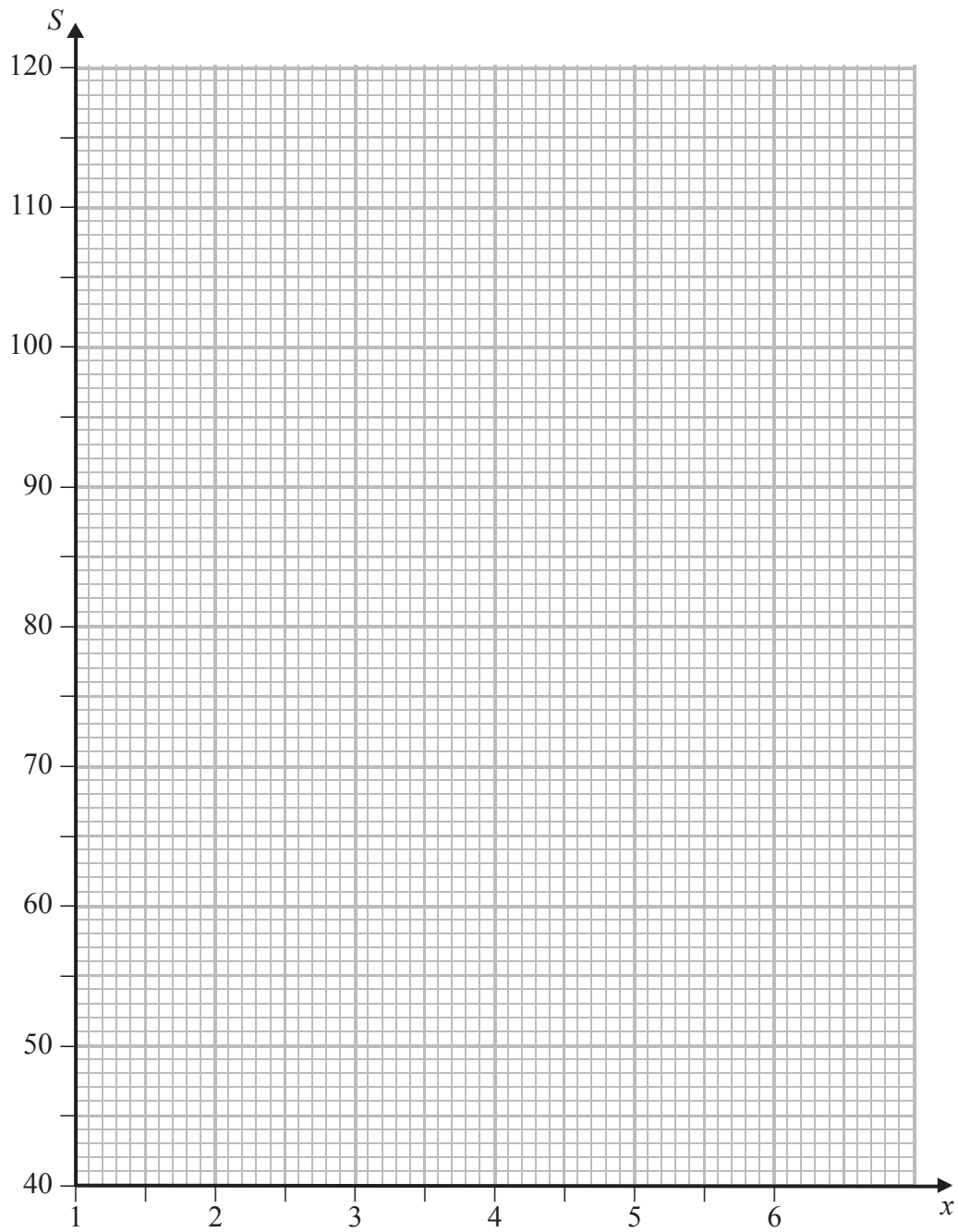








Question 10 continued



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

Triangle *B* is transformed to triangle *C* under the transformation with matrix  $\mathbf{S}$ .

(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  $\mathbf{T}$ .

(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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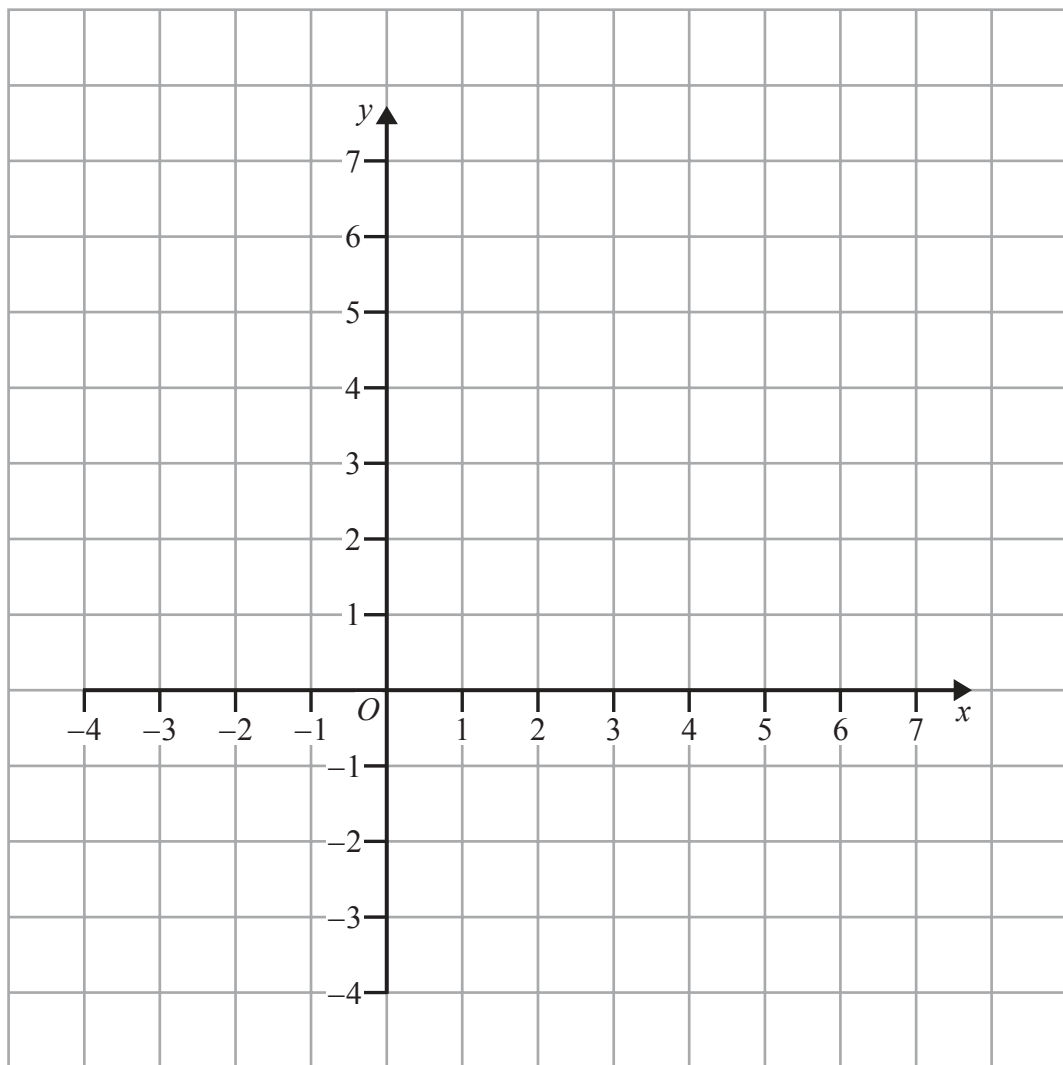
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Question 11 continued



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