

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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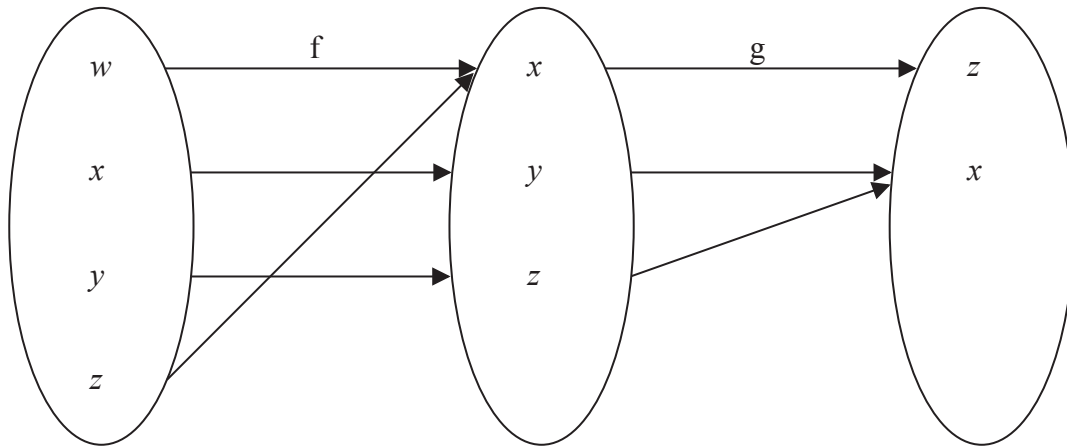


Figure 1

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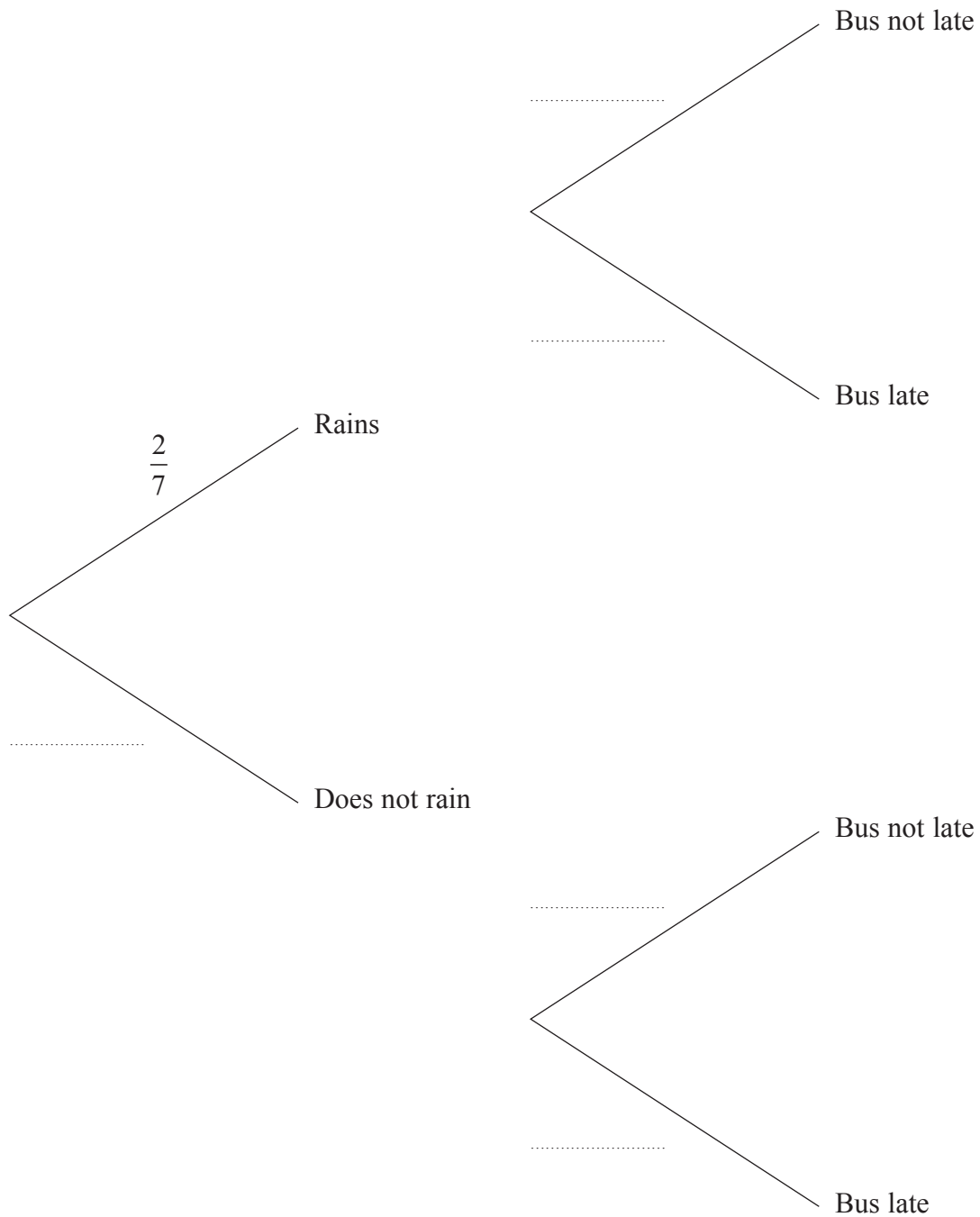
6 On school days, Fatima goes to school by bus.

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)



8

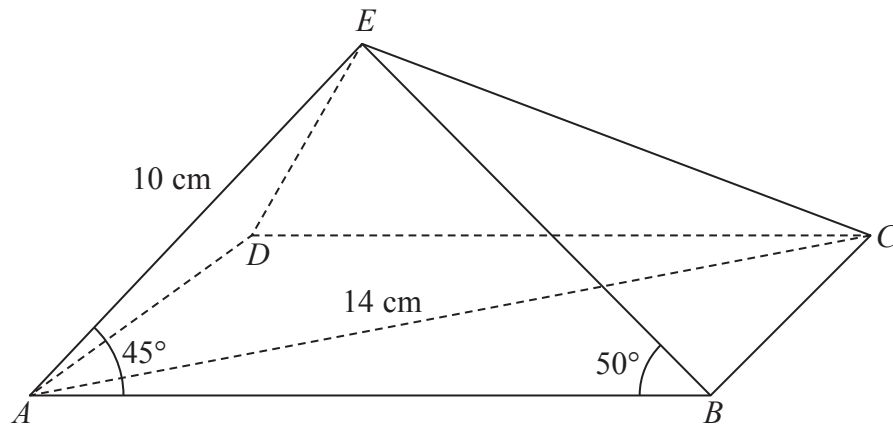
Diagram NOT
accurately drawn

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 consisting of 25 horizontal dotted lines.



Question 8 continued

A series of horizontal dotted lines for writing.



Question 8 continued

A series of horizontal dotted lines for writing the answer.

(Total for Question 8 is 15 marks)



9

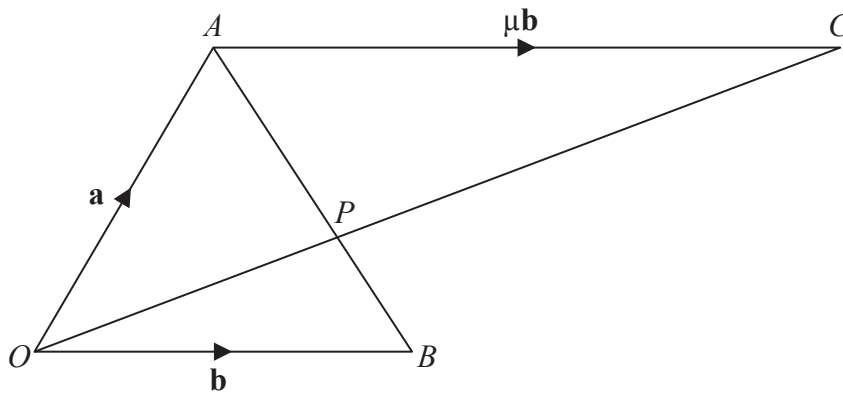
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Figure 3

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)



Question 9 continued

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 9 continued

A series of horizontal dotted lines for writing.



Question 9 continued

A large rectangular area containing numerous horizontal dotted lines, intended for a student to write their answer to Question 9.

(Total for Question 9 is 14 marks)



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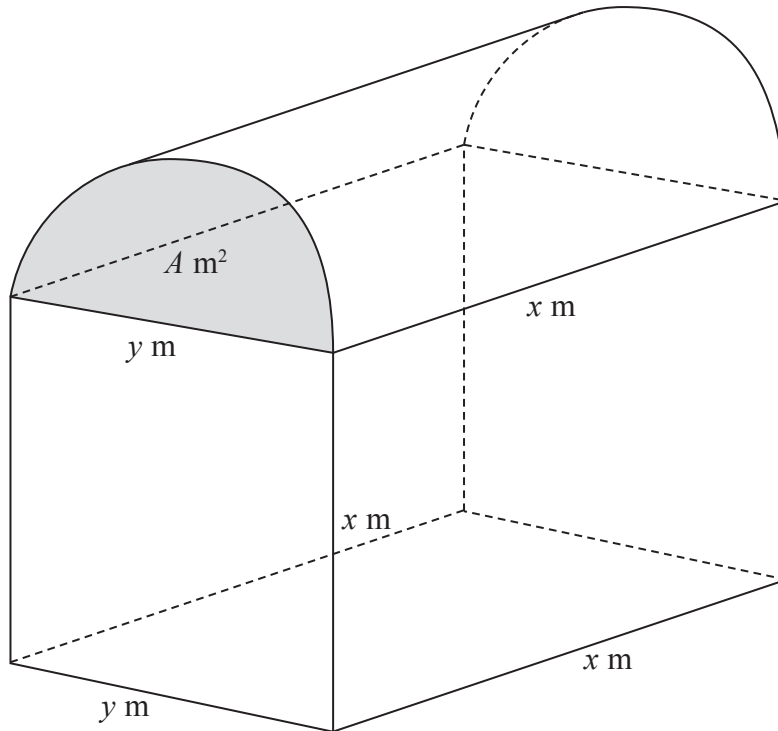
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Figure 4

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

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

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



Question 10 continued

Handwriting practice area with 20 horizontal dotted lines.



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 $S \leq 80$

(2)

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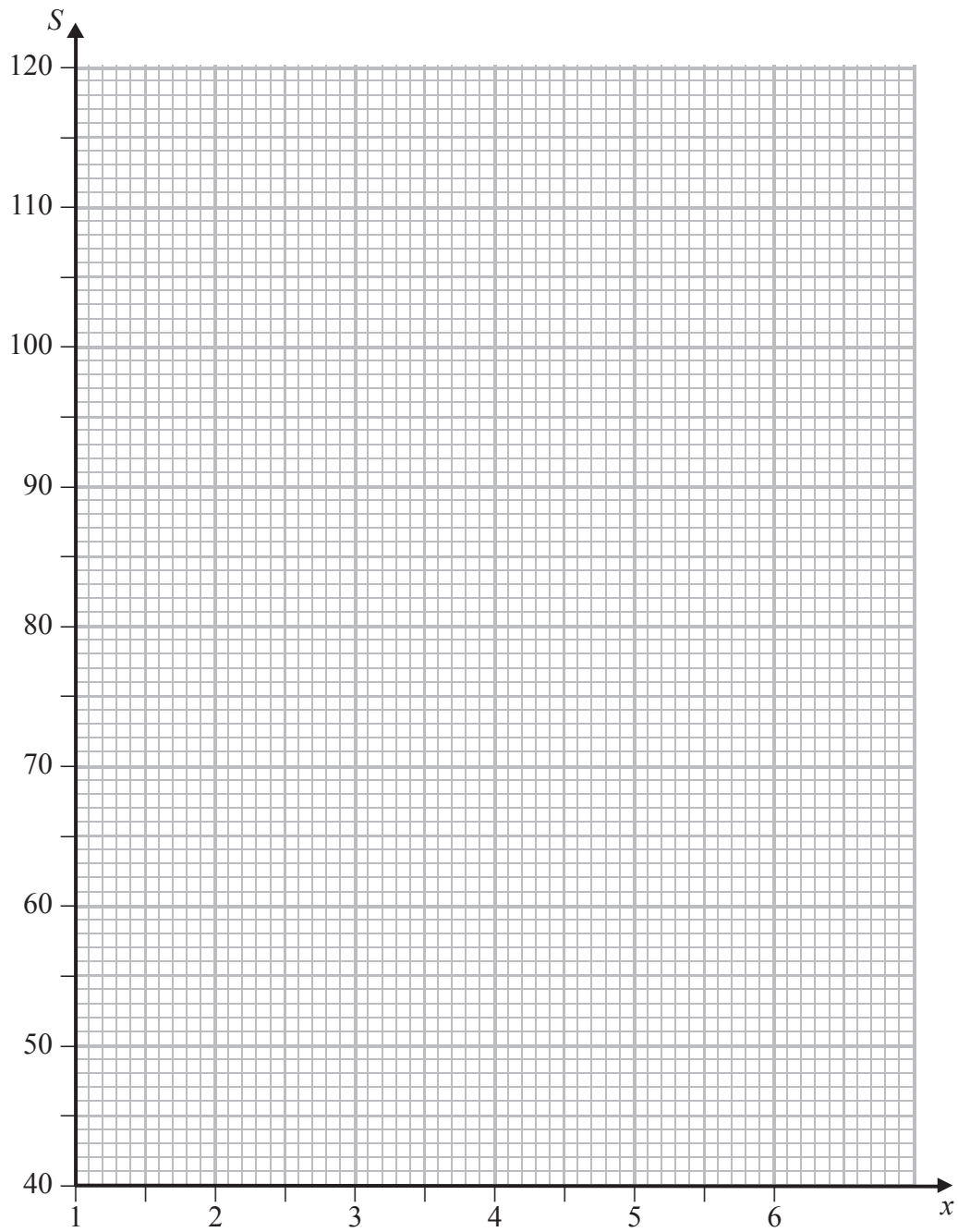
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Question 10 continued



(Total for Question 10 is 16 marks)



P 4 2 9 3 7 A 0 2 5 2 8

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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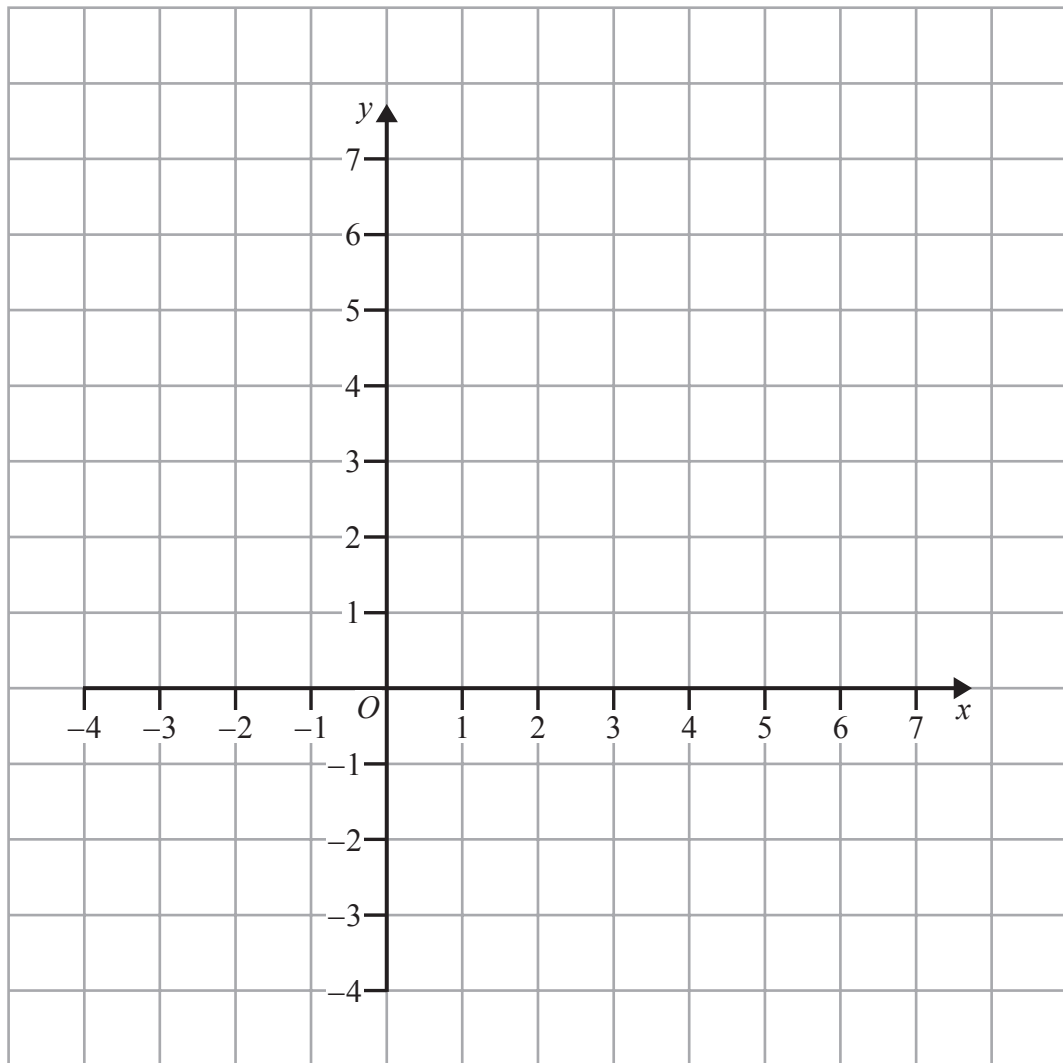
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Question 11 continued



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