

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Wednesday 15 January 2020

Morning (Time: 2 hours 30 minutes)

Paper Reference **4MB1/02R**

Mathematics B

Paper 2R



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.

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Question 1 continued

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(Total for Question 1 is 5 marks)



Question 2 continued

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(Total for Question 2 is 5 marks)



Question 3 continued

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(Total for Question 3 is 8 marks)



Question 4 continued

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Question 4 continued

A large rectangular area with a dotted grid pattern for writing answers.

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(Total for Question 4 is 9 marks)



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5 Solve $\frac{3^{4x} \times 5^{3x+1} \times 45^{1-2x}}{9} = 5^4$

Show clear algebraic working.

(4)

Dotted lines for working.

(Total for Question 5 is 4 marks)



6 The functions f , g and h are defined as

$$f: x \mapsto x + 3$$

$$g: x \mapsto x^2 - 2x + 3$$

$$h: x \mapsto \frac{6}{x} \quad x \neq 0$$

(a) Find (i) $g(-3)$ (ii) $fh\left(-\frac{1}{4}\right)$ (2)

(b) (i) Express the inverse of the composite function hf in the form $(hf)^{-1}: x \mapsto \dots$ and simplify your answer.

(ii) State the value of x that must be excluded from any domain of $(hf)^{-1}$ (4)

(c) Find the two values of x for which $hgf(x) = 2$ (5)



Question 6 continued

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(Total for Question 6 is 11 marks)



- 7 (a) Write down all the multiples of 3 lying between 1 and 20

(1)

Ahmed and Hani play a game with 20 numbered balls.
The 20 balls are numbered from 1 to 20



The balls are put in a bag.

Ahmed takes at random a ball from the bag, makes a note of its number and puts the ball back into the bag.

If the number of the ball is a multiple of 5, Ahmed wins the game.

If Ahmed does not win the game, Hani takes at random a ball from the bag, makes a note of its number and puts the ball back into the bag.

If the number of the ball is a multiple of 3, Hani wins the game.

If Hani does not win the game, Ahmed takes at random a ball from the bag, makes a note of its number and puts the ball back into the bag.

If the number of the ball is a multiple of 6, Ahmed wins the game.

If Ahmed does not win the game, Hani takes at random a ball from the bag, makes a note of its number and puts the ball back into the bag.

If the number of the ball is a multiple of 4, Hani wins the game.

If Hani does not win the game, the game stops and the result is a draw.

The incomplete probability tree diagram for the game is shown below.

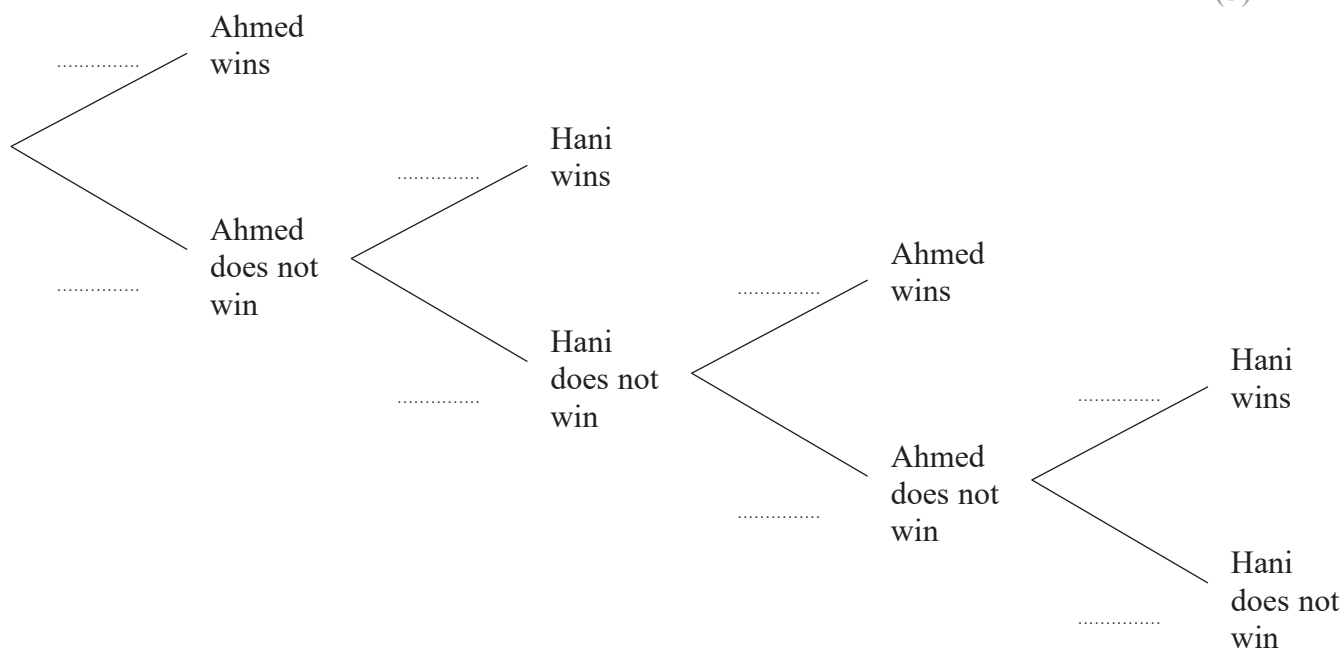
- (b) Complete the probability tree diagram for Ahmed and Hani's game.

(4)

- (c) Determine which player, Ahmed or Hani, is more likely to win the game.

Give a reason for your answer.

(5)



Question 7 continued

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(Total for Question 7 is 10 marks)



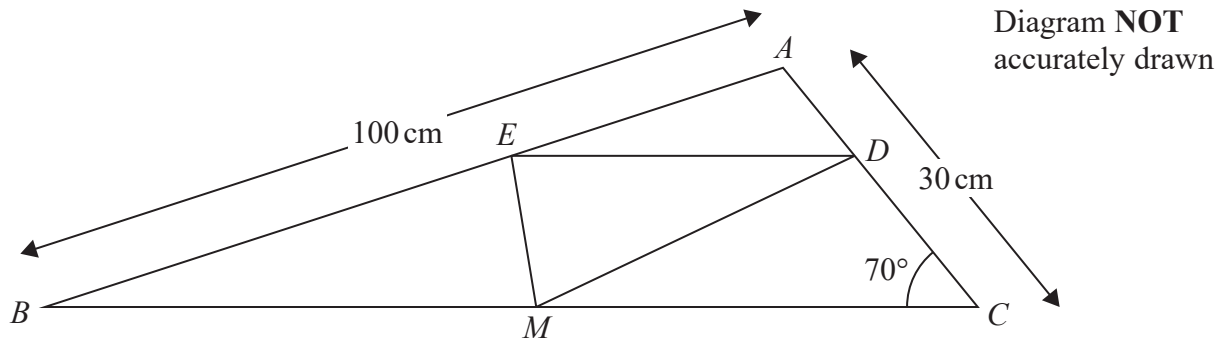


Figure 1

Figure 1 shows triangle ABC in which $AB = 100$ cm, $AC = 30$ cm and $\angle ACB = 70^\circ$

Calculate, to 3 significant figures,

(a) the size, in degrees, of $\angle ABC$, (3)

(b) the length, in cm, of BC . (3)

As shown in Figure 1, the point E lies on AB and the point D lies on AC such that ED and BC are parallel and $AD:DC = 1:2$

(c) Write down the length, in cm, of DC . (1)

The midpoint of BC is the point M .

(d) Calculate the area, in cm^2 to 3 significant figures, of triangle DCM . (2)

Given that $\frac{\text{area } \triangle ABC}{\text{area } \triangle DCM} = k$,

(e) find the value of k without working out the area of triangle ABC . (1)

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



Question 8 continued

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Question 8 continued

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Question 8 continued

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(Total for Question 8 is 10 marks)



9 The triangle A has vertices with coordinates $(-5, 2)$, $(-11, 0)$ and $(-7, 6)$.

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

(1)

Triangle B is the image of triangle A under the enlargement with centre $(1, 4)$ and scale factor $-\frac{1}{2}$

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

(3)

Triangle C is the image of triangle B under a rotation of 180° about the point $(3, 1)$.

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

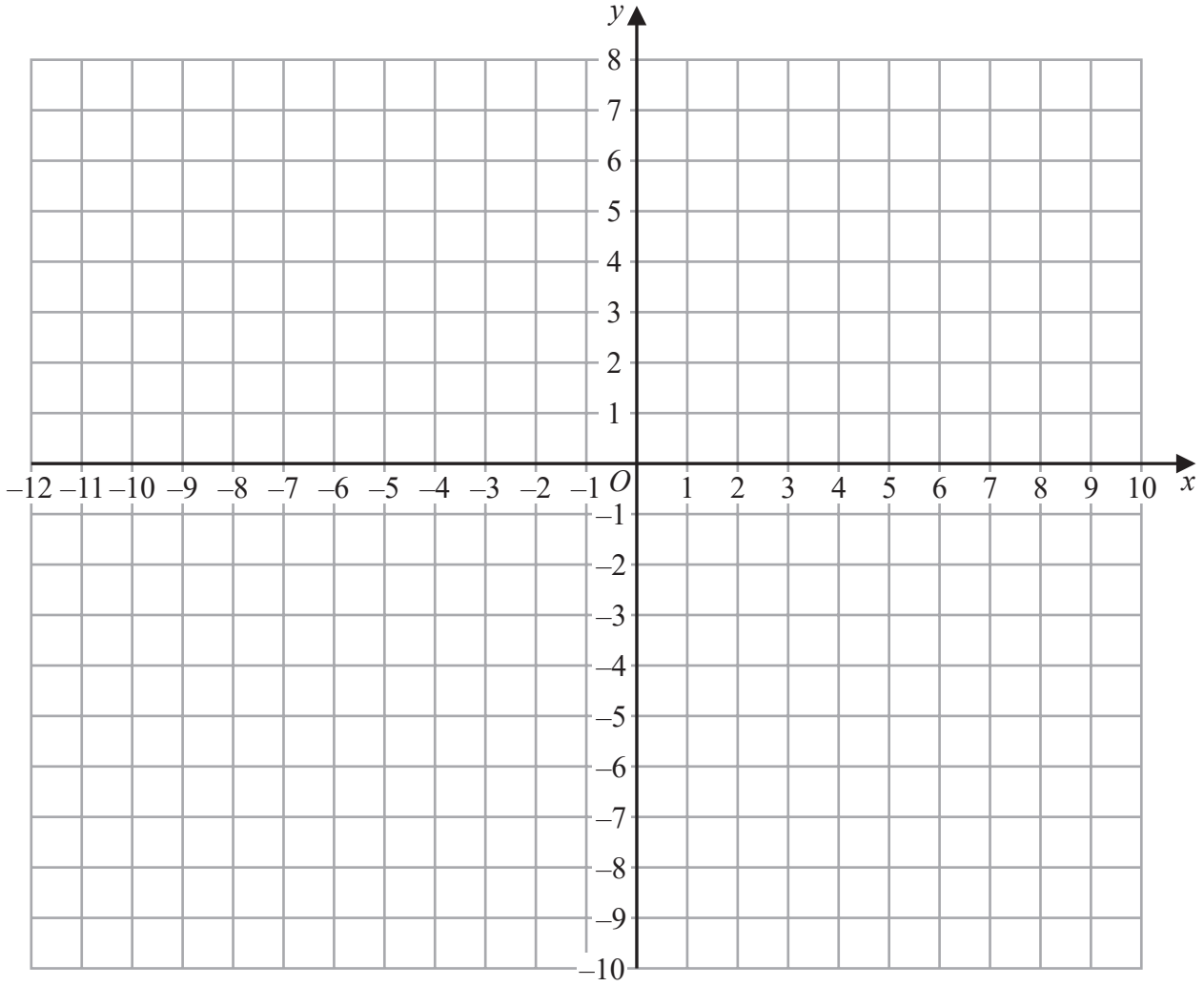
(3)

(d) Describe fully the **single** transformation that maps triangle C onto triangle A .

(3)



Question 9 continued



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Question 9 continued

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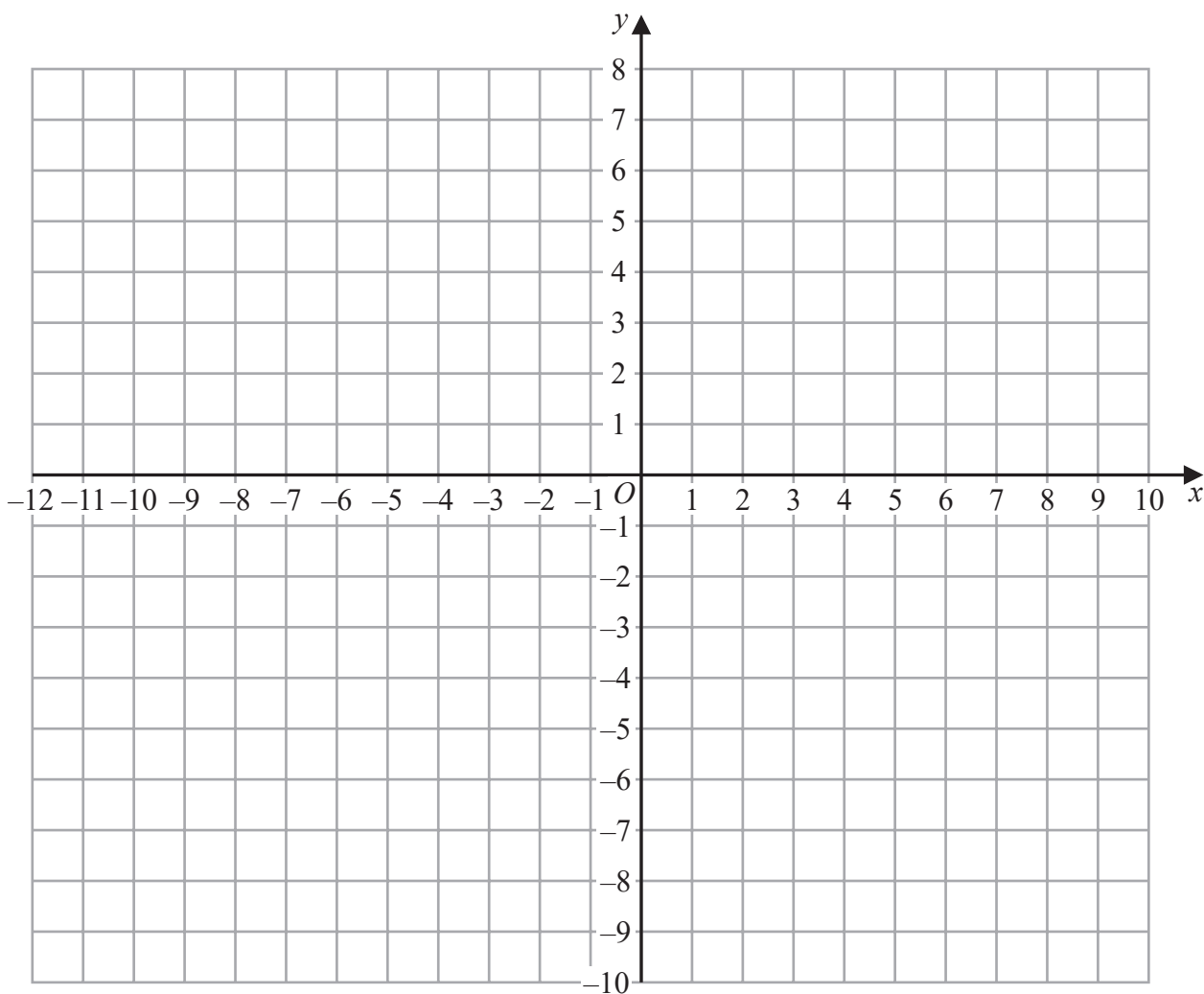
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Question 9 continued

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(Total for Question 9 is 10 marks)



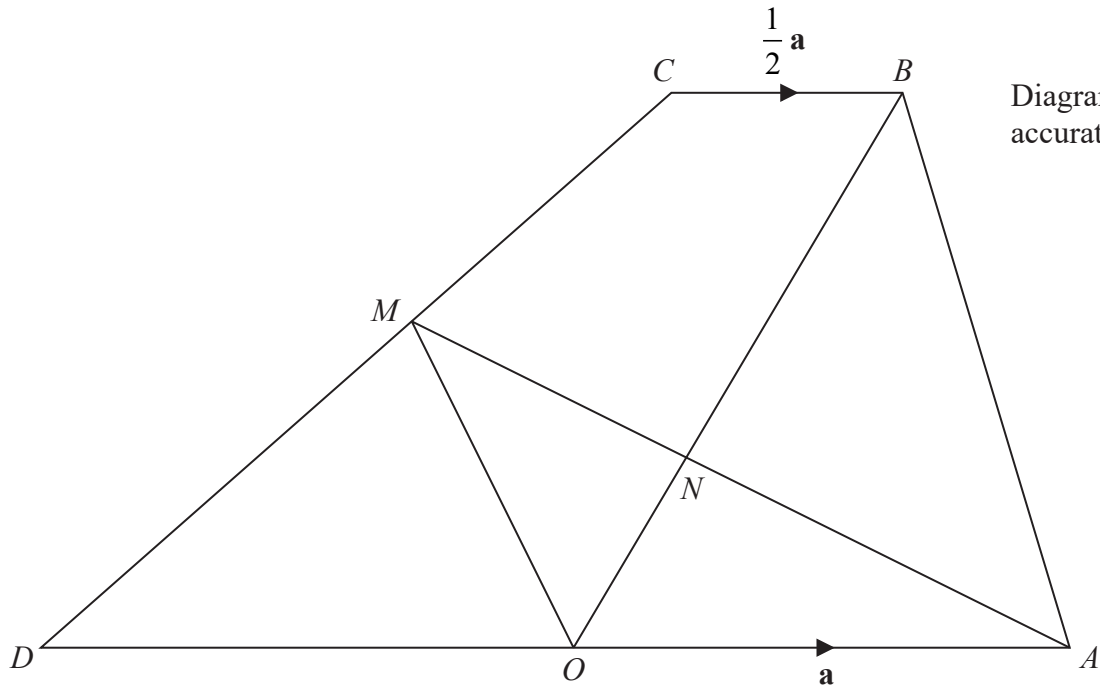


Figure 2

Figure 2 shows trapezium $ABCD$ in which the point O is the midpoint of AD and the point M is the midpoint of CD .

Given that $\vec{OA} = \mathbf{a}$, $\vec{CB} = \frac{1}{2} \mathbf{a}$ and $\vec{OB} = \mathbf{b}$,

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

- (i) \vec{AB} (ii) \vec{AC} (iii) \vec{CD} (iv) \vec{AM} (7)

The lines OB and AM intersect at N so that $\vec{AN} = \lambda \vec{AM}$ and $\vec{ON} = \mu \vec{OB}$, where λ and μ are positive constants.

(b) (i) Find and simplify an expression in terms of \mathbf{a} , \mathbf{b} and λ for \vec{ON} (2)

(ii) Hence find the value of λ and the value of μ (4)

The area of triangle OAB is 14 square units.

(c) Find the area of triangle BNA . (1)

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 14 marks)



11 Part of the curve with equation $y = x^2 - 5x + 3$ is drawn on the grid.

The equation of another curve is $y = -\frac{x^3}{6} + \frac{6x^2}{5} - \frac{3x}{2}$

(a) Complete the table of values for $y = -\frac{x^3}{6} + \frac{6x^2}{5} - \frac{3x}{2}$

Give your values of y to 2 decimal places.

x	0	0.5	1	2	3	4	4.5	5
y	0	-0.47			1.8			1.67

(3)

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

(3)

(c) Use the two curves on the grid to find an estimate, to 2 decimal places, of the range of positive values of x for which $\frac{x^3}{6} - \frac{x^2}{5} - \frac{7x}{2} + 3 < 0$

Show your working clearly.

(4)

For positive values of x , the two curves on the grid intersect at the points P and Q .

(d) Find an estimate, to 1 decimal place, of the gradient of the straight line through P and Q .

(2)

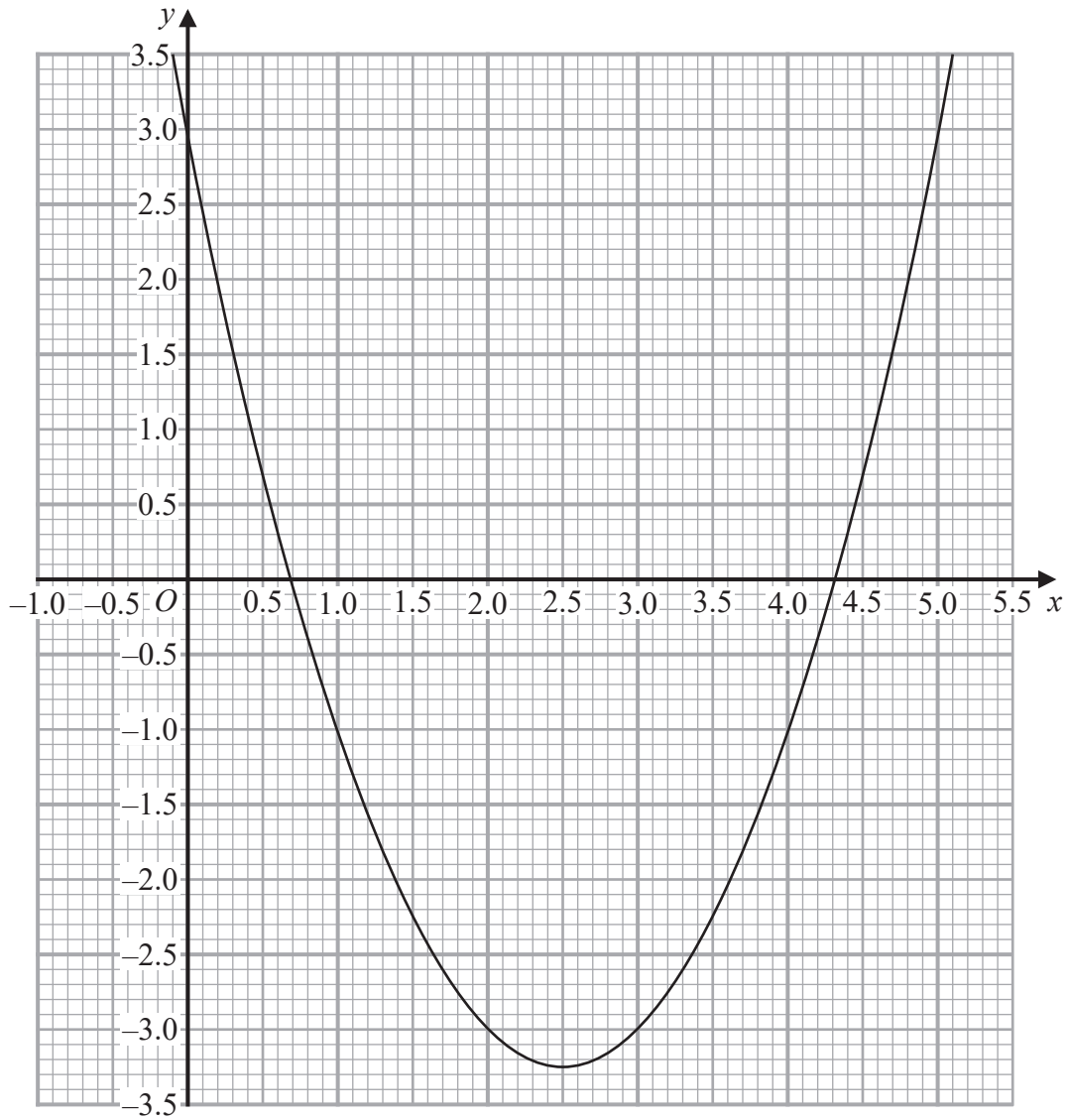
The equation of the straight line through P and Q has the form $y = ax + b$

(e) Find, to 1 decimal place, the value of b .

(2)



Question 11 continued



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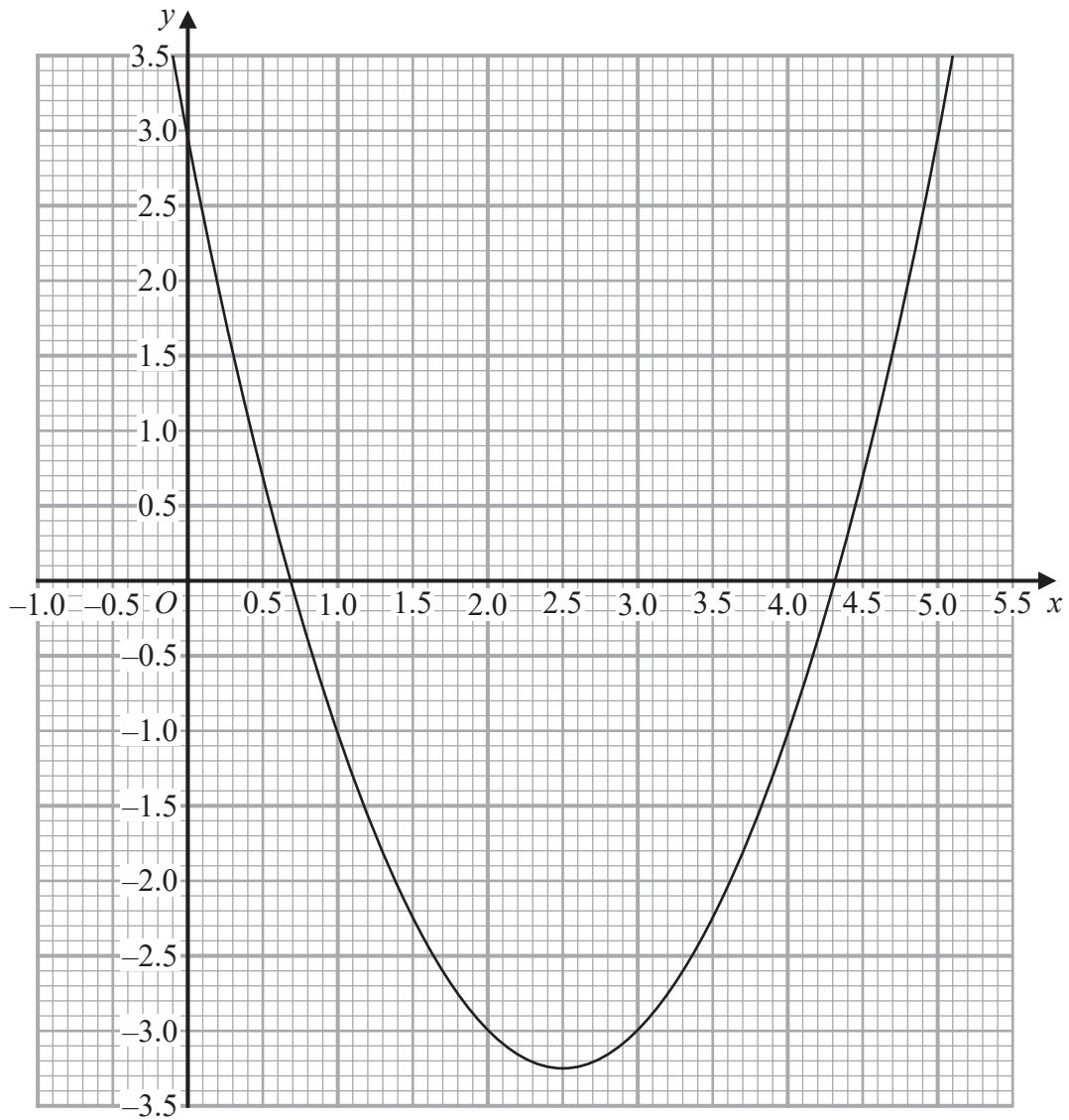
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Question 11 continued

Only use this grid if you need to redraw your curve.



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