

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International GCSE

Time 2 hours 30 minutes

Paper
reference

4MB1/02

Mathematics B PAPER 2



You must have: Ruler graduated in centimetres and millimetres, protractor, pair of 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 ►

P69489A

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Q:1/1/1/1/1/



P 6 9 4 8 9 A 0 1 3 2



Pearson

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The GDP per capita for a region is defined as follows

$$\text{GDP per capita} = \frac{\text{total GDP}}{\text{population}}$$

Complete the table below, giving each value to 2 significant figures.

Region	Total GDP	Population	GDP per capita
Grenada	1.23×10^9	112 000	
Hungary	1.61×10^{11}		16 500
World		7.67×10^9	11 400

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Question 1 continued

Area with horizontal dotted lines for writing.

(Total for Question 1 is 6 marks)

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Question 2 continued

Area with horizontal dotted lines for writing.

(Total for Question 2 is 7 marks)

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3 Given that $2^x \times 4^y = 128$

(a) show that $x + 2y = 7$

(3)

Given that $\frac{8^x}{4^y} = 32$

(b) show that $3x - 2y = 5$

(2)

(c) Hence, or otherwise, solve the simultaneous equations

$$2^x \times 4^y = 128$$

$$\frac{8^x}{4^y} = 32$$

(3)

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Question 3 continued

Area with horizontal dotted lines for writing.

(Total for Question 3 is 8 marks)

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4 Sophie conducted a survey on the time spent on the internet per day. There were 90 people in her survey. The results are shown in the table below.

Time (t minutes)	Frequency
$0 \leq t < 10$	5
$10 \leq t < 30$	7
$30 \leq t < 60$	15
$60 \leq t < 120$	36
$120 \leq t < 240$	19
$240 \leq t < 360$	8

- (a) Write down the class interval that contains the median time spent on the internet per day. (1)
- (b) Calculate an estimate for the mean time spent on the internet per day. (4)

Sophie drew a histogram for the information in the table.

In her histogram, the bar for the class interval $30 \leq t < 60$ is a square with sides of length 3 cm.

Given that the bar for the class interval $10 \leq t < 30$ is a rectangle of width w cm and of height h cm,

- (c) find the value of w and the value of h (3)

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Question 4 continued

Area with horizontal dotted lines for writing.

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Question 5 continued

Area with horizontal dotted lines for writing.

(Total for Question 5 is 8 marks)

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Question 6 continued

Area with horizontal dotted lines for writing.

(Total for Question 6 is 7 marks)

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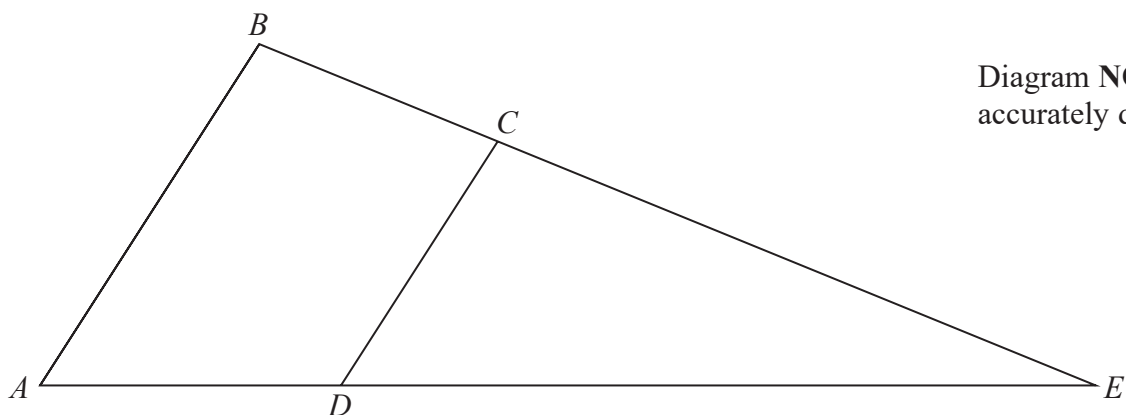


Diagram NOT accurately drawn

Figure 1

Figure 1 shows quadrilateral $ABCD$ such that $\vec{AB} = \mathbf{a}$ and $\vec{AD} = \mathbf{b}$

E is the point such that ADE and BCE are straight lines.

Given that $\vec{BC} = \mathbf{b} - \frac{1}{3}\mathbf{a}$

(a) show that AB is parallel to DC (2)

Given also that λ is a scalar such that $\vec{BE} = \lambda\mathbf{b} - \mathbf{a}$

(b) find the value of λ (2)

The area of triangle ABE is x square units.

Given that the area of quadrilateral $ABCD$ is P square units,

(c) find an expression for P in terms of x (3)

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Question 7 continued

Handwriting practice area with 20 horizontal dotted lines.

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Question 7 continued

Handwriting practice area with 20 horizontal dotted lines.

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Question 7 continued

Area with horizontal dotted lines for writing.

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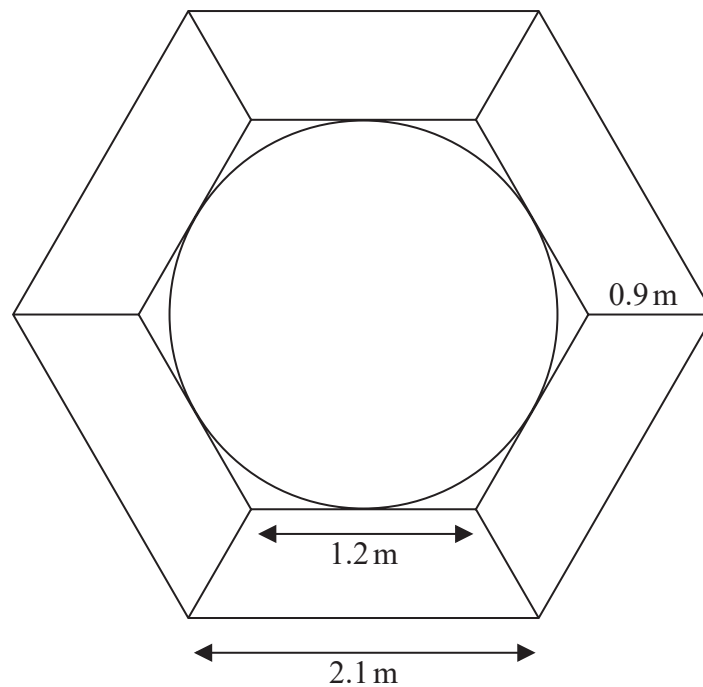


Diagram **NOT**
accurately drawn

Figure 2

Figure 2 shows the design for a garden feature.

In the middle of the feature is a circular pond.
The pond is surrounded by 6 identical flower beds.
Each flower bed is in the shape of an isosceles trapezium.

- (a) Calculate the area, in m^2 to 3 significant figures, of one of the flower beds.

(3)

Each flower bed needs to be filled with compost to a depth of 10 cm.
The compost is sold in bags containing 50 litres of compost.

- (b) Show that 16 bags of compost will be needed to fill all six flower beds to a depth of 10 cm.
Show your working clearly.

(4)

- (c) Find the area of the circular pond.
Give your answer in m^2 to 3 significant figures.

(4)

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Question 8 continued

Area for writing answers with horizontal dotted lines.

$$\text{Area of trapezium} = \frac{1}{2}(a + b)h$$

(Total for Question 8 is 11 marks)

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9

[In this question the coordinates of the points are given in centimetres]

The points with coordinates (1, 1), (2, 4), (4, 6) and (3, 3) are the vertices of quadrilateral A

(a) On the grid opposite, draw and label quadrilateral A (1)

Quadrilateral A is transformed to quadrilateral B by a rotation of 90° anticlockwise about the origin, O

(b) On the grid opposite, draw and label quadrilateral B (2)

Quadrilateral B is transformed to quadrilateral C under the transformation with matrix \mathbf{M} where

$$\mathbf{M} = \begin{pmatrix} 1 & 3 \\ 1 & 1 \end{pmatrix}$$

(c) On the grid opposite, draw and label quadrilateral C (3)

(d) Calculate the determinant of \mathbf{M} (1)

(e) Calculate the area of quadrilateral A (2)

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$$\left[\text{Determinant of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} = ad - bc \right]$$

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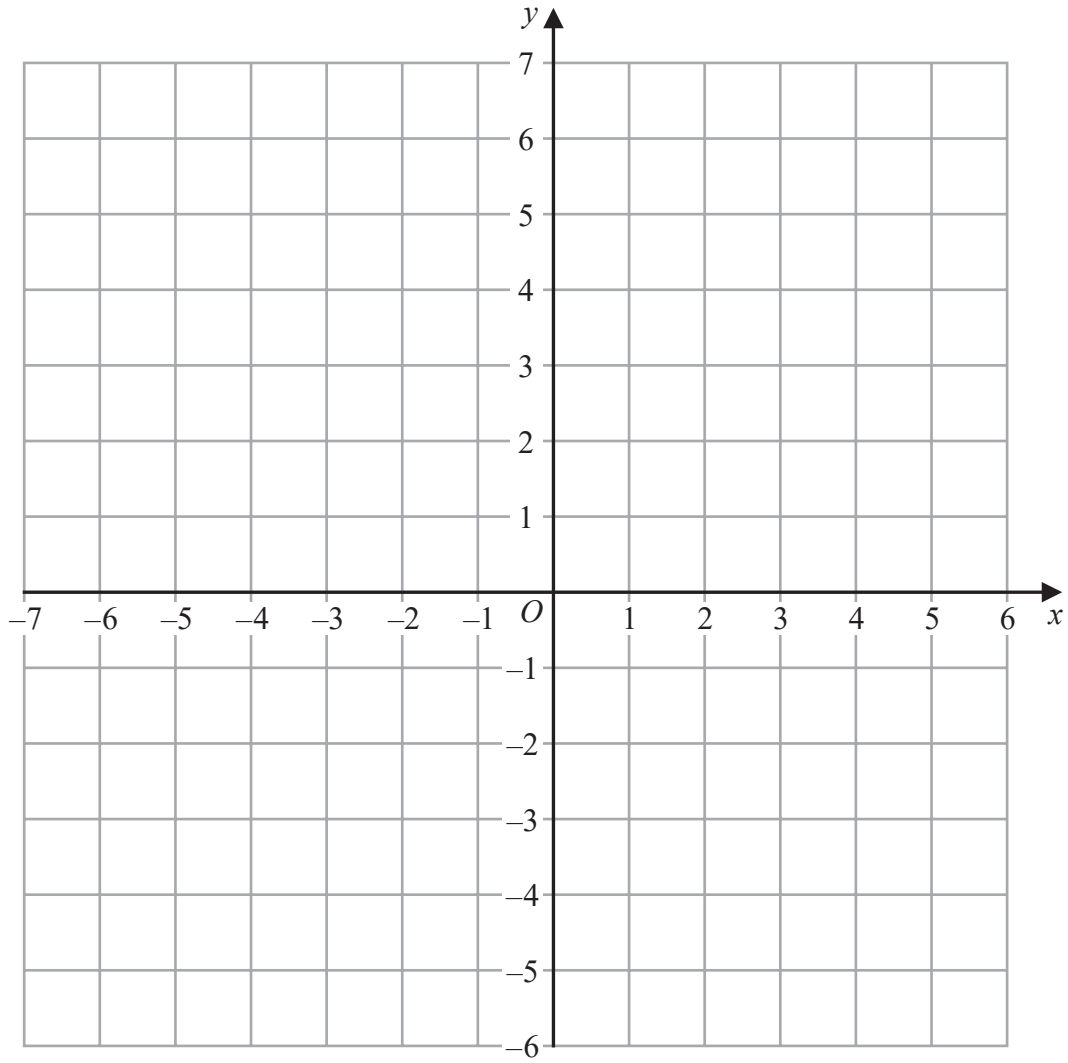
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Question 9 continued



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Turn over for a spare grid if you need to redraw your shapes.



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Question 9 continued

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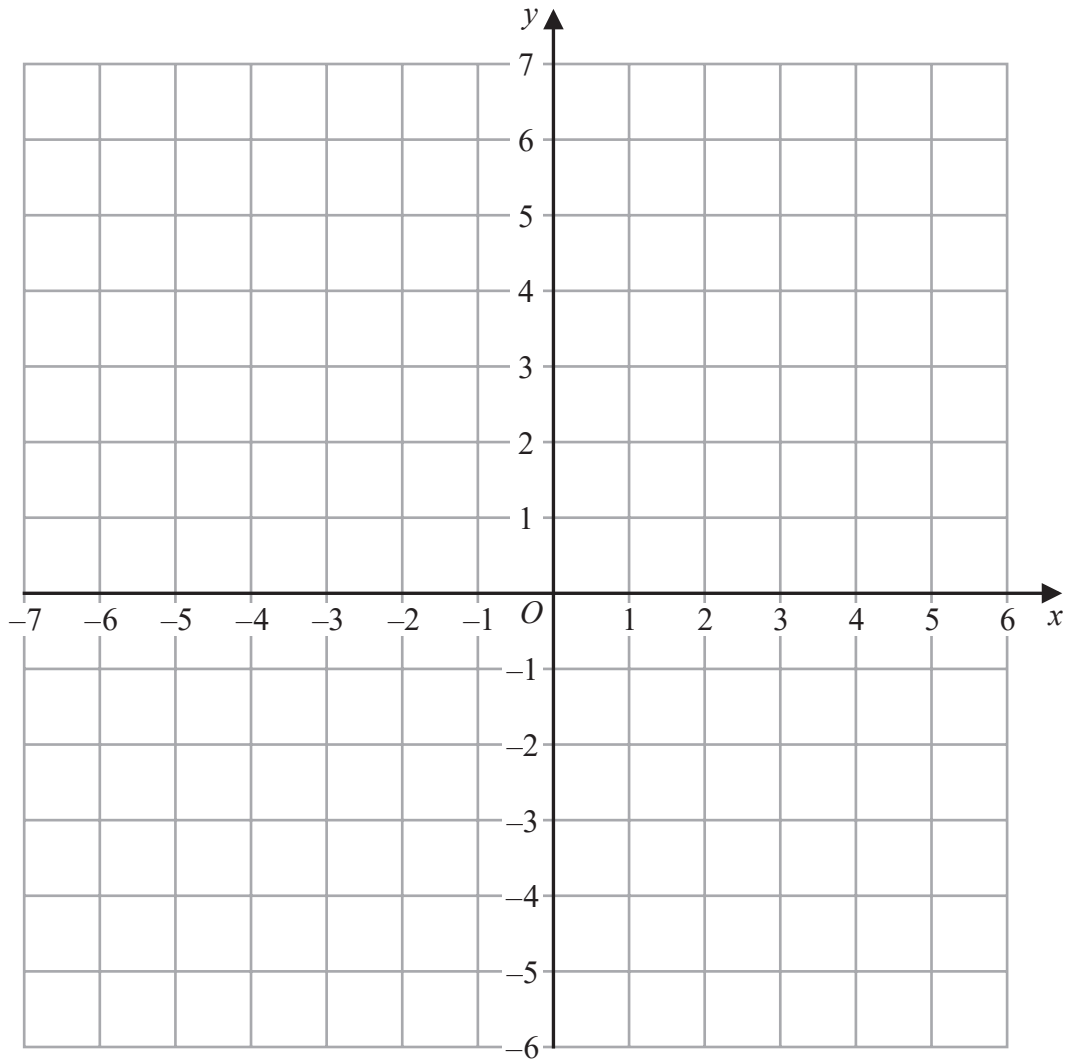
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Question 9 continued

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



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(Total for Question 9 is 9 marks)



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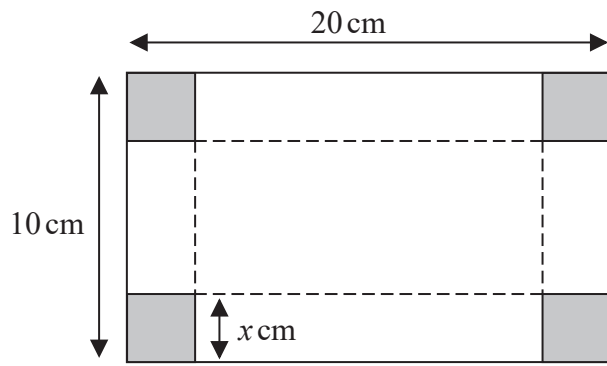


Figure 3

Diagrams NOT accurately drawn

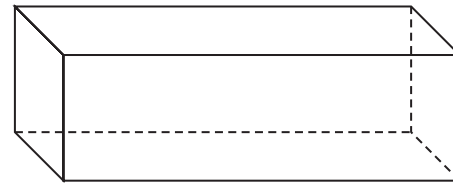


Figure 4

Figure 3 shows a rectangle with dimensions 20 cm by 10 cm from which a square with sides of length x cm is removed from each of the corners. The shape in Figure 3 is then folded along the dotted lines to form a box, without a lid, in the shape of a cuboid, shown in Figure 4

The volume of the box is $V \text{ cm}^3$

(a) Show that $V = 4x^3 - 60x^2 + 200x$ (2)

(b) Find, to 3 significant figures, the value of x such that $\frac{dV}{dx} = 0$ (4)

$$\left[\text{Solutions of } ax^2 + bx + c = 0 \text{ are } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \right]$$

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Question 10 parts (c), (d), (e) and (f) continue on page 26



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Question 10 continued

Handwriting practice area with 20 horizontal dotted lines.

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Question 10 continued

(c) Complete the following table of values for $V = 4x^3 - 60x^2 + 200x$

x	0	1	1.5	2.5	3	3.5	4	5
V	0	144	178.5	187.5		136.5		0

(2)

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

(2)

(e) By drawing on the grid a tangent to the curve, find an estimate of the gradient of the curve at the point where $x = 1.5$

(2)

Starting with a square of side 15 cm and removing a square with sides of length x cm from each corner, a second box without a lid is formed by folding as in part (a).

The volume of this box is $B \text{ cm}^3$ where $B = 4x^3 - 60x^2 + 225x$

Given that $B = 200$

(f) find, by drawing a suitable straight line on the grid, estimates, to one decimal place, of the possible values of x

(3)

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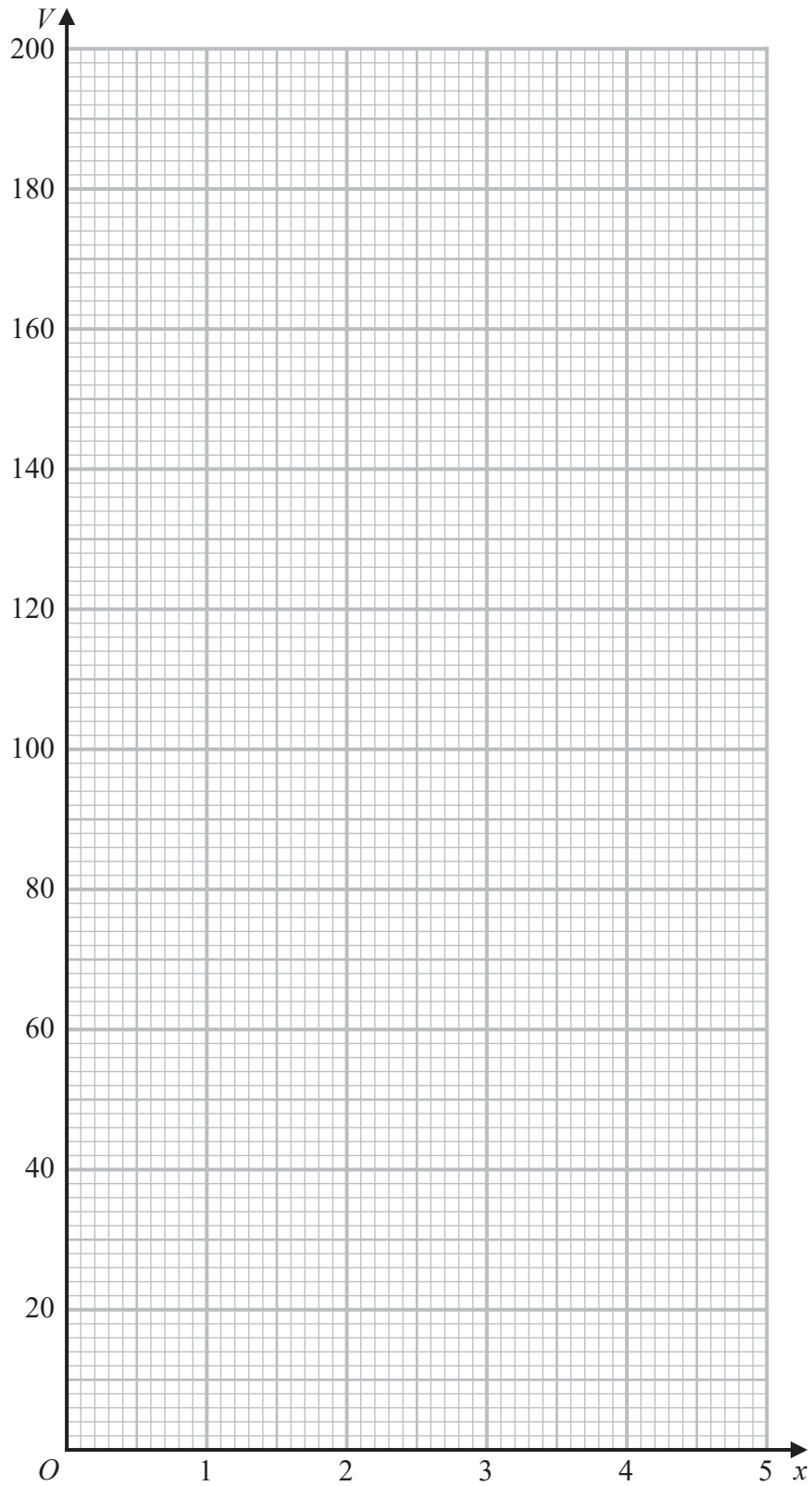
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Question 10 continued



Turn over for a spare grid if you need to redraw your curve.

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Question 10 continued

Handwriting practice area with 20 horizontal dotted lines.

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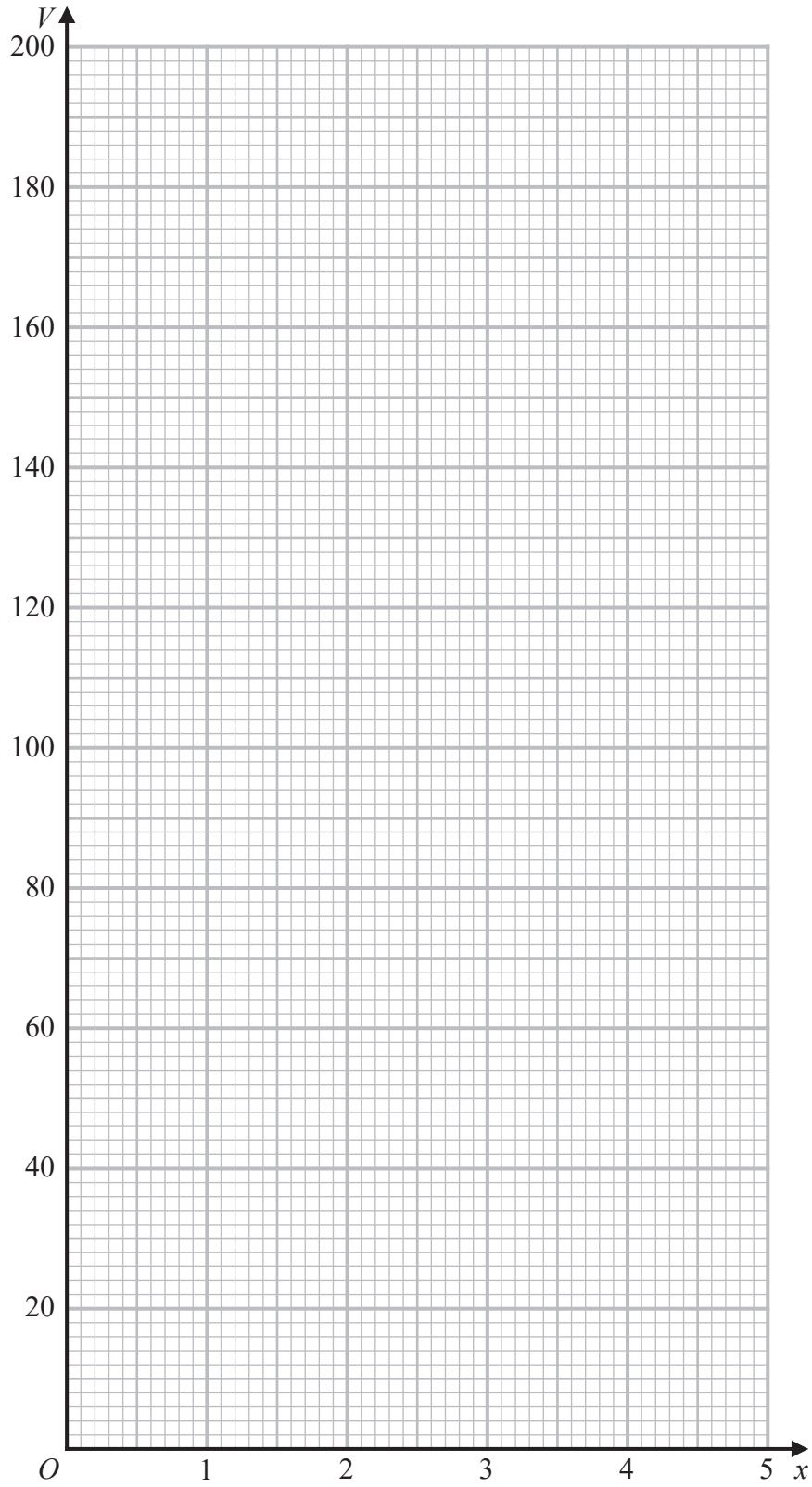
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Question 10 continued

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(Total for Question 10 is 15 marks)

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11 The function f is defined as

$$f: x \mapsto \frac{3x + 1}{x - 1}$$

(a) Find $f(3)$

(2)

(b) State the value of x that must be excluded from any domain of the function f

(1)

(c) Find the inverse of the function f
Give your answer in its simplest form.

(4)

The function g is such that

$$fg(x) = \frac{x - 1}{3x + 1}$$

(d) Find the value of a such that $gf(a) = fg(a)$

(7)

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Question 11 continued

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Question 11 continued

Dotted lines for writing.

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(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS

