Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Paper 2

Thursday 8 June 2017 – 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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Pearson

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $\mathscr{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{x : x \text{ is an even integer}\}$
$B = \{x : x \text{ is a factor of } 36\}$
$C = \{x : x \text{ is not a prime number}\}$

(a) List the elements of B

(1)

(b) List the elements of $B \cap C$

(1)

(c) Find $n([A \cap B] \cap [B \cap C'])$

(3)

(Total for Question 1 is 5 marks)

2 Given that $y = (2x - 3)\left(1 - \frac{1}{x^2}\right)$

(a) find $\frac{dy}{dx}$

(3)

(b) find the value of $\frac{dy}{dx}$ when $x = -2$

(2)

(Total for Question 2 is 5 marks)

3 On Monday, a shopkeeper bought 200 pineapples.
Each pineapple cost US $0.60

By Wednesday, the shopkeeper had sold 120 of these pineapples.
The selling price of each of the 120 pineapples was such that he made a profit of 50% on each pineapple.

(a) Calculate the selling price of each of these 120 pineapples.

(2)

On Thursday, the shopkeeper lowered the selling price of the pineapples and sold the remaining 80 pineapples.
The selling price of each of the 80 remaining pineapples was such that he made a total profit of 20% in selling all 200 pineapples.

(b) Calculate the selling price of each of these 80 pineapples.

(4)

Question 3 continued

(Total for Question 3 is 6 marks)

4 Given that $x > 0$ and $y > 0$ and that

$$\begin{pmatrix} x & y \\ y & z \end{pmatrix}\begin{pmatrix} \frac{1}{x} & x \\ y & x \end{pmatrix} = \begin{pmatrix} 17 & 9 + 4x \\ \frac{y}{x} - 20 & -3 \end{pmatrix}$$

find the value of x, the value of y and the value of z.

Question 4 continued

(Total for Question 4 is 6 marks)

5 A farmer has c cows and h hens.

The number of cows is 3 times the number of hens.

(a) Write down an equation in c and h to represent this information.

(1)

Each cow has 4 legs and each hen has 2 legs.

The cows and the hens have a total number of 700 legs.

(b) Write down another equation in c and h to represent this information.

(1)

(c) Hence find the value of c and the value of h.

(3)

The farmer sells $\frac{2}{3}$ of his cows and all of his hens.

He sells each cow for £400 and each hen for £8

(d) Calculate how much money the farmer received by selling these cows and hens.

(2)

Question 5 continued

(Total for Question 5 is 7 marks)

6 The two functions, f and g, are defined as

$$\text{f: } x \mapsto 2x - 3$$
$$\text{g: } x \mapsto 2 - \frac{1}{x} \quad \text{where} \quad x \neq 0$$

(a) Express the composite function fg in the form fg: $x \mapsto$ ..., simplifying your answer.

(2)

The function h is defined as

$$\text{h: } x \mapsto \frac{3x}{1 - 2x} \quad \text{where} \quad x \neq \frac{1}{2}$$

(b) (i) Express the inverse function h^{-1} in the form $h^{-1}: x \mapsto$ ...

(ii) Write down the value of x that must be excluded from any domain of h^{-1}

(3)

(c) Find the value of x for which $fg(x) = 2h^{-1}(x)$

(3)

Question 6 continued

(Total for Question 6 is 8 marks)

7 The points (1, 1), (3, 1) and (3, 4) are the vertices of triangle A.

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

(1)

Triangle B is the image of triangle A under the enlargement with centre (–1, 2) and scale factor –2

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

(3)

Triangle C is the image of triangle B under the transformation with matrix $\begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \end{pmatrix}$

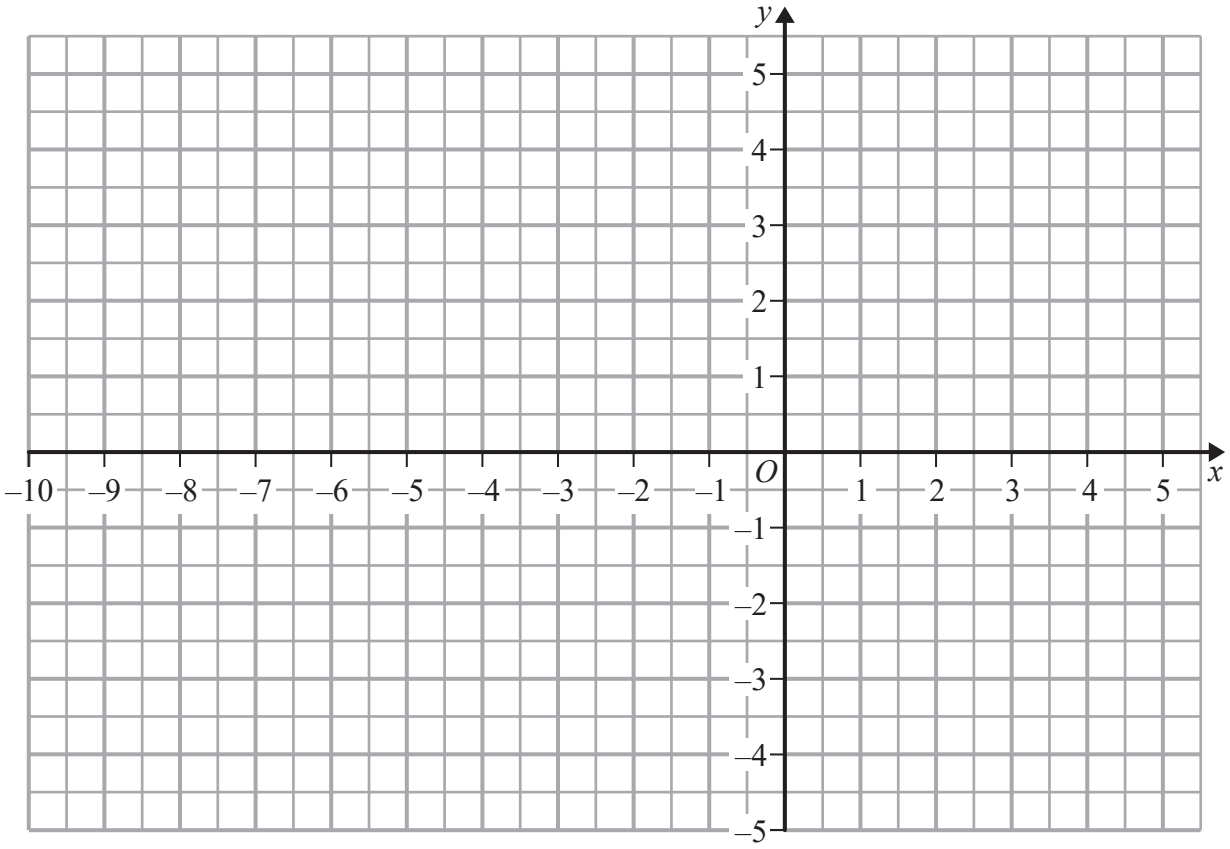
(c) On the grid, draw and label triangle C.

(3)

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

(3)

Question 7 continued

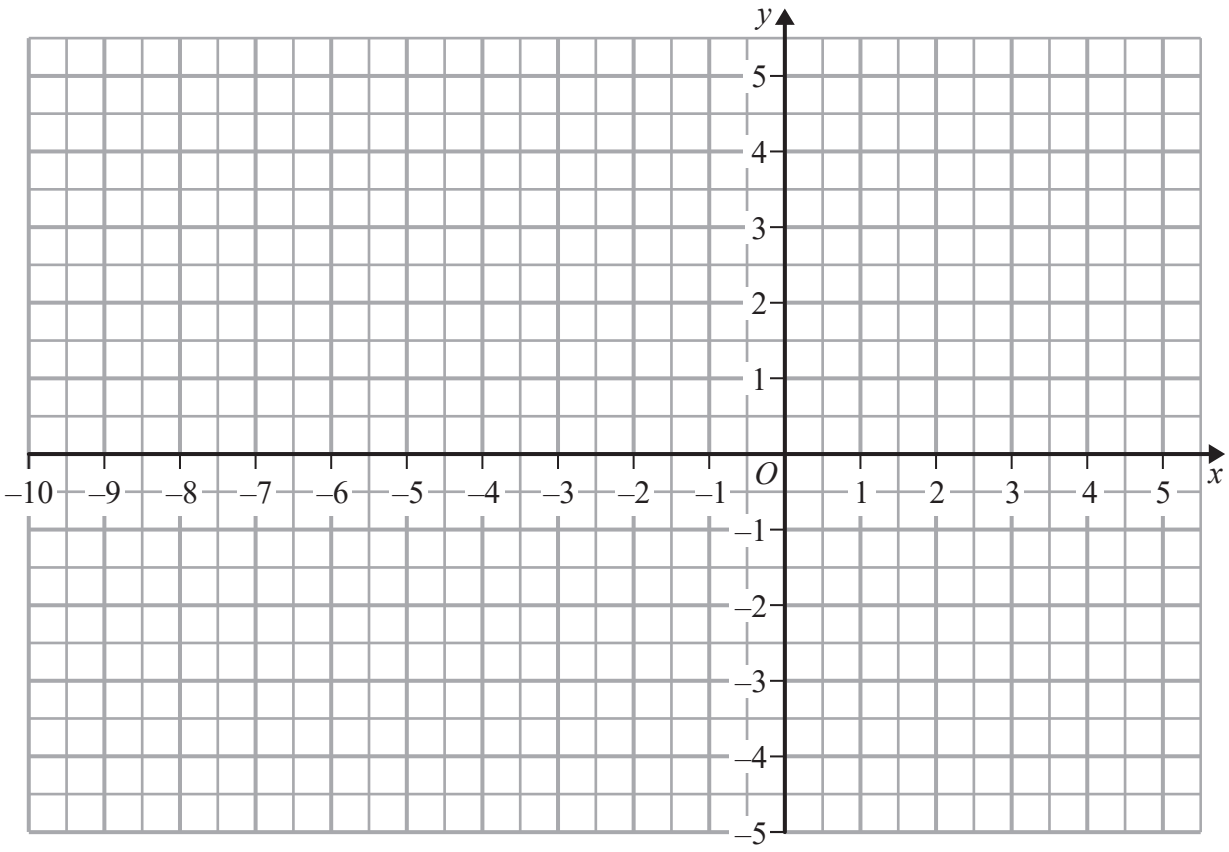


Turn over for a spare grid if you need to redraw your triangles.

Question 7 continued

Question 7 continued

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



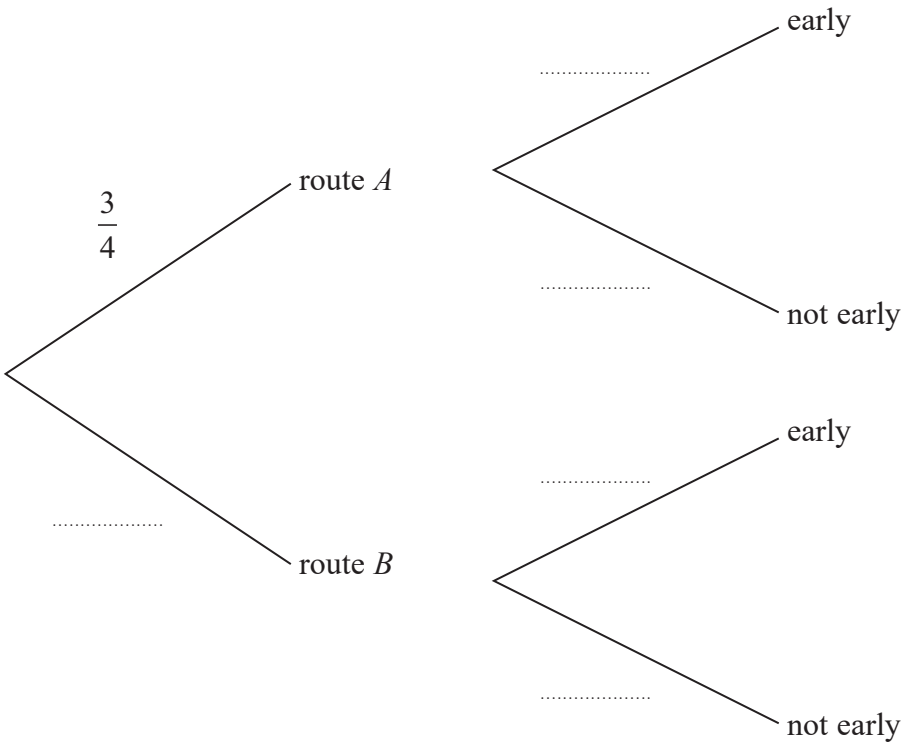
(Total for Question 7 is 10 marks)

8 When James travels to work, he can take two routes, route A and route B.

The probability that on any work day he takes route A is $\frac{3}{4}$

When James takes route A, the probability of his arriving early at work is x.
When James takes route B, the probability of his arriving early at work is kx, where k is a constant.

(a) Complete the probability tree diagram to show this information.



(3)

(b) Write down an expression in terms of x for the probability that James takes route A to work and arrives early.

(1)

The probability that James takes route A to work and arrives early is $\frac{1}{8}$

(c) Find the value of x.

(2)

The probability that James takes route B to work and does **not** arrive early is $\frac{1}{10}$

(d) Find the value of k.

(3)

(e) Calculate the probability that on any day James goes to work, he does **not** arrive early.

(3)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 12 marks)

9

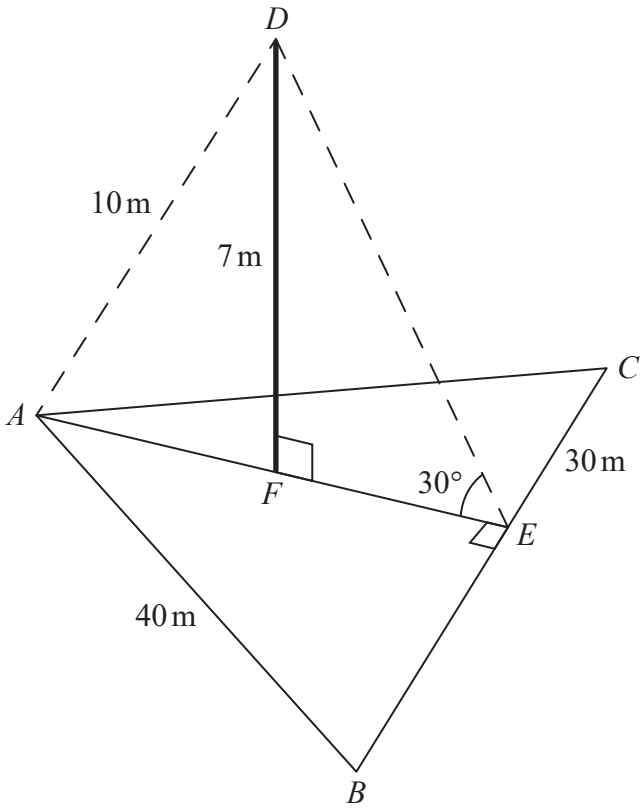


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a horizontal triangular field ABC in which $AB = 40$ metres.

The point E lies on BC so that AE is perpendicular to BC and $EC = 30$ metres.
The point F on AE is the bottom of a vertical flagpole, FD, of height 7 metres.
In ΔADE, $AD = 10$ metres and $\angle AED = 30°$

(a) Calculate the length, in metres to 3 significant figures, of

(i) FE,

(ii) AE,

(iii) EB.

(7)

The point X lies on AB so that CFX is a straight line.

(b) Calculate the length, in metres to 3 significant figures, of CX.

(6)

$$\left[\text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}\right]$$

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 13 marks)

10

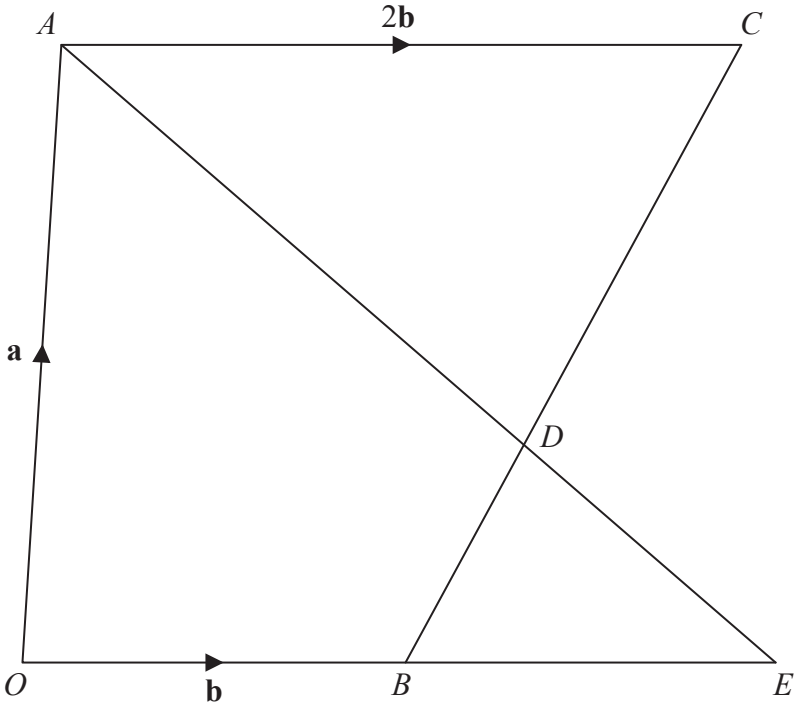


Diagram **NOT** accurately drawn

Figure 2

In Figure 2, $OACB$ is a quadrilateral such that $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{AC} = 2\mathbf{b}$
D is the point on BC such that $BD : BC = 1 : 3$

(a) Express in terms of **a** and **b**, simplifying your answers where possible,

(i) $\overrightarrow{OC}$, (ii) $\overrightarrow{BC}$, (iii) $\overrightarrow{AD}$.

(5)

E is the point such that OBE and ADE are straight lines.
Given that $OB : OE = 1 : n$, where n is a constant,

(b) find an expression, in terms of **a**, **b** and n, for $\overrightarrow{AE}$.

(1)

Given also that $\overrightarrow{AD} = \lambda \overrightarrow{AE}$, where λ is a constant,

(c) find the value of λ and the value of n.

(5)

(d) Explain why $OACE$ is a parallelogram.

(1)

The area of triangle ACD is $30\,\text{cm}^2$

(e) Calculate the area, in cm^2, of triangle BDE.

(2)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 14 marks)

11 The equation of a curve is given by

$$y = -\frac{8}{3}x^3 + 7x^2 - 4$$

(a) Complete the table for y, giving your values of y to 2 decimal places.

x	–1	–0.75	–0.5	0	0.5	1	1.5	2	2.5
y	5.67	1.06		–4	–2.58	0.33		2.67	–1.92

(2)

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

(3)

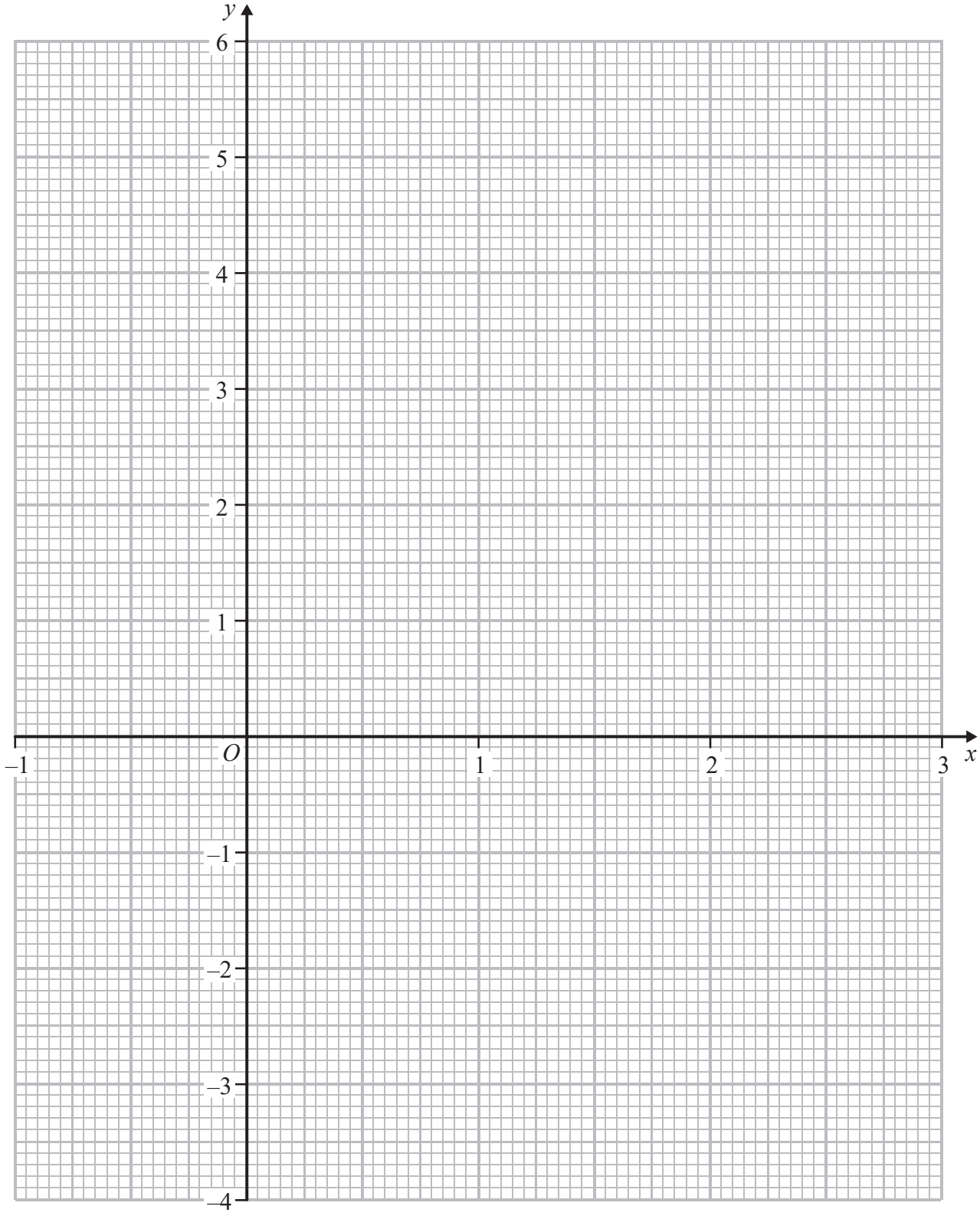
(c) **By drawing a suitable straight line on the grid**, find an estimate, to one significant figure, of the gradient of the curve at the point where $x = 2$

(3)

(d) By drawing and labelling a straight line on the grid, find estimates for the solutions of $\frac{8}{3}x^3 + \frac{5}{3}x + \frac{7}{2} = 7x^2$

(6)

Question 11 continued

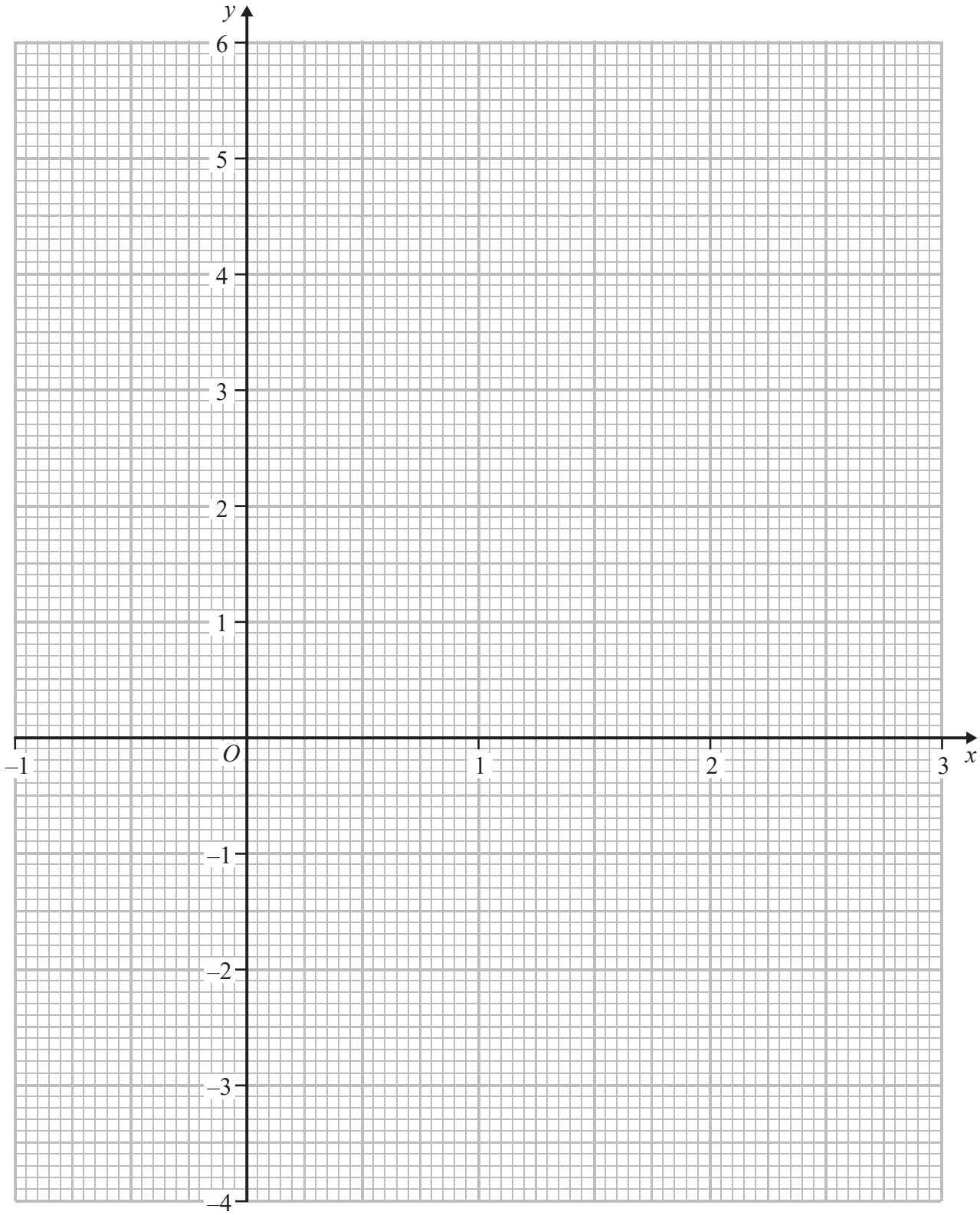


Turn over for a spare grid if you need to redraw your graph

Question 11 continued

Question 11 continued

Only use this grid if you need to redraw your graph



Question 11 continued

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS