Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Paper 2

Thursday 4 June 2015 – 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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P 4 4 3 9 6 A 0 1 3 2

PEARSON

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Robert went on a holiday to France.

He changed £1400 (British pounds) into euros.

The exchange rate was £1 = 1.20 euros.

By the end of his holiday in France, he had spent a total of 1230 euros.

(a) Calculate the number of euros that Robert had left at the end of his holiday.

(2)

Robert changed 75% of these euros to British pounds.

The exchange rate was the same.

(b) Calculate the amount, in British pounds, that he should receive.

(3)

(Total for Question 1 is 5 marks)

2 A box contains p peaches and m melons.

The total number of peaches and melons in the box is 100

(a) Write down an equation in p and m for this information.

(1)

There are 22 more peaches than melons in the box.

(b) Write down another equation in p and m.

(1)

(c) Hence find the number of peaches and the number of melons in the box.

(3)

(Total for Question 2 is 5 marks)

3 Solve $\frac{2}{x} - \frac{3}{x-2} = 5$

Question 3 continued

(Total for Question 3 is 5 marks)

4

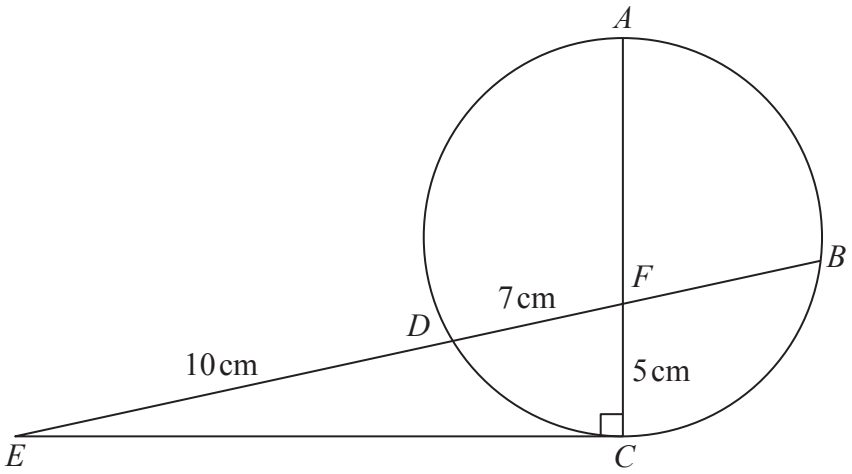

Diagram **NOT** accurately drawn

Figure 1

In Figure 1, A, B, C and D are four points on a circle such that the diameter AC intersects the chord BD at the point F. The point E is such that EC is a tangent to the circle and $BFDE$ is a straight line.

$ED = 10$ cm, $DF = 7$ cm, $CF = 5$ cm and $\angle ACE = 90°$

(a) Calculate the length, in cm to 3 significant figures, of EC.

(2)

Calculate the length, in cm, of

(b) FB,

(2)

(c) FA.

(2)

Question 4 continued

(Total for Question 4 is 6 marks)

5

$$f : x \mapsto 5x - 6$$

$$g : x \mapsto 2(2 + x)$$

(a) Find the value of $gf(-1)$

(2)

(b) Express the inverse function f^{-1} in the form $f^{-1} : x \mapsto \ldots$

(2)

(c) Find the value of x for which $fg(x) = 3g(x)$

(4)

Question 5 continued

(Total for Question 5 is 8 marks)

6

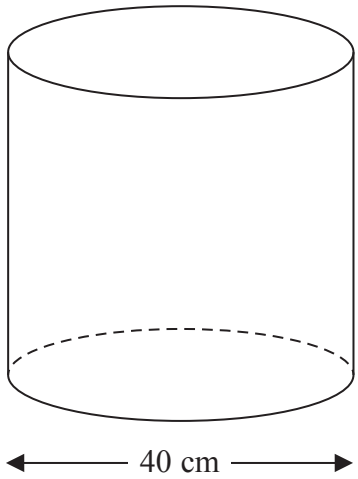

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Figure 2

Figure 2 shows a cylindrical can, of diameter 40 cm, open at its top. Water is poured into the can until the depth of the water in the can is 10 cm.

(a) Calculate as a multiple of π, the volume, in cm^3, of the water in the can.

(2)

30 solid glass spheres, each of radius r cm, are placed in the can. The water completely covers all the spheres and no water overflows from the can.

The depth of the water in the can is now 16.4 cm.

(b) Find the exact value of r.

(6)

$$\left[\begin{array}{c}\text{Area of circle} = \pi r^2 \\ \text{Volume of sphere} = \frac{4}{3}\pi r^3\end{array}\right]$$

Question 6 continued

(Total for Question 6 is 8 marks)

7 A particle P is moving along a straight line. At time t seconds, the distance, s metres, of P from a fixed point O of the line is given by

$$s = 2t^3 + 7t^2 + 13t + 4 \qquad t \geqslant 0$$

At time t seconds, the velocity of P is v m/s and the acceleration of P is a m/s^2.

Find an expression, in terms of t,

(a) for v,

(2)

(b) for a.

(2)

(c) Calculate, to 3 significant figures, the value of t for which the numerical value of v equals the numerical value of a.

(5)

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

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 9 marks)

8 The points (2, 2), (2, 5) and (4, 1) are the coordinates of the vertices of triangle A.

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

(1)

Triangle A is transformed onto triangle B by the enlargement with scale factor 2 and centre of enlargement the point (1, 1).

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

(3)

Triangle B is transformed onto triangle C by a reflection in the line with equation $y = -x$

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

(3)

Triangle C is transformed onto triangle D under the transformation with matrix $\mathbf{T}$ where

$$\mathbf{T} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

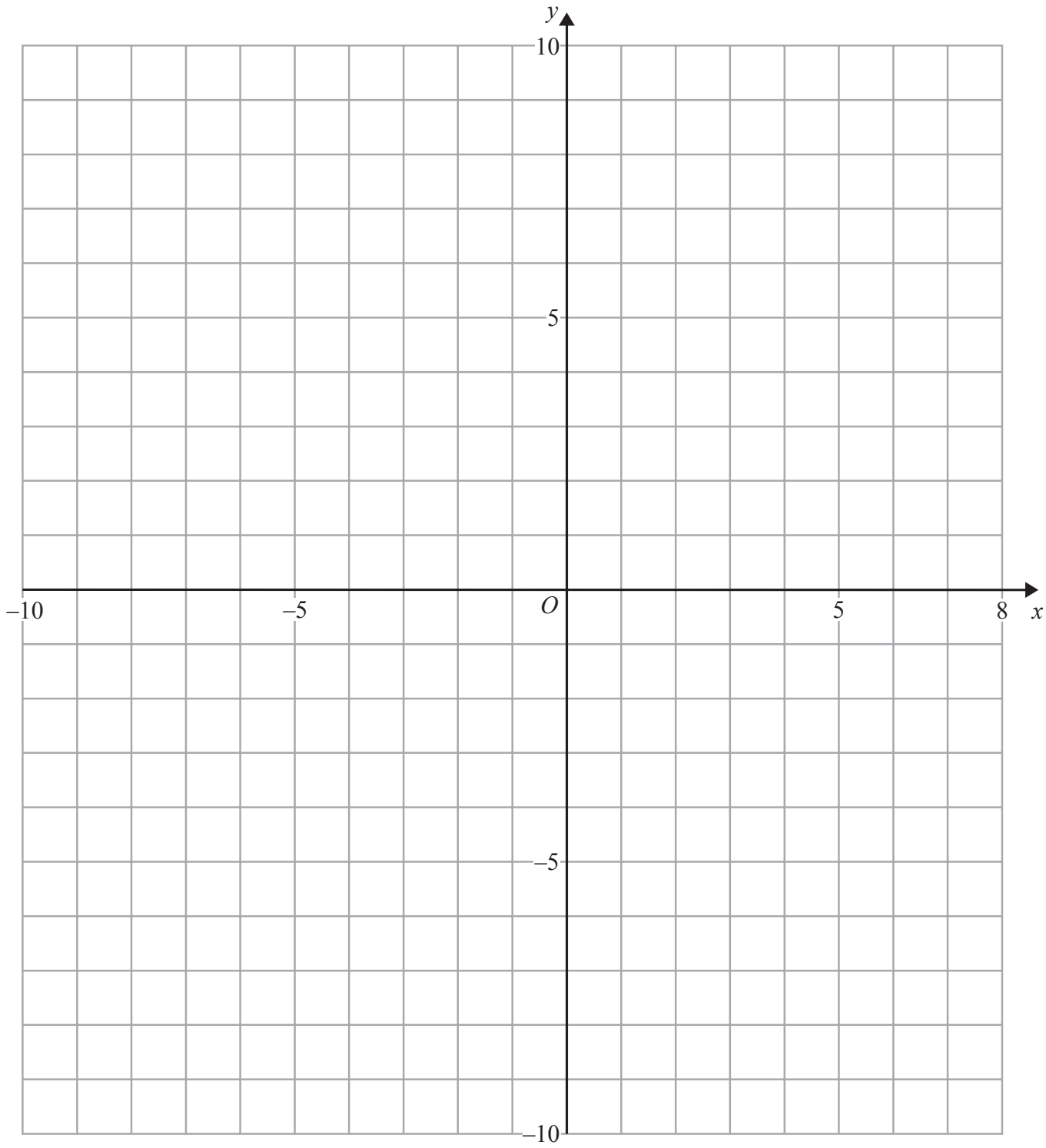
(d) On the grid, draw and label triangle D.

(3)

(e) Describe fully the single transformation which maps triangle B onto triangle D.

(1)

Question 8 continued

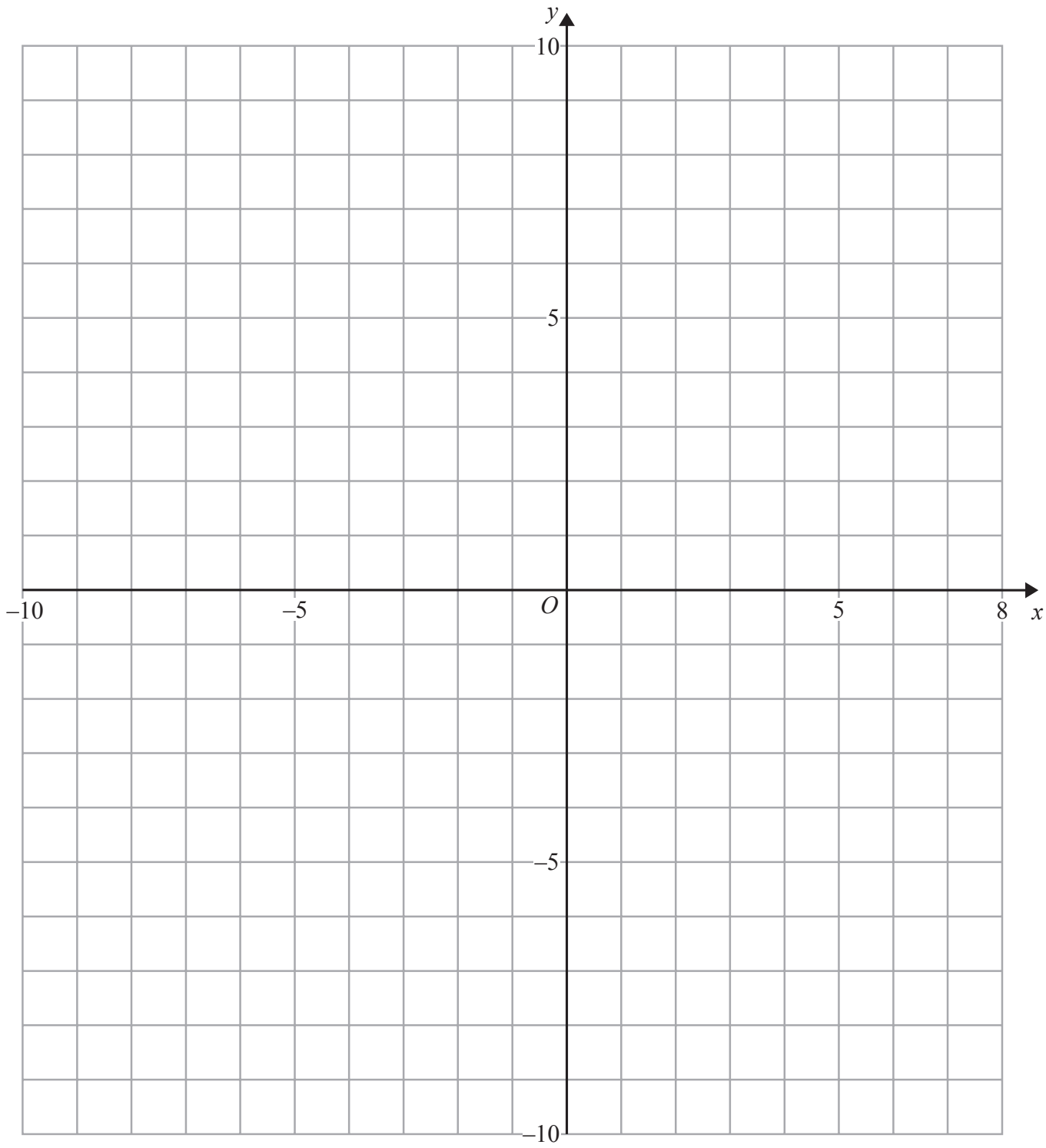


Use the grid on page 19 if you need to redraw your triangles.

Question 8 continued

Question 8 continued

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



(Total for Question 8 is 11 marks)

9 The table gives information about the times taken, in minutes, by 200 students to complete an examination paper.

Time taken (t minutes)	$0 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 90$
Frequency	10	14	90	54	32

(a) Calculate an estimate, to the nearest minute, of the mean time taken to complete the examination paper.

(4)

(b) On the grid, draw a histogram to represent this information.

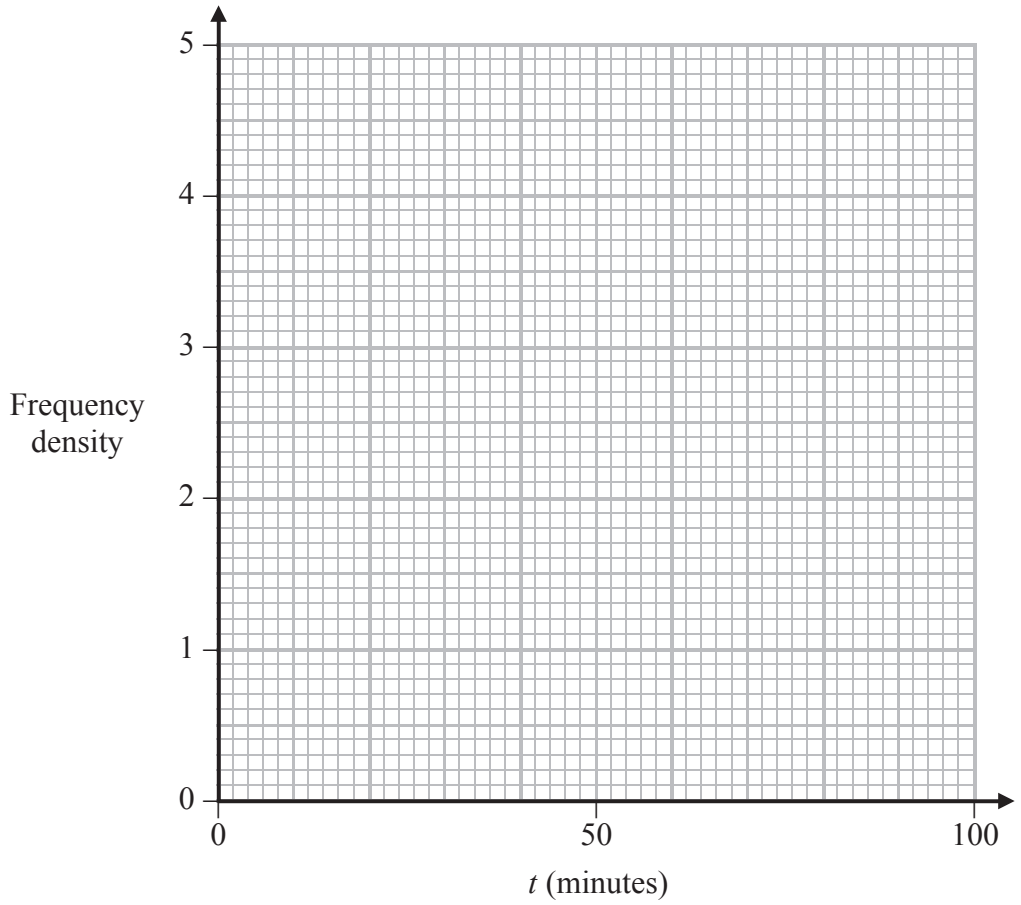
(5)

One of these students is to be chosen at random.

(c) Calculate an estimate of the probability that this student took less than 56 minutes to complete the examination paper.

(4)

Question 9 continued

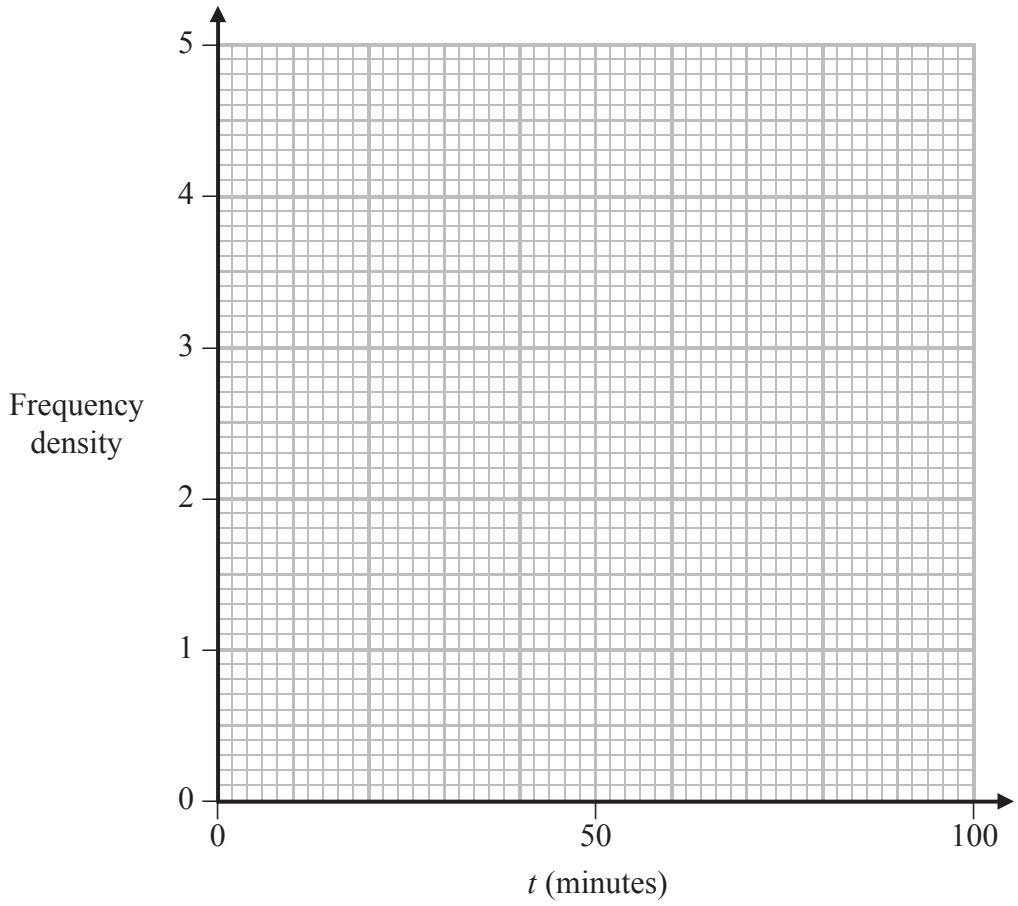


Use the grid on page 23 if you need to redraw your histogram.

Question 9 continued

Question 9 continued

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



(Total for Question 9 is 13 marks)

10

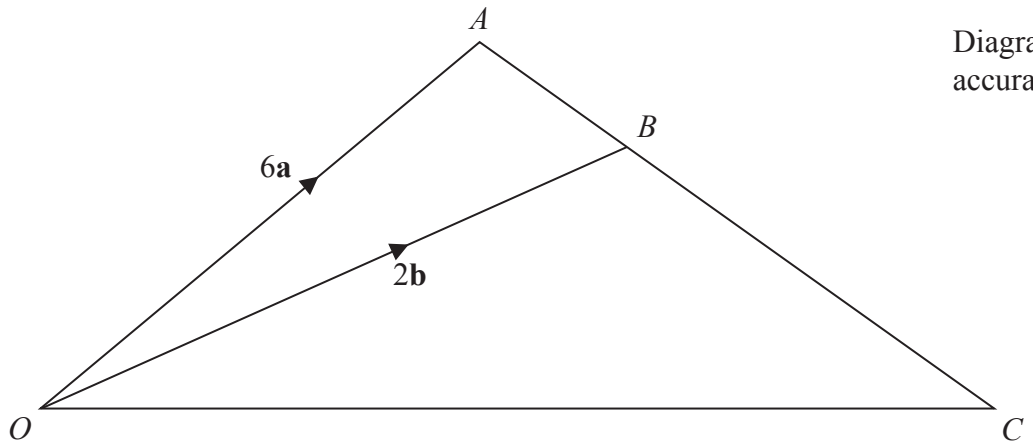


Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows the triangle OAC with the point B on AC such that $AB : AC = 1 : 3$

The point P is on the line OA such that $OP : OA = 1 : 2$

Given that $\overrightarrow{OA} = 6\mathbf{a}$ and that $\overrightarrow{OB} = 2\mathbf{b}$

(a) find, in terms of **a** and **b** or **a** or **b**, simplifying your answer where possible,

(i) $\overrightarrow{AB}$

(ii) $\overrightarrow{OP}$

(iii) $\overrightarrow{OC}$

(4)

The point Q lies on OC such that $OQ : OC = 1 : m$

(b) Find $\overrightarrow{PQ}$ in terms of m, **a** and **b**.

Simplify your expression.

(3)

Given also that PQ is parallel to AC,

(c) find the value of m.

(3)

(d) Hence write down $\overrightarrow{PQ}$ in terms of **a** and **b**.

(1)

The area of triangle OAC is 12 cm^2

(e) Calculate the area, in cm^2, of $PACQ$.

(3)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 14 marks)

11 $y = \frac{x^3}{6} + \frac{5}{x^2} - 8$

(a) Complete the table of values for $y = \frac{x^3}{6} + \frac{5}{x^2} - 8$, giving your values to 1 decimal place.

x	0.8	1	1.5	2	2.5	3	3.5	4
y	−0.1		–5.2	–5.4		–2.9		3.0

(3)

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

(3)

(c) Using your curve, determine an estimate of the minimum value, to 1 decimal place, of $\frac{x^3}{6} + \frac{5}{x^2} - 8$ in the interval $0.8 \leqslant x \leqslant 4$

(1)

(d) By drawing a suitable tangent to your curve, calculate an estimate, to 1 decimal place, of the gradient at the point where $x = 3$ on the curve.

(2)

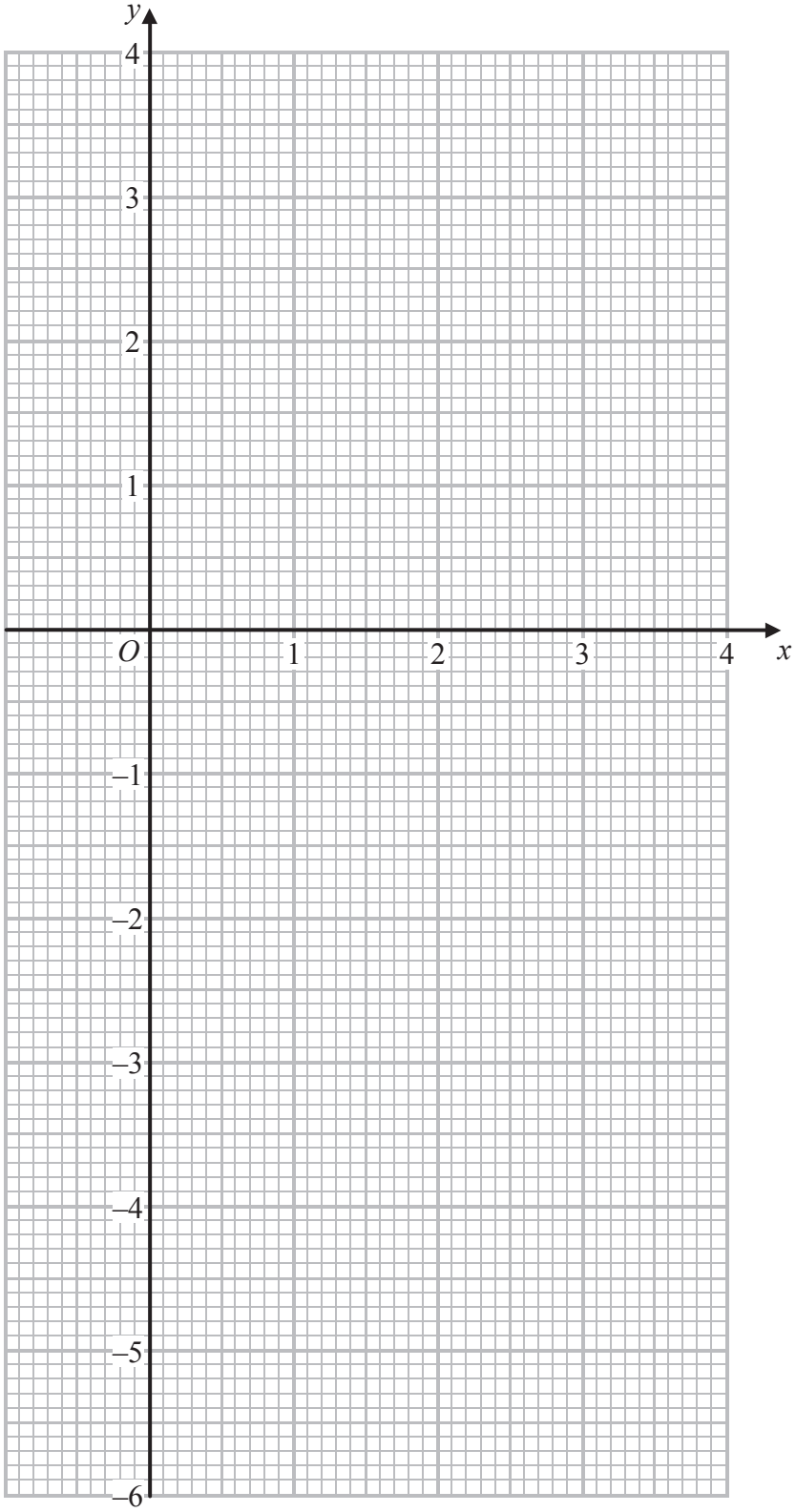
(e) By drawing and labelling a straight line on the grid, find estimates, to 1 decimal place, of the two solutions of the equation $\frac{x^3}{6} - \frac{x}{4} + \frac{5}{x^2} - 4 = 0$ in the interval $0.8 \leqslant x \leqslant 4$

(4)

(f) Explain clearly why the equation $\frac{x^3}{6} + \frac{5}{x^2} - 2 = 0$ has no solution in the interval $0.8 \leqslant x \leqslant 4$

(3)

Question 11 continued

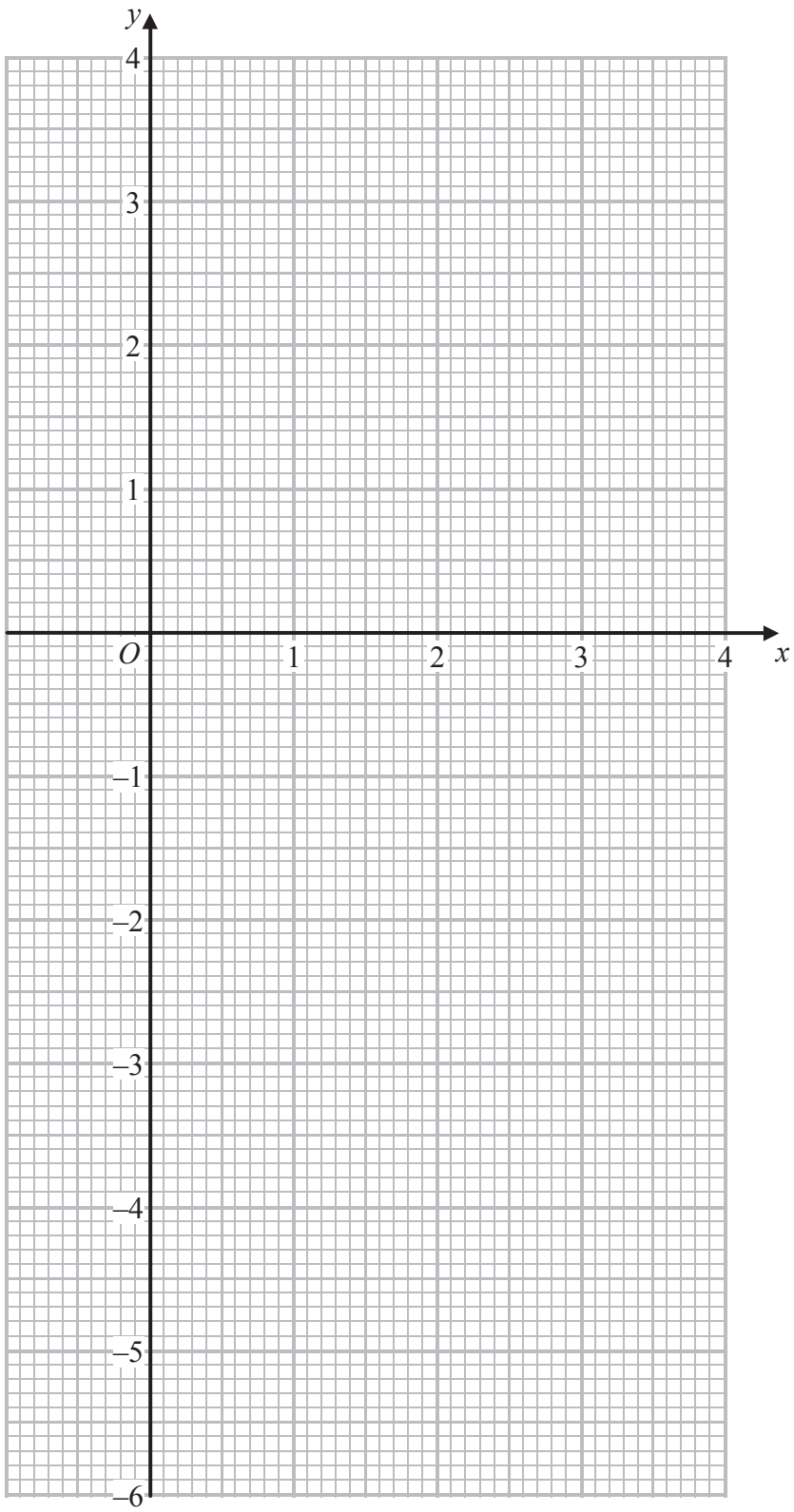


Use the grid on page 31 if you need to redraw your curve.

Question 11 continued

Question 11 continued

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



Question 11 continued

(Total for Question 11 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS