Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

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.
- Good luck with your examination.

Turn over ▶

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P 6 6 0 2 2 R A 0 1 3 2

Pearson

Answer ALL ELEVEN questions.

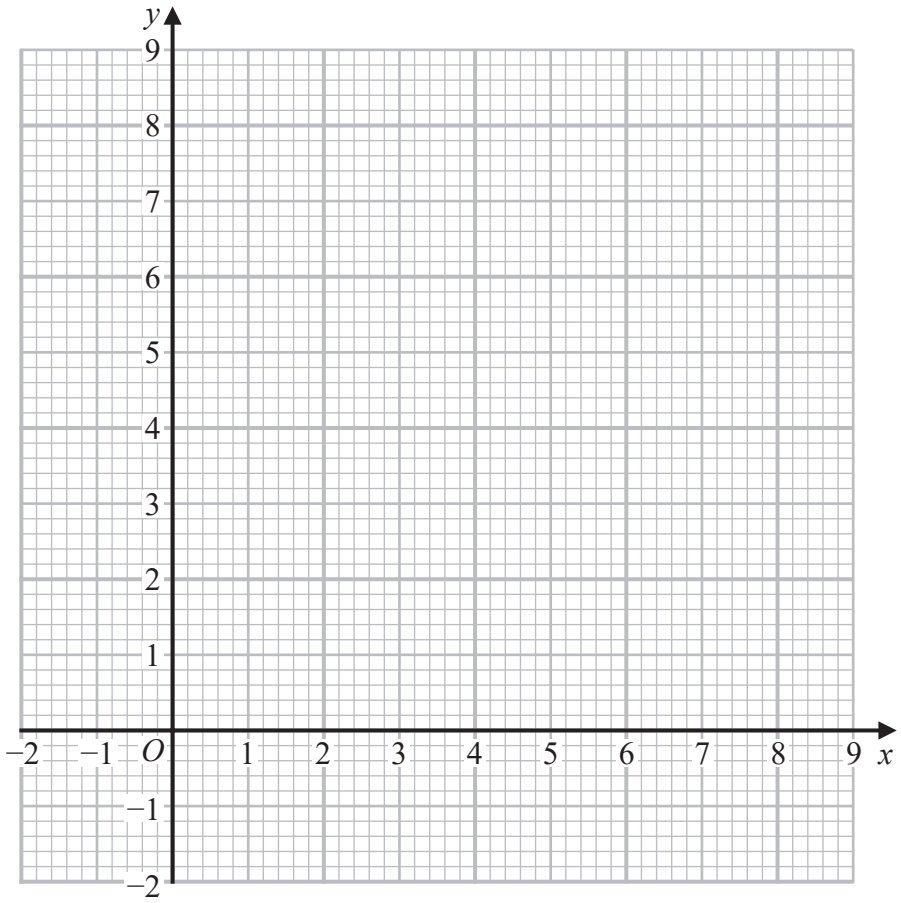
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) By drawing suitable straight lines on the grid below, show, by shading, the region R defined by all of the inequalities

$$y \leqslant x \qquad x + y \leqslant 8 \qquad y \geqslant 2$$

Label the region R.



(3)

The point P with coordinates (x, y) is a point of the region R.

Given that x and y are **integers** and that P lies on the straight line with equation $x - 2y + 2 = 0$

(b) write down the coordinates of **all** possible points P.

(2)

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Question 1 continued

(Total for Question 1 is 5 marks)

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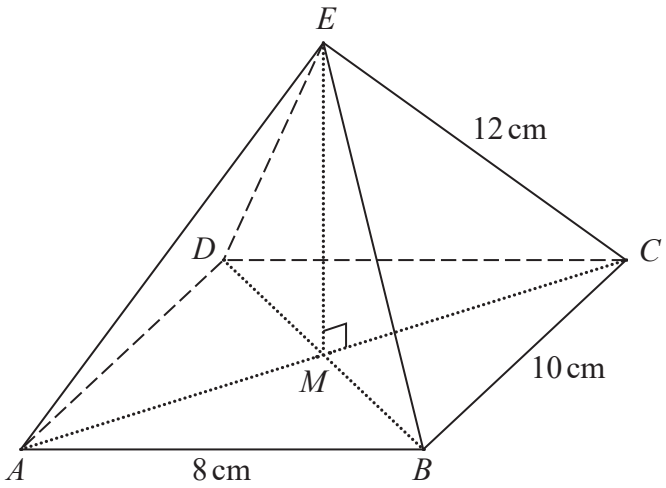

Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a right pyramid $ABCDE$ with horizontal rectangular base $ABCD$ and vertex E.

$AB = 8\,\text{cm}$ $BC = 10\,\text{cm}$ $EA = EB = EC = ED = 12\,\text{cm}$

M is the midpoint of the base.

(a) Calculate the **total** surface area, in cm^2 to 3 significant figures, of the pyramid.

(4)

The point P is the midpoint of AB and the point Q is the midpoint of BC.

(b) Calculate the size, in degrees to one decimal place, of $\angle PEQ$.

(4)

$\left[\text{Cosine rule: } a^2 = b^2 + c^2 - 2bc\cos A\right]$

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Question 2 continued

(Total for Question 2 is 8 marks)

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3 The table below gives information about the lengths of time, in minutes, that 200 people waited for a train.

Time t minutes	Frequency
$0 < t \leqslant 5$	28
$5 < t \leqslant 15$	74
$15 < t \leqslant 35$	42
$35 < t \leqslant 50$	36
$50 < t \leqslant 75$	20

(a) Find the class interval that contains the median time.

(2)

(b) Calculate an estimate for the mean time, in minutes, that these 200 people waited for the train.

(4)

(c) On the grid opposite, draw a histogram for the information in the table.

(3)

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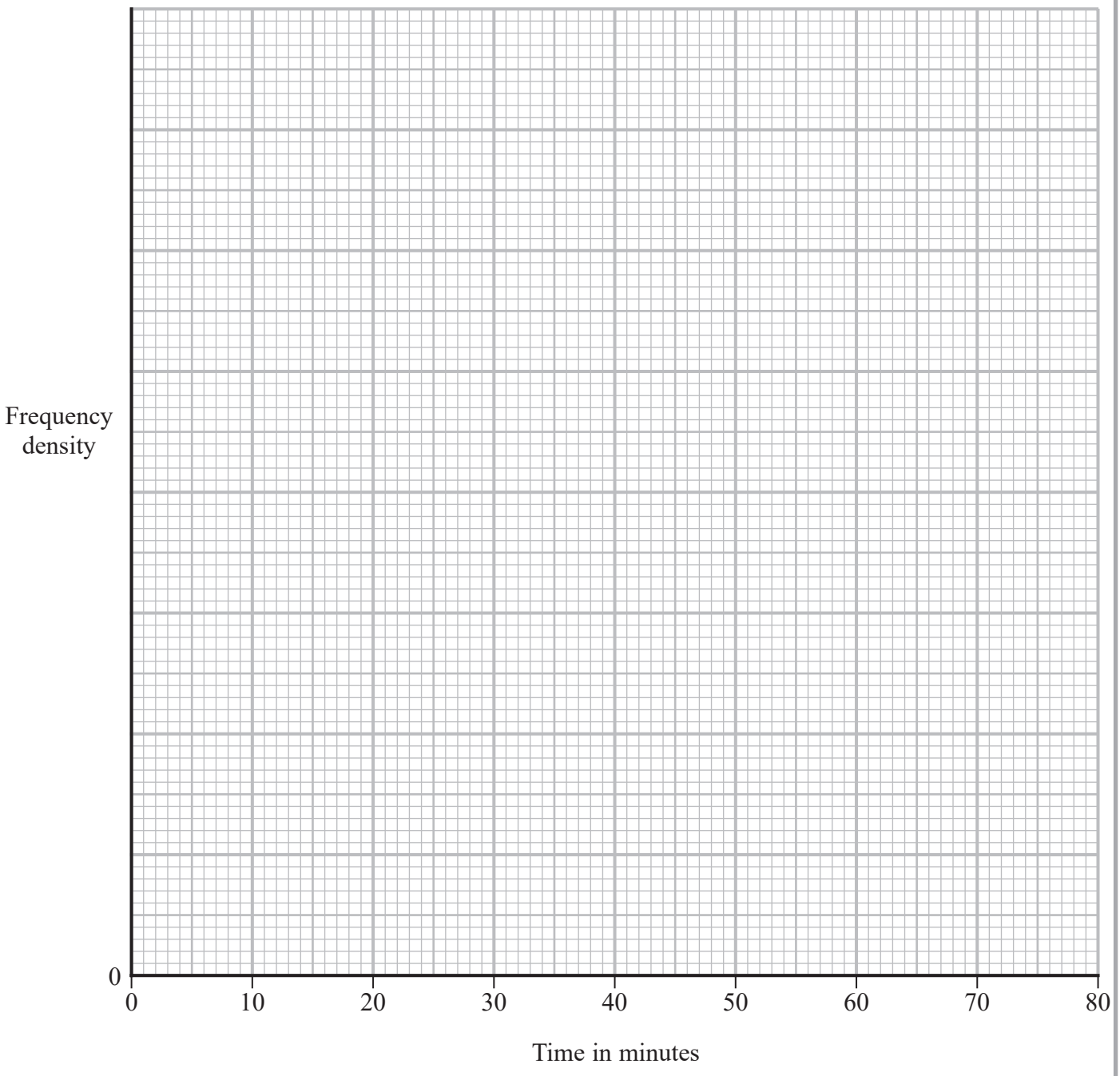
Question 3 continued



(Total for Question 3 is 9 marks)

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4 Ella sells jars of jam, jars of honey and jars of chutney from her market stall.

On Thursday, the total number of jars she sold was 320
55% of the jars were jars of jam.

The ratio of the number of jars of honey to the number of jars of chutney that Ella sold on Thursday was 5 : 3

(a) Calculate the number of jars of chutney that Ella sold on Thursday.

(4)

On Friday, Ella sold 99 jars of strawberry jam.
This was $\frac{9}{20}$ of the total number of jars of jam that she sold on Friday.
The number of jars of jam that Ella sold increased from Thursday to Friday.

Given that this increase = $\frac{1}{n}$ × the number of jars of jam that Ella sold on Thursday,

(b) find the value of n.

(3)

Ella increases the price of a jar of jam from 3.20 euros to 3.50 euros.

(c) Calculate the percentage increase in the price of a jar of jam.

(2)

Ella increases the price of a jar of honey by 6.25%
The price of a jar of honey after the price increase is 5.10 euros.

(d) Calculate the price of a jar of honey before the price increase.

(3)

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Question 4 continued

(Total for Question 4 is 12 marks)

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5 On the grid opposite, trapezium B is the image of trapezium A under a single transformation.

(a) Describe fully the single transformation.

(3)

Trapezium C is the image of trapezium A under a reflection in the line with equation $x = -1$

(b) On the grid opposite, draw and label trapezium C.

(2)

Trapezium A is transformed to trapezium D under the transformation with matrix $\mathbf{M}$ where

$$\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 0 & -1 \end{pmatrix}$$

(c) On the grid opposite, draw and label trapezium D.

(3)

Trapezium D is transformed to trapezium B under the transformation with matrix $\mathbf{N}$.

(d) Find matrix $\mathbf{N}$.

(3)

$$\left[\text{The inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ is } \frac{1}{ad - bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}\right]$$

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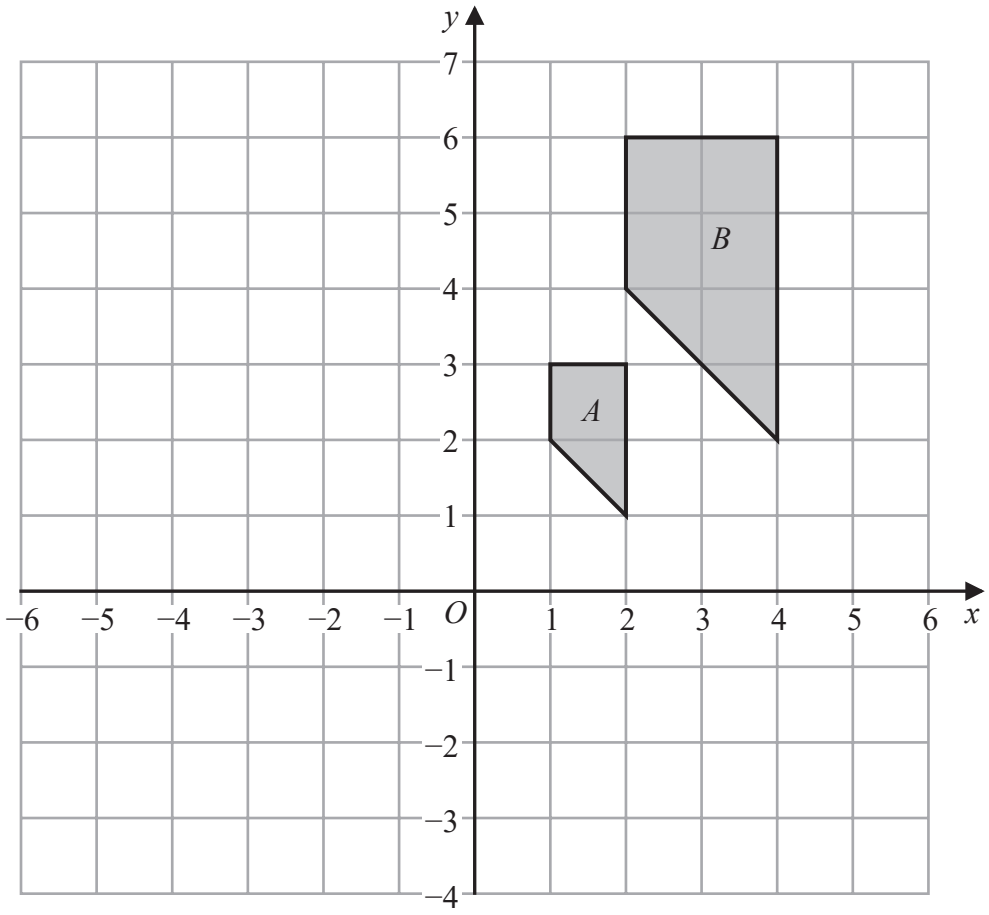
Question 5 continued



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

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Question 5 continued

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Question 5 continued

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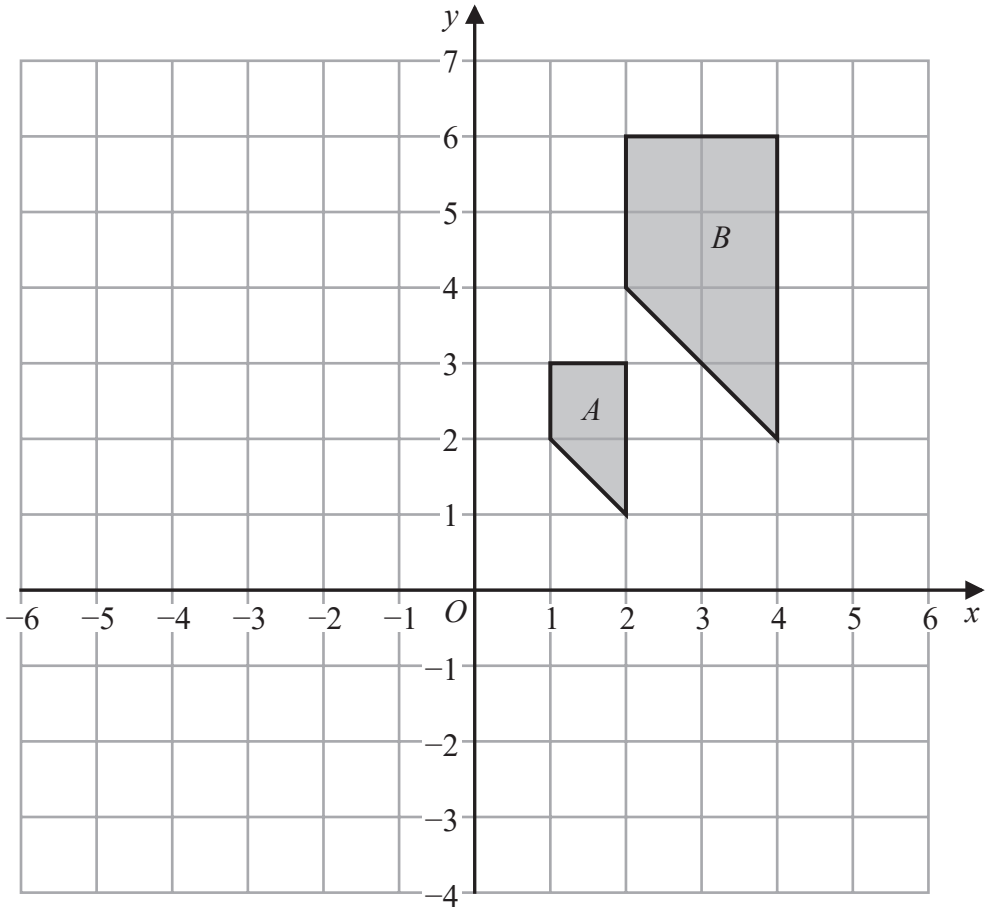

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6 The point A has coordinates (5, 4) and the point B has coordinates (−7, −1)

The point C is such that $\overrightarrow{BC} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$

(a) Find the coordinates of the point C.

(2)

The point D is such that $ABCD$ is a parallelogram with diagonals AC and BD.

The length of BC is 5 cm.

(b) Find the area, in cm^2, of the parallelogram $ABCD$.

(5)

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

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Question 6 continued

(Total for Question 6 is 7 marks)

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7 Here is the equation of a curve $y = x^3 - 3x - 1$

(a) Complete the table of values for $y = x^3 - 3x - 1$, giving your values of y to 2 decimal places where necessary.

x	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2
y		0.13		0.38			−3	−2.13	1

(3)

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

(3)

(c) Use your graph to estimate, to one decimal place, the solutions in the interval $-2 \leqslant x \leqslant 2$ of the equation

$$x^3 - 3x - 1 = 0.5$$

(2)

(d) 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 $x = 0.5$

(2)

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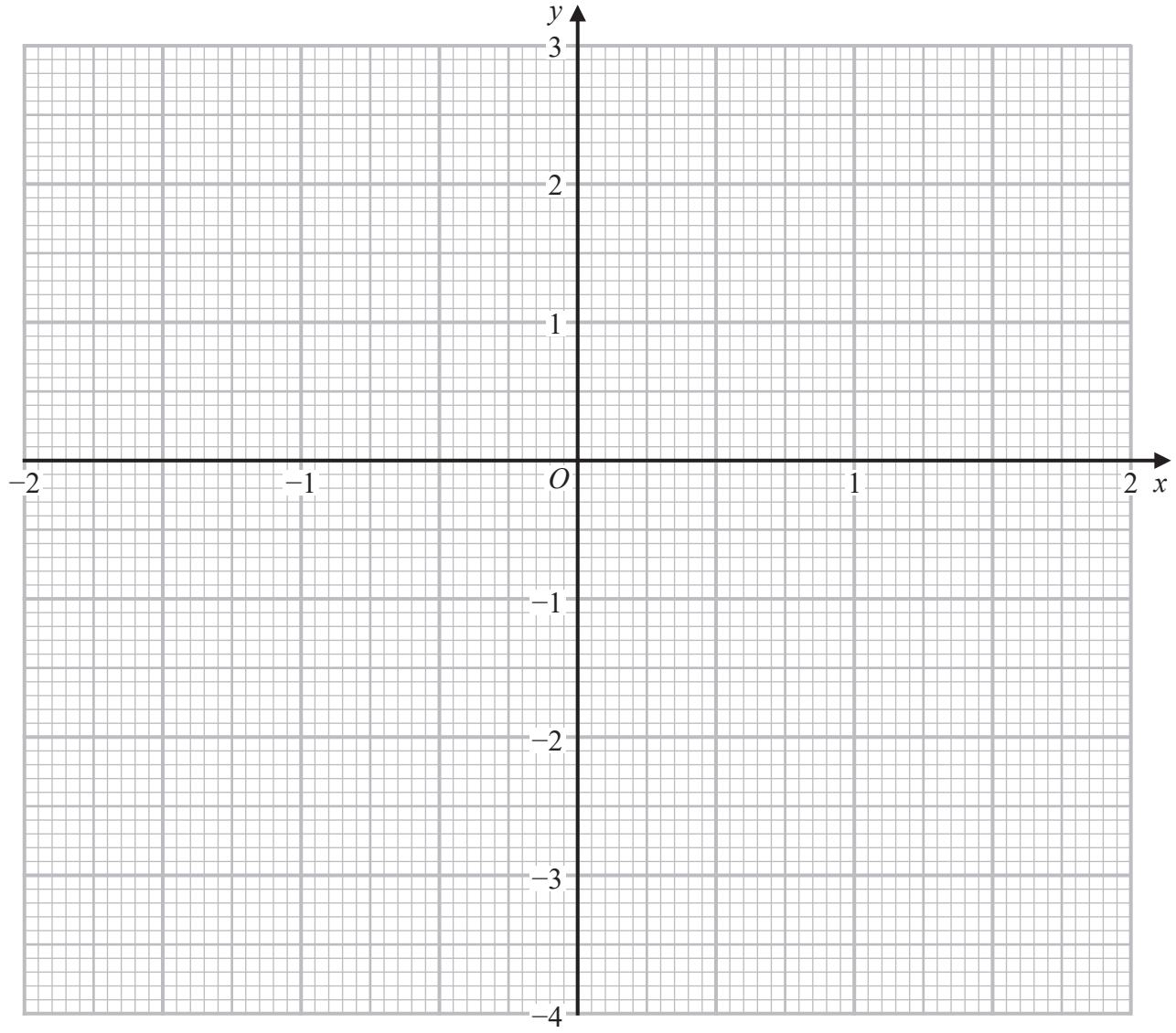
Question 7 continued



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

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Question 7 continued

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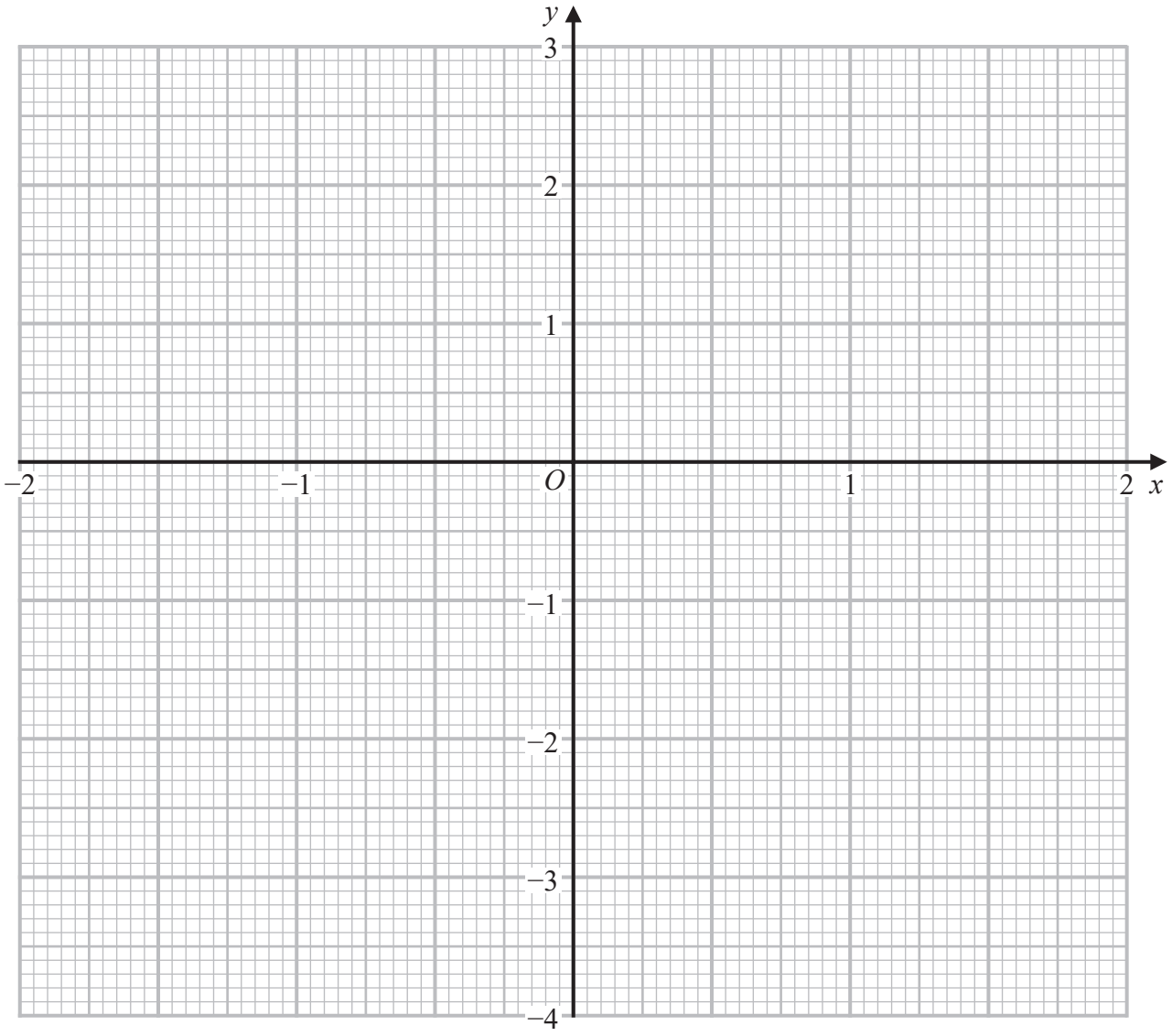
Question 7 continued

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



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8 Some college students were each asked which of the subjects Mathematics (M), Physics (P) and Chemistry (C) they were studying.

Here is some information about their answers.

$n(M \cap P) = 21$
$n(M \cap C) = 24$
$n(P \cap C) = 25$
$n(M) = 43$
$n(P) = 50$
$n([M \cup P \cup C]') = 25$
$n([M \cup P]' \cap C) = 8$
$n(M \cap P \cap C) = x$, where x is a positive integer.

(a) Use all the given information to complete the Venn diagram on the opposite page, giving the number of elements in each appropriate subset, in terms of x where necessary.

(4)

Given that $n(C) = 40$

(b) find the total number of college students that were asked.

(4)

One of these college students is to be chosen at random.
Given that the college student studies Chemistry,

(c) find the probability that this student also studies Physics.

(2)

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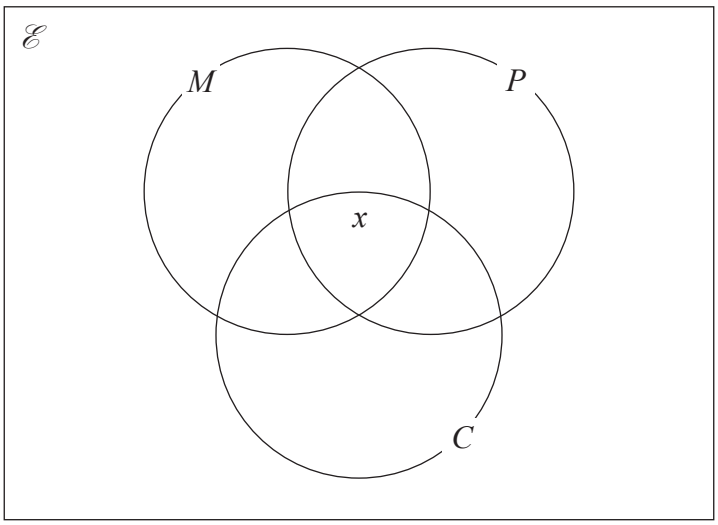
Question 8 continued



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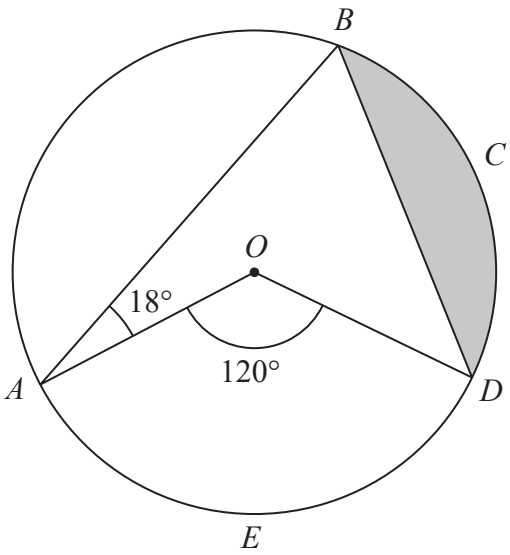

Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a circle $ABCDE$ with centre O.

$$\angle BAO = 18° \qquad \angle AOD = 120°$$

The area of segment BCD, shown shaded in Figure 2, is $T\,\text{cm}^2$

Given that the perimeter of the sector $AODE$ is $5(3 + \pi)\,\text{cm}$,

calculate the value, to one decimal place, of T.

(6)

$$\left[\text{Area of triangle} = \frac{1}{2}ab\sin C\right]$$

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Question 9 continued

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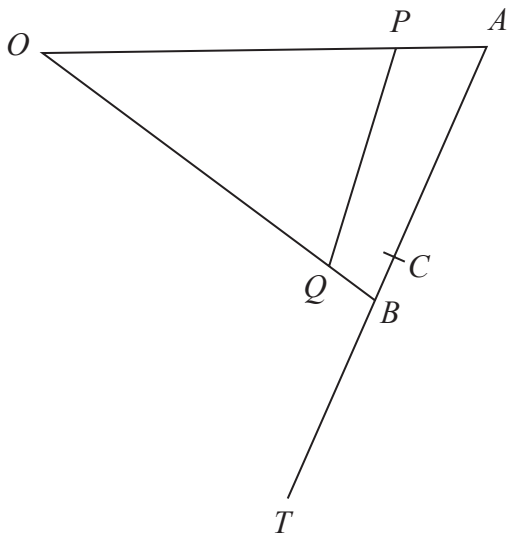

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Figure 3

Figure 3 shows the triangle OAB in which $\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 6\mathbf{b}$

C is the point on AB such that $AC : CB = 3 : 1$

(a) Find and simplify an expression for $\overrightarrow{OC}$ in terms of **a** and **b**.

(3)

The point T is such that ABT is a straight line and $AC = CT$.

The point P is such that $\overrightarrow{OP} = \frac{3}{4}\overrightarrow{OA}$

Q is the point on OB such that the points P, Q and T are collinear.

Given that $OQ : QB = n : 1$

(b) find the value of n.

(4)

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Question 10 continued

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Question 10 continued

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Question 10 continued

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11 The three functions, f, g and h, are defined as

$$f : x \mapsto 4x^3 + 4x^2 - 5x - 3$$

$$g : x \mapsto \frac{x - 7}{3 - 2x}$$

$$h : x \mapsto 2x + 1$$

(a) Write down the value of x that must be excluded from any domain of g

(1)

(b) Find g(2)

(1)

(c) Express the inverse function g^{-1} in the form $g^{-1}(x) = \ldots$

(3)

(d) Solve the equation $g(x) = h(x)$

(4)

(e) (i) Use the factor theorem to show that $(2x + 3)$ is a factor of $f(x)$

(2)

(ii) Hence solve the equation $f(x) = 0$
Show clear algebraic working.

(4)

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Question 11 continued

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Question 11 continued

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Question 11 continued

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TOTAL FOR PAPER IS 100 MARKS

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