

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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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 ►

P66022RA

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



Pearson

Answer ALL ELEVEN questions.

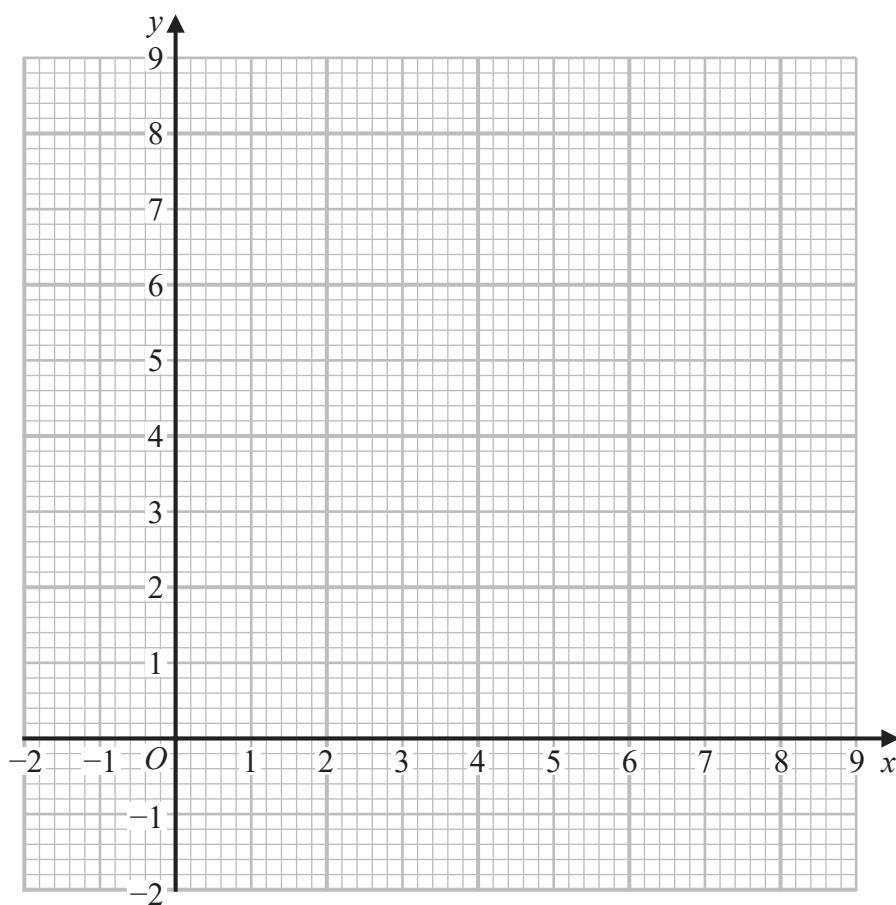
Write your answers in the spaces provided.

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

$$y \leq x \quad x + y \leq 8 \quad y \geq 2$$

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

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(Total for Question 1 is 5 marks)



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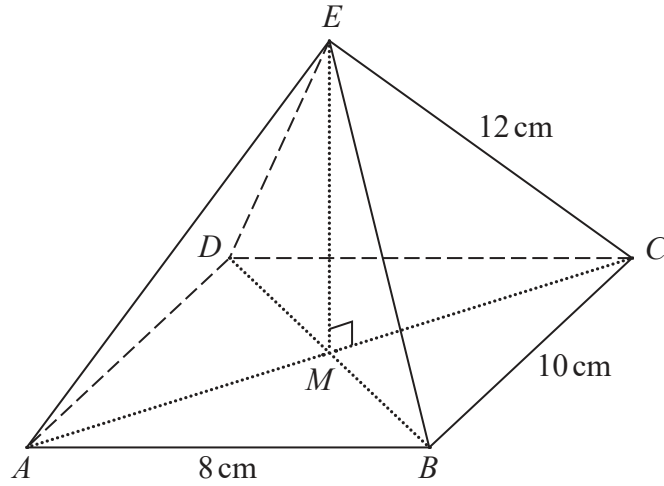


Diagram **NOT** accurately drawn

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)

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[Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$]



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Question 2 continued

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(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
$0 < t \leq 5$	28
$5 < t \leq 15$	74
$15 < t \leq 35$	42
$35 < t \leq 50$	36
$50 < t \leq 75$	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

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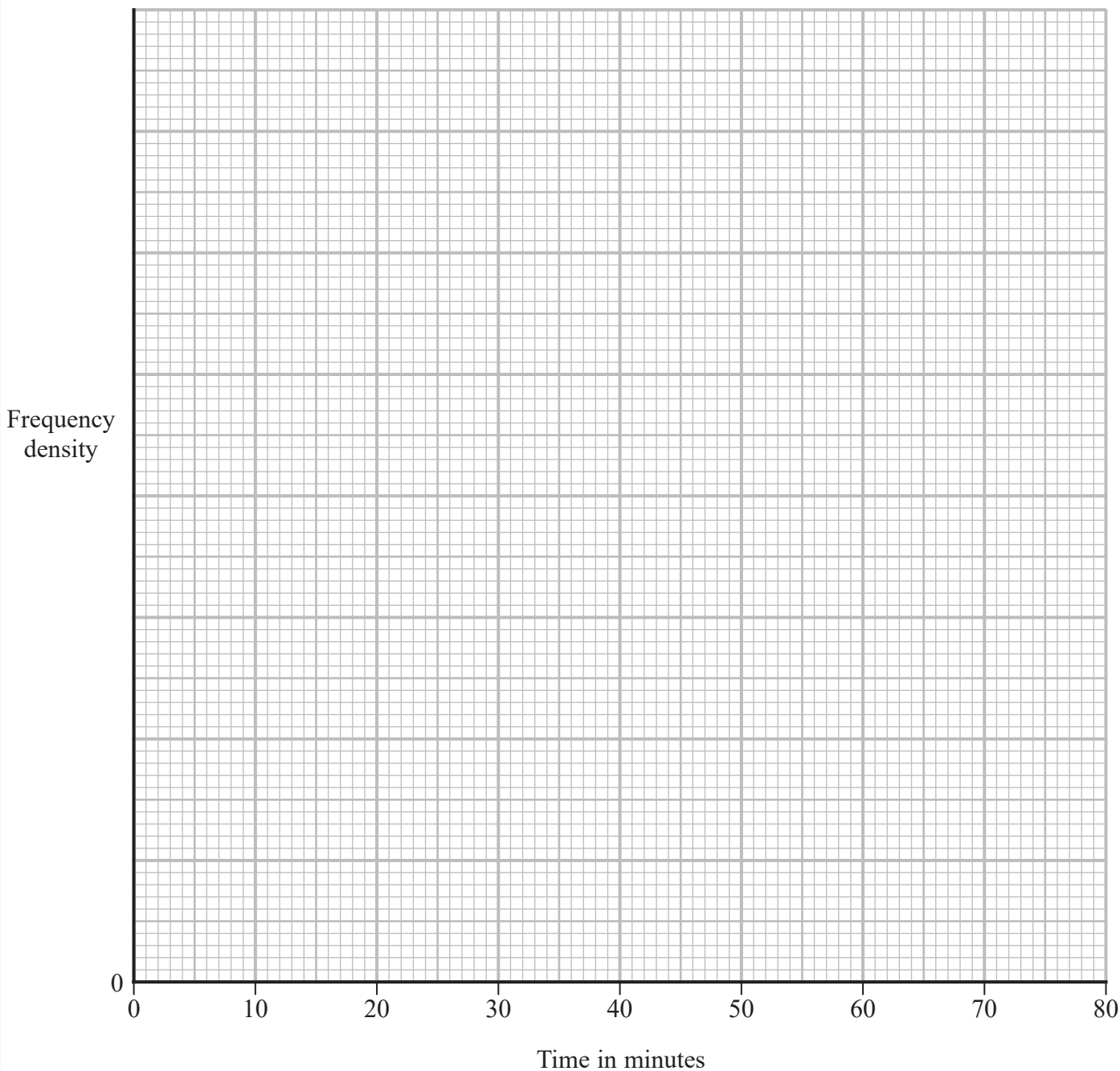
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(Total for Question 3 is 9 marks)



- 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 = $\frac{1}{n} \times$ 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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(Total for Question 4 is 12 marks)



P 6 6 0 2 2 R A 0 9 3 2

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)

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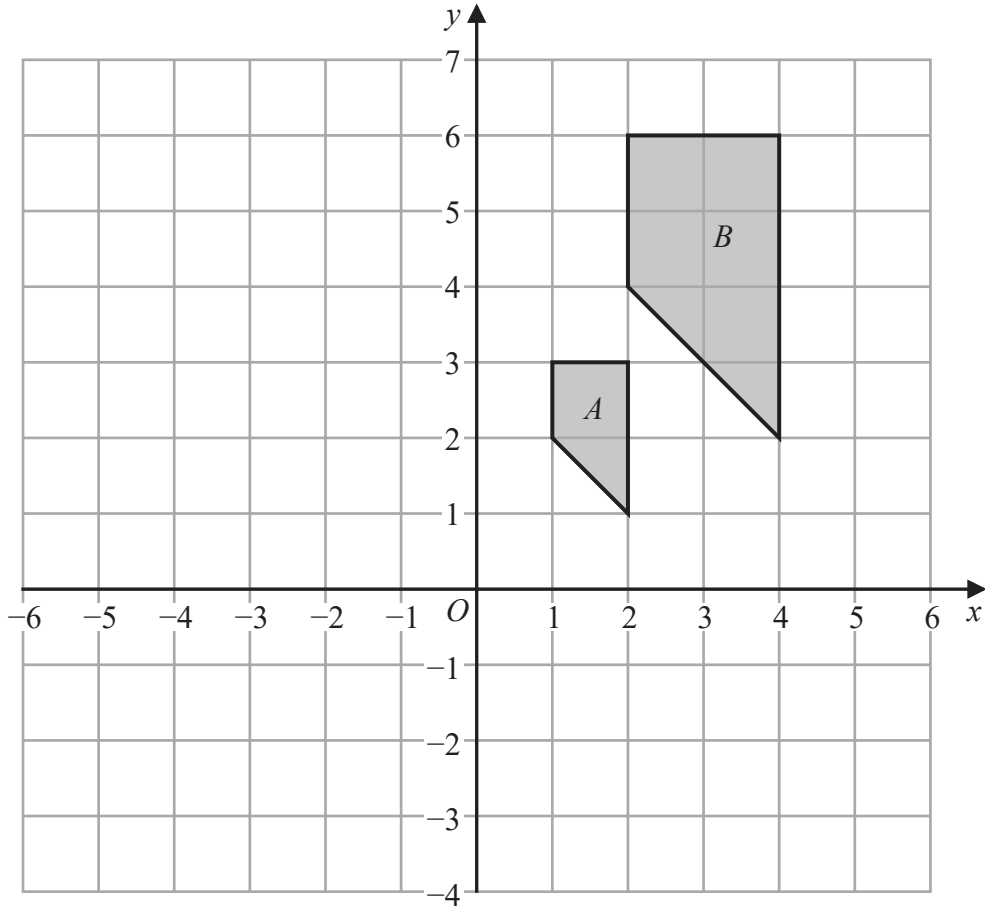
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$$\left[\text{The inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ is } \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix} \right]$$



Question 5 continued



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

A series of horizontal dotted lines for writing.

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Question 5 continued

Handwriting practice area with 25 horizontal dotted lines.

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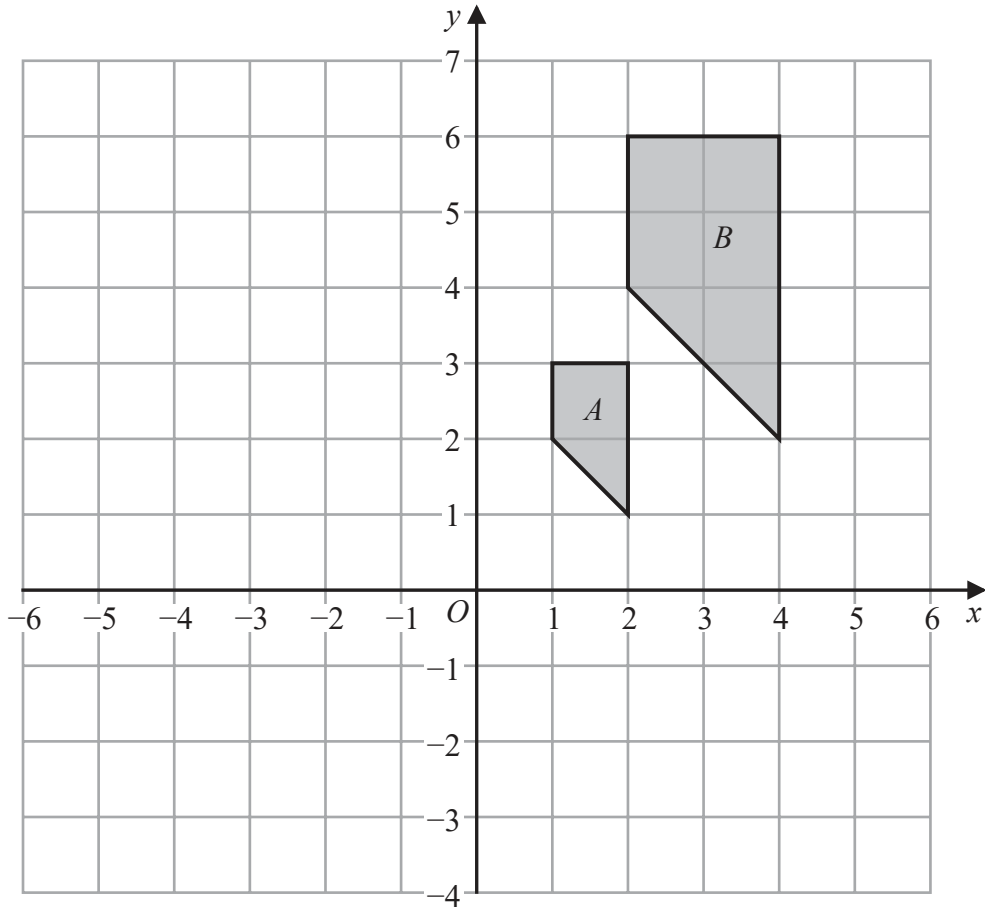
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Question 5 continued

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(Total for Question 5 is 11 marks)



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)

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



Question 6 continued

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Area with horizontal dotted lines for writing.

(Total for Question 6 is 7 marks)



P 6 6 0 2 2 R A 0 1 5 3 2

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 $-2 \leq x \leq 2$ 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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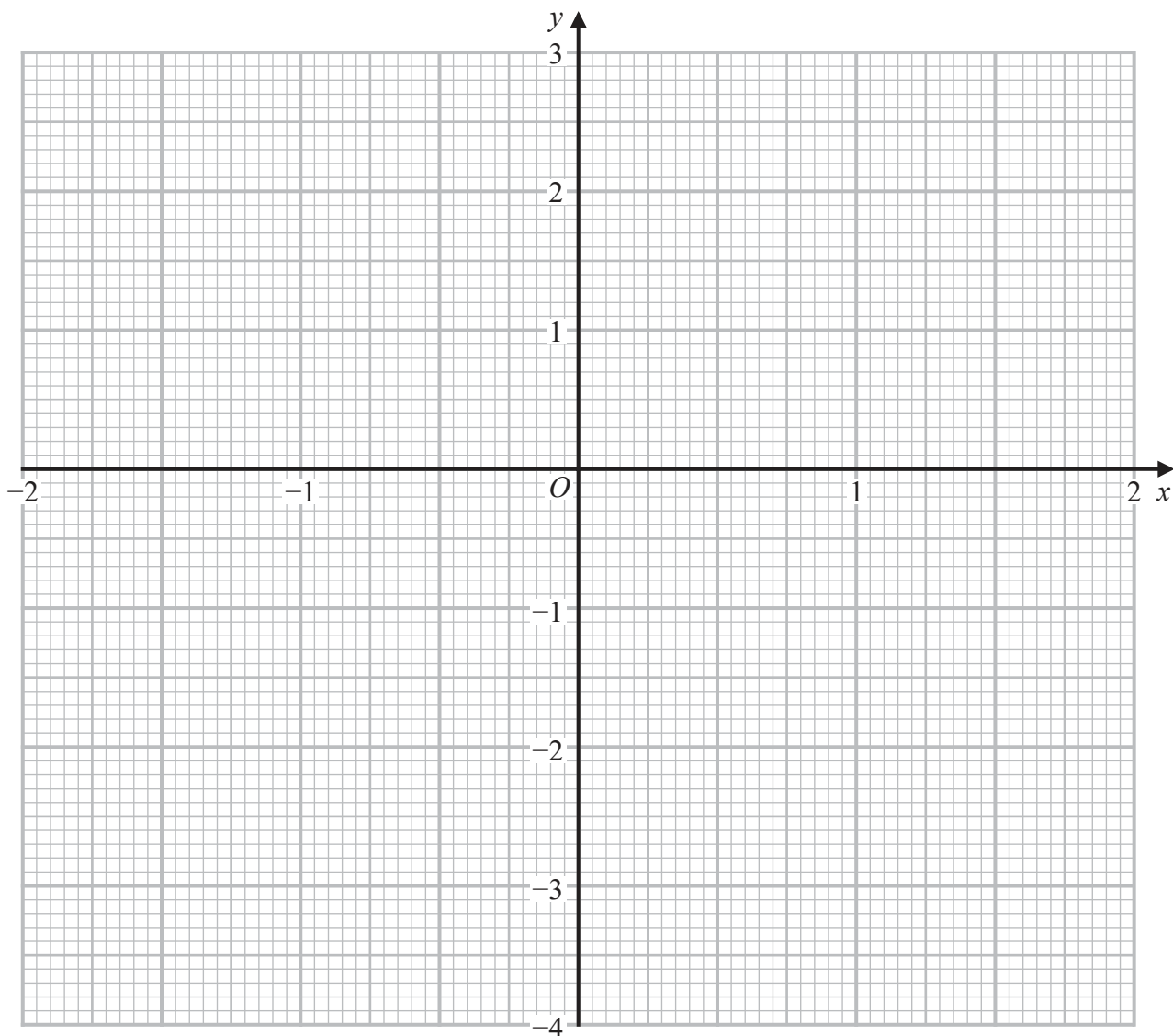
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Question 7 continued



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

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Question 7 continued

Handwriting practice area consisting of 20 horizontal dotted lines.

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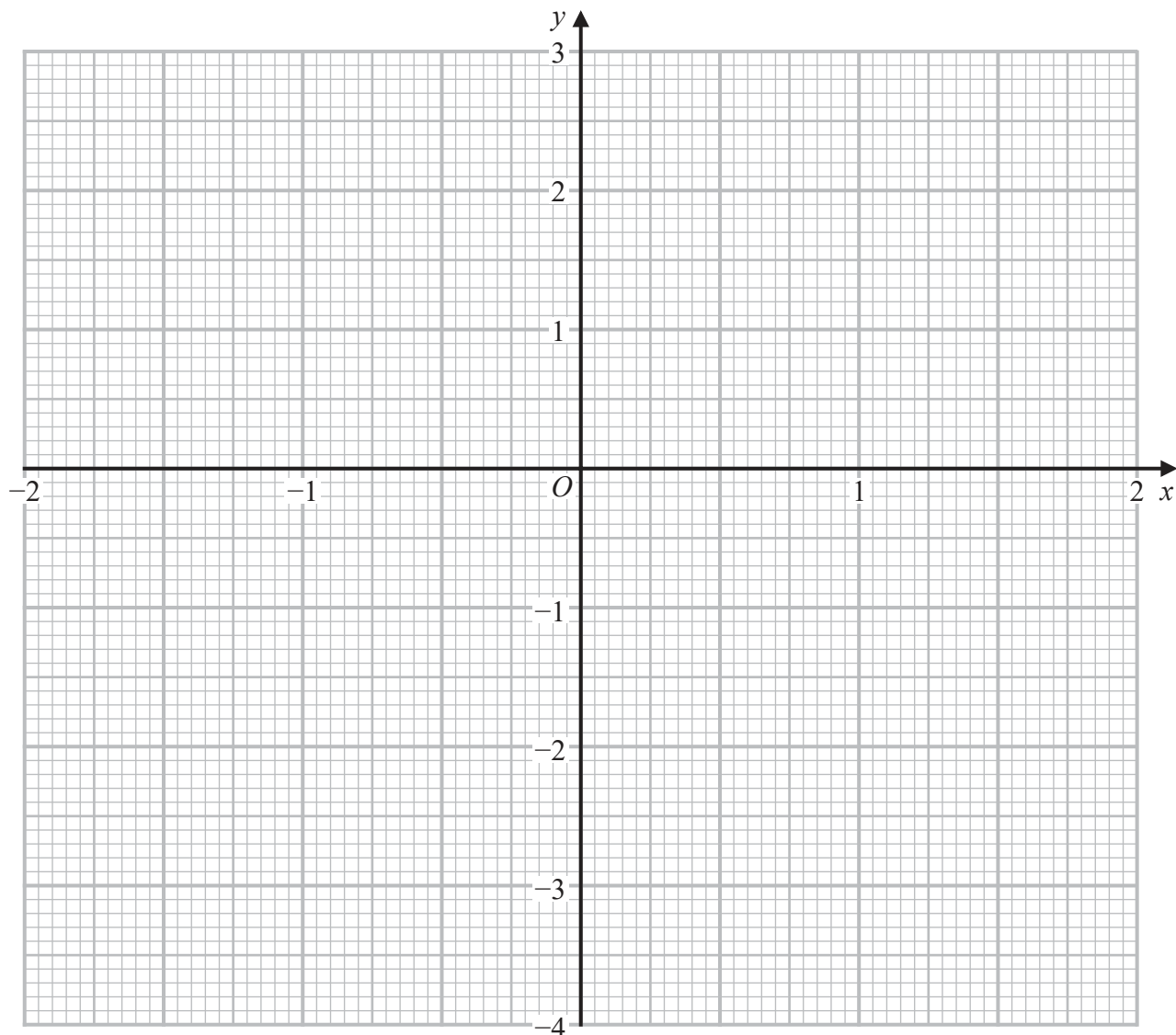
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Question 7 continued

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(Total for Question 7 is 10 marks)



- 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.

$$n(M \cap P) = 21$$

$$n(M \cap C) = 24$$

$$n(P \cap C) = 25$$

$$n(M) = 43$$

$$n(P) = 50$$

$$n([M \cup P \cup C]') = 25$$

$$n([M \cup P]' \cap C) = 8$$

$$n(M \cap P \cap C) = x, \text{ where } x \text{ is a positive integer.}$$

- (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)

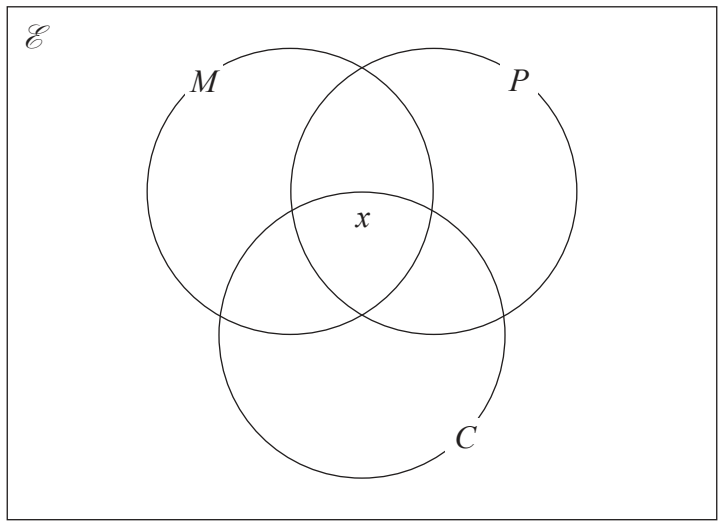
One of these college students is to be chosen at random.

Given that the college student studies Chemistry,

- (c) find the probability that this student also studies Physics. (2)



Question 8 continued



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(Total for Question 8 is 10 marks)



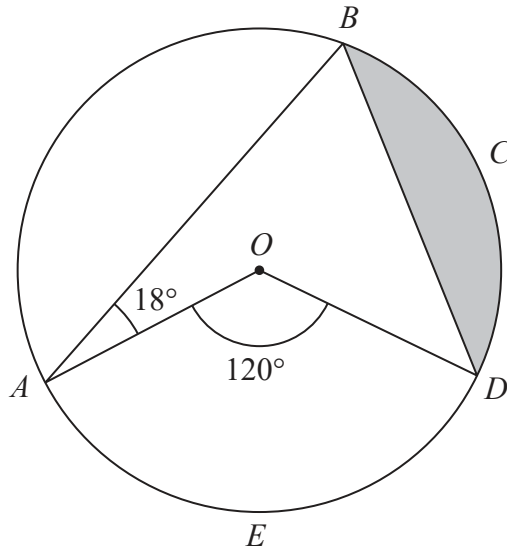


Diagram **NOT** accurately drawn

Figure 2

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

$$\angle BAO = 18^\circ \qquad \angle AOD = 120^\circ$$

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 .

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



Question 9 continued

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(Total for Question 9 is 6 marks)



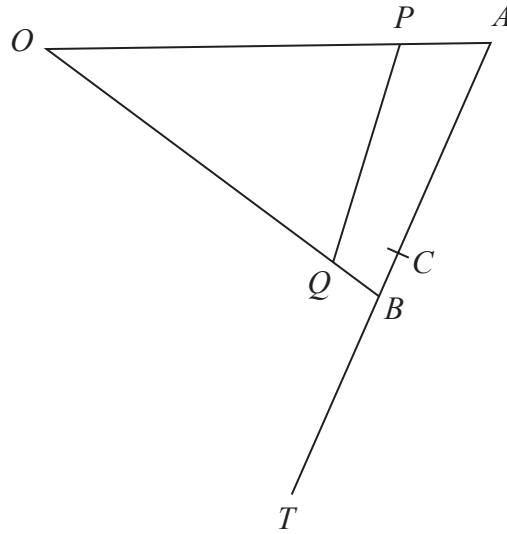


Diagram NOT accurately drawn

Figure 3

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

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

(a) Find and simplify an expression for \vec{OC} in terms of \mathbf{a} and \mathbf{b} .

(3)

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

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

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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Handwriting practice area with 25 horizontal dotted lines.



Question 10 continued

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Area with horizontal dotted lines for writing.

(Total for Question 10 is 7 marks)



P 6 6 0 2 2 R A 0 2 7 3 2

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 $g^{-1}(x) = \dots$ (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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Handwriting practice area with 25 horizontal dotted lines.



Question 11 continued

Area with horizontal dotted lines for writing.

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Question 11 continued

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(Total for Question 11 is 15 marks)

TOTAL FOR PAPER IS 100 MARKS



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