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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE

Time 2 hours 30 minutes

Paper reference **4MB1/02R**

Mathematics B
PAPER 2R



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 ▶

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Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The functions f and g are defined as

$$f(x) = 3^x$$

$$g(x) = \frac{15}{2x-3}$$

(a) Write down the value of x for which $f(x) = 81$

(1)

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

(1)

(c) Find fg(4)

(2)

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Question 1 continued

(Total for Question 1 is 4 marks)

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2 (a) Find the set of values of x for which

$$-2x - 4 < 3x + 6 \leqslant 21 - 2x$$

(3)

(b) Solve the inequality $4x^2 - 8x < 21$

(3)

(c) Hence represent on the number line on the opposite page, the set of values of x for which

$$-2x - 4 < 3x + 6 \leqslant 21 - 2x \quad \textbf{and} \quad 4x^2 - 8x < 21$$

(2)

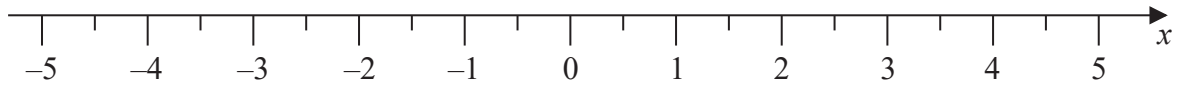
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Question 2 continued



(Total for Question 2 is 8 marks)

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3 Peter has two boxes of bricks, box **A** and box **B**.
Each box contains only red bricks, green bricks and yellow bricks.

In box **A** there are 15 bricks of which

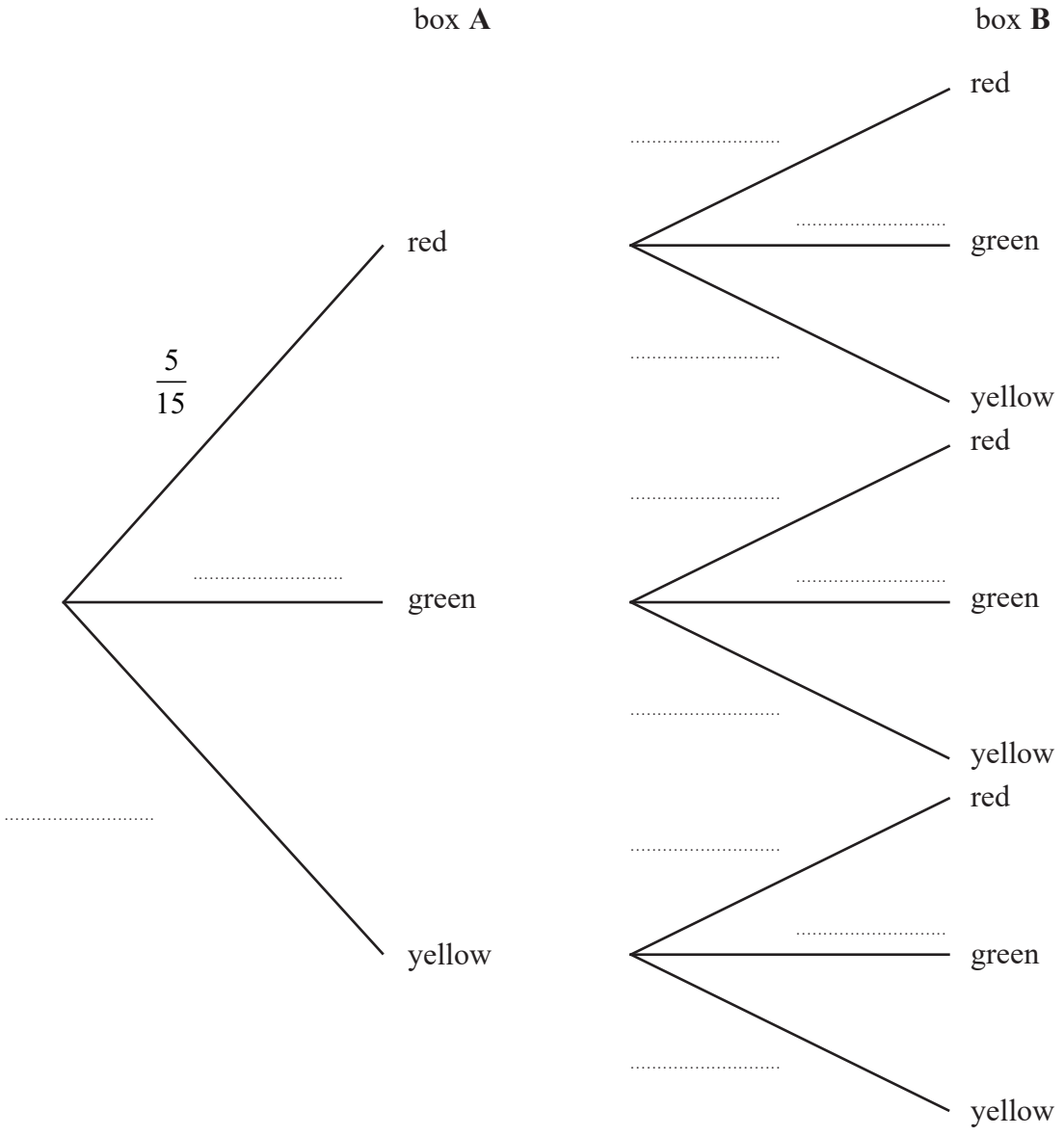
5 are red,
7 are green,
and 3 are yellow.

In box **B** there are 20 bricks of which

8 are red,
9 are green,
and 3 are yellow.

Ami is going to take a brick at random from box **A** and a brick at random from box **B**.
She is going to put these two bricks on a table.

(a) Complete the probability tree diagram.



(3)

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Question 3 continued

(b) Calculate the probability that the two bricks on the table are different colours.

(

Peter has a third box of bricks, box **C**.
This box also contains only red bricks, green bricks and yellow bricks.

After taking a brick from box **A** and a brick from box **B**, Ami then takes at random a brick from box **C**.
Ami then puts this brick with the other two bricks on the table.

The probability that there are three yellow bricks on the table is $\frac{19}{1000}$

(c) Find the least number of bricks that were in box **C** before Ami took a brick from box **C**.

(3)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 9 marks)

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4 $\mathbf{A} = \begin{pmatrix} 4 & 3 \\ -7 & 5 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 11 & -3 \\ 10 & -5 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 5 & 6 \\ -7 & 2 \\ 4 & -1 \end{pmatrix}$

(a) Find $\mathbf{D}$ such that $2\mathbf{A} - \mathbf{B} = 3\mathbf{D}$

(3)

(b) Find $\mathbf{A}^2$

(2)

(c) Find $\mathbf{B}^{-1}$

(2)

(d) Find $\mathbf{CA}$

(2)

$$\left[\textbf{Inverse of matrix } \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix} \right]$$

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Question 4 continued

(Total for Question 4 is 9 marks)

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5 The graph of the straight line with equation $3x + y = 11$ is drawn on the grid oppo for $0 \leqslant x \leqslant 4$

(a) (i) On the grid, draw the graph of the straight line with equation $4x = 3 + 2y$ for $0 \leqslant x \leqslant 4$

(3)

(ii) Use your graphs to find estimates, to one decimal place, of the value of x and the value of y that satisfy the simultaneous equations

$$3x + y = 11$$
$$4x = 3 + 2y$$

(1)

(b) Solve the simultaneous equations

$$4x + xy - x^2 = -10$$
$$3y + x = 7$$

Show clear algebraic working.

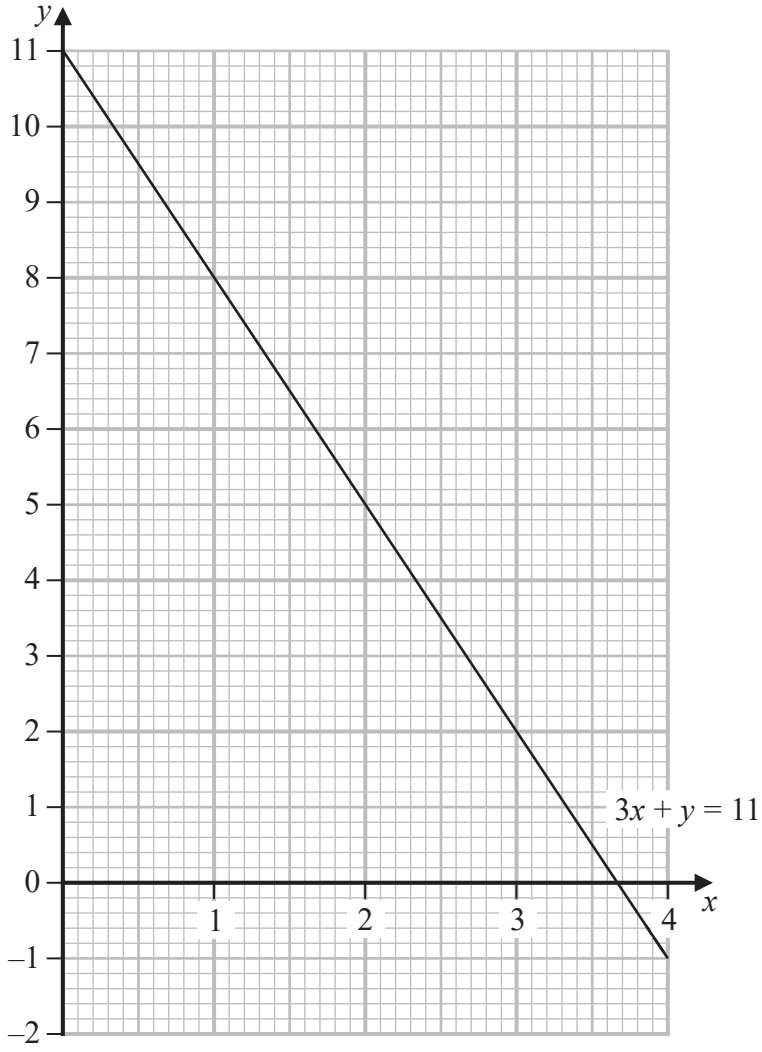
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Question 5 continued



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Question 5 continued

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Question 5 continued

(Total for Question 5 is 10 marks)

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6 Triangle A is drawn on the grid opposite.

Triangle A is reflected in the line with equation $x = -1$ to give triangle B.

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

(2)

Triangle A is transformed to triangle C under a rotation of 90° clockwise about the point with coordinates (1, 0)

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

(2)

Triangle B is transformed to triangle D under the translation $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$

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

(2)

Triangle A is transformed to triangle E under the transformation with matrix $\mathbf{M}$ where

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

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

(2)

Triangle E is the image of triangle C under a **single** transformation.

(e) Describe fully this transformation.

(3)

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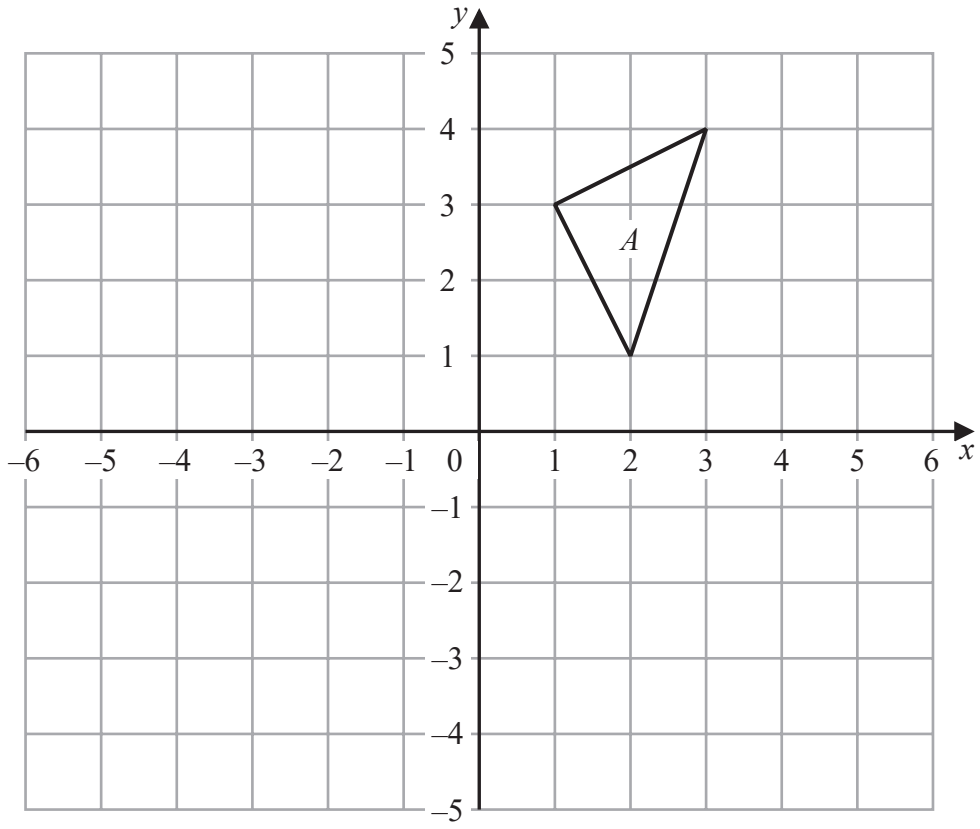
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Question 6 continued



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

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Question 6 continued

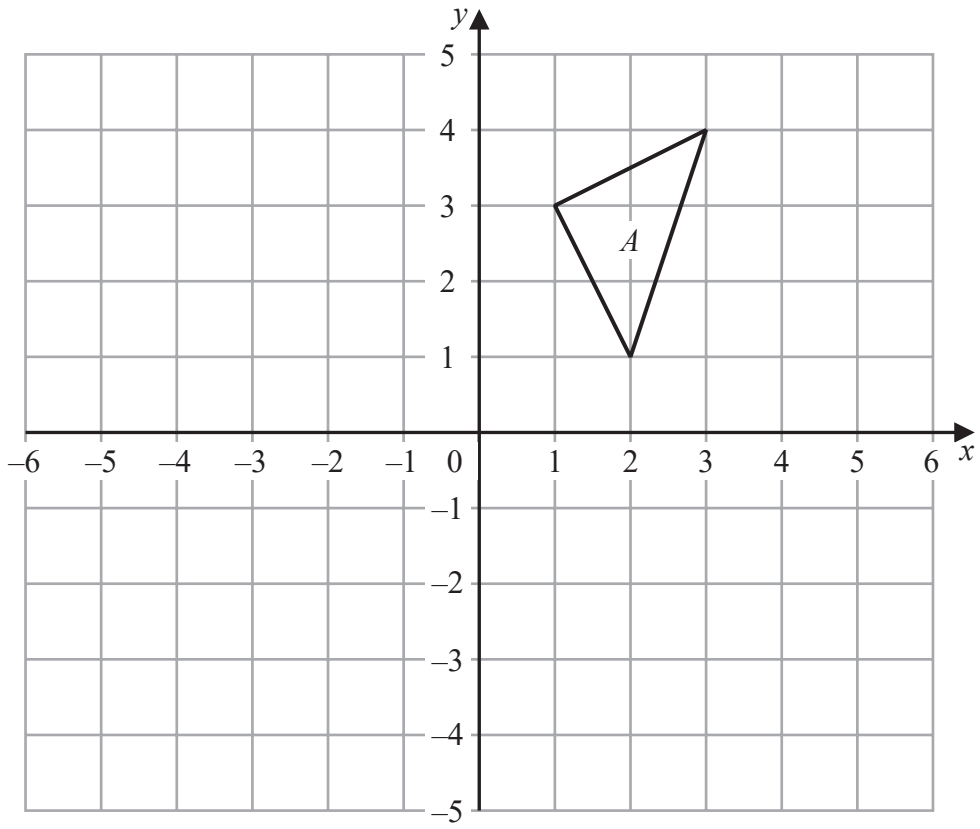
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Question 6 continued

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



(Total for Question 6 is 11 marks)

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7 There are 480 people in an airport departure lounge.

30% of these people are catching a plane to Dubai.

(a) Show that 336 of these people are **not** catching a plane to Dubai.

(2)

The people in the airport lounge who are not catching a plane to Dubai are catching a plane to Sweden or a plane to Greece or a plane to Brazil.

Of these 336 people

the number catching a plane to Sweden is s
the number catching a plane to Greece is g
the number catching a plane to Brazil is b where

$$s : g : b = 6 : 7 : 8$$

(b) Calculate the value of s

(3)

Pablo went by plane from Canada to Brazil in February 2020 and in February 2021

In February 2020, the cost of his ticket was \$680
In February 2021, the cost of his ticket was \$730

(c) Calculate the percentage increase, to one decimal place, in the cost of the ticket from February 2020 to February 2021

(2)

Pablo bought a ticket to go by plane to Sweden in June 2021
The cost of his ticket was \$468

The cost of this ticket was 4% greater than the cost of his ticket the last time he went by plane to Sweden, which was in December 2020

(d) Calculate the cost of Pablo's ticket to Sweden in December 2020

(2)

At the end of his trip, Pablo had 320 Swedish krona left.
He changed the 320 Swedish krona into Canadian dollars.

Using the following exchange rates,

1 Canadian dollar = 0.57 euros 1 Swedish krona = 0.094 euros

(e) calculate the number, to 2 decimal places, of Canadian dollars that Pablo should have received.

(3)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 12 marks)

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8 The equation of a curve C is $y = x^2 - \frac{3}{2}x - 1$

The curve C has a minimum at the point A

(a) Show that the coordinates of A are $(0.75, -1.5625)$

(4)

(b) Complete the table of values for $y = x^2 - \frac{3}{2}x - 1$

x	–3	–2	–1	0	1	2	3	4
y	12.5						3.5	

(3)

The point A has been plotted on the grid opposite.

(c) On the grid opposite, draw the curve with equation $y = x^2 - \frac{3}{2}x - 1$ for values of x from –3 to 4

(3)

(d) Using your curve, find an estimate, to one decimal place, for the range of values of x for which $x^2 - \frac{3}{2}x - 1 \leqslant 3$

Show your working clearly.

(2)

(e) By drawing a suitable straight line on the grid, find estimates, to one decimal place, of the solutions of the equation $x^2 - \frac{7}{2}x = \frac{1}{2}$

Show your working clearly.

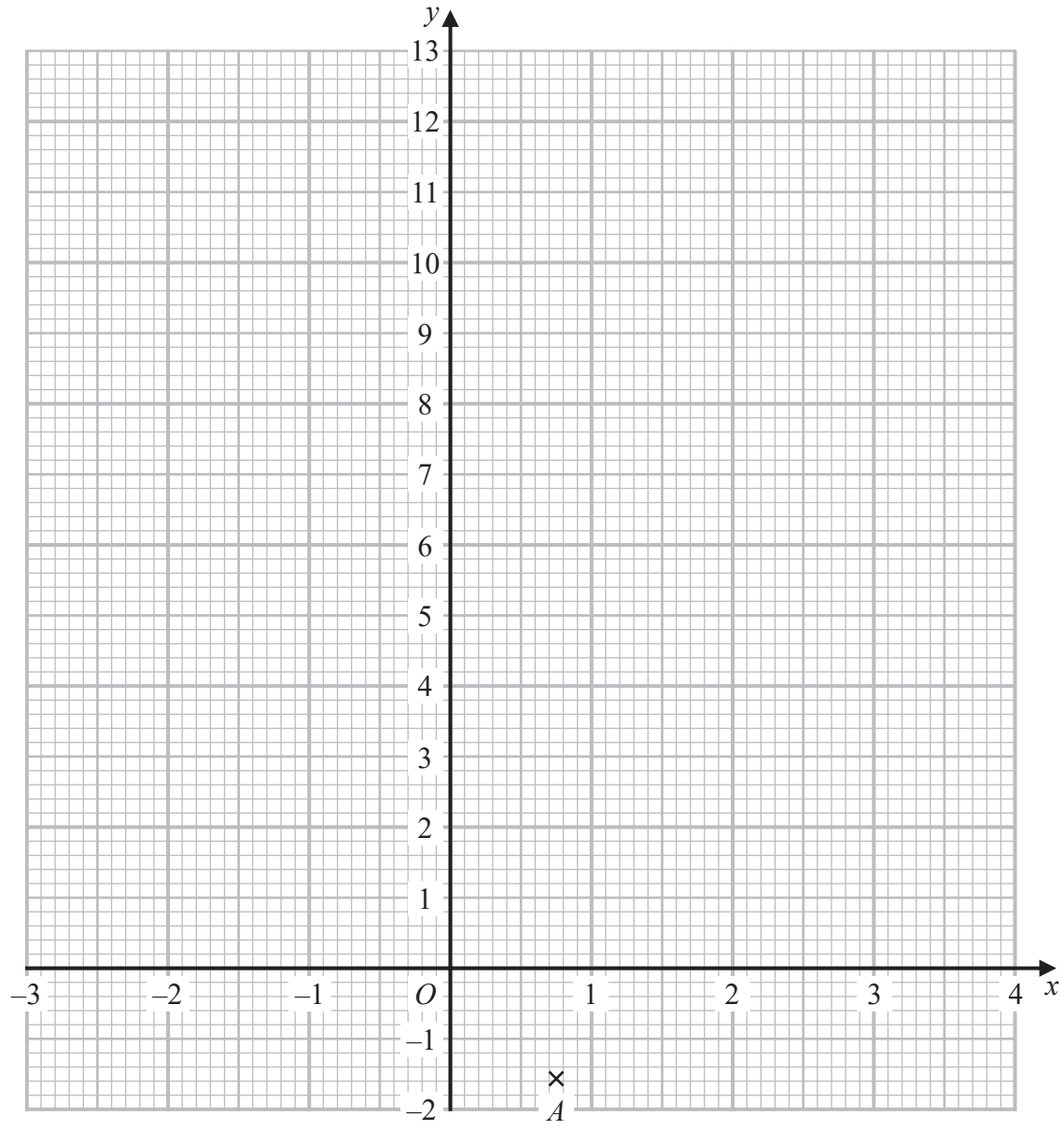
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Question 8 continued



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

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Question 8 continued

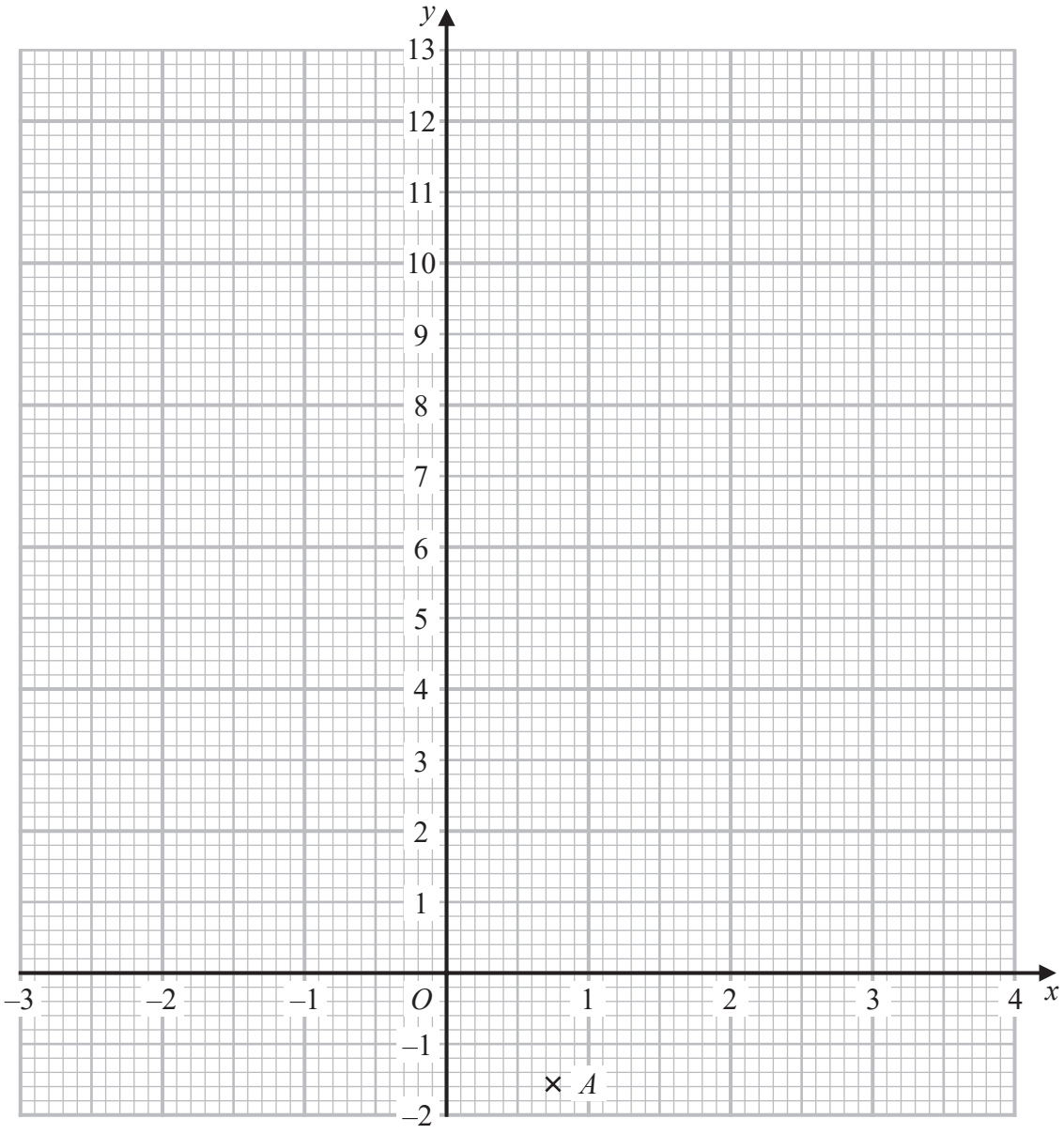
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Question 8 continued

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(Total for Question 8 is 15 marks)

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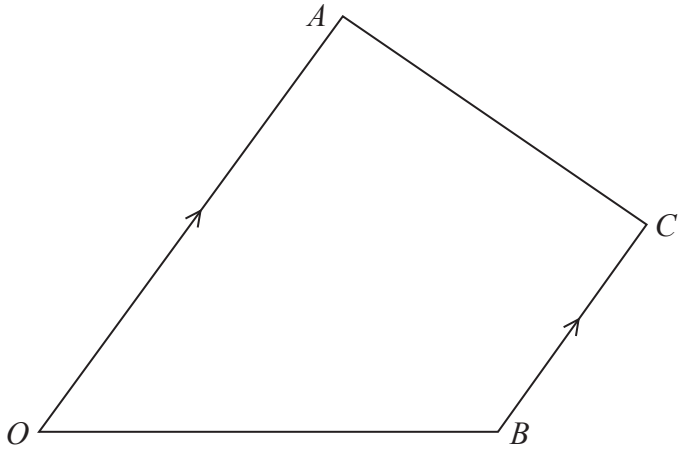


Diagram **NOT** accurately drawn

Figure 1

Figure 1 shows a trapezium $OACB$ in which OA is parallel to BC and $OA : BC = 2 : 1$

The point P lies on AC such that $AP : PC = 3 : 1$

The point D is such that $\overrightarrow{OD} = \lambda \overrightarrow{OP}$ where $\lambda > 1$ and such that BCD is a straight line.

Given that $\overrightarrow{OA} = 6\mathbf{a}$ and that $\overrightarrow{OB} = 8\mathbf{b}$

use a vector method to find and simplify an expression, in terms of **a** and **b** only, for $\overrightarrow{AD}$
Show your working clearly.

(6)

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Question 9 continued

(Total for Question 9 is 6 marks)

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10

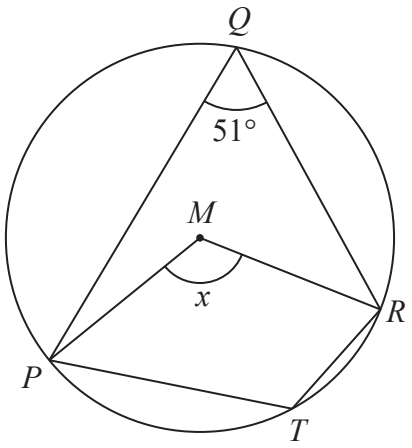


Diagram **NOT** accurately drawn

Figure 2

In Figure 2, P, Q, R and T are points on a circle with centre M such that $\angle PQR = 51°$

(a) Find the size, in degrees, of the angle marked x in Figure 2

(1)

(b) Find the size, in degrees, of the obtuse angle PTR.

(1)

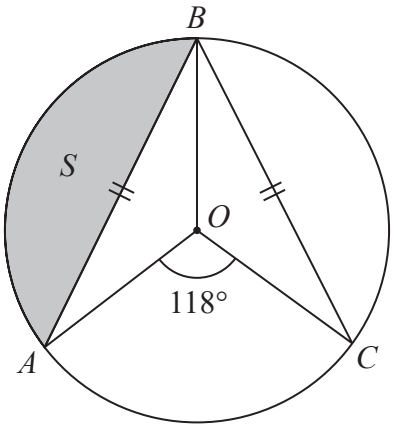


Diagram **NOT** accurately drawn

Figure 3

In Figure 3, A, B and C are points on a circle with centre O such that $\angle AOC = 118°$ and $BA = BC$.

The area of the region S, shown shaded in Figure 3, is $70\,\text{cm}^2$

(c) Calculate the total area, in cm^2 to 3 significant figures, of the unshaded region inside the circle.

(5)

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

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Question 10 continued

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Diagram **NOT** accurately drawn

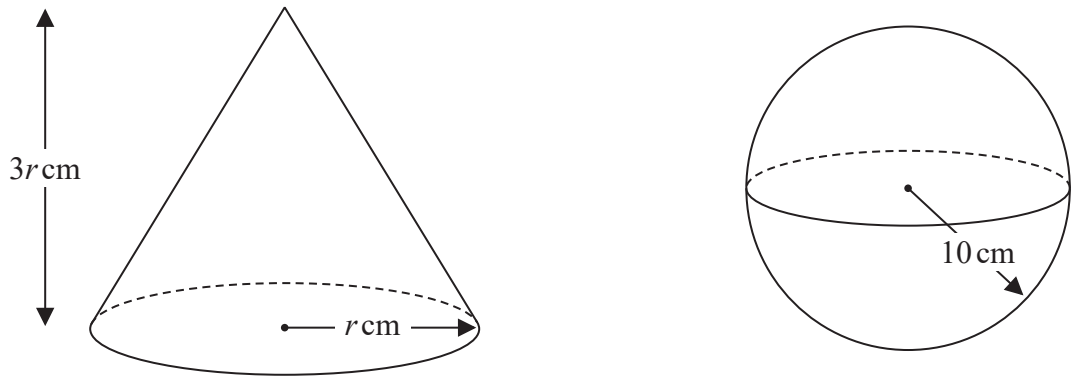


Figure 4

Figure 4 shows a solid right circular cone of radius r cm and height $3r$ cm and a sphere of radius 10 cm.

The total surface area of the cone is equal to the surface area of the sphere.

(a) Calculate the value, to one decimal place, of r

(4)

$$\left[\begin{array}{c}\textbf{Curved surface area of cone} = \pi rl \\ \textbf{Surface area of sphere} = 4\pi r^2\end{array}\right]$$

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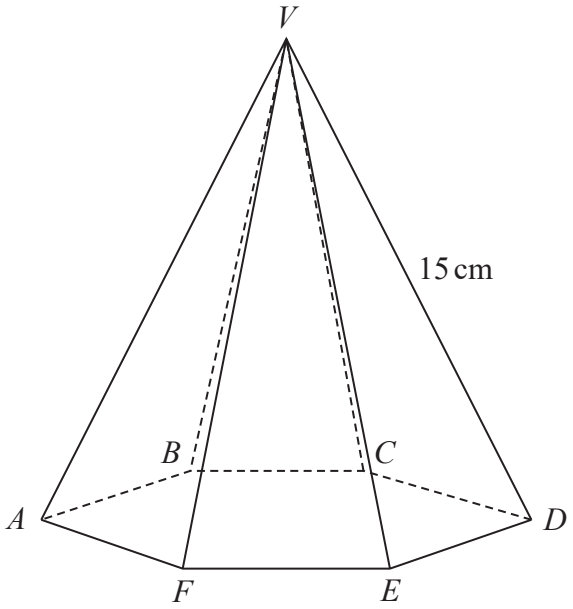
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Question 11 continued

Question 11 continues on page 34

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Figure 5

Figure 5 shows a right pyramid.

The base $ABCDEF$ of the pyramid is a regular hexagon and the vertex V of the pyramid is such that
$AV = BV = CV = DV = EV = FV = 15\,\text{cm}$ and $\angle AVD = 40°$

(b) Calculate the volume, in cm^3 to 3 significant figures, of the pyramid.

(5)

$$\left[\begin{array}{c} \textbf{Area of triangle} = \frac{1}{2}ab\sin C \\ \textbf{Volume of pyramid} = \frac{1}{3} \times \text{base area} \times \text{height} \end{array}\right]$$

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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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