Write your name here

Surname	Other names

Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Paper 2R

Tuesday 21 May 2013 – Morning
Time: 2 hours 30 minutes

Paper Reference
4MB0/02R

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 2 9 3 5 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 Solve the simultaneous equations

$$3x - 2y = 10$$

$$2x - 3y = 5$$

Question 1 continued

(Total for Question 1 is 4 marks)

2

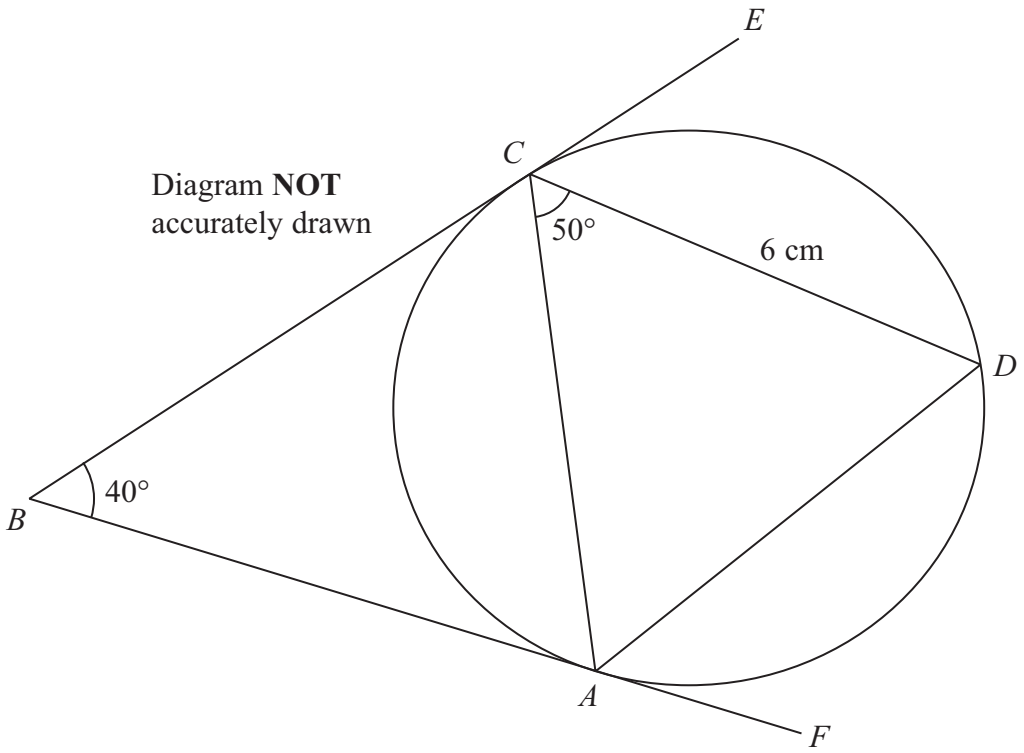

Figure 1

In Figure 1, BCE is the tangent to the circle ACD at C and BAF is the tangent to the circle at A.

Given that $\angle ABC = 40°$ and $\angle ACD = 50°$,

(a) find the size of $\angle CAD$. Give your reasons.

(3)

Given also that $CD = 6$ cm,

(b) calculate the length, in cm to 3 significant figures, of AD.

(3)

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

Question 2 continued

(Total for Question 2 is 6 marks)

3 The curve C has the equation $y = 6 - x - x^2$

(a) Show that the coordinates of the stationary point of C are $\left(-\frac{1}{2}, 6\frac{1}{4}\right)$.

(4)

(b) (i) Find the gradient of the curve C at each of the points where $x = -1$ and $x = 0$

(ii) Hence, or otherwise, explain why the stationary point of C is a maximum.

(2)

Question 3 continued

(Total for Question 3 is 6 marks)

4 172 people went to a market.

The incomplete Venn diagram in Figure 2 shows information about the 172 people who went to the market and about the numbers of these people who bought combinations of fruit (F), vegetables (V) and meat (M).

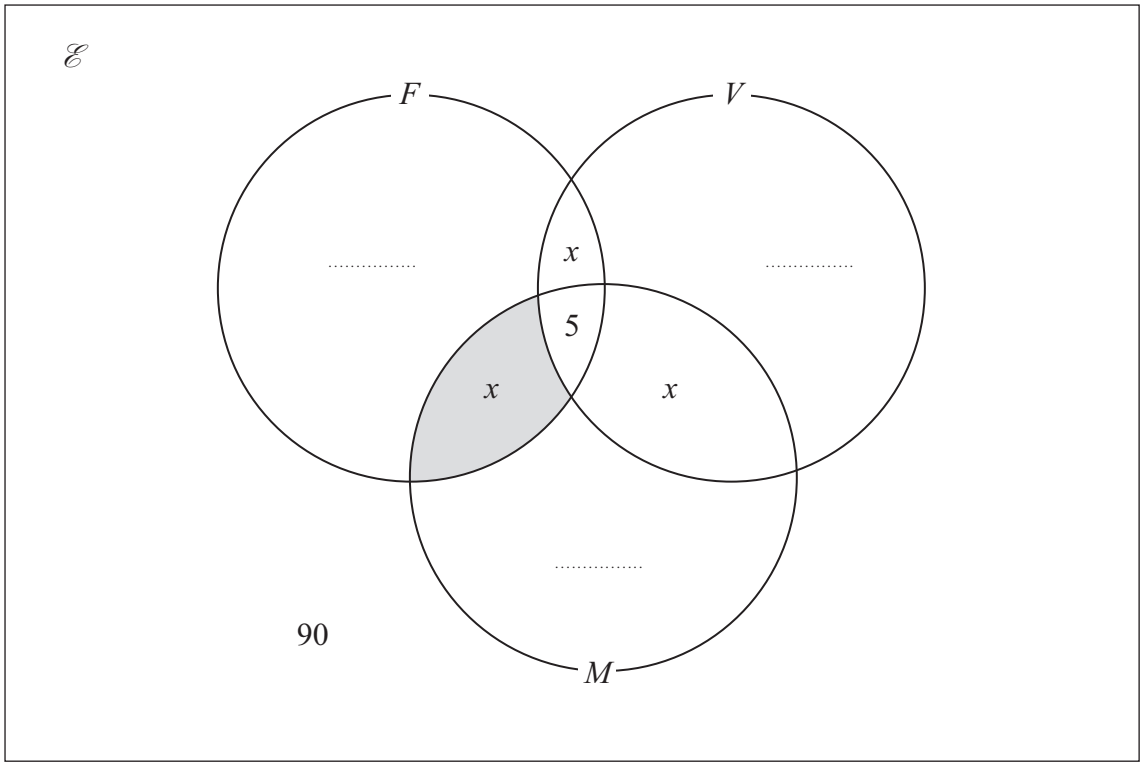

Figure 2

(a) Explain what the number 90 in the Venn diagram represents.

(1)

Given that n(F) = 60, n(V) = 30 and n(M) = 20,

(b) complete the Venn diagram.

Give your answers in terms of x where appropriate.

(2)

(c) Describe, in set notation, the shaded region of the Venn diagram.

(1)

(d) Calculate the value of x

(3)

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Question 4 continued

(Total for Question 4 is 7 marks)

5 Mariam walked $(3x + 5)$ kilometres in $(x + 3)$ hours.

Her average speed for this journey was $\frac{2x}{3}$ km/h.

(a) Show that $2x^2 - 3x - 15 = 0$

(3)

(b) Calculate the distance, in kilometres to 3 significant figures, that Mariam walked.

(4)

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

Question 5 continued

(Total for Question 5 is 7 marks)

6 (a) Given that $\mathbf{M} + \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \\ 3 \end{pmatrix}$

write down the matrix **M**.

(2)

(b) Given that

$$2\begin{pmatrix} 3 & a-1 \\ c-1 & 2 \end{pmatrix} + \begin{pmatrix} 4 & 2-4b \\ 2-5d & 2 \end{pmatrix} = \begin{pmatrix} a & 12 \\ 2-c & 3d \end{pmatrix}$$

find the values of a, b, c and d.

(8)

Question 6 continued

(Total for Question 6 is 10 marks)

7 Umar has two unbiased six-sided dice, one coloured yellow and one coloured blue.
The dice are numbered as shown below.

Yellow die	1	2	2	2	3	6
Blue die	1	2	3	4	5	6

Umar throws both dice once and adds together the scores on the dice. He calls this the Total Score.

The table below shows some of the possible Total Scores.

		Yellow die					
		1	**2**	**2**	**2**	**3**	**6**
Blue die	**1**	2	3	3	3	4	7
	2	3	4	4	4	5	8
	3	4	5	5	5	6	9
	4	5	6	6			
	5	6	7	7			
	6						

(a) Complete the table.

(2)

Umar throws both dice once.

(b) Use your table to write down the probability that

(i) the Total Score is 2
(ii) the Total Score is less than 5

(2)

Umar throws both dice once and he then throws both dice again.
He adds together both Total Scores to get a Grand Total.

(c) Use your table to calculate the probability that the Grand Total is

(i) 4

(ii) 9

(6)

Question 7 continued

(Total for Question 7 is 10 marks)

8 The points $A(2, 2)$, $B(4, 2)$ and $C(6, 4)$ are the vertices of a triangle.

(a) On the graph paper opposite, draw and label ΔABC.

(1)

ΔDEF is the image of ΔABC under the enlargement with scale factor $\frac{1}{2}$ and centre of enlargement $(0, 0)$.

(b) On the graph paper, draw and label ΔDEF.

(2)

The matrix $\mathbf{S} = \begin{pmatrix} 0 & 4 \\ -4 & 0 \end{pmatrix}$

ΔDEF is transformed to ΔPQR, where P, Q and R are respectively the images of D, E and F under the transformation with matrix $\mathbf{S}$.

(c) On the graph paper, draw and label ΔPQR.

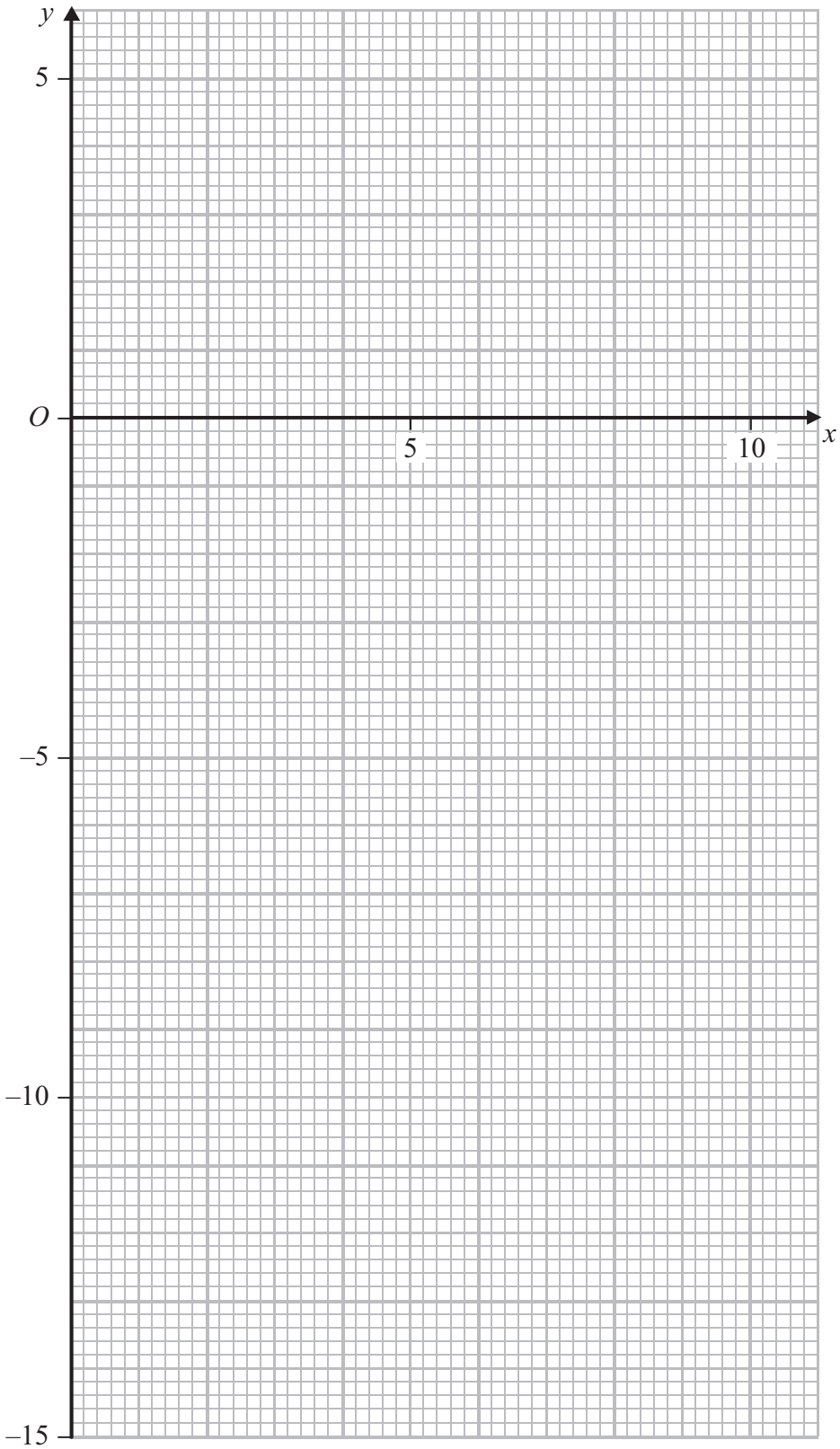
(3)

ΔABC is mapped onto ΔPQR by a rotation followed by an enlargement.

(d) Describe fully the rotation and the enlargement.

(3)

Question 8 continued



Question 8 continued

Question 8 continued

(Total for Question 8 is 9 marks)

9

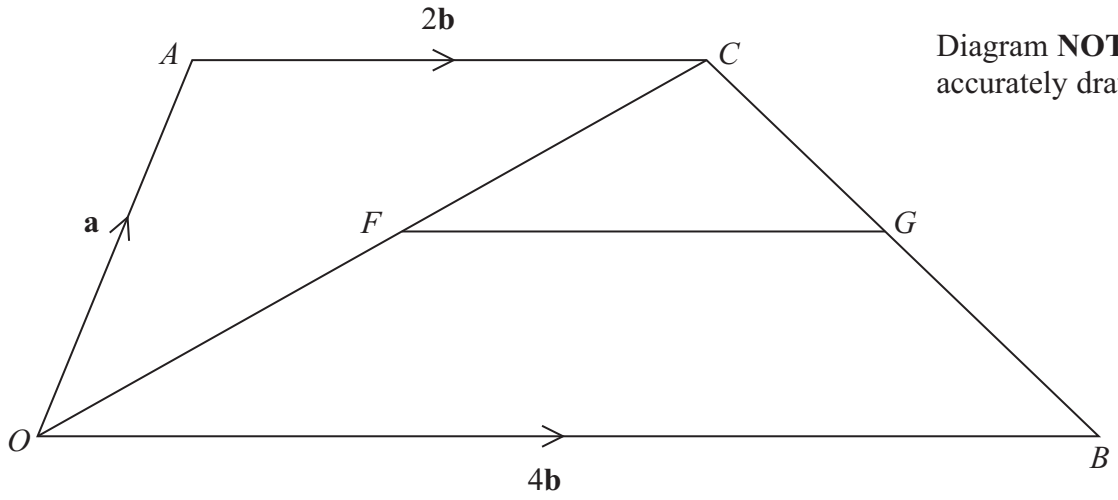


Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows a quadrilateral $OACB$ where $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = 4\mathbf{b}$ and $\overrightarrow{AC} = 2\mathbf{b}$

The point F on OC is such that $OF : OC = 2 : 5$

The point G on CB is such that $CG : CB = 3 : 5$

(a) Find, in terms of **a** and **b**

(i) $\overrightarrow{OC}$

(ii) $\overrightarrow{CG}$

(4)

(b) (i) Show that $\overrightarrow{FG} = \lambda\mathbf{b}$, where λ is a constant. Write down the value of λ.

(ii) Write down the geometrical name of quadrilateral $OFGB$.

(4)

Given that ΔOCB is similar to ΔFCG,

(c) find the ratio (area of ΔOCB) : (area of ΔFCG) in the form $m : n$ where m and n are integers.

(3)

Given that the area of ΔFCG is 18 cm^2,

(d) calculate the area, in cm^2, of ΔOCB.

(2)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 13 marks)

10

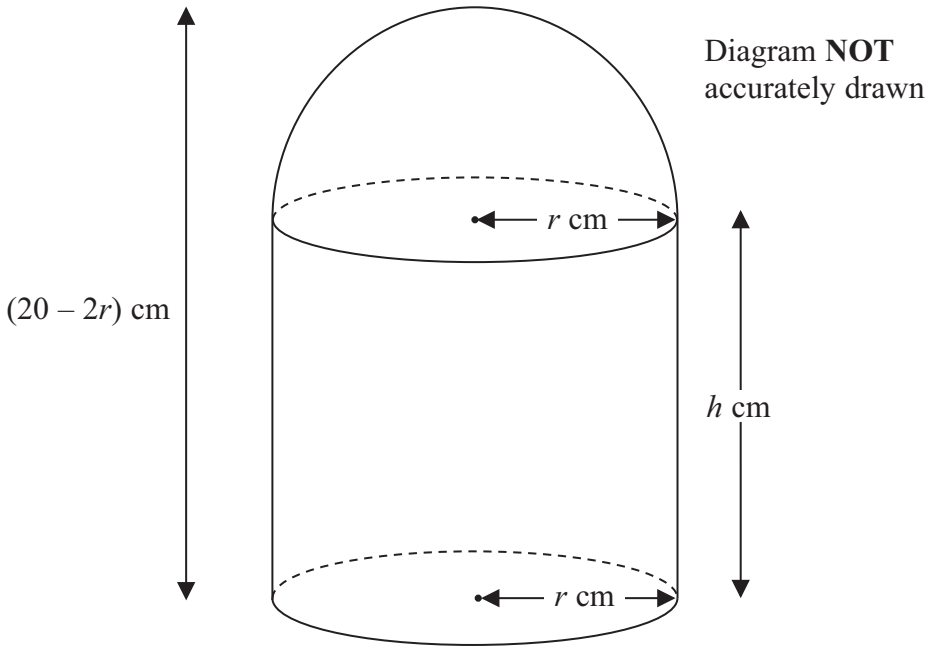


Figure 4

Figure 4 shows a solid which is made of a hemisphere of radius r cm on top of a cylinder of radius r cm. The centre of the hemisphere coincides with the centre of the upper circular face of the cylinder.

Given that the total height of the solid is $(20 - 2r)$ cm and that the height of the cylinder is h cm,

(a) explain why $h = 20 - 3r$

(1)

Given that the total volume of the solid is V cm^3 and $\frac{V}{\pi} = y$

(b) show that

$$y = r^2\left(20 - \frac{7}{3}r\right)$$

(4)

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

Question 10 continued

Question 10 continues on page 26

Question 10 continued

(c) Complete the following table for $y = r^2\left(20 - \frac{7}{3}r\right)$, giving the values of y to the nearest integer.

r	0	1	2	3	4	5	6	6.5
y	0	18		117		208		204

(3)

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

(3)

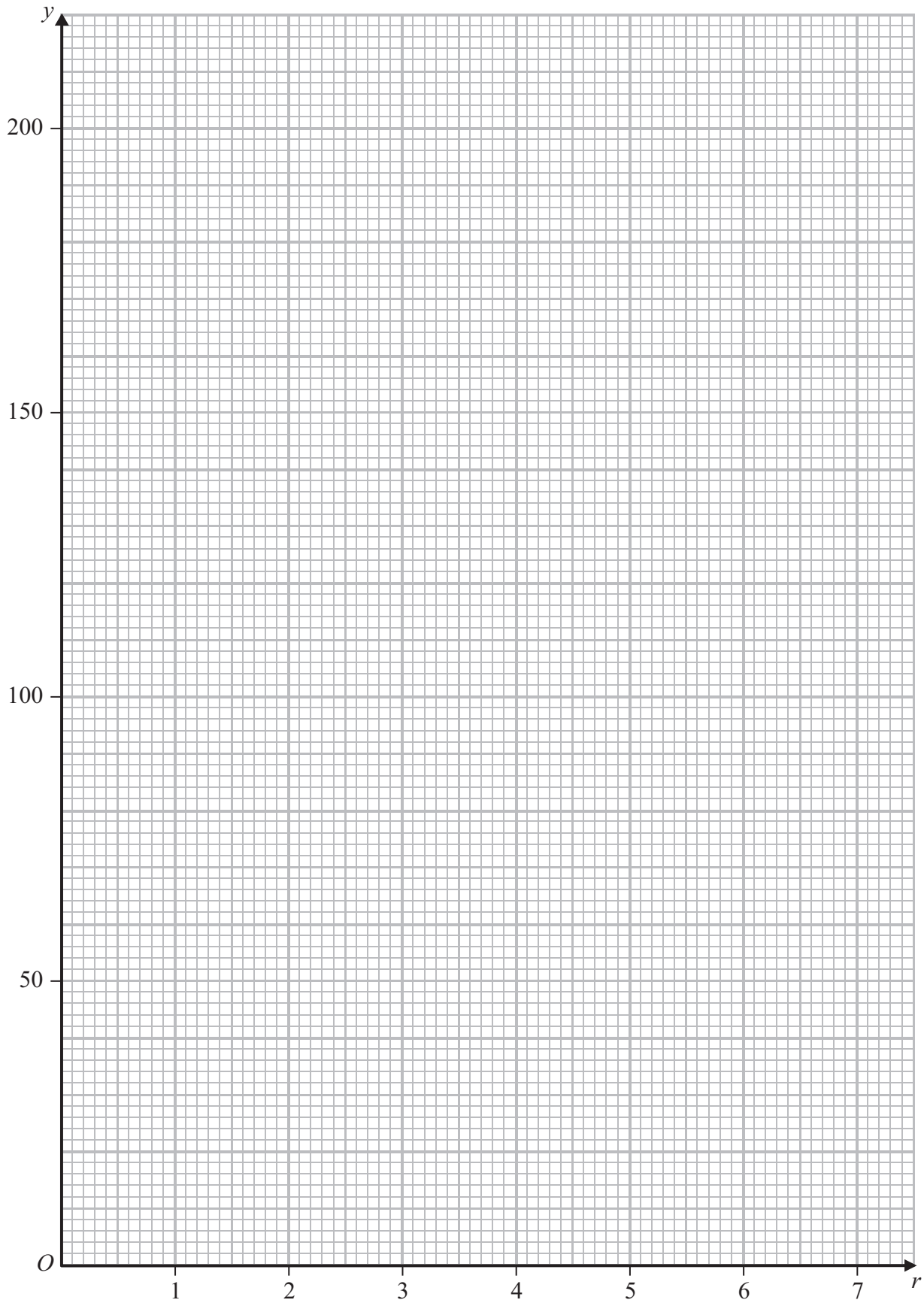
(e) Using your curve, find in terms of π, the maximum volume $V\,\text{cm}^3$ of the solid.

(1)

(f) From your curve, find the range of values of r for which $y \geqslant 210$

(2)

Question 10 continued



(Total for Question 10 is 14 marks)

11

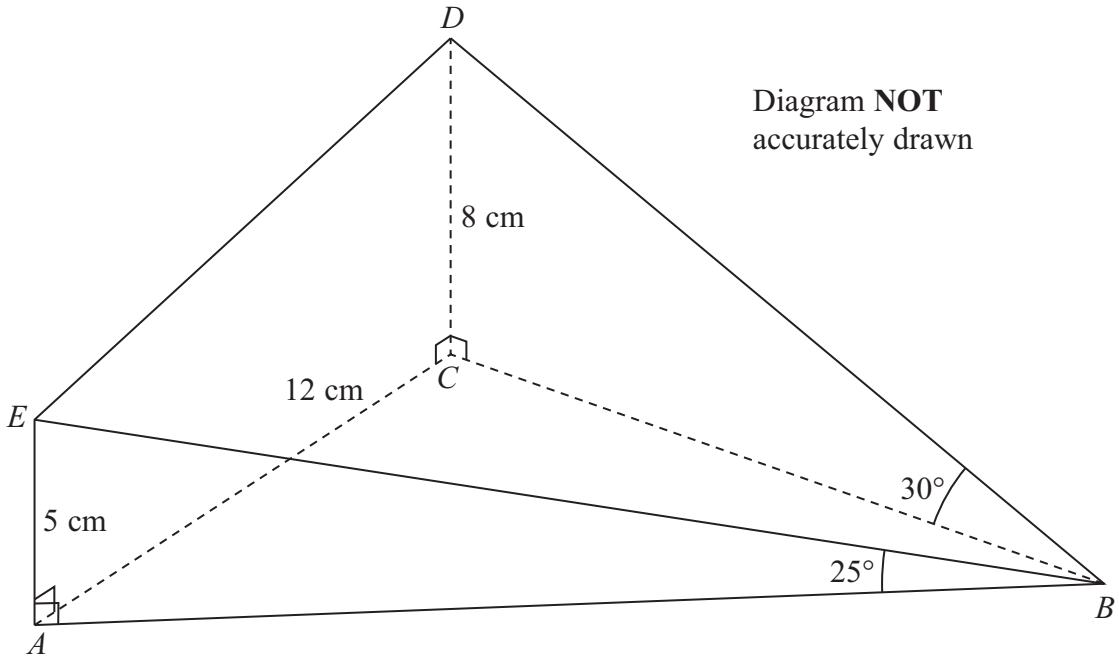


Figure 5

Figure 5 shows a solid *ABCDE*. The base of the solid is a triangle, *ABC*, that lies on a horizontal plane and the edges of the solid, *AE* and *CD*, are vertical.

In *ABCDE*, $AE = 5$ cm, $CD = 8$ cm and $AC = 12$ cm with $\angle ABE = 25°$ and $\angle CBD = 30°$

Calculate the length, in cm to 3 significant figures, of

(a) *BE*,

(2)

(b) *ED*.

(3)

(c) Calculate the size, in degrees to 3 significant figures, of $\angle EBD$.

(4)

The faces *BED* and *ACDE* are to be painted.

(d) Calculate the total surface area, in cm^2 to 3 significant figures, to be painted.

(5)

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

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS

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