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Edexcel

International GCSE

Centre Number

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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 ►

P42935A

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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

$$3x - 2y = 10$$

$$2x - 3y = 5$$

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Question 1 continued

Dotted lines for writing.

(Total for Question 1 is 4 marks)



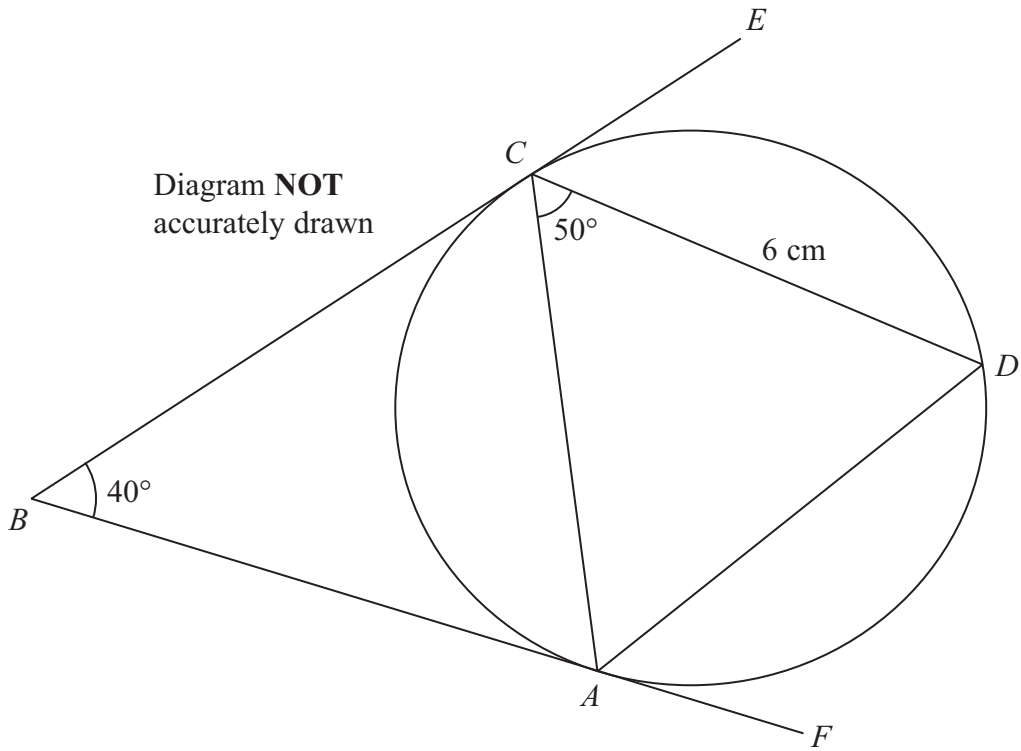


Figure 1

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 $\angle ABC = 40^\circ$ and $\angle ACD = 50^\circ$,

(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)

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

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Question 2 continued

Dotted lines for writing.

(Total for Question 2 is 6 marks)



Question 3 continued

[Dotted lines for writing]

(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).

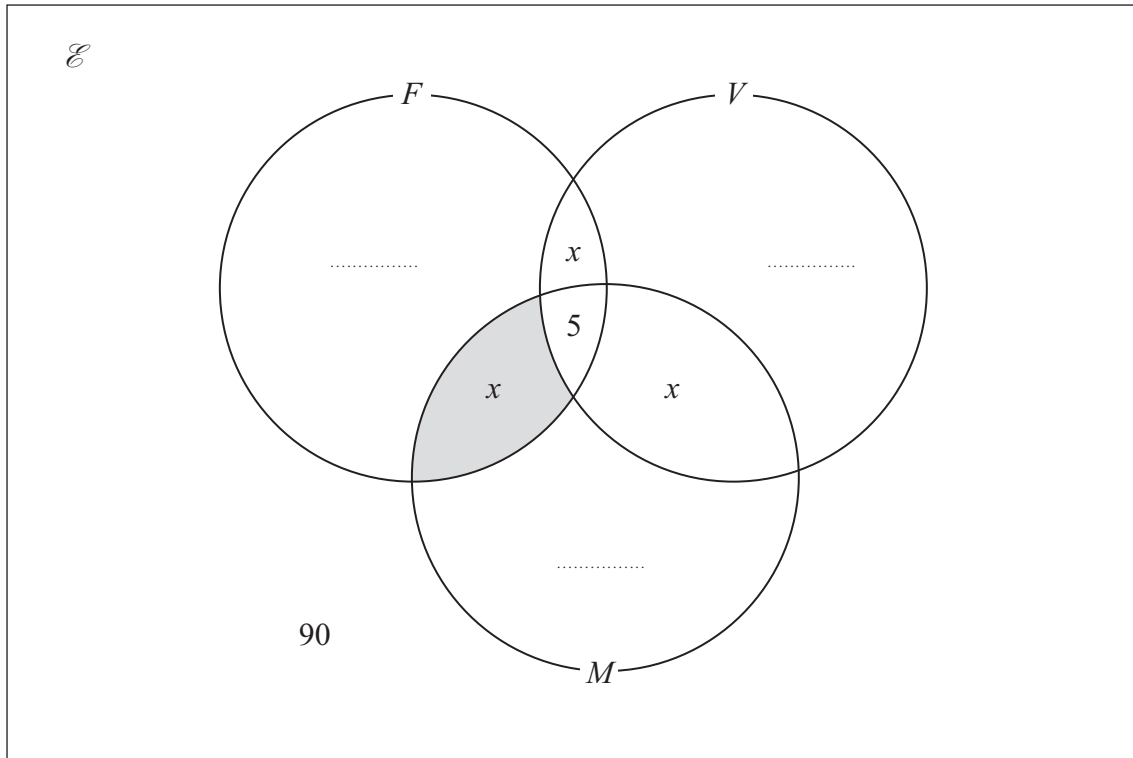


Figure 2

(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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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)

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

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Question 5 continued

Ruled area for writing the answer to Question 5.

(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 \mathbf{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)

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Question 6 continued

Handwritten response area consisting of approximately 30 horizontal dotted lines.

(Total for Question 6 is 10 marks)



P 4 2 9 3 5 A 0 1 3 3 2

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)

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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 $\triangle ABC$.

(1)

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

(b) On the graph paper, draw and label $\triangle DEF$.

(2)

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

$\triangle DEF$ is transformed to $\triangle PQR$, where P , Q and R are respectively the images of D , E and F under the transformation with matrix S .

(c) On the graph paper, draw and label $\triangle PQR$.

(3)

$\triangle ABC$ is mapped onto $\triangle PQR$ by a rotation followed by an enlargement.

(d) Describe fully the rotation and the enlargement.

(3)

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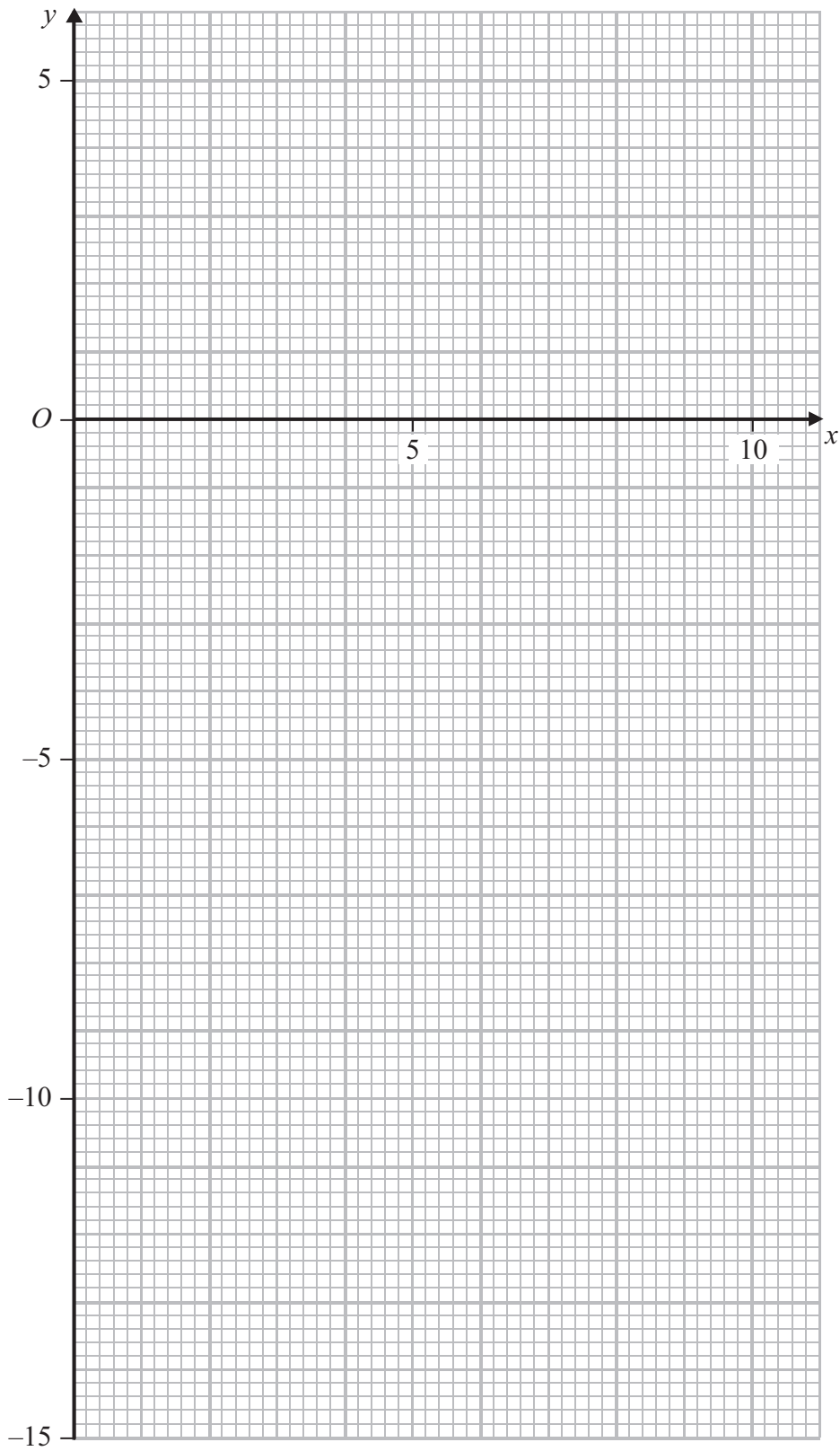
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Question 8 continued



Question 8 continued

A series of horizontal dotted lines for writing.



Question 8 continued

A series of horizontal dotted lines for writing, spanning the width of the page.

(Total for Question 8 is 9 marks)



P 4 2 9 3 5 A 0 1 9 3 2

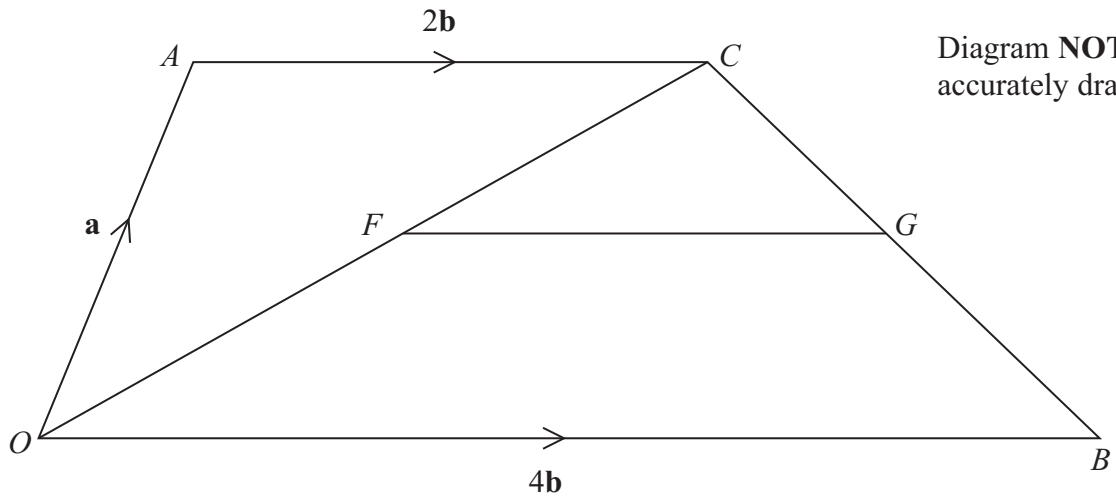


Figure 3

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

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 \mathbf{a} and \mathbf{b}

(i) \vec{OC}

(ii) \vec{CG}

(4)

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

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

(4)

Given that $\triangle OCB$ is similar to $\triangle FCG$,

(c) find the ratio (area of $\triangle OCB$) : (area of $\triangle FCG$) in the form $m : n$ where m and n are integers.

(3)

Given that the area of $\triangle FCG$ is 18 cm^2 ,

(d) calculate the area, in cm^2 , of $\triangle OCB$.

(2)

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Question 9 continued

Ruled writing area with horizontal dotted lines.



P 4 2 9 3 5 A 0 2 1 3 2

Question 9 continued

A series of horizontal dotted lines for writing.



Question 9 continued

Dotted lines for writing the answer.

(Total for Question 9 is 13 marks)



10

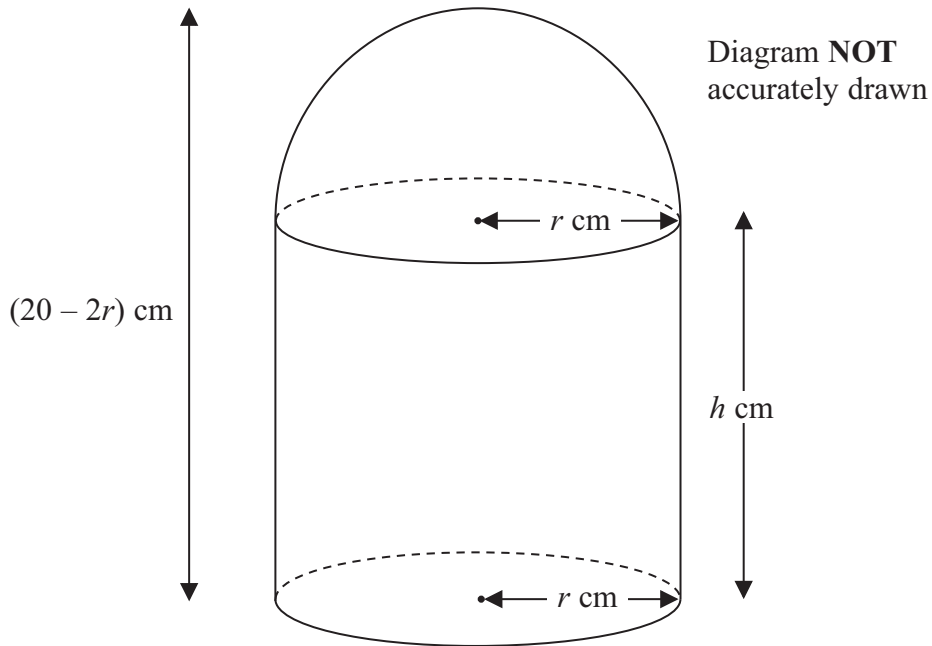


Figure 4

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 cm³ and $\frac{V}{\pi} = y$

(b) show that

$$y = r^2 \left(20 - \frac{7}{3}r \right) \tag{4}$$

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



Question 10 continued

(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 $y \geq 210$

(2)

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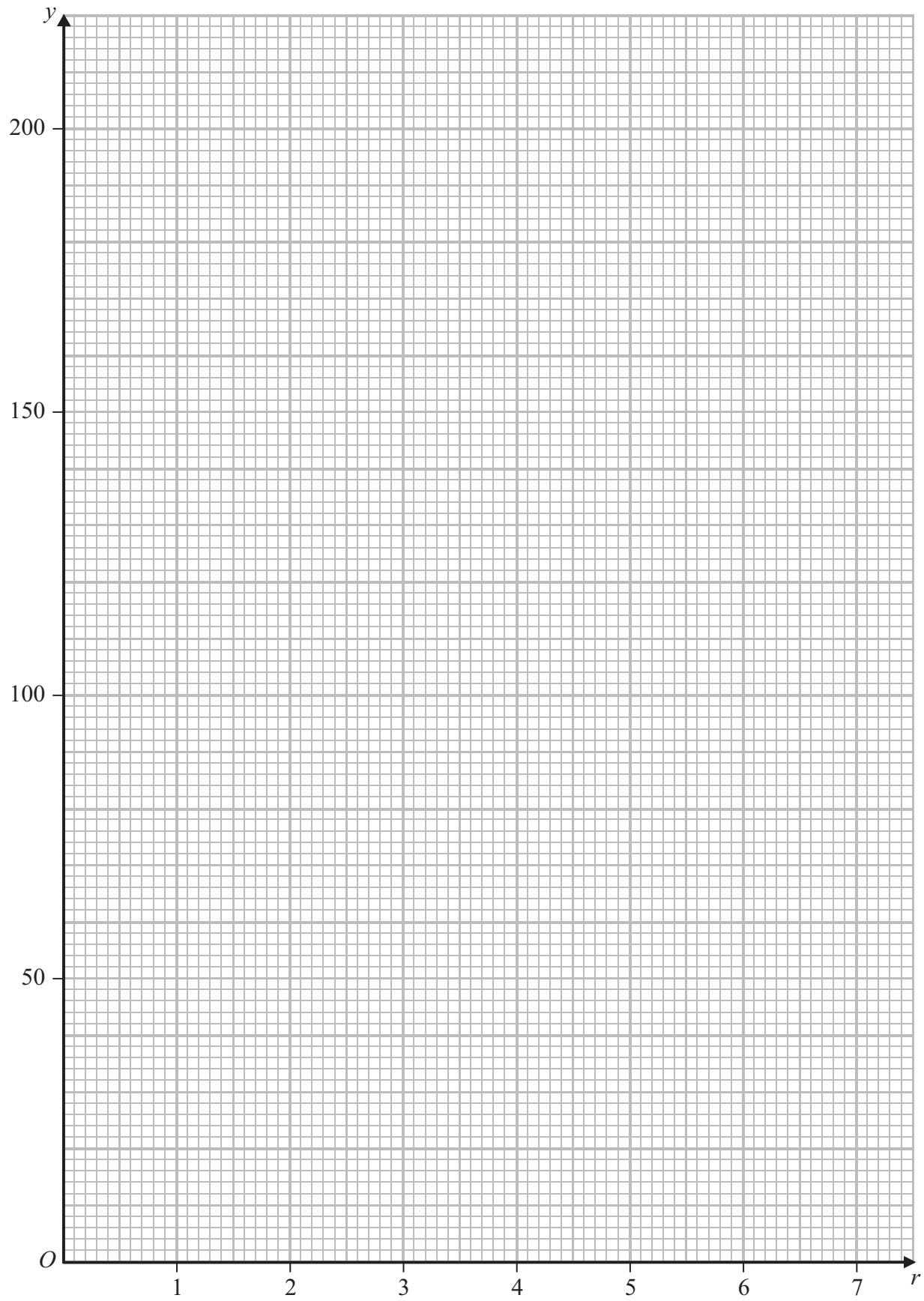
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Question 10 continued



(Total for Question 10 is 14 marks)



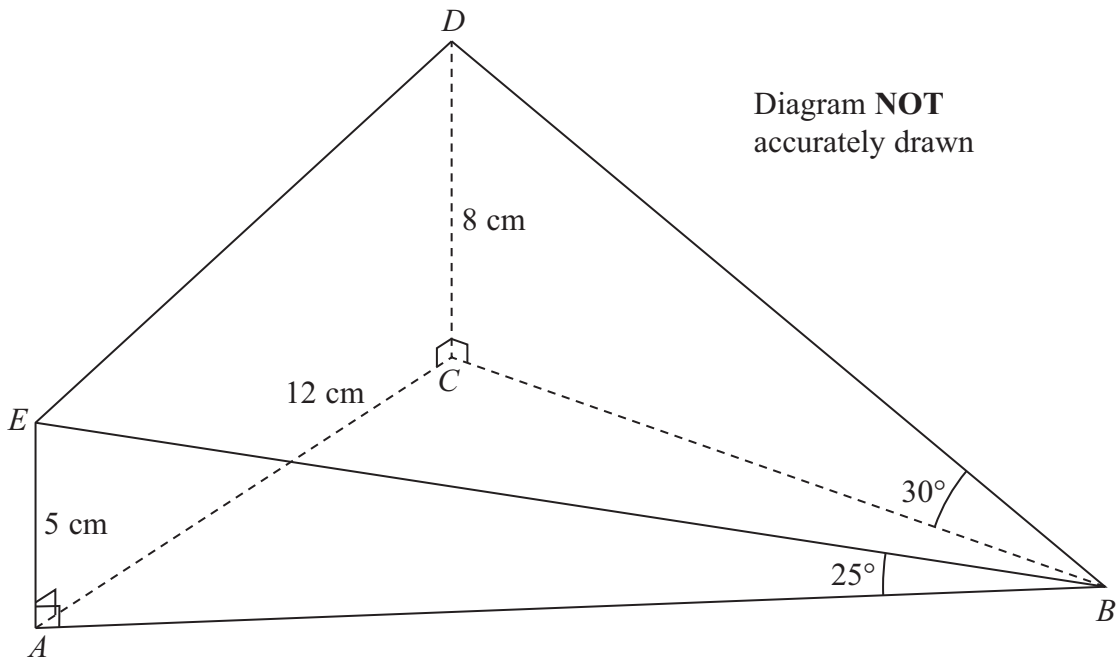


Diagram NOT accurately drawn

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 $\angle ABE = 25^\circ$ and $\angle CBD = 30^\circ$

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)

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

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Question 11 continued

Handwriting practice area consisting of multiple horizontal dotted lines.



Question 11 continued

A series of horizontal dotted lines for writing.



Question 11 continued

Dotted lines for writing.

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS



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