

Write your name here

Surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics B

Paper 2



Tuesday 19 January 2016 – Morning
Time: 2 hours 30 minutes

Paper Reference

4MB0/02

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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2 (a) Find the inverse of the matrix $\begin{pmatrix} 3 & -2 \\ 5 & -1 \end{pmatrix}$

(2)

(b) Hence, or otherwise, find the value of x and the value of y that satisfy

$$\begin{pmatrix} 3 & -2 \\ 5 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ 9 \end{pmatrix}$$

(4)

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

(Total for Question 2 is 6 marks)



Question 3 continued

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(Total for Question 3 is 6 marks)



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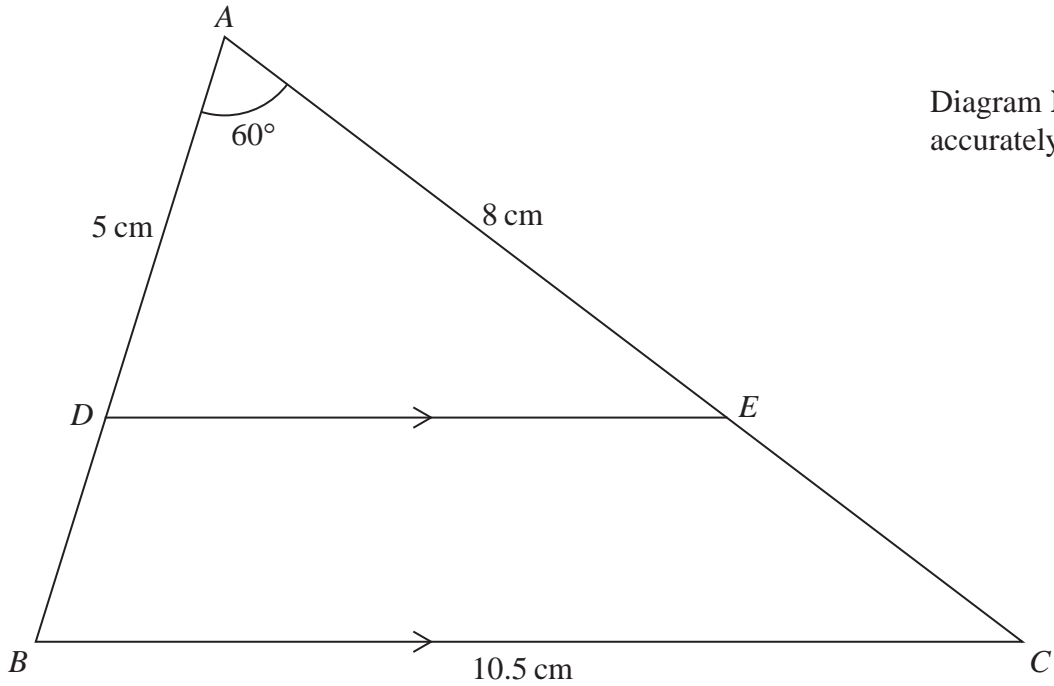


Figure 1

In $\triangle ADE$, $AD = 5$ cm, $AE = 8$ cm and $\angle DAE = 60^\circ$ as shown in Figure 1.

(a) Calculate the length, in cm, of DE .

(3)

In Figure 1, D is a point on AB and E is a point on AC so that DE is parallel to BC .

$BC = 10.5$ cm.

(b) Calculate the length, in cm, of BD .

(2)

Given that the area of $\triangle ADE$ is 17.3 cm² to 3 significant figures,

(c) calculate the area, in cm², of $\triangle ABC$.

(2)

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

6



Question 4 continued

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(Total for Question 4 is 7 marks)



Question 5 continued

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(Total for Question 5 is 9 marks)



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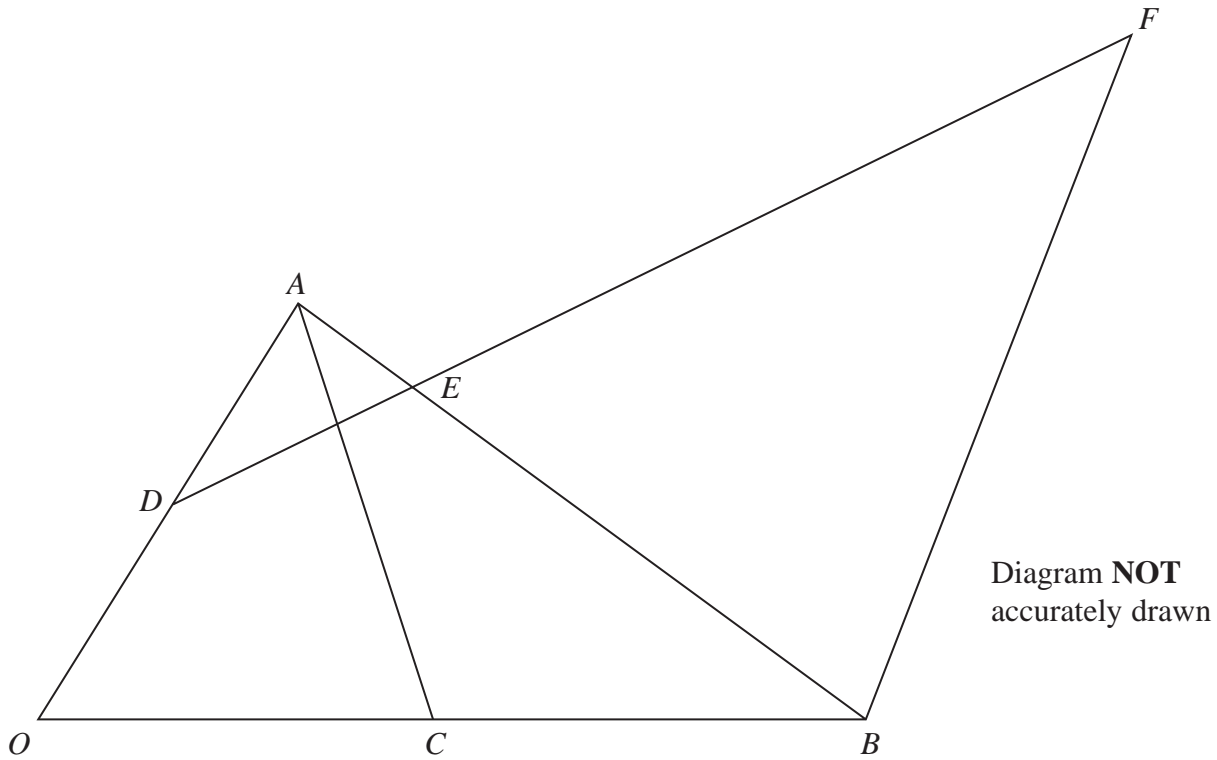


Figure 2

Figure 2 shows $\triangle OAB$ in which $\vec{OA} = 2\mathbf{a}$ and $\vec{OB} = 12\mathbf{b}$

The point D is the midpoint of OA and the point C is the midpoint of OB .

The point E on AB is such that $AE : EB = 1 : 4$

(a) Find in terms of \mathbf{a} and \mathbf{b} , simplifying your answers where possible,

(i) \vec{AB} (ii) \vec{AE} (iii) \vec{DE} (4)

The point F is such that DEF is a straight line and $\vec{BF} = m\mathbf{a}$, where m is a scalar.

(b) Write down \vec{EF} in terms of \mathbf{a} , \mathbf{b} and m . (1)

Given that $\vec{DE} = n\vec{EF}$, where n is a scalar,

(c) find the value of m and the value of n . (5)

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Question 6 continued

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Question 6 continued

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Question 6 continued

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(Total for Question 6 is 10 marks)



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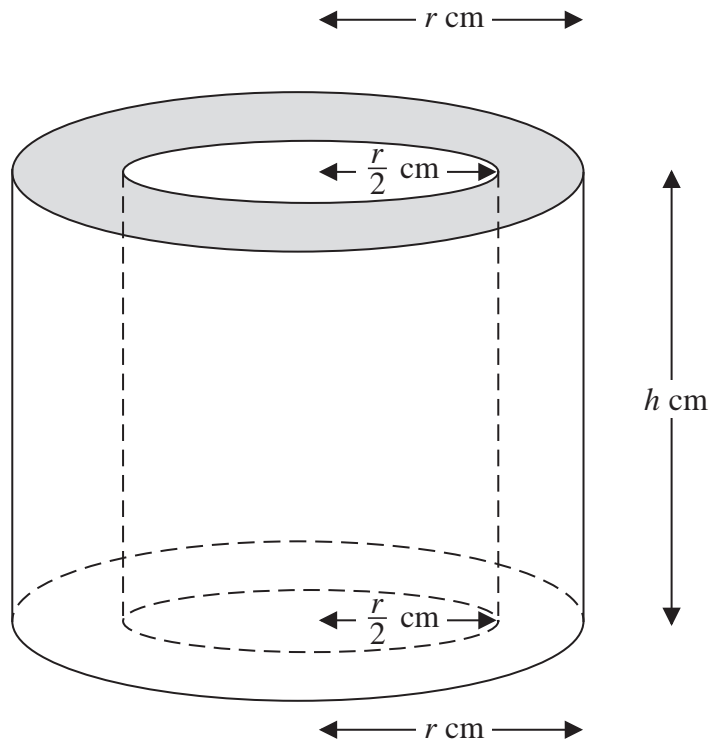


Figure 3

Figure 3 shows solid S formed by removing a right circular cylinder of radius $\frac{1}{2}r$ cm and height h cm from a right circular cylinder of radius r cm and height h cm. Both cylinders have the same axis.

The total surface area of S is A cm²

(a) Show that $A = \frac{3}{2}\pi r^2 + 3\pi rh$ (2)

The volume of S is 30 cm³

(b) Find a formula for h in terms of π and r . (2)

(c) Hence show that $A = \frac{3}{2}\pi r^2 + \frac{120}{r}$ (2)

(d) Find the value of r , to 3 significant figures, for which the value of A is a minimum. (4)

$$\left[\begin{array}{l} \text{Area of circle} = \pi r^2 \\ \text{Curved surface area of a right circular cylinder} = 2\pi rh \end{array} \right]$$

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Question 7 continued

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 10 marks)



Question 8 continued

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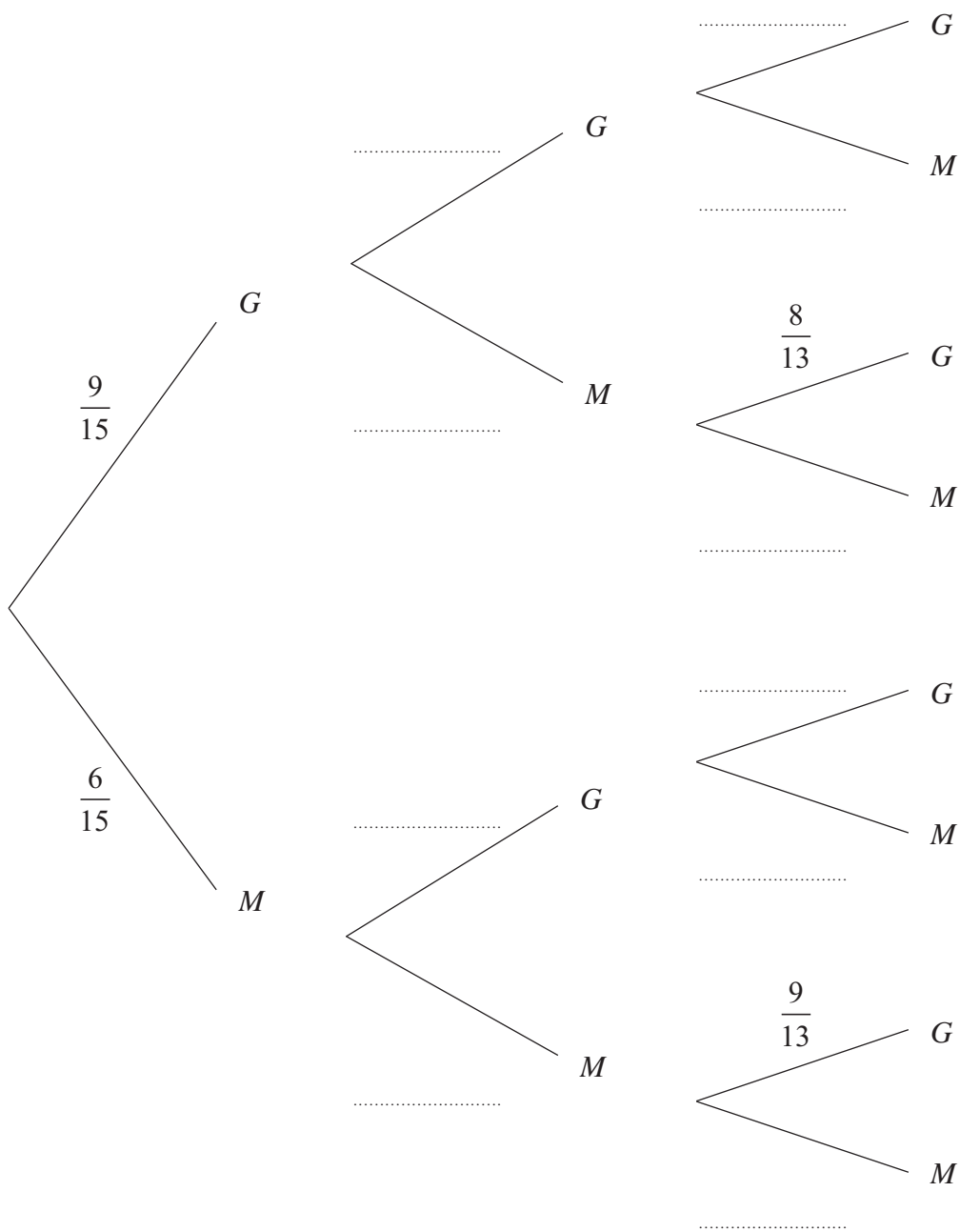
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Question 8 continued

Handwriting practice area consisting of 20 horizontal dotted lines for writing.

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Question 8 continued

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(Total for Question 8 is 11 marks)



Question 9 continued

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Question 9 continued

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(Total for Question 9 is 11 marks)



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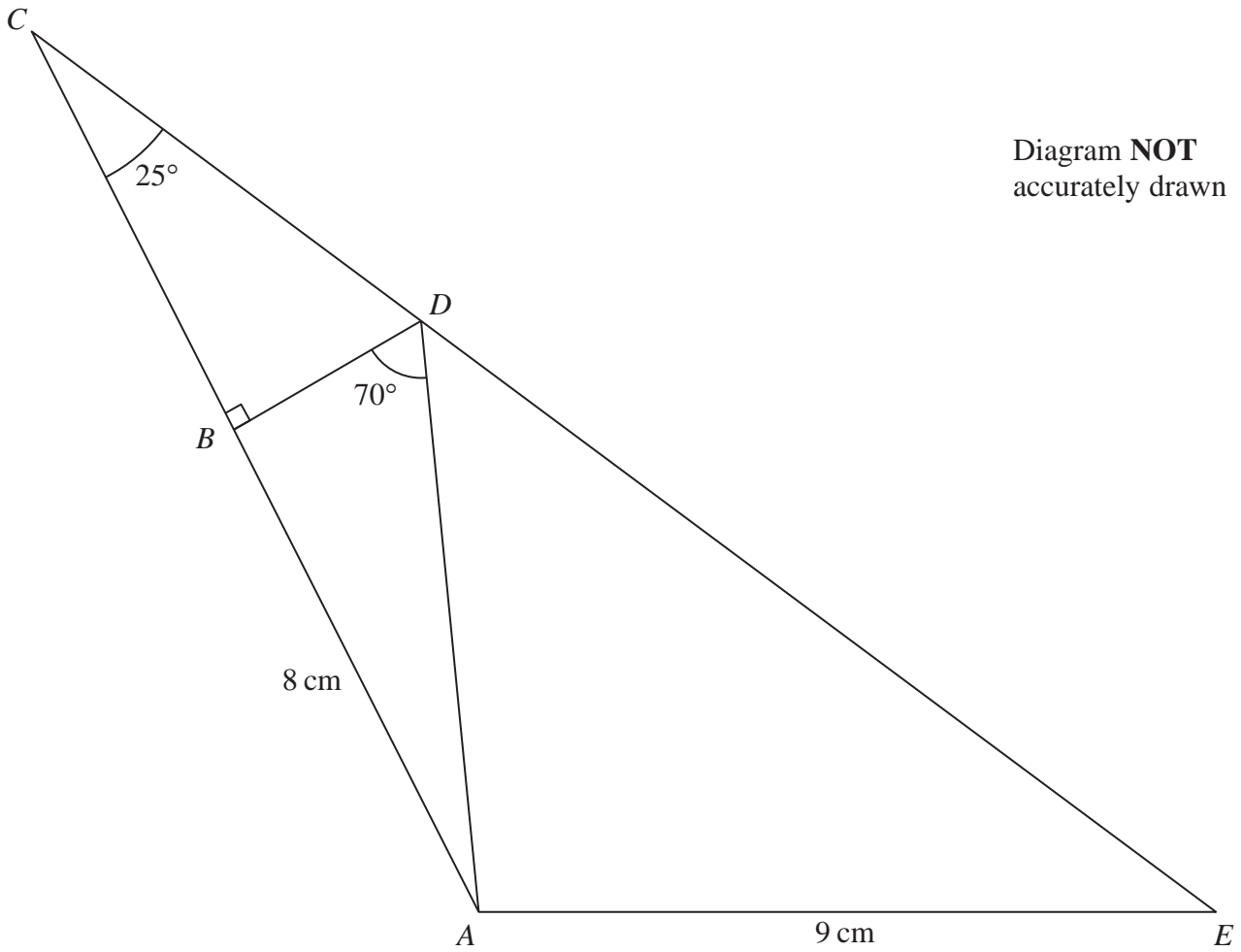


Figure 4

Figure 4 shows $\triangle ACE$ in which $AE = 9$ cm.

The point B lies on AC and the point D lies on CE so that $\angle DBC = 90^\circ$, $\angle BCD = 25^\circ$, $\angle BDA = 70^\circ$ and $AB = 8$ cm.

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

- (a) AD , (2)
- (b) BC . (3)
- (c) Calculate the size, to the nearest degree, of $\angle AEC$. (3)
- (d) Calculate the area, in cm^2 to 3 significant figures, of $ABDE$. (5)



Question 10 continued

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$$\left[\begin{array}{l} \text{Area of triangle} = \frac{1}{2}bc \sin A \\ \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \end{array} \right]$$



Question 10 continued

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Question 10 continued

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- 11 (a) Complete the following table for $y = 3x^3 - x^2 - 20x$ giving the values of y to one decimal place.

x	0	0.5	1	1.5	2	2.5	3
y	0.0		-18.0		-20.0		12.0

(3)

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

(3)

- (c) On your grid, draw the straight line with equation $y = 5x - 8$

(1)

- (d) Use your graphs to find the range of values of x in $0 \leq x \leq 3$ for which $3x^3 - x^2 - 25x + 8 < 0$

(4)

- (e) By drawing a suitable straight line on your grid, explain why the equation $3x^3 - x^2 - 20x + 25 = 0$ has no solutions in $0 \leq x \leq 3$

(2)

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Question 11 continued

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