

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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**PEARSON**







**Question 3 continued**

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**(Total for Question 3 is 6 marks)**



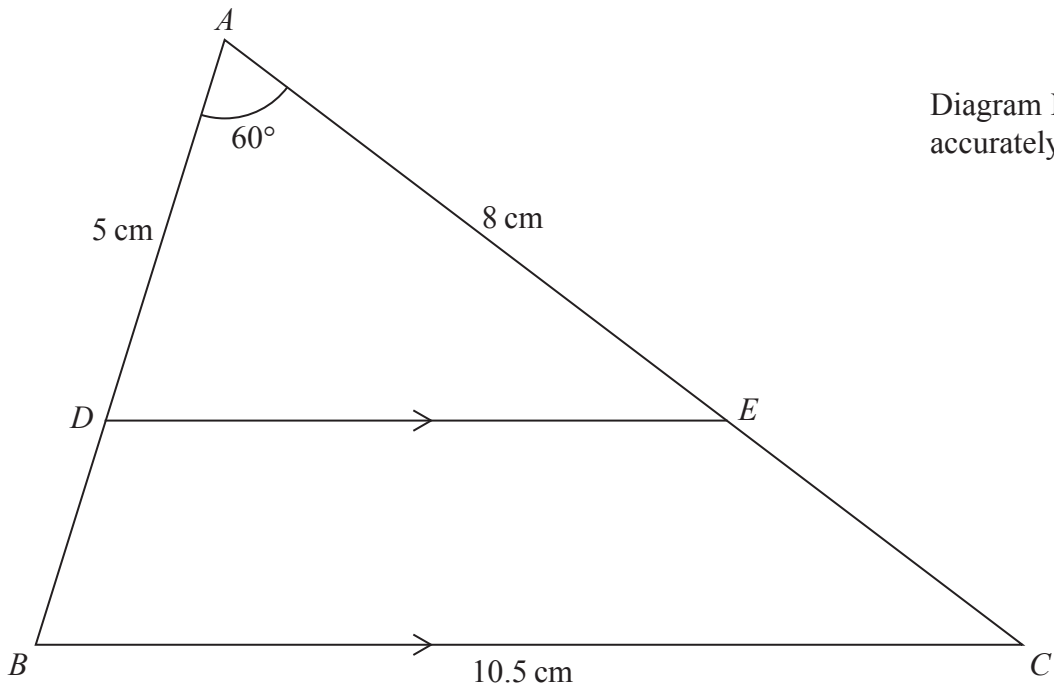


Diagram **NOT**  
accurately drawn

**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  $17.3$  cm<sup>2</sup> to 3 significant figures,

(c) calculate the area, in cm<sup>2</sup>, of  $\triangle ABC$ .

(2)

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



**Question 4 continued**

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**(Total for Question 4 is 7 marks)**



5  $f$  and  $g$  are two functions such that

$$f : x \mapsto 2 - 4x \quad \text{where } x < 1$$

$$g : x \mapsto 7 - x^2 \quad \text{where } x \leq 0$$

(a) Write down the range of

(i)  $f$

(ii)  $g$

(2)

(b) Express the inverse function  $f^{-1}$  in the form  $f^{-1} : x \mapsto \dots$

(2)

(c) Find the value of  $x$  for which  $3f(x) = 4g(x)$ .  
Give your answer to 3 significant figures.

(5)

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





**Question 5 continued**

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**(Total for Question 5 is 9 marks)**



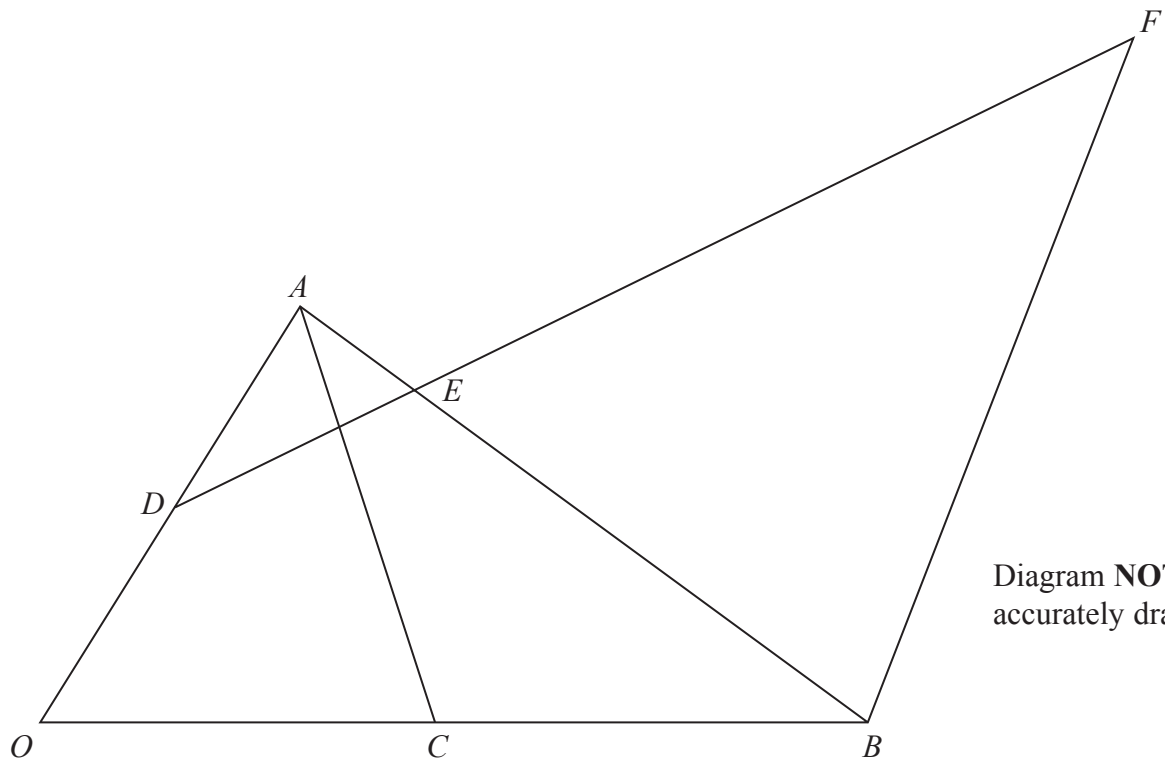


Figure 2

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)



**Question 6 continued**

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**Question 6 continued**

Handwriting practice area consisting of 25 horizontal dotted lines.

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**Question 6 continued**

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**(Total for Question 6 is 10 marks)**



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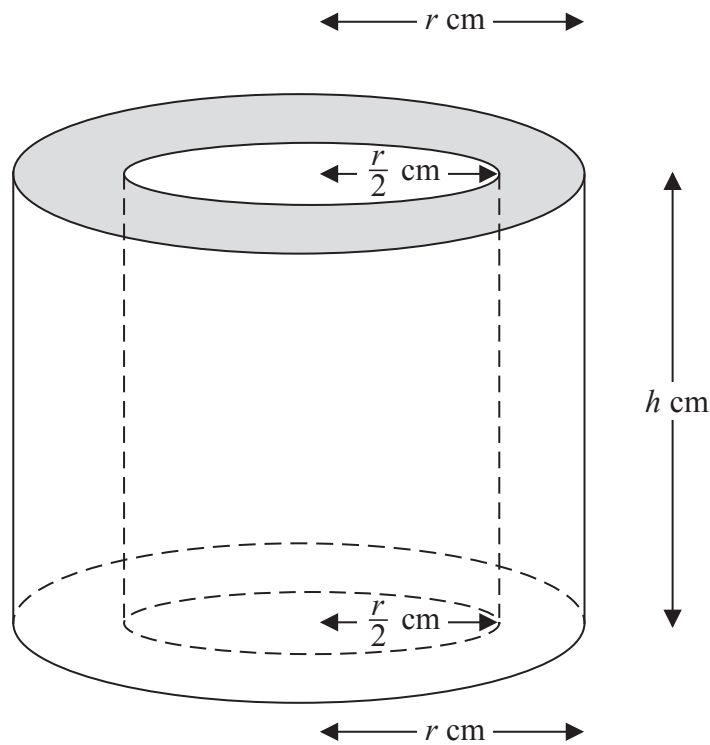


Figure 3

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  $A$  cm<sup>2</sup>

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

The volume of  $S$  is 30 cm<sup>3</sup>

(b) Find a formula for  $h$  in terms of  $\pi$  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)

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



**Question 7 continued**

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**Question 7 continued**

Handwriting practice area with 25 horizontal dotted lines.

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**Question 7 continued**

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**(Total for Question 7 is 10 marks)**



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Question 8 continued

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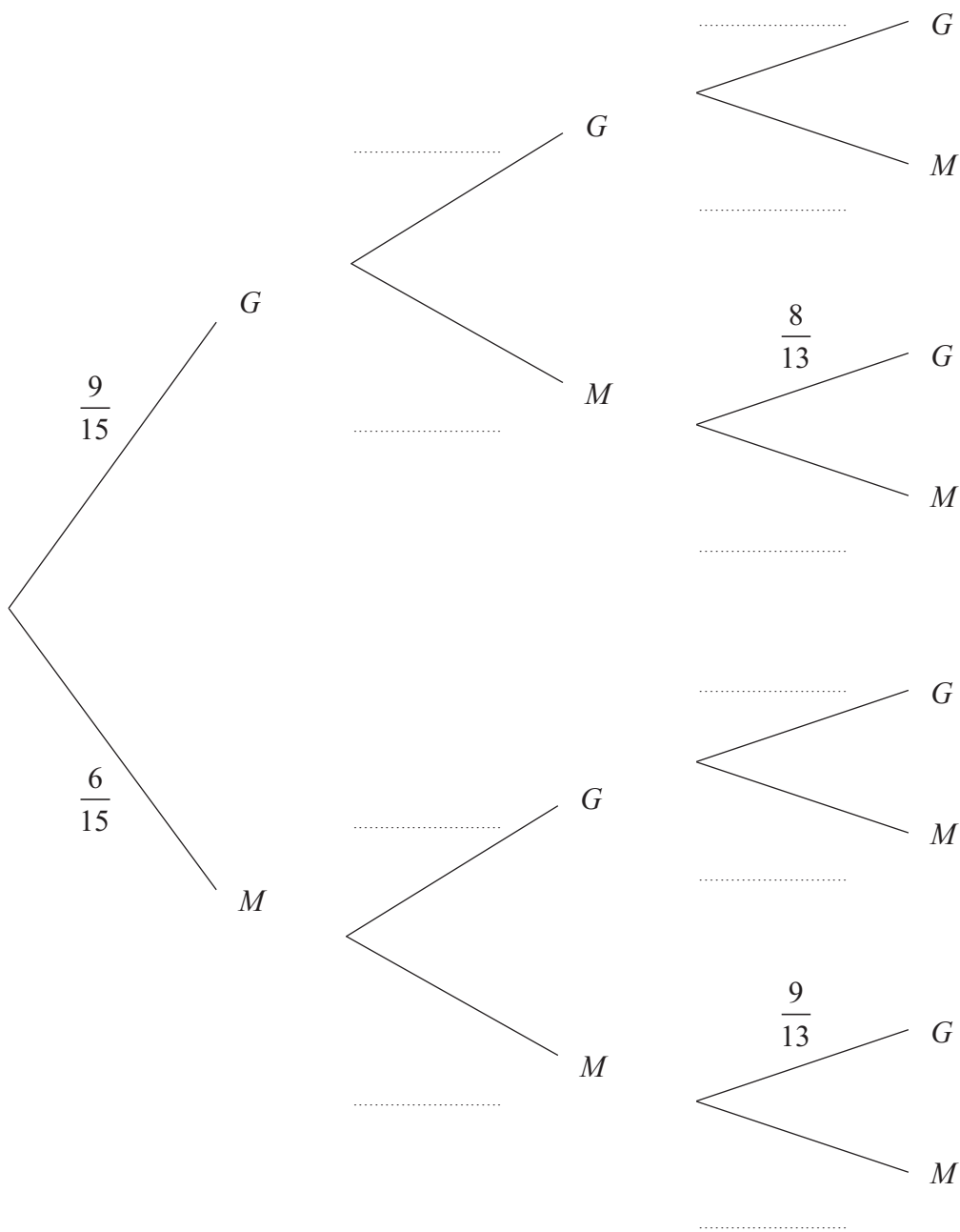
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**Question 8 continued**

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**Question 8 continued**

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**(Total for Question 8 is 11 marks)**



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**Question 9 continued**

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**Question 9 continued**

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**(Total for Question 9 is 11 marks)**



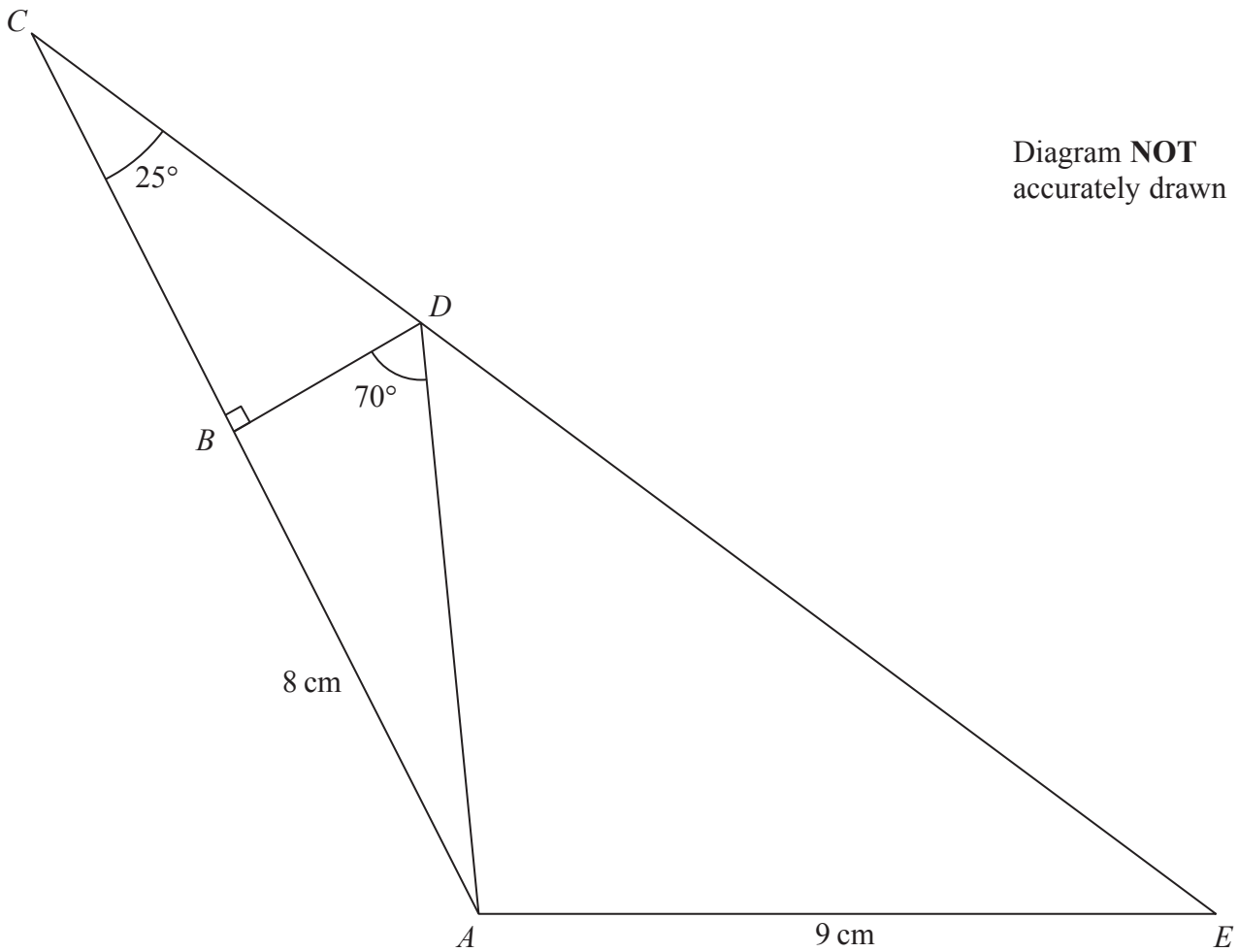


Figure 4

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  $\text{cm}^2$  to 3 significant figures, of  $ABDE$ . (5)



Question 10 continued

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Area for writing the answer to Question 10, consisting of multiple horizontal dotted lines.

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



**Question 10 continued**

Handwriting practice area with 20 horizontal dotted lines.

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**Question 10 continued**

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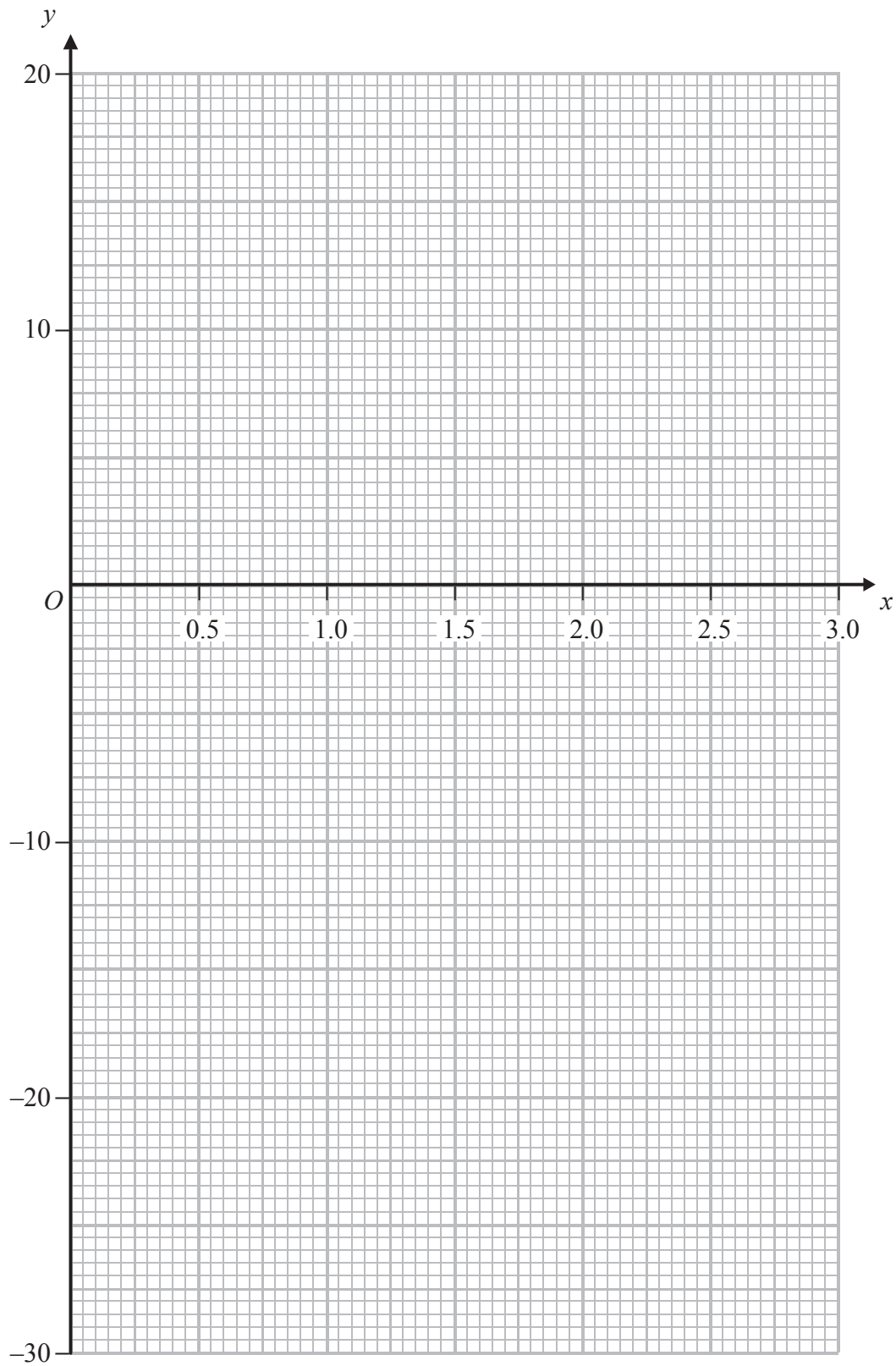
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**(Total for Question 10 is 13 marks)**





Question 11 continued



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**Question 11 continued**

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**(Total for Question 11 is 13 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

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