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Surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics B

Paper 2R



Tuesday 16 January 2018 – 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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5 150 tourists in London took part in a survey to see how popular three tourist attractions are.

Each tourist was asked to say whether they had visited *Buckingham Palace* (B), *Hampton Court* (H) or the *Tower of London* (T).

25 of the 150 tourists had not visited any of the three tourist attractions.

Of the other tourists who were asked

20 had visited all three attractions

25 had visited *Buckingham Palace* and *Hampton Court*

35 had visited *Hampton Court* and the *Tower of London*

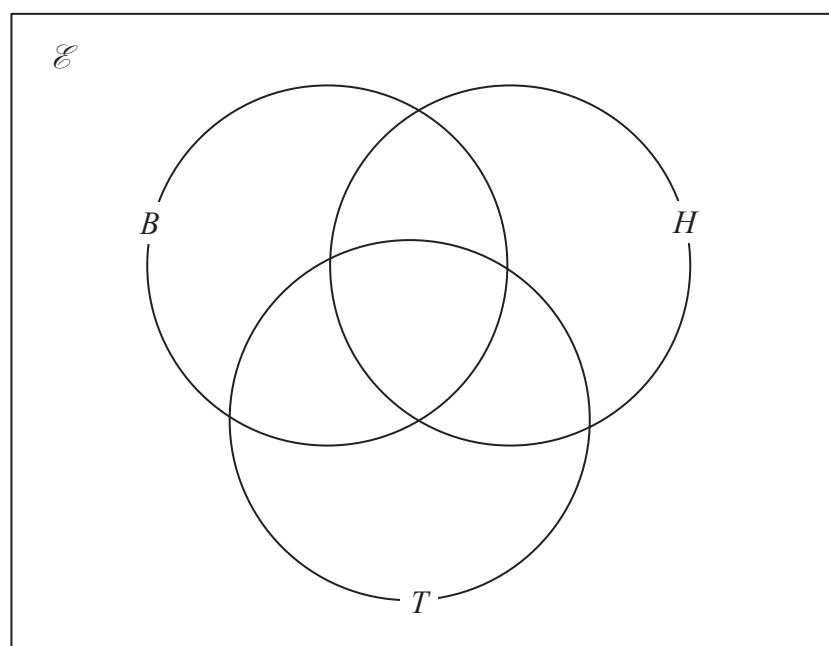
30 had visited *Buckingham Palace* and the *Tower of London*

45 had visited *Buckingham Palace* only

x had visited *Hampton Court* only

The results of the survey also showed that the number of visitors who had visited the *Tower of London* only was 4 times the number of visitors who had visited *Hampton Court* only.

(a) Show all this information on the Venn diagram.



(4)

(b) Use the information in the Venn diagram to write down an equation in x .

(1)

(c) Hence find the value of x .

(2)

One of the tourists who took part in the survey was picked at random.

Given that this tourist had visited *Buckingham Palace*,

(d) write down the probability that this tourist had visited the *Tower of London*.

(1)

Turn over for a spare Venn diagram if you need to redraw your diagram.



Question 5 continued

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Handwriting practice area with 25 horizontal dotted lines.



Question 5 continued

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Question 6 continued

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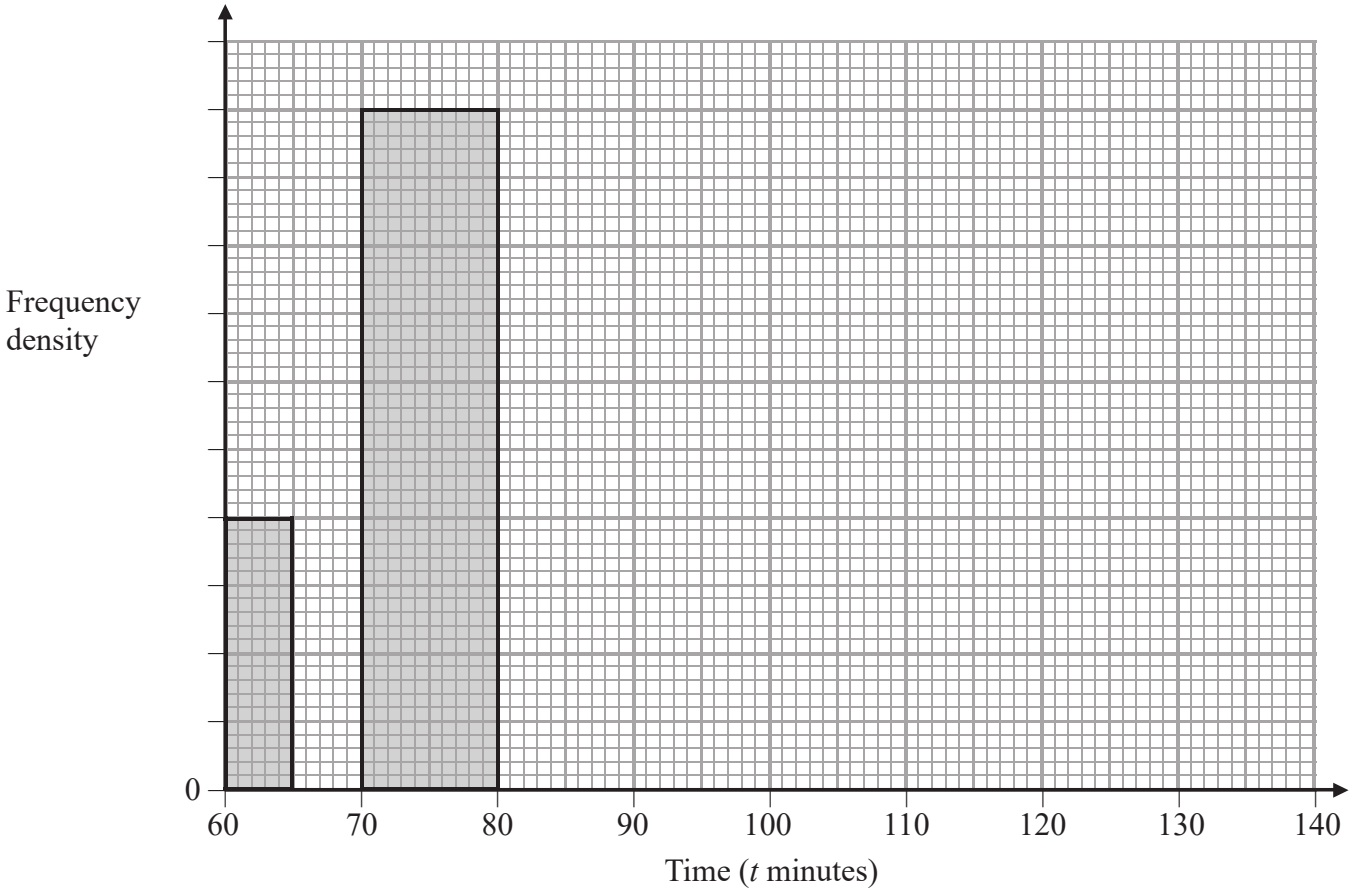
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(Total for Question 6 is 9 marks)



7 Information about the times, in minutes, taken by 305 runners to complete a half marathon is given in the incomplete table and the incomplete histogram.

Time (t minutes)	$60 < t \leq 65$	$65 < t \leq 70$	$70 < t \leq 80$	$80 < t \leq 95$	$95 < t \leq 115$	$115 < t \leq 140$
Frequency	10	20		60	90	



- (a) Complete the table and the histogram. (5)
- (b) Write down the class interval that contains the median. (1)
- (c) Calculate an estimate of the mean time, to the nearest minute, taken by the 305 runners to complete the half marathon. (4)

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

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Question 7 continued

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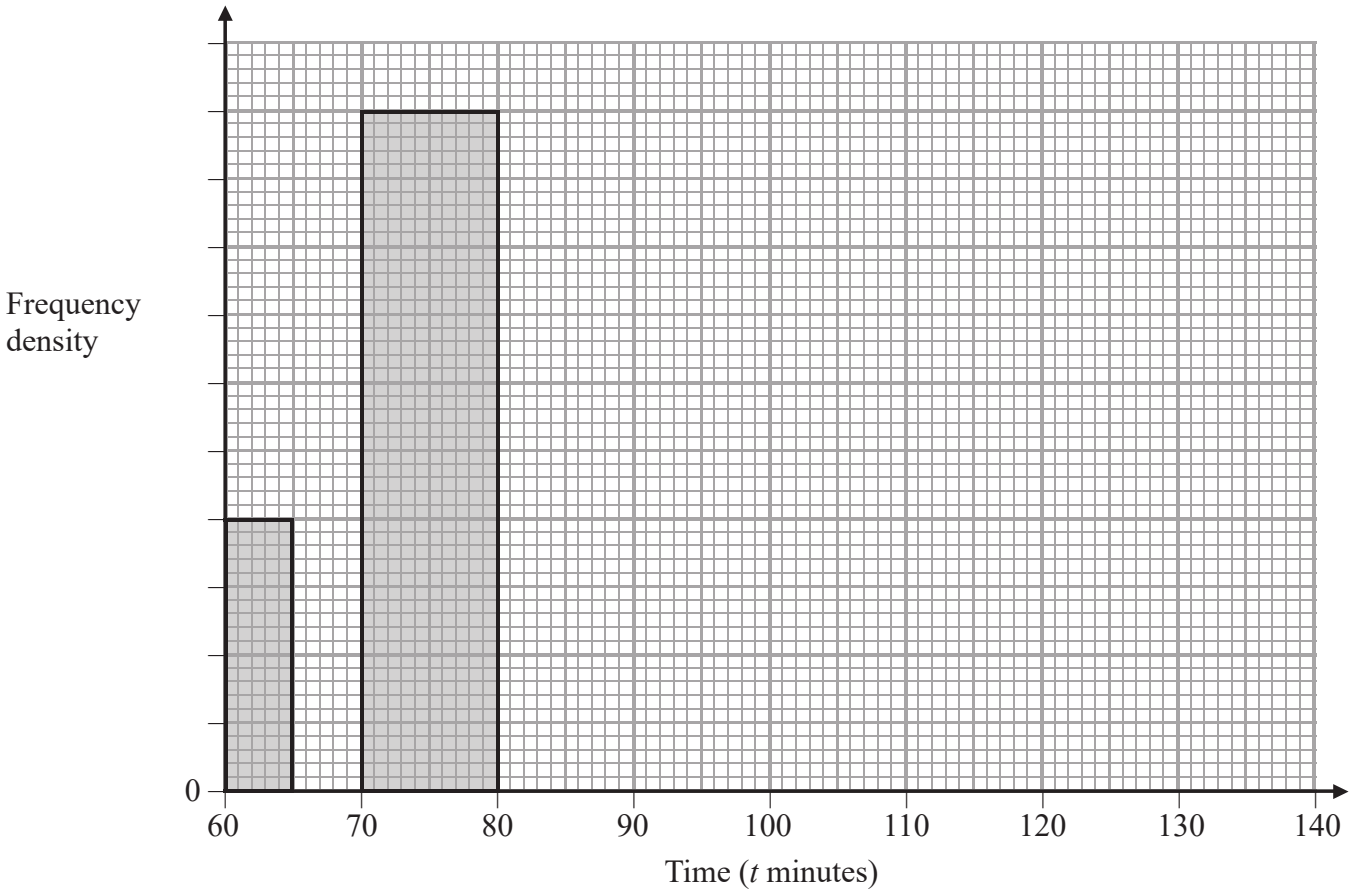
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Question 7 continued

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

Time (t minutes)	$60 < t \leq 65$	$65 < t \leq 70$	$70 < t \leq 80$	$80 < t \leq 95$	$95 < t \leq 115$	$115 < t \leq 140$
Frequency	10	20		60	90	



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Question 7 continued

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(Total for Question 7 is 10 marks)



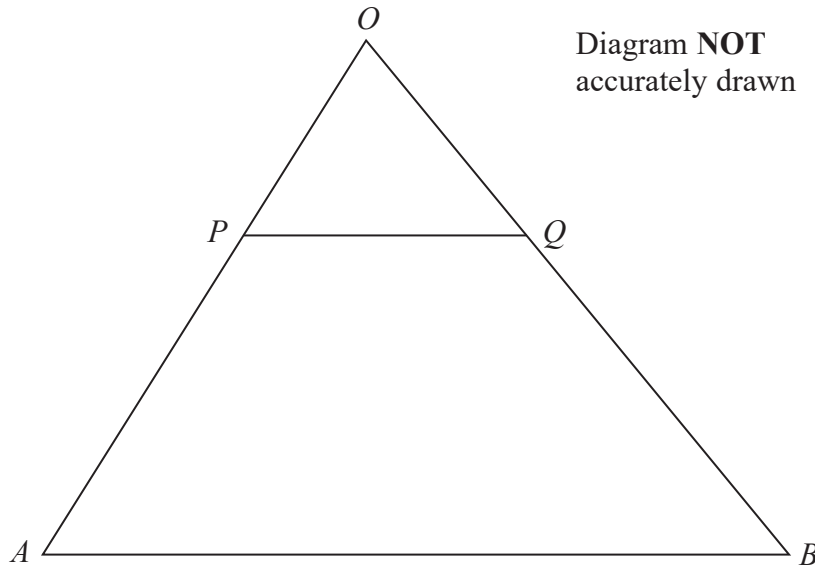


Diagram **NOT**
accurately drawn

Figure 1

Figure 1 shows triangle OAB in which $\vec{OA} = 4\mathbf{a}$ and $\vec{OB} = 8\mathbf{b}$

P is the point on OA such that $OP : OA = 1 : 4$

(a) Express in terms of \mathbf{a} or \mathbf{b} or \mathbf{a} and \mathbf{b} where appropriate,

(i) \vec{AB} (ii) \vec{PO}

(2)

Q is the point on OB such that $OQ : OB = 1 : m$ where m is a constant.

$\vec{PQ} = \alpha \vec{AB}$ where α is a scalar.

(b) Using vectors, find the value of m and the value of α .

(3)

R is the point on AB such that $AR : AB = 1 : n$ where n is a constant.

(c) Find and simplify an expression for \vec{PR} in terms of n , \mathbf{a} and \mathbf{b} .

(2)

Given that PR is parallel to OB ,

(d) find the value of n .

(2)

The area of $APQB$ is 150 cm^2

(e) Calculate the area of triangle OPQ .

(3)



Question 8 continued

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Question 8 continued

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Question 8 continued

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(Total for Question 8 is 12 marks)



9 The points (4, 2), (4, 3) and (6, 3) are the vertices of triangle *S*.

(a) On the grid opposite, draw and label triangle *S*. (1)

Triangle *T* is the image of triangle *S* under a reflection in the line with equation $y = x$

(b) On the grid opposite, draw and label triangle *T*. (2)

Triangle *U* is the image of triangle *T* under a rotation through 180° about the point $(-2, 2)$

(c) On the grid opposite, draw and label triangle *U*. (3)

Triangle *U* is transformed to triangle *V* under the translation $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$

(d) On the grid opposite, draw and label triangle *V*. (2)

Triangle *V* is transformed to triangle *W* under the transformation with matrix **P** where

$$\mathbf{P} = \begin{pmatrix} -3 & 1 \\ 1 & 1 \end{pmatrix}$$

(e) On the grid opposite, draw and label triangle *W*. (3)

(f) Find the determinant of the matrix **P**. (1)

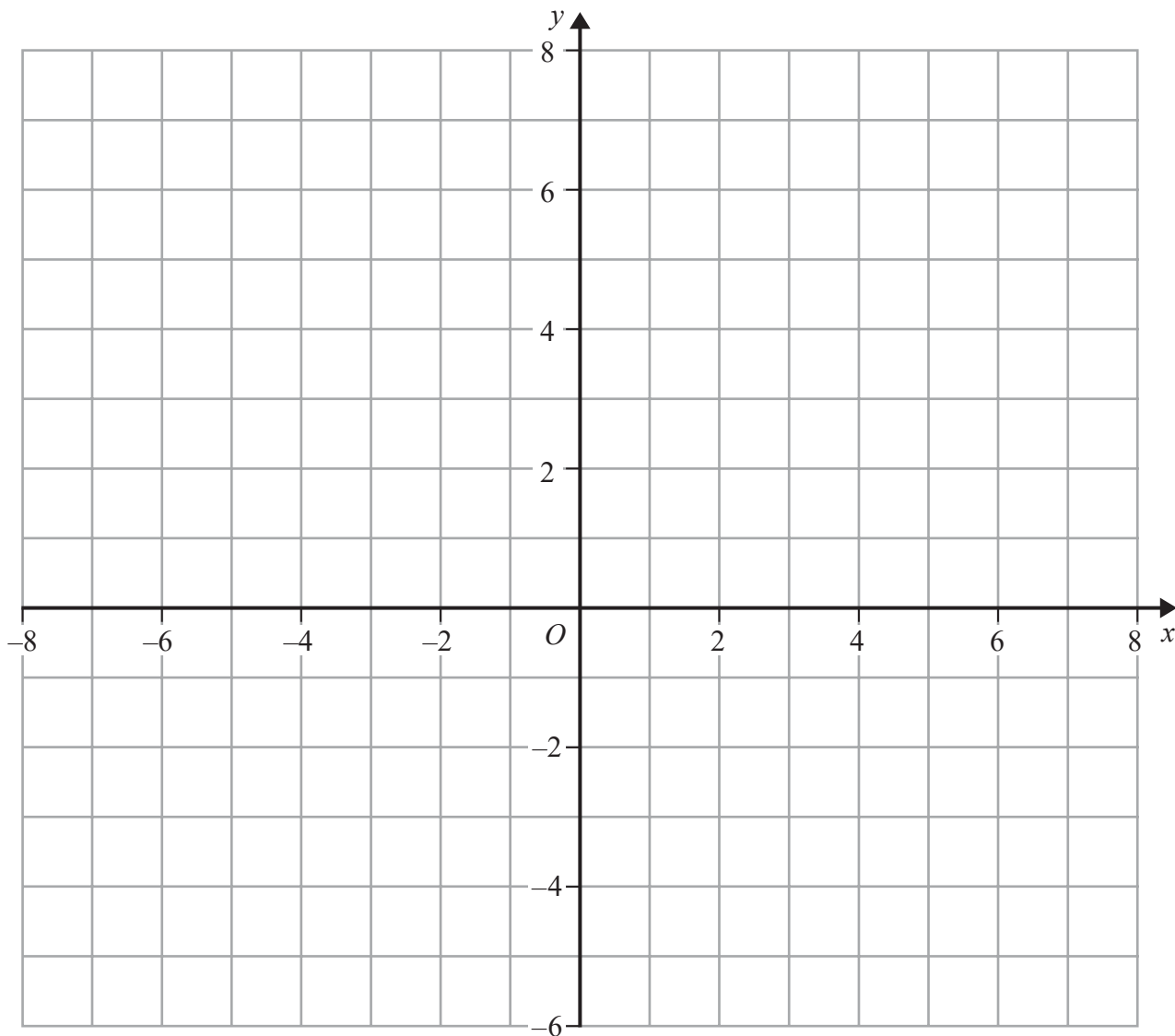
(g) Write down the ratio (area of triangle *S*) : (area of triangle *W*) in the form $1 : n$ (1)

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



Question 9 continued



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Question 9 continued

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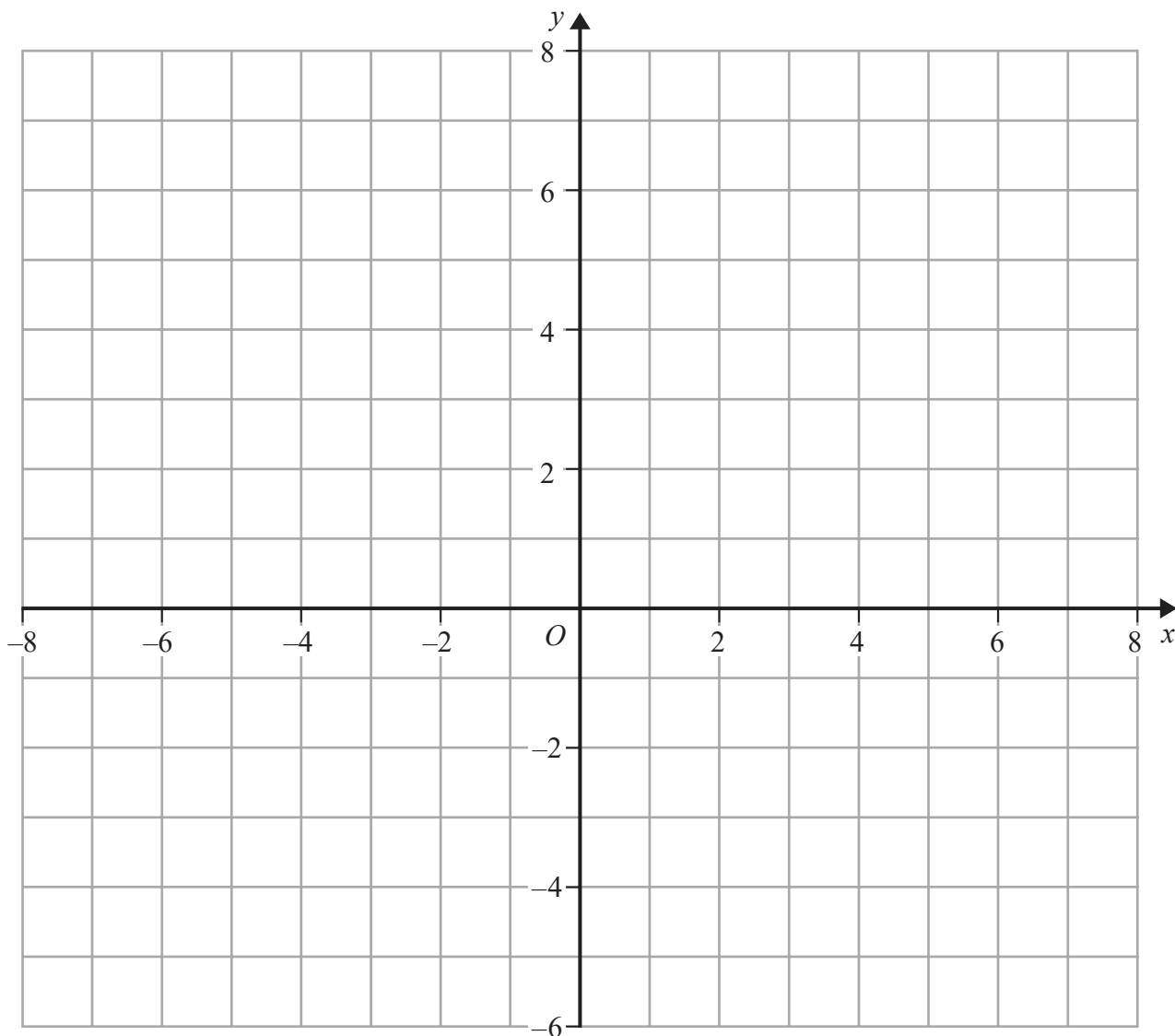
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Question 9 continued

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(Total for Question 9 is 13 marks)



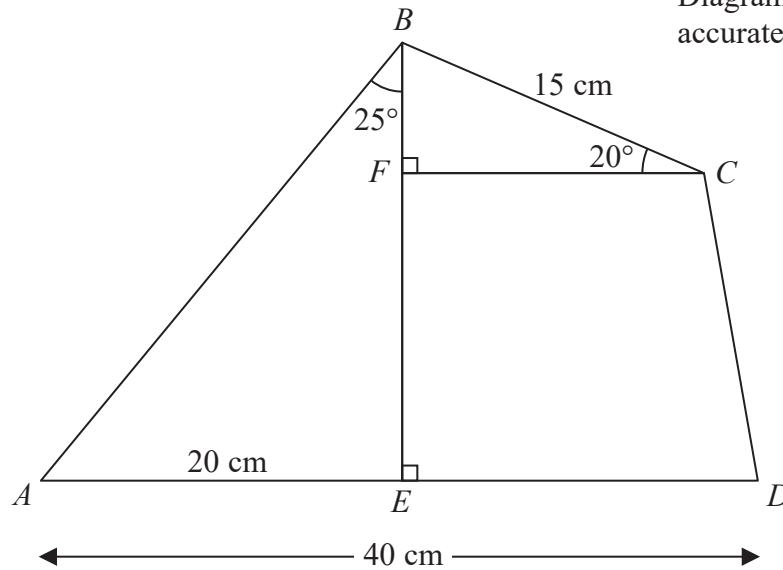
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accurately drawn

Figure 2

Figure 2 shows quadrilateral $ABCD$ in which $BC = 15$ cm and $AD = 40$ cm.

The point E on AD is such that BE is perpendicular to AD with $AE = 20$ cm and $\angle ABE = 25^\circ$

(a) Calculate the length, in cm to 3 significant figures, of AB . (2)

The point F on BE is such that FC is perpendicular to BE with $\angle BCF = 20^\circ$

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

(b) FC , (2)

(c) AC . (3)

(d) Calculate the area, in cm^2 to 3 significant figures, of quadrilateral $ABCD$. (6)

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



Question 10 continued

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Question 10 continued

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Question 10 continued

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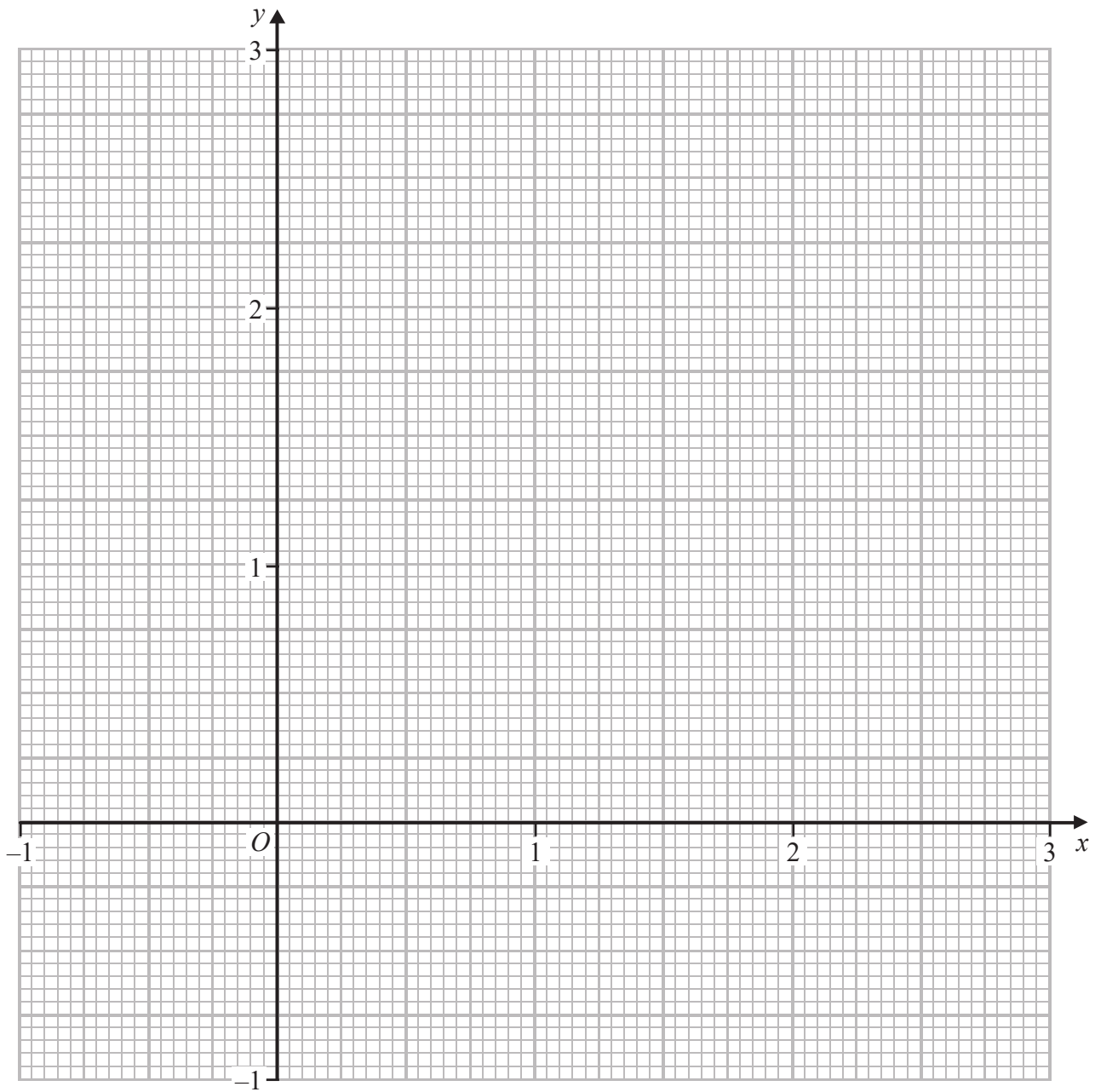
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(Total for Question 10 is 13 marks)



Question 11 continued



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Question 11 continued

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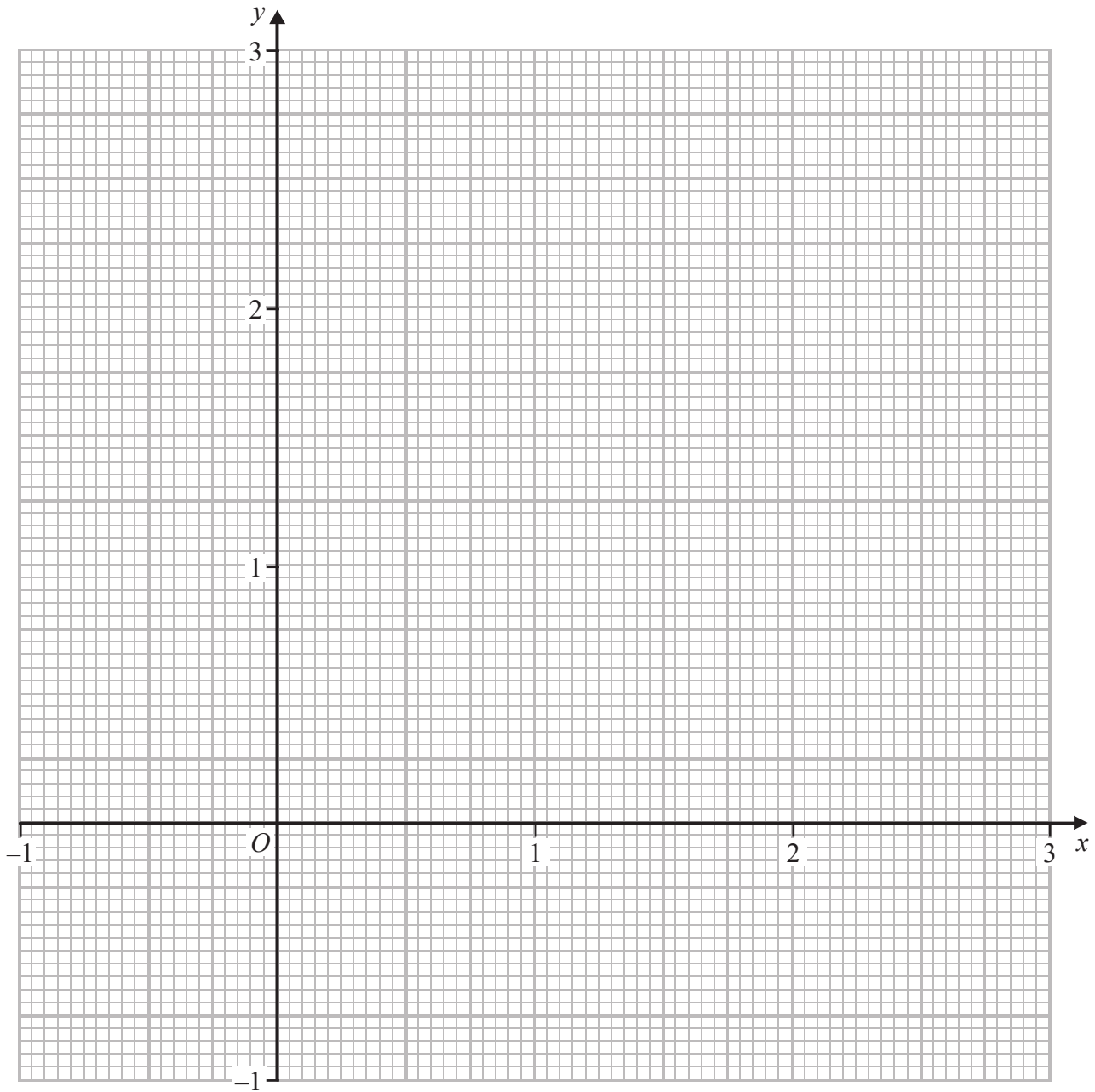
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Question 11 continued

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