

5-Aug-24

Objective: Complete **iGCSE questions** on Sine & Cosine Rule skills.

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7	(a)	19.9 or 19.89 to 19.90	3	<b>M2</b> for $36^2 - 30^2$ soi by 396 or <b>M1</b> for $AD^2 + 30^2 = 36^2$ oe
	(b)	$30 \div \tan 68$ oe 12.12...	<b>M2</b> <b>A1</b>	<b>M1</b> for $\tan 68 = \frac{30}{AC}$ oe
	(c)	301 or 301.3 to 301.4 or 239 or 238.6 to 238.7	3	<b>B2</b> for 31.3 or 31.30 to 31.35 or <b>M1</b> for $\tan = 12.1 \div \text{their (a)}$ oe

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11	(a)	$9^2 = (3x - 1)^2 + (2x)^2$ $-2(2x)(3x - 1) \cos 60$ oe	<b>M1</b>	
		$81 = 9x^2 - 6x + 1 + 4x^2 - 6x^2 + 2x$ oe	<b>A2</b>	or <b>B1</b> for $9x^2 - 3x - 3x + 1$
		$7x^2 - 4x - 80 = 0$	<b>A1</b>	Completion with no errors or omissions

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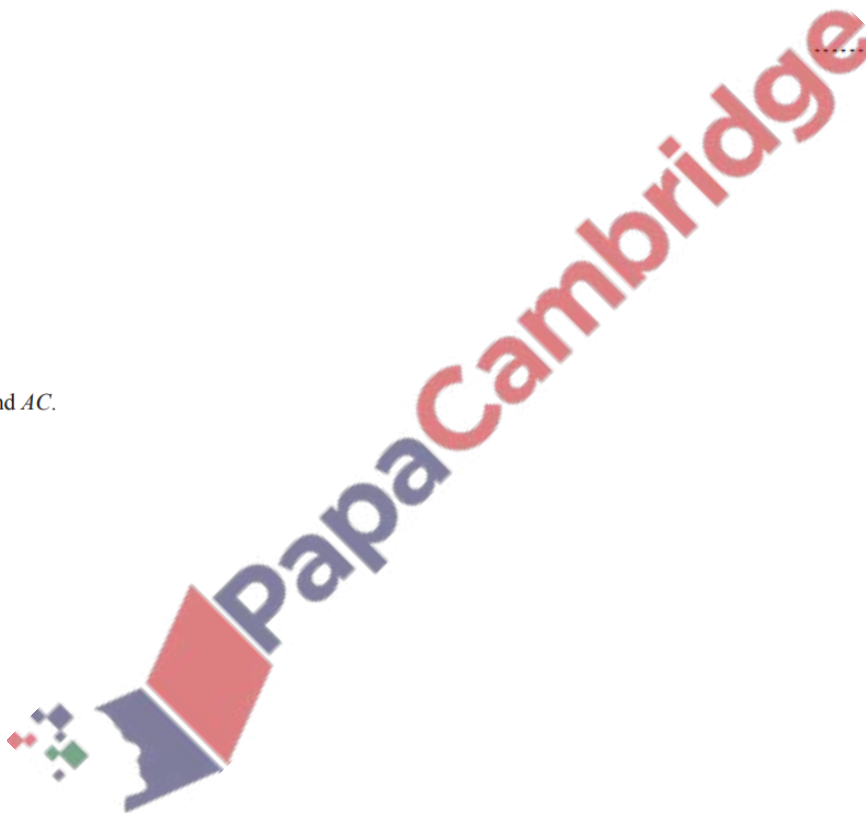
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(c) Calculate the area of triangle  $ABC$ .

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(b) Find  $AC$ .



$AC = \dots\dots\dots$  cm [3] Slide

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(c) Find angle  $CAB$ .

Angle  $CAB = \dots\dots\dots$  [3] Slid

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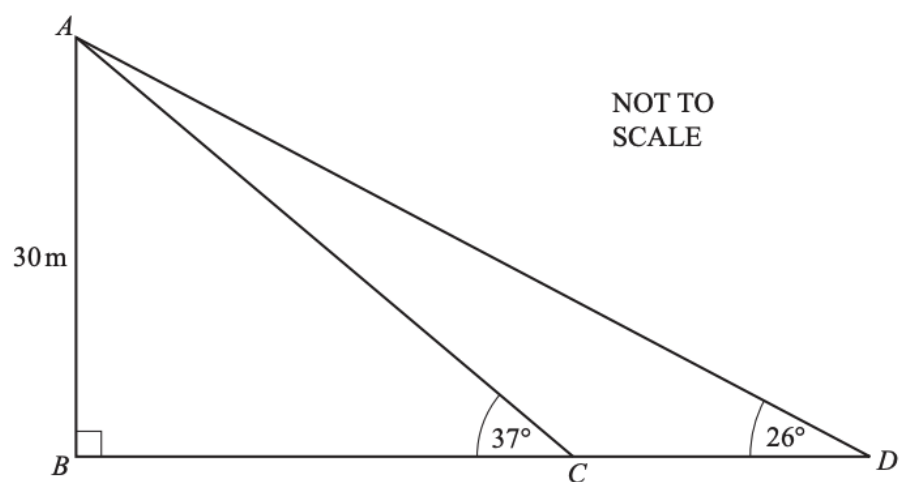
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5 (a)	$0.5 \times 12.4 \times x \times \sin 30 [= 34.1]$ oe	1	
(b)	6.21 or 6.205 to 6.206	3	<b>B2</b> for 38.50 to 38.51 or <b>M1</b> for $11^2 + 12.4^2 - 2 \times 11 \times 12.4 \times \cos C$
(c)	62.3 or 62.4 or 62.33 to 62.41...	3	<b>M2</b> for $\sin A = \frac{11 \times \sin 30}{\text{their } 6.21}$ or $\cos A = \frac{12.4^2 + (\text{their } (b))^2 - 11^2}{2 \times 12.4 \times \text{their } (b)}$
(d)	6.2	2	or <b>M1</b> for $\frac{11}{\sin A} = \frac{\text{their } 6.21}{\sin 30}$ oe <b>M1</b> for $12.4 \times \sin 30$ oe

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In the diagram,  $BCD$  is a straight line.

(a) Find  $AC$ .

$AC = \dots\dots\dots \text{m}$  [3]

(b) Find  $BC$ .

$BC = \dots\dots\dots \text{m}$  [3]

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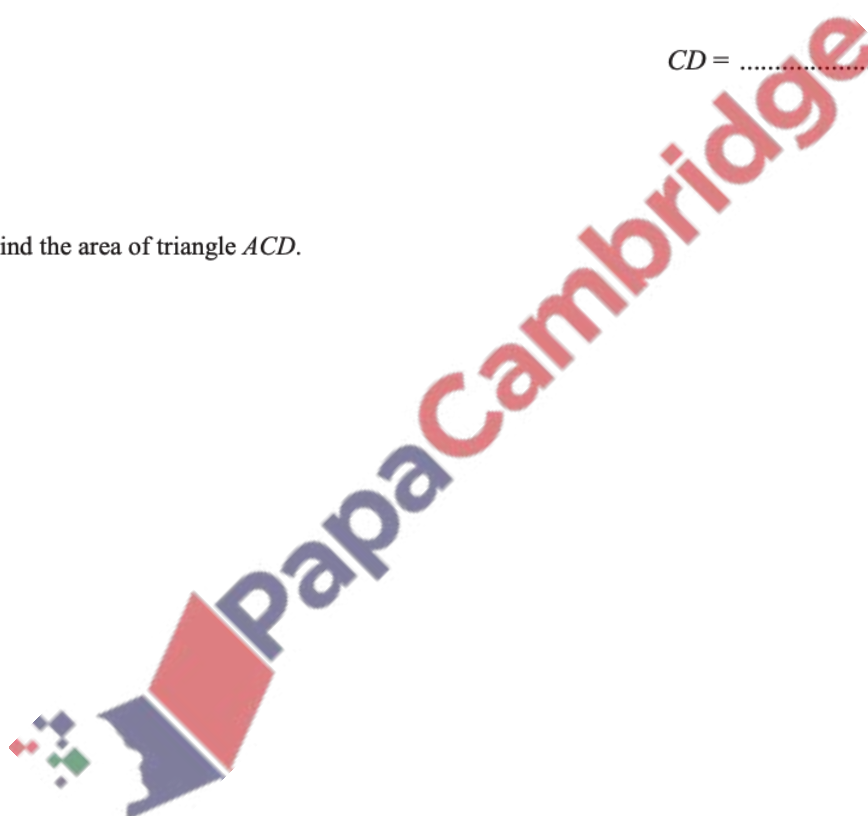
(c) Find  $CD$ .

$CD = \dots\dots\dots$  m [3]

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(d) Find the area of triangle  $ACD$ .

$\dots\dots\dots$  m<sup>2</sup> [2]



3(a)	49.8 or 49.84 to 49.85	3	<b>M2</b> for $\frac{30}{\sin 37}$ oe or <b>M1</b> for $\sin 37 = \frac{30}{AC}$ oe
3(b)	39.7 or 39.8 or 39.74 to 39.81...	3	<b>M2</b> for $\frac{30}{\tan 37}$ or <i>their</i> (a) $\times \cos 37$ oe or <b>M1</b> for $\tan 37 = \frac{30}{BC}$ or $\cos 37 = \frac{BC}{\text{their}}$ oe

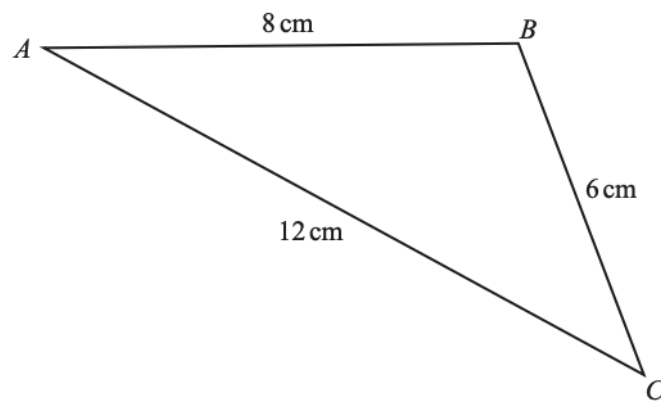
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3(c)	21.7 or 21.8 or 21.67 to 21.81	3	<b>M2</b> for $\frac{30}{\tan 26} - \text{their}(b)$ or $\frac{(\text{their}(a)) \times \sin(180 - (180 - 37) - 26)}{\sin 26}$ oe or <b>M1</b> for $\frac{30}{\tan 26}$ or $\frac{\text{their}(a)}{\sin 26} = \frac{CD}{\sin(180 - (180 - 37) - 26)}$ oe
3(d)	325 or 326 or 327 or 325[.0] to 327.2	2	<b>M1</b> for $\frac{1}{2} \times \text{their}(c) \times 30$ oe

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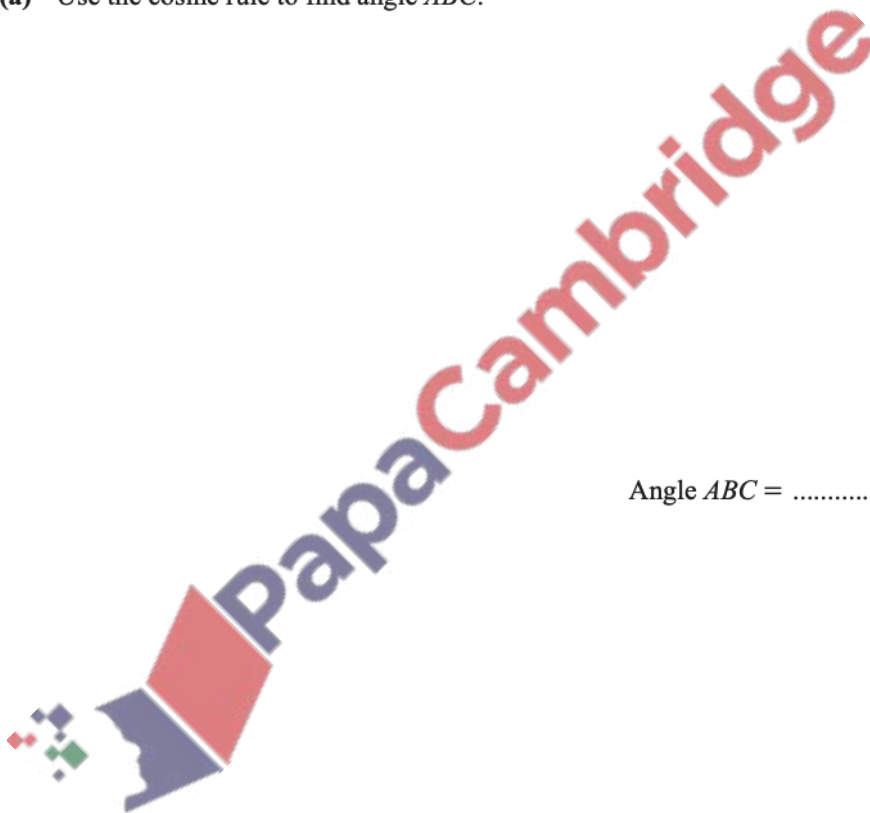
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The diagram shows triangle  $ABC$ .

- (a) Use the cosine rule to find angle  $ABC$ .

Angle  $ABC = \dots\dots\dots$  [3]

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(b) Use the sine rule to find angle  $BAC$ .

Angle  $BAC = \dots\dots\dots$

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9(a)	$[\cos x =] \frac{8^2 + 6^2 - 2^2}{2 \times 6 \times 8} \text{ oe}$	<b>M2</b>	<b>M1</b> for $12^2 = 8^2 + 6^2 - 2 \times 8 \times 6 \cos[\dots]$
	117.3 or 117.2 to 117.3	<b>B1</b>	
9(b)	$[\sin =] \frac{6 \times \sin(\text{their}(a))}{12} \text{ oe}$	<b>M2</b>	<b>M1</b> for $\frac{6}{\sin A} = \frac{12}{\sin(\text{their}(a))} \text{ oe}$
	26.4 or 26.5 or 26.37 to 26.46	<b>B1</b>	

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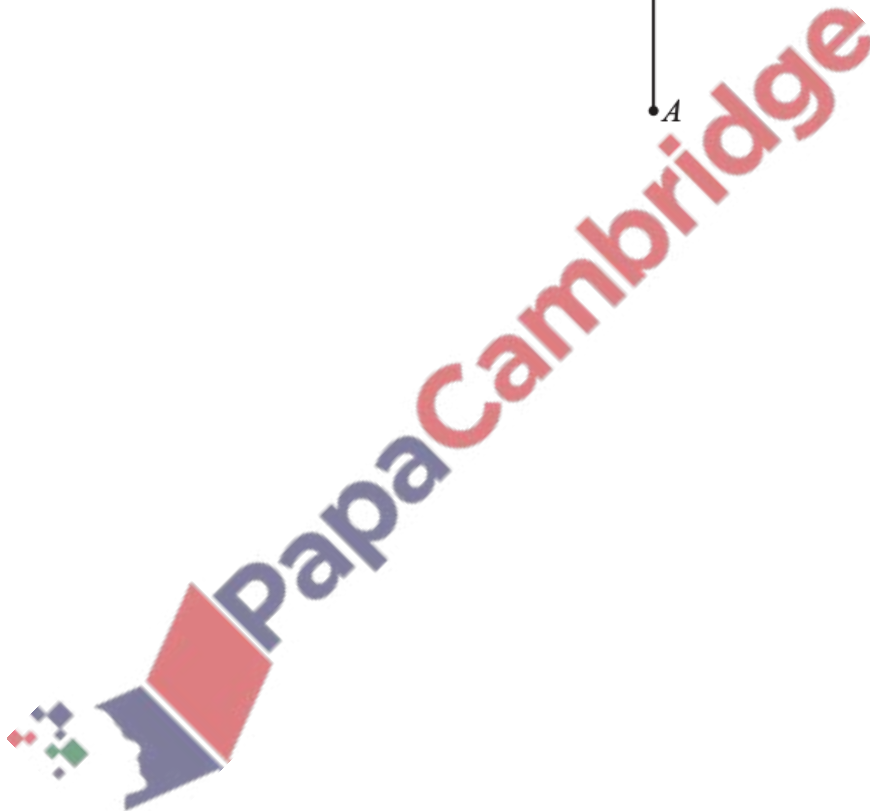


- 7 A ship sails 65 km on a bearing of  $310^\circ$  from  $A$  to  $B$ .  
It then changes course and sails 40 km on a bearing of  $250^\circ$  from  $B$  to  $C$ .  
The ship then returns to  $A$ .

- (a) On the diagram, sketch the path of the ship from  $A$ .  
On your diagram show the bearings and distances.

North

$A$



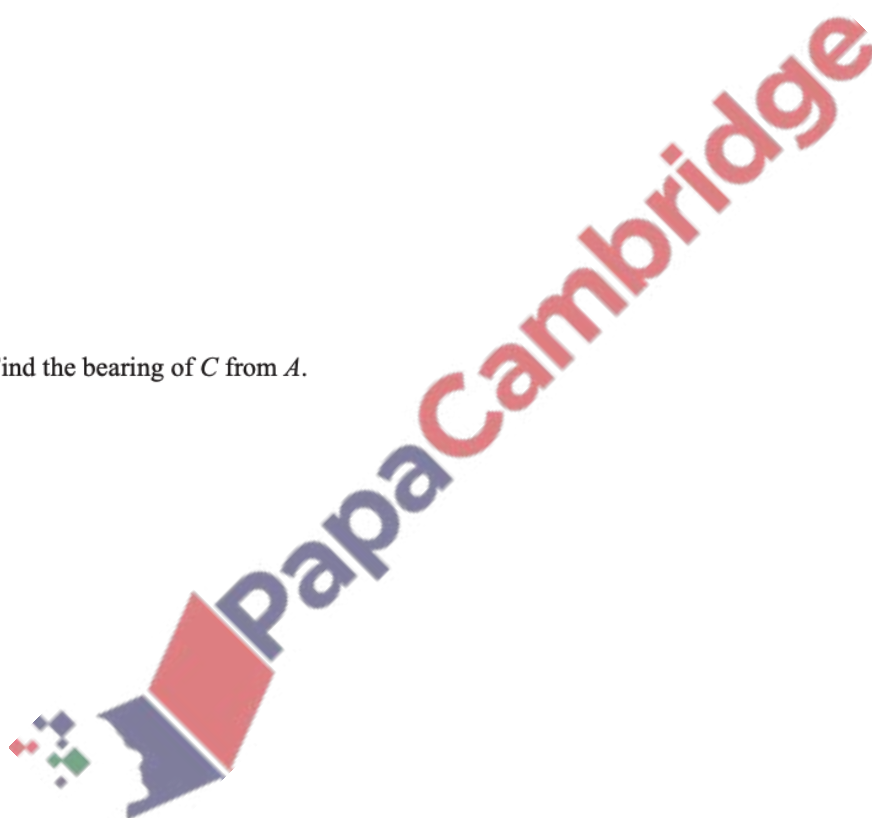
(b) Find angle  $ABC$ .

.....

(c) Calculate  $AC$  and show that it rounds to 91.8 km, correct to the nearest tenth of a kilometre.

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(d) Find the bearing of  $C$  from  $A$ .



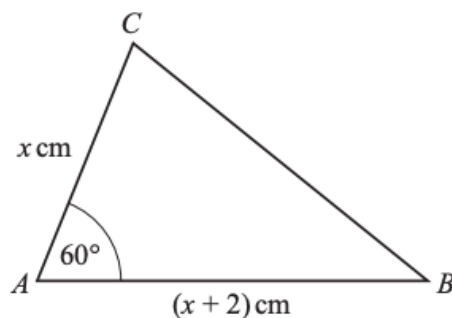
..... [4]

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Question	Answer	Marks	Partial Marks
7(a)	Correct sketch showing bearings and distances	3	<b>B1</b> for 310° bearing approx correct (270 marked) <b>B1</b> for 250° bearing approx correct (180 marked) <b>B1</b> for distances correctly marked
7(b)	120	1	
7(c)	$40^2 + 65^2 - 2 \times 40 \times 65 \times \cos \text{their } 120$	<b>M1</b>	<i>their</i> 120 must be between 0 and 180 Allow $\cos 120 = \frac{40^2 + 65^2 - [ ]^2}{2 \times 40 \times 65}$
	91.78 to 91.79	<b>A2</b>	<b>A1</b> for 8425 or $5\sqrt{337}$
7(d)	288 or 287.8...	4	<b>M2</b> for $\frac{40 \sin(\text{their } 120)}{91.8}$ oe or <b>M1</b> for $\frac{\sin \theta}{40} = \frac{\sin(\text{their } 120)}{91.8}$ oe If cosine rule used, <b>M2</b> for explicit expression <b>M1</b> for implicit.  <b>A1</b> for 22.2 or 22.16 to 22.17...  If 0 scored <b>SC2</b> for answer 108 or 107.8

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In the diagram  $AC = x$  cm,  $AB = (x + 2)$  cm and angle  $A = 60^\circ$ .

- (a) (i) Find an expression, in terms of  $x$ , for the area of triangle  $ABC$ .  
Give your answer in surd form.

..... cm<sup>2</sup> [2]

- (ii) The area of triangle  $ABC = 18\sqrt{3}$  cm<sup>2</sup>.

Show that  $x^2 + 2x - 72 = 0$ .

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Question	Answer	Marks	Partial Marks
9(a)(i)	$\frac{1}{2} \times x \times (x + 2) \times \frac{\sqrt{3}}{2}$ oe or better final answer	2	M1 for $\frac{1}{2} \times x \times (x + 2) \times \sin 60$
9(a)(ii)	equating to $18\sqrt{3}$ and correct elimination of $\sqrt{3}$	M1	Dependent on correct answer used from or answer to (a)(i) contains $\sin 60$ but is otherwise correct.

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Question	Answer	Marks	Part Marks
7(a)	9.77 or 9.766...	3	M2 for $\frac{8}{\cos 35}$ oe or M1 for $\cos 35 = \frac{8}{AB}$ oe
7(b)	60.6 or 60.61...	3	M2 for $\frac{6^2 + 9^2 - 8^2}{2 \times 6 \times 9}$ or M1 for $8^2 = 6^2 + 9^2 - 2 \times 6 \times 9 \cos$

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(b) the length  $BD$ ,



$BD = \dots\dots\dots$  cm [2]

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(c) the length  $CD$ ,

$CD = \dots\dots\dots$  cm [4]

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9(a)	12.2 or 12.21 to 12.22	2	<b>M1</b> for $\sin 70 = \frac{[]}{13}$ oe
9(b)	15.5 or 15.49...	2	<b>M1</b> for $\tan 50 = \frac{BD}{13}$ oe
9(c)	5.32 or 5.316 to 5.319...	4	<b>B1</b> for [angle $DBC =$ ] 20 <b>M1</b> for $(\text{their } BD)^2 + 15^2 - 2 \times \text{their } BD \times 15 \cos(\text{their } 20)$ <b>A1</b> for 28.26 to 28.30...
9(d)	art 195	3	<b>M2</b> two of $0.5 \times 13 \times 13 \times \sin 40$ oe $0.5 \times 13 \times \text{their } BD$ oe $0.5 \times 15 \times \text{their } BD \times \sin(\text{their } 20)$ or <b>M1</b> for one of above

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6(c)(ii)	$\tan[x] = \frac{\text{their } 46.5}{\text{their } 187}$ oe soi by 13.9...	<b>M1</b>	
	284 or 283.9 to 284.0	<b>B2</b>	<b>M1</b> for $270 + \text{their } x$ oe

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(c) Calculate the total area of the quadrilateral  $ABCD$ .



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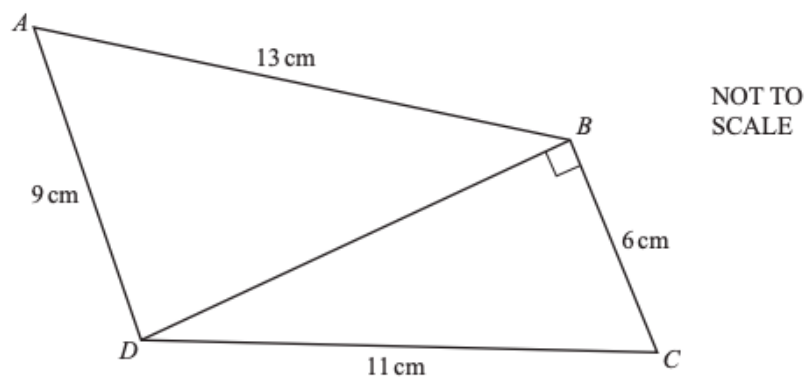
(d) Calculate the length of the diagonal  $AC$ .

$AC = \dots\dots\dots$

8(a)	Correct Pythagoras statement leading to $11^2 - 6^2$ or $121 - 36$ or 85	<b>M2</b>	or <b>M1</b> for $[BD]^2 + 6^2 = 11^2$ oe
	9.219...	<b>A1</b>	9.219... implies M1 A1
8(b)	43.8 or 43.80... nfw	<b>3</b>	<b>M2</b> for $\cos[ABD] = \frac{9.22^2 + 13^2 - 11^2}{2 \times 9.22 \times 13}$ or <b>M1</b> for $9^2 = 9.22^2 + 13^2 - 2 \times 9.22 \times 13 \cos$
8(c)	69.1 or 69.13 to 69.14... nfw	<b>3</b>	<b>M1</b> for $0.5 \times 9.22 \times 6$ oe <b>M1</b> for $0.5 \times 9.22 \times 13 \times \sin$ (their)
8(d)	17.7 or 17.69...	<b>3</b>	<b>M1</b> for $6^2 + 13^2 - 2 \times 6 \times 13 \cos (90 + \dots)$ <b>A1</b> for 313 or 312.9 to 313.0



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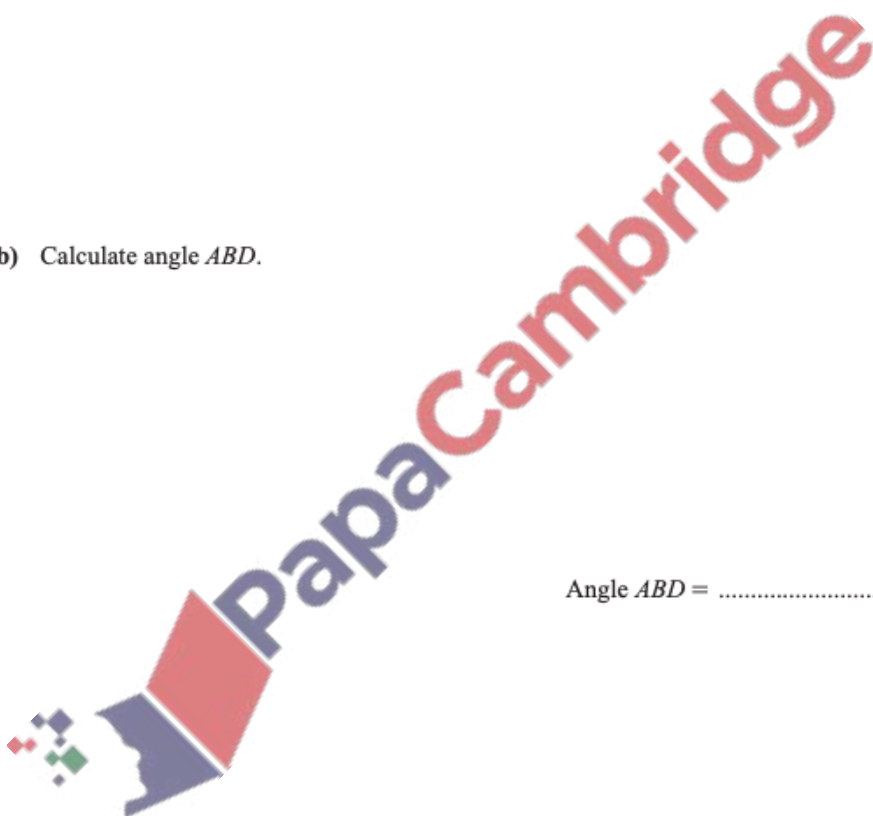
$ABCD$  is a quadrilateral.

- (a) Show that  $BD = 9.22$  cm, correct to 3 significant figures.

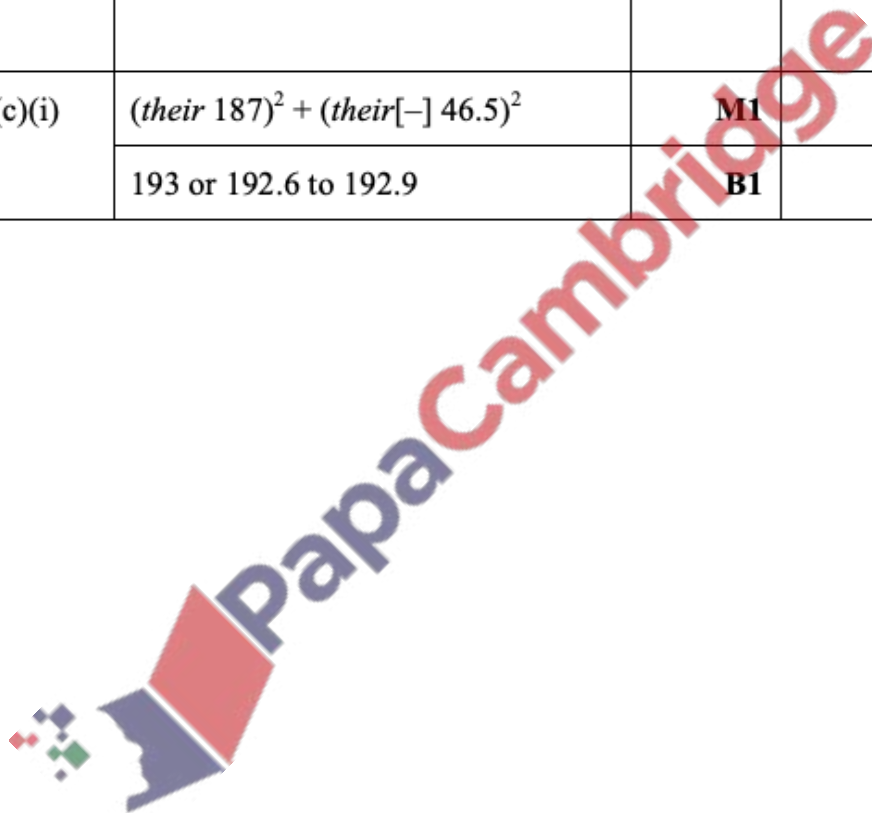
[3]

- (b) Calculate angle  $ABD$ .

Angle  $ABD = \dots\dots\dots$  [3]



6(a)	$\left( \begin{array}{l} 72.5 \text{ or } 72.50... \\ 33.8 \text{ or } 33.80 \text{ to } 33.81 \end{array} \right)$	4	<b>B2</b> for 72.5 or 72.50... or <b>M1</b> for $\frac{[\dots]}{80} = \sin 65$ oe seen (80) <b>B2</b> for 33.8 or 33.80 to 33.81 or <b>M1</b> for $\frac{[\dots]}{80} = \cos 65$ oe seen (80)
6(b)	$\left( \begin{array}{l} 187 \text{ or } 187.1 \text{ to } 187.2 \\ -46.5 \text{ or } -46.49... \end{array} \right)$	5	<b>M2</b> for <i>their</i> $72.5 + 140\cos 35$ oe or <b>M1</b> for $\frac{[\dots]}{140} = \cos 35$ oe seen (140) <b>M2</b> for <i>their</i> $33.8 - 140\sin 35$ oe or <b>M1</b> for $\frac{[\dots]}{140} = \sin 35$ oe seen (140)
6(c)(i)	$(\text{their } 187)^2 + (\text{their}[-] 46.5)^2$	<b>M1</b>	
	193 or 192.6 to 192.9	<b>B1</b>	



- (c) The ship sails directly back from  $C$  to  $A$ .

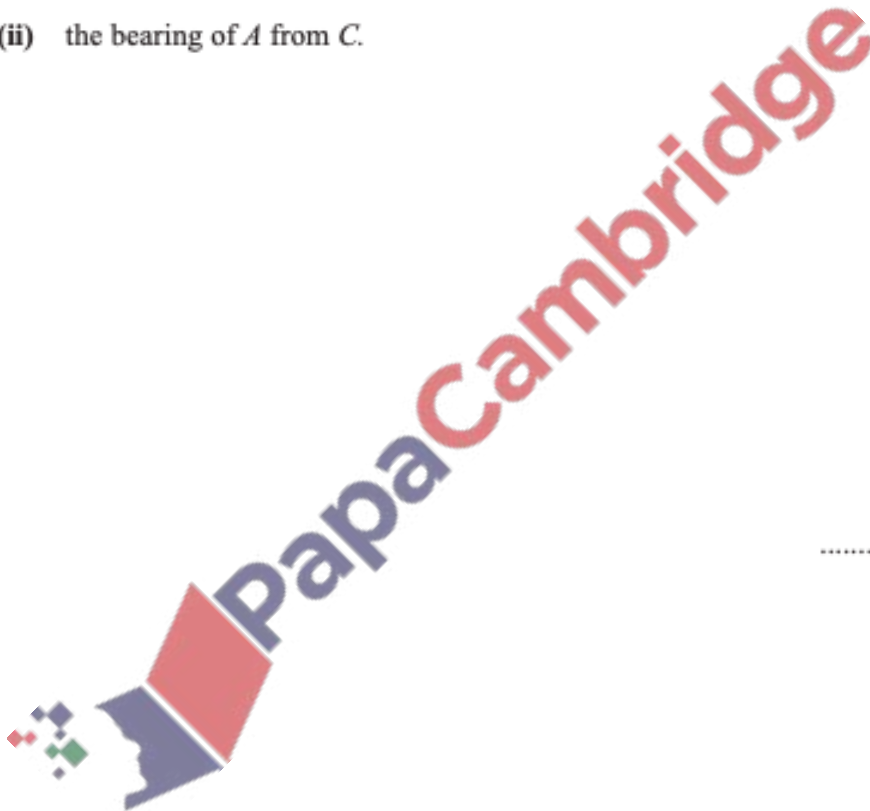
Using your answer to **part (b)**, calculate

- (i) the distance the ship sails from  $C$  to  $A$ ,

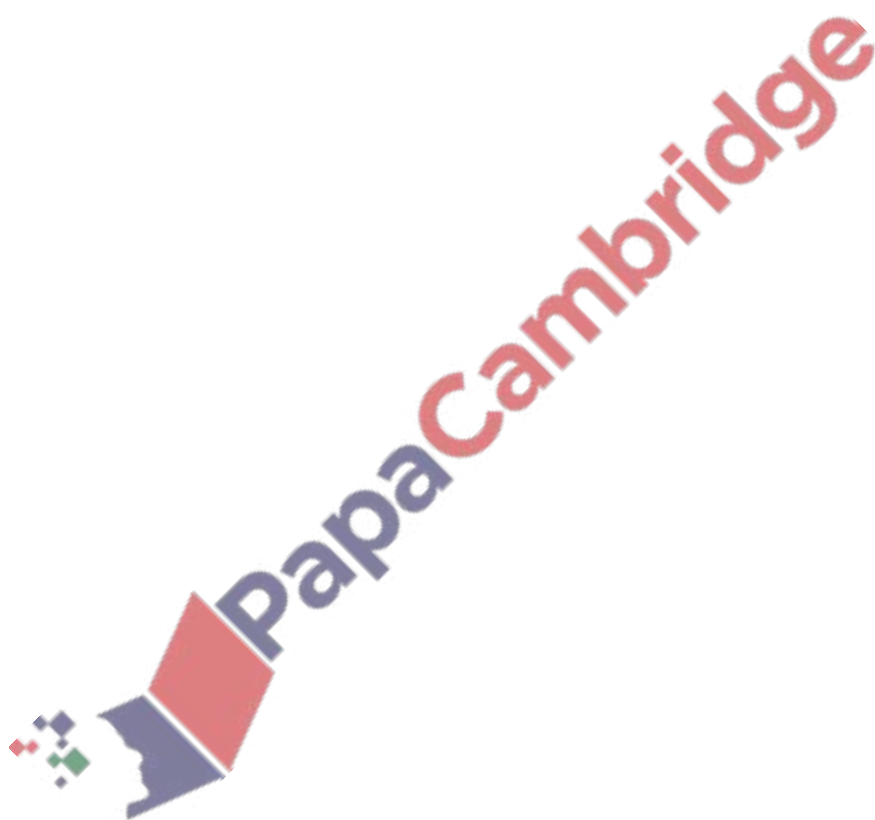
..... km [2]

- (ii) the bearing of  $A$  from  $C$ .

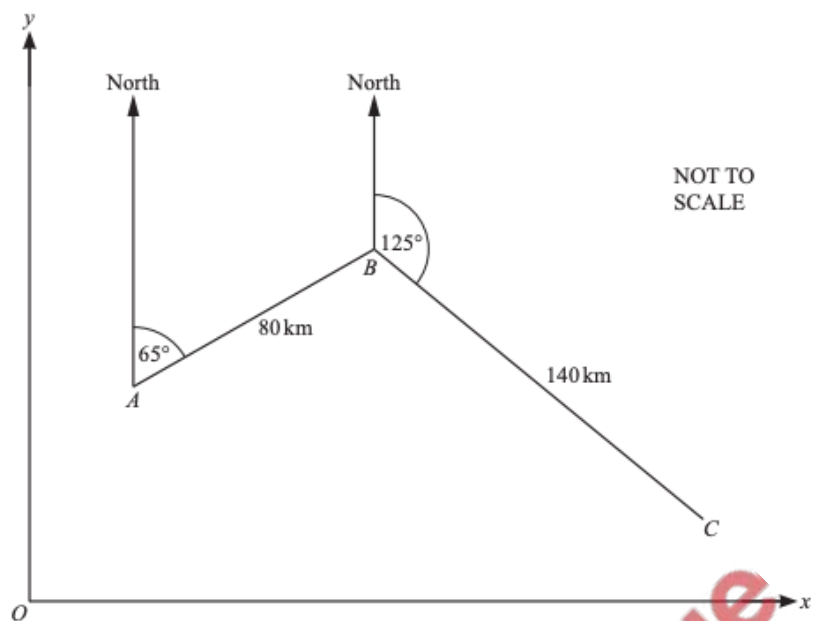
..... [3]



- (b) Find  $\overrightarrow{AC}$  as a column vector with the components in kilometres.



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A ship sails 80 km on a bearing of  $065^\circ$  from  $A$  to  $B$ .  
It then sails 140 km on a bearing of  $125^\circ$  from  $B$  to  $C$ .

- (a) Find  $\vec{AB}$  as a column vector with the components in kilometres.

$$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix} \quad [4]$$

9(a)	$[\cos A] = \frac{11^2 + 9.1^2 - 8.2^2}{2 \times 11 \times 9.1}$	<b>M2</b>	<b>M1</b> for $8.2^2 = 11^2 + 9.1^2 - 2 \times 11 \times 9.1 \times \cos A$
	46.98 to 46.99	<b>A1</b>	
9(b)	$[\sin B] = \frac{11}{8.2} \times \sin 47.0$	<b>M2</b>	<b>M1</b> for $\frac{8.2}{\sin 47} = \frac{11}{\sin B}$
	78.8 or 78.74 to 78.84	<b>A1</b>	If 0 scored then <b>SC1</b> for correct answer from rule or other method
9(c)	36.6 or 36.54 to 36.60...	<b>2</b>	<b>M1</b> for $0.5 \times 9.1 \times 11 \times \sin 47.0$ or <b>M1</b> for $0.5 \times 9.1 \times 8.2 \times \sin(\text{their}(\mathbf{b}))$ or <b>M1</b> for $0.5 \times 8.2 \times 11 \times \sin(180 - 47.0)$
9(d)	6.65 or 6.66 or 6.647 to 6.656...	<b>2</b>	<b>M1</b> for $9.1 \times \sin 47.0$ oe or $\text{their}(\mathbf{c}) \div (0.5)$

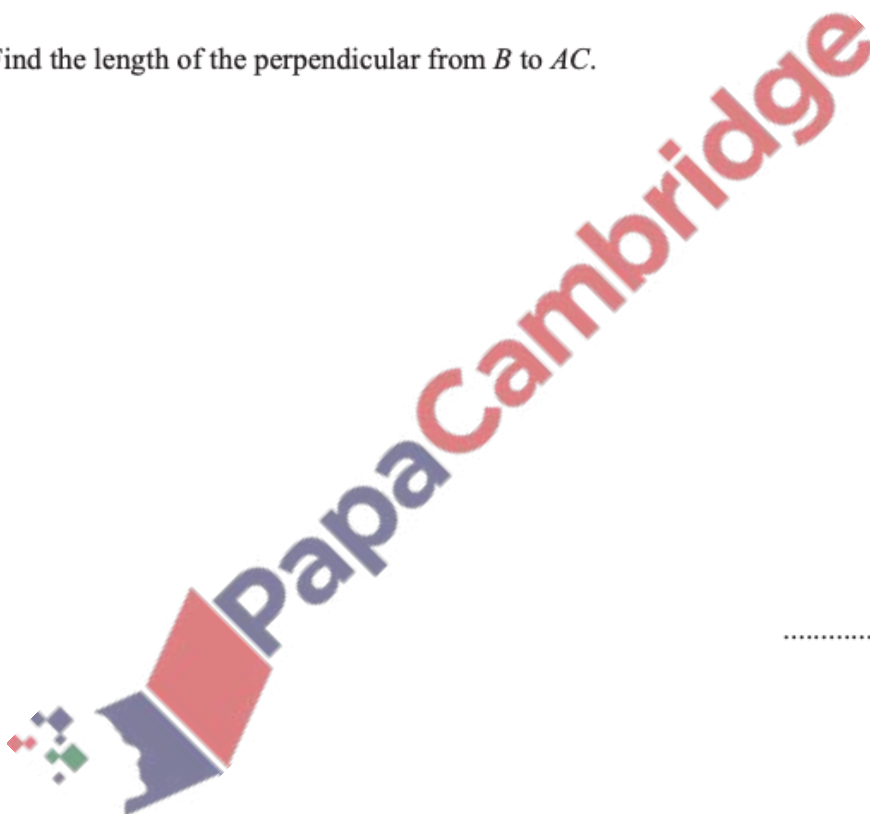


(c) Find the area of triangle  $ABC$ .

.....  $\text{cm}^2$  [2]

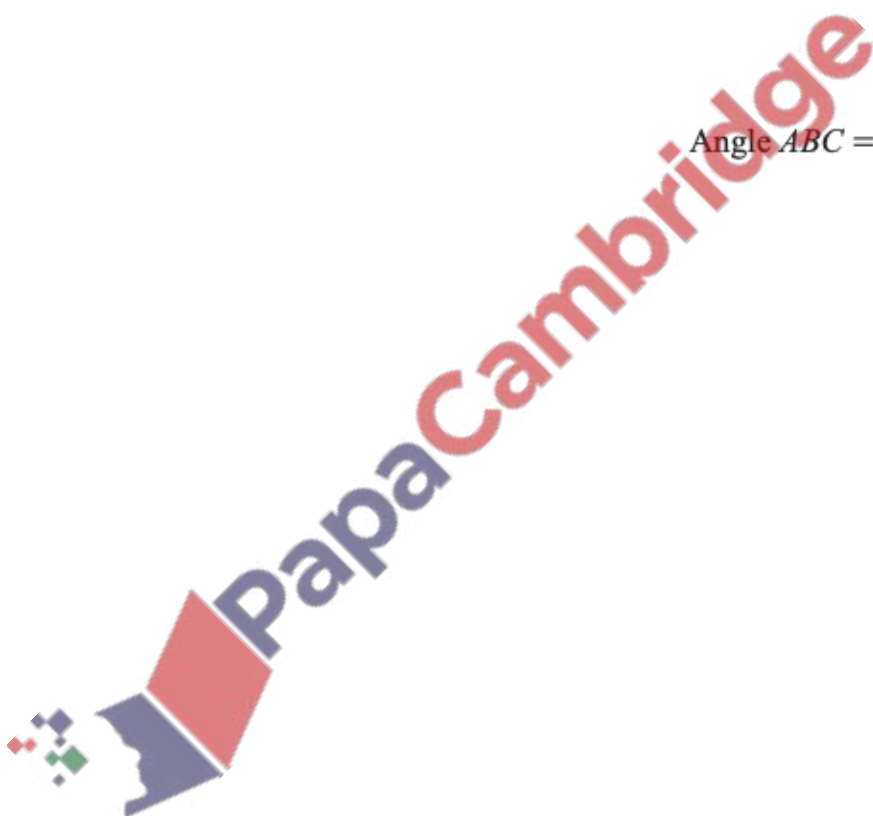
(d) Find the length of the perpendicular from  $B$  to  $AC$ .

.....  $\text{cm}$  [2]

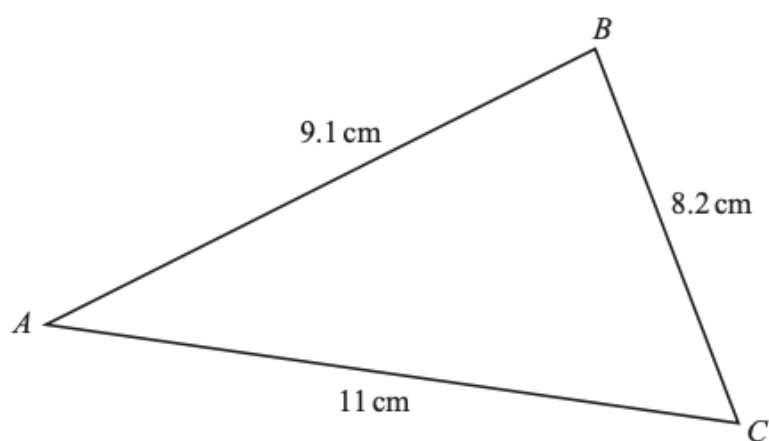


(b) Use the sine rule to find angle  $ABC$ .

Angle  $ABC = \dots\dots\dots$

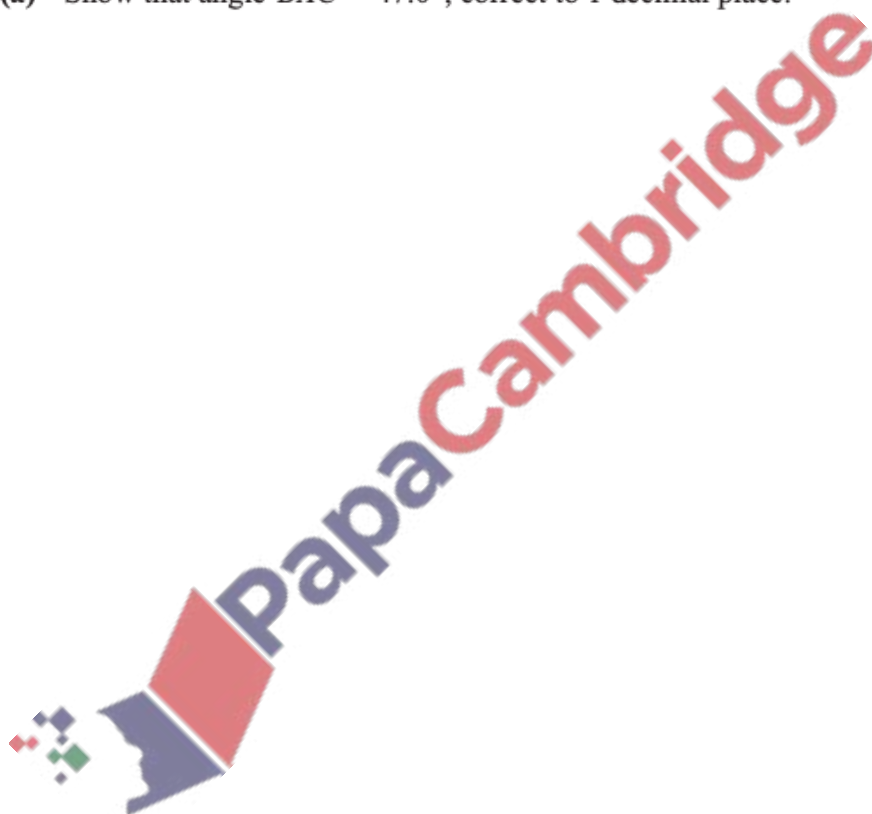




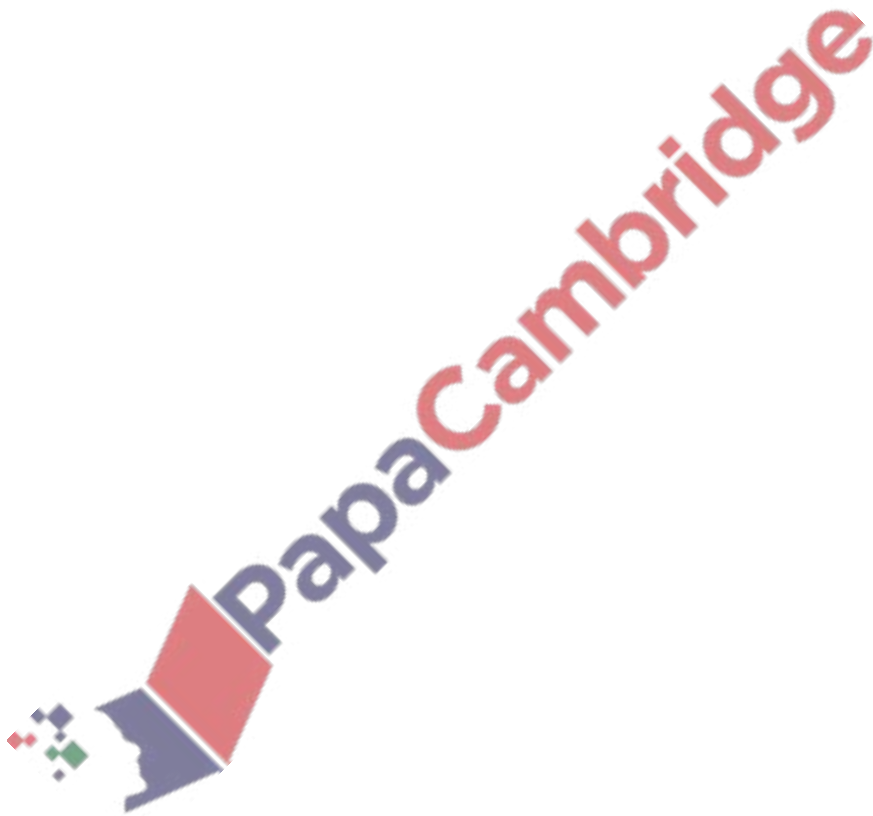


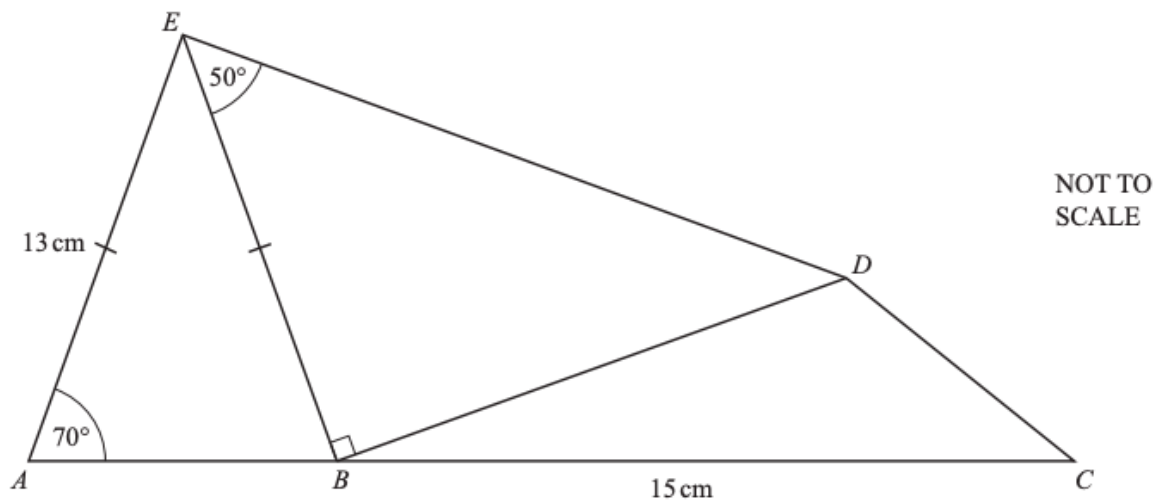
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- (a) Show that angle  $BAC = 47.0^\circ$ , correct to 1 decimal place.



(d) the area of the quadrilateral  $ACDE$ .



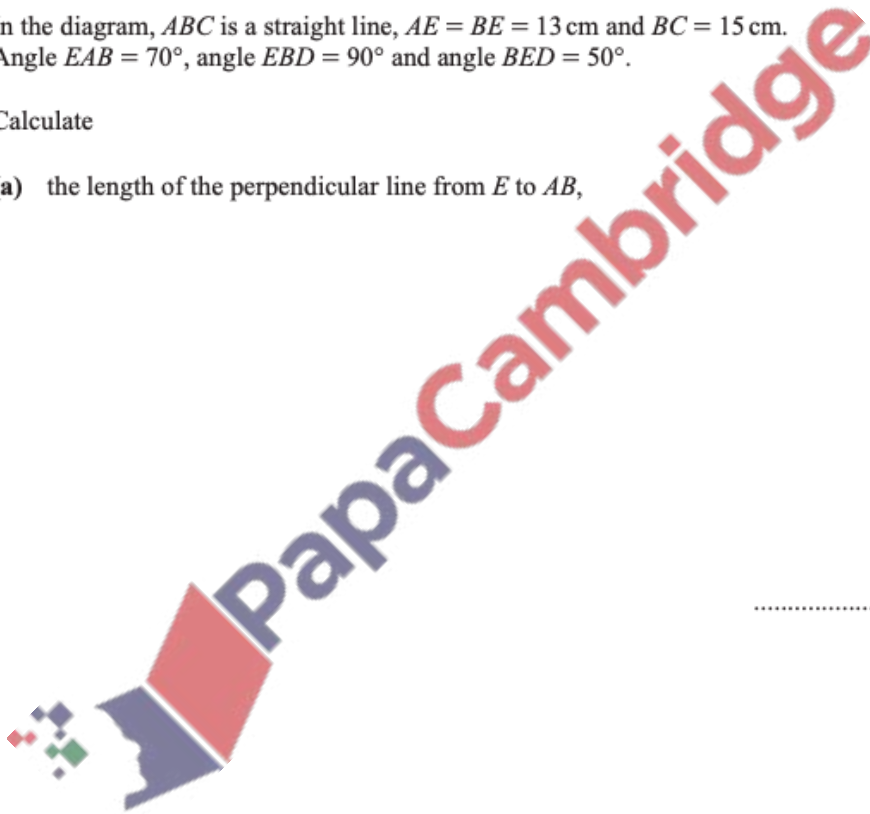


In the diagram,  $ABC$  is a straight line,  $AE = BE = 13 \text{ cm}$  and  $BC = 15 \text{ cm}$ .  
 Angle  $EAB = 70^\circ$ , angle  $EBD = 90^\circ$  and angle  $BED = 50^\circ$ .

Calculate

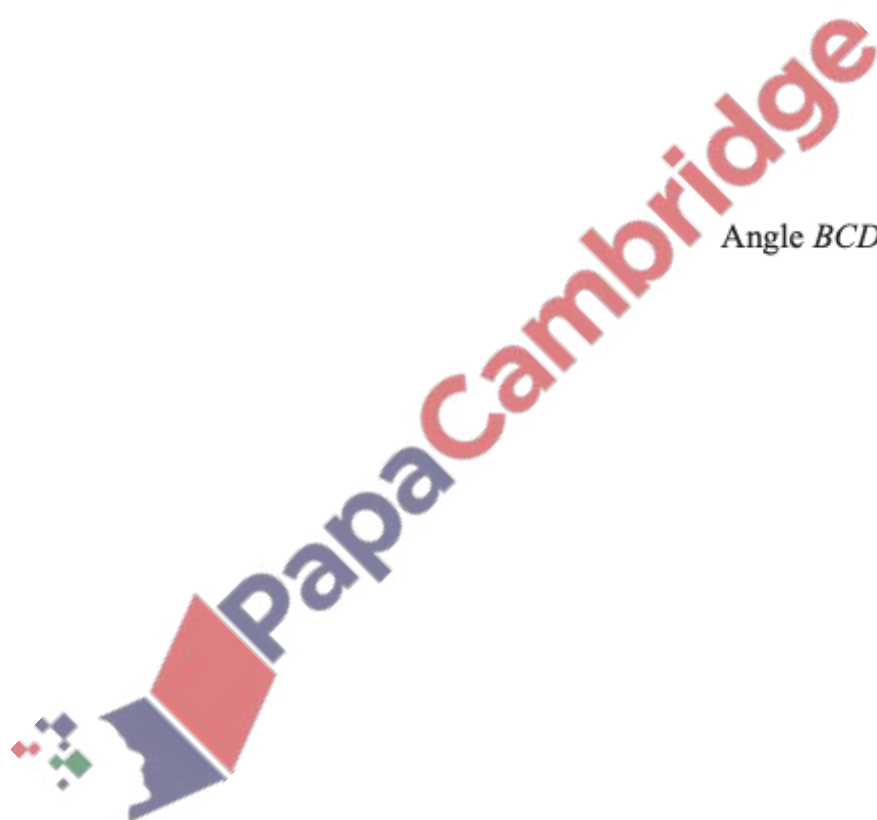
- (a) the length of the perpendicular line from  $E$  to  $AB$ ,

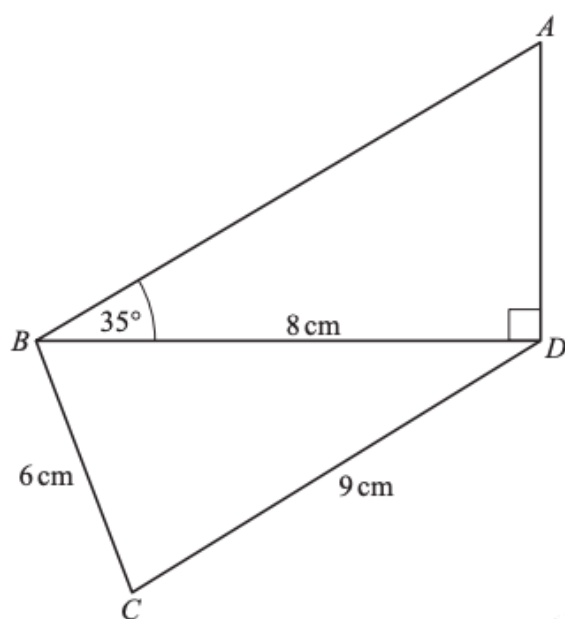
..... cm [2]



(b) Calculate angle  $BCD$ .

Angle  $BCD = \dots\dots\dots$



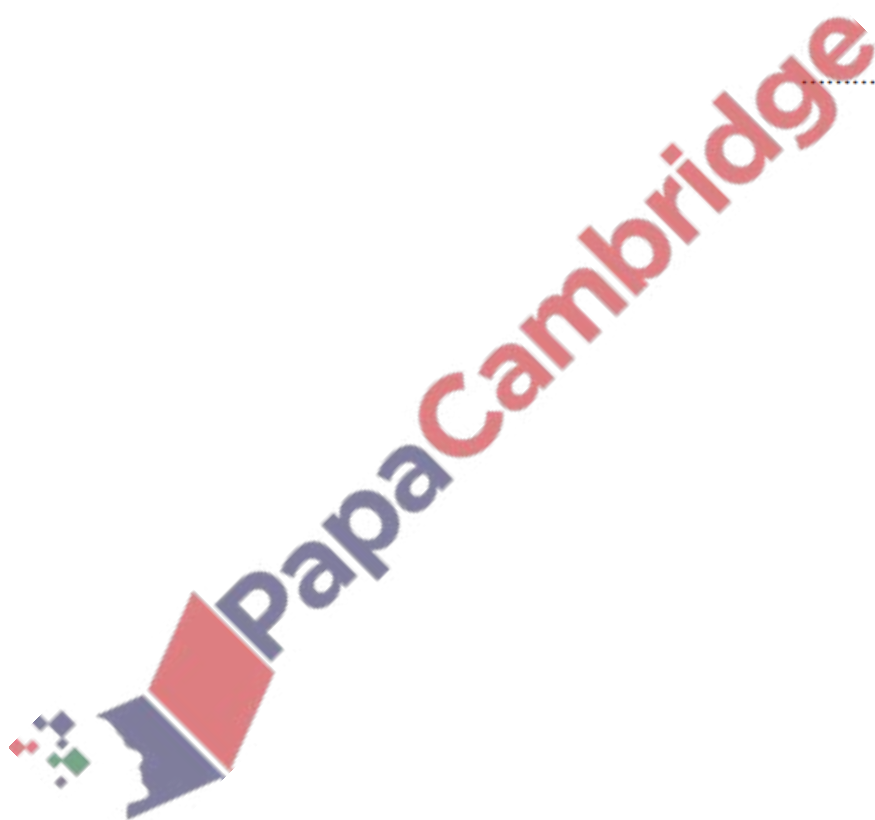


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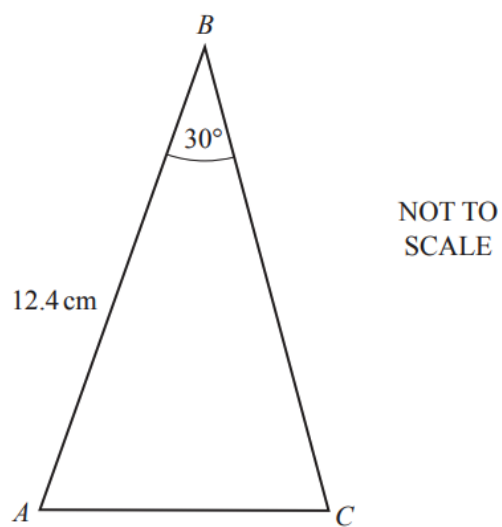
- (a) Calculate  $AB$ .

$AB = \dots\dots\dots\text{ cm}$  [3]

- (d) Find the length of the perpendicular line from  $A$  to the line  $BC$ .



5



The area of triangle  $ABC$  is  $34.1\text{ cm}^2$ .  
 $AB = 12.4\text{ cm}$  and angle  $ABC = 30^\circ$ .

(a) Show that  $BC = 11\text{ cm}$ .

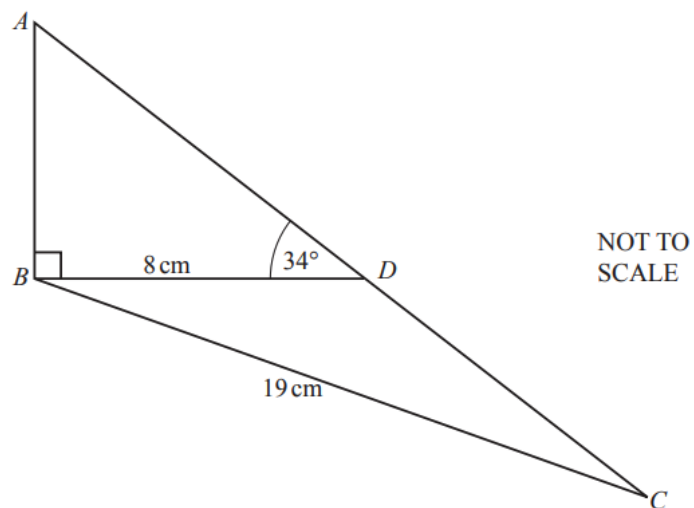
[1]

11 (a)	5.4[0] or 5.396...	2	M1 for $\tan 34 = \frac{AB}{8}$ oe or better
(b)	20.4 or 20.38... nfw	5	<p>B1 for angle <math>D = 146</math></p> <p>M2 for <math>[\sin C = ] \frac{8 \sin(\text{their } D)}{19}</math>  or M1 for <math>\frac{8}{\sin C} = \frac{19}{\sin(\text{their } D)}</math> oe  A1 for [angle <math>C = ] 13.6</math> or <math>13.61</math> to</p> <p>OR</p> <p>B1 for angle <math>A = 56</math></p> <p>M2 for <math>[\sin C = ] \frac{\text{their } AB \times \sin(\text{their } A)}{19}</math>  or M1 for <math>\frac{\text{their } AB}{\sin C} = \frac{19}{\sin(\text{their } A)}</math>  A1 for [angle <math>C = ] 13.6</math> or <math>13.61</math> to</p>
(c)	48[.0] or 48.1 or 48.04 to 48.12 cao	2	<p>M1 for  <math>0.5 \times \text{their}(a) \times 19 \times \sin(90 + \text{their}(b))</math></p>





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In the diagram,  $ADC$  is a straight line.

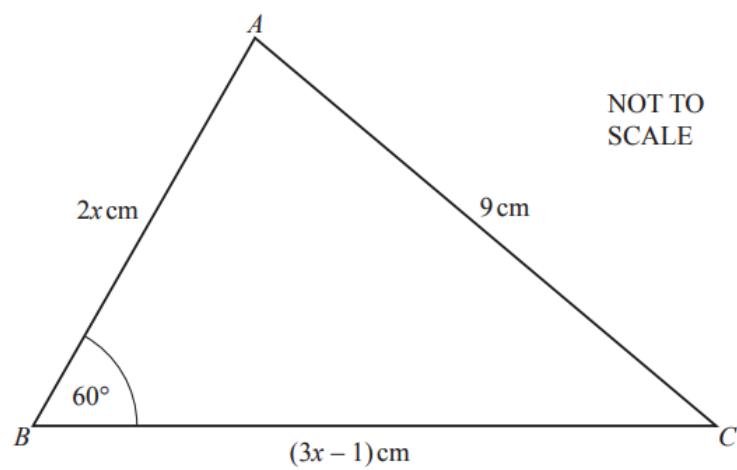
(a) Calculate  $AB$ .

$AB = \dots\dots\dots\text{ cm}$  [2]

(b) Calculate angle  $DBC$ .

Angle  $DBC = \dots\dots\dots$  [5]

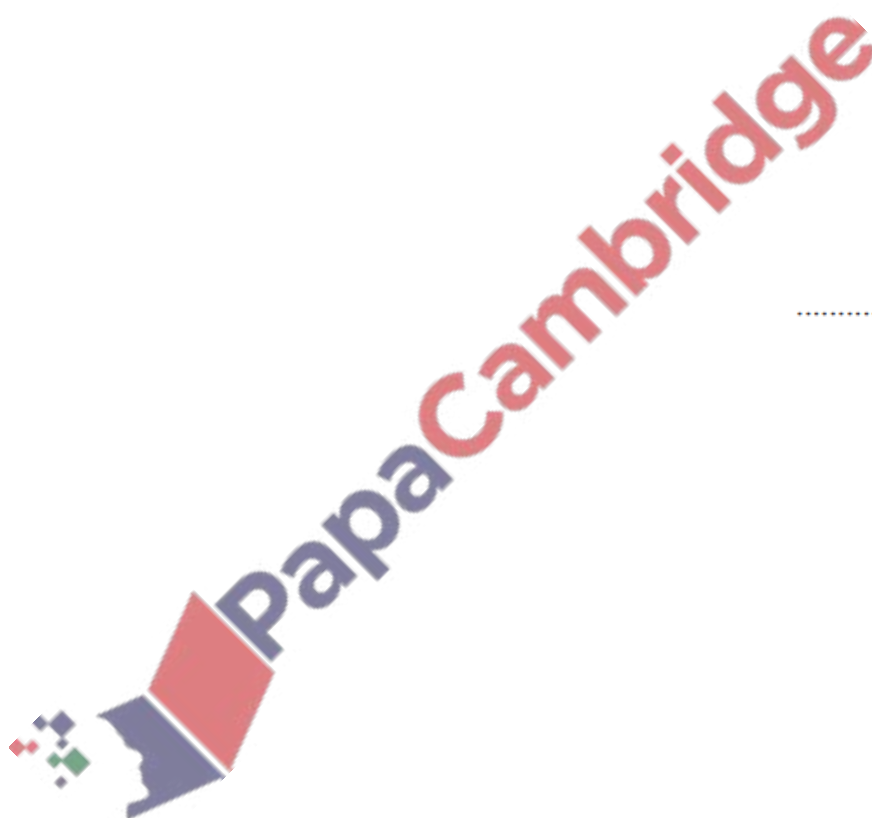


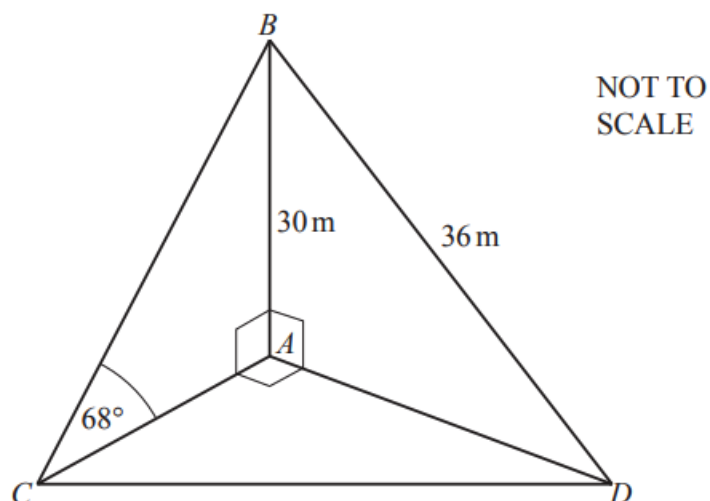


- (a) Use the cosine rule to show that  $7x^2 - 4x - 80 = 0$ .

(b) Calculate  $AC$  and show that it rounds to 12.1 m, correct to 3 significant figures.

(c) Calculate the bearing of  $A$  from  $D$ .





$AB$  is a vertical tower of height  $30\text{ m}$ .

$BC$  and  $BD$  are straight wires attached to  $B$ .

$A$ ,  $C$  and  $D$  are on horizontal ground with  $C$  due west of  $D$ .

Angle  $BCA = 68^\circ$  and  $BD = 36\text{ m}$ .

(a) Calculate  $AD$ .

$AD = \dots\dots\dots$

