

Combined Sine and Cosine Rules

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1) Combined Sine and Cosine Rules: Easier

- 1 $ABCD$ is a quadrilateral.

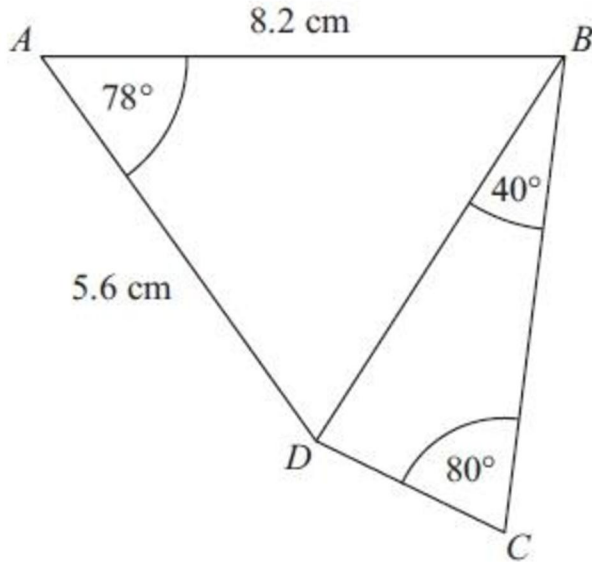


Diagram **NOT** accurately drawn

Work out the length of DC .

Give your answer correct to 3 significant figures.

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

$$(BD)^2 = (8.2)^2 + (5.6)^2 - 2(8.2)(5.6) \cos 78^\circ = 79.505 \dots$$

$$BD = \sqrt{79.505 \dots} = 8.9165795 \dots$$

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B}$

$$\frac{DC}{\sin 40^\circ} = \frac{(8.9165 \dots)}{\sin 80^\circ}$$

$$DC = \frac{(8.9165 \dots) \times \sin 40^\circ}{\sin 80^\circ} = 5.8198 \dots = 5.82 \text{ (3sf)}$$

..... **5.82**..... cm

(Total 5 marks)

1) Combined Sine and Cosine Rules: Medium

2

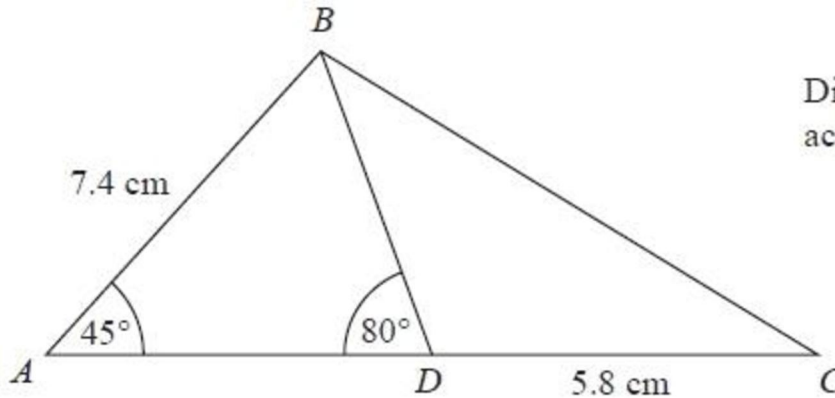


Diagram NOT accurately drawn

ABC is a triangle.
 D is a point on AC .
 Angle $BAD = 45^\circ$
 Angle $ADB = 80^\circ$
 $AB = 7.4$ cm
 $DC = 5.8$ cm

Work out the length of BC .
 Give your answer correct to 3 significant figures.

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B}$

$$\frac{BD}{\sin 45} = \frac{7.4}{\sin 80}$$

$$BD = \frac{7.4 \times \sin 45}{\sin 80} = 5.3133 \dots$$

Angle $BDC = 180 - 80 = 100$

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

$$(BC)^2 = (5.8)^2 + (5.3133 \dots)^2 - 2(5.8)(5.3133 \dots) \cos 100^\circ = 72.573 \dots$$

$$BC = \sqrt{72.573 \dots} = 8.52 \text{ (3sf)}$$

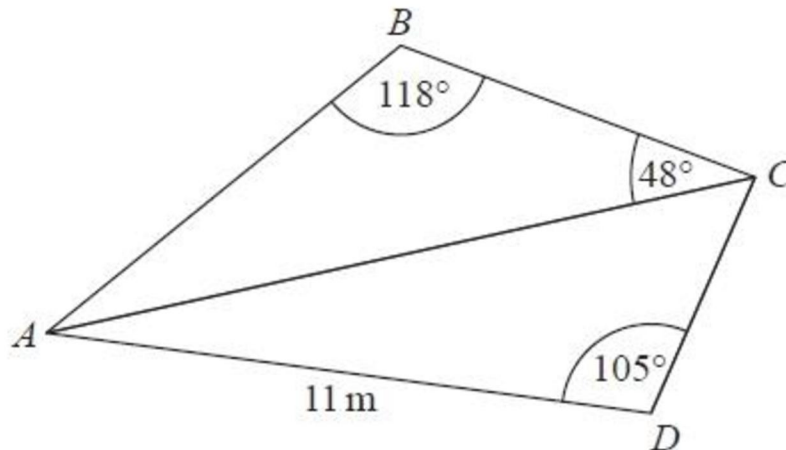
..... 8.52..... cm

(Total 5 marks)

1) Combined Sine and Cosine Rules: Harder

3

ABC and ADC are triangles.



The area of triangle ADC is 56 m^2

Work out the length of AB .

Give your answer correct to 1 decimal place.

Area of triangle: $Area = \frac{1}{2}ab \sin C$

Area ADC : $\frac{1}{2}(11)(CD) \sin 105^\circ = 56$

$$CD = \frac{56 \times 2}{11 \times \sin 105^\circ} = 10.54 \dots$$

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

$$(AC)^2 = (11)^2 + (10.54 \dots)^2 - 2(11)(10.54 \dots) \cos 105^\circ = 292.06 \dots$$

$$AC = \sqrt{292.06 \dots} = 17.09 \dots$$

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B}$

$$\frac{AB}{\sin 48} = \frac{(17.09 \dots)}{\sin 118}$$

$$AB = \frac{(17.09 \dots) \times \sin 48}{\sin 118} = 14.4 \text{ (3sf)}$$

..... 14.4..... m

(Total 6 marks)