OGUN DIGICLASS

CLASS: SECONDARY SCHOOL

SUBJECT: MATHEMATICS

TOPIC: TRIGONOMETRY

SUBTOPIC: Sine and Cosine Rule

www.ogundigiclass.ng

Sine Rule

and

Cosine Rule

If the question concerns lengths or angles in a triangle, you **may** need the sine rule or the cosine rule.

First, decide if the triangle is **right-angled**.

Then, decide whether an angle is involved at all.

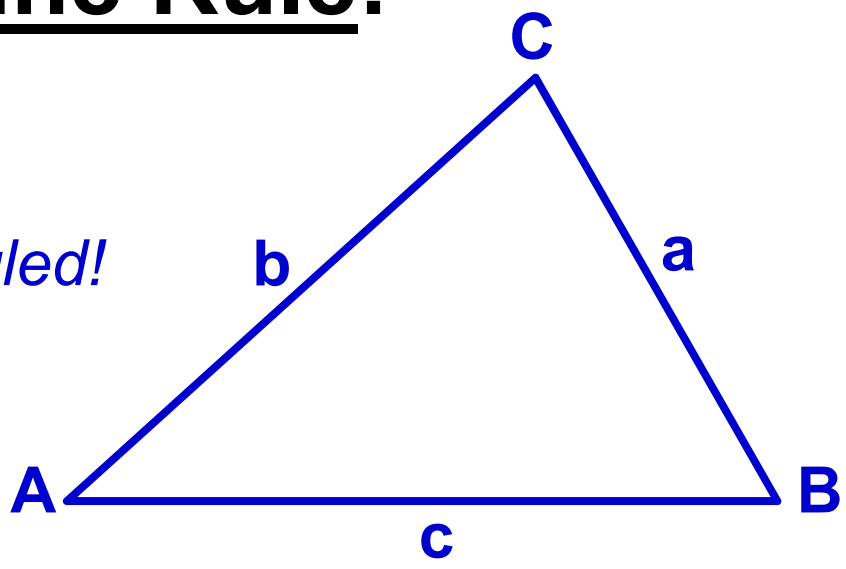
If it is a right-angled triangle, and there are **no angles** involved, you will need **Pythagoras' Theorem**

If it is a right-angled triangle, and there **are** angles involved, you will need straightforward **Trigonometry**, using **Sin**, **Cos** and **Tan**.

If the triangle is **not** **right-angled**, you may need the **Sine Rule** or the **Cosine Rule**

The Sine Rule:

Not right-angled!



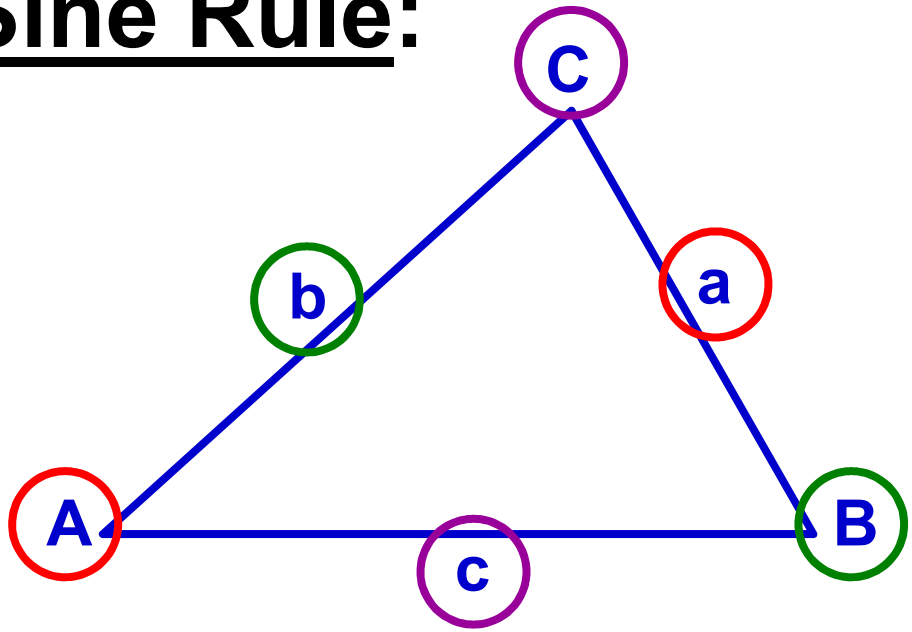
In any triangle *ABC*

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

or

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

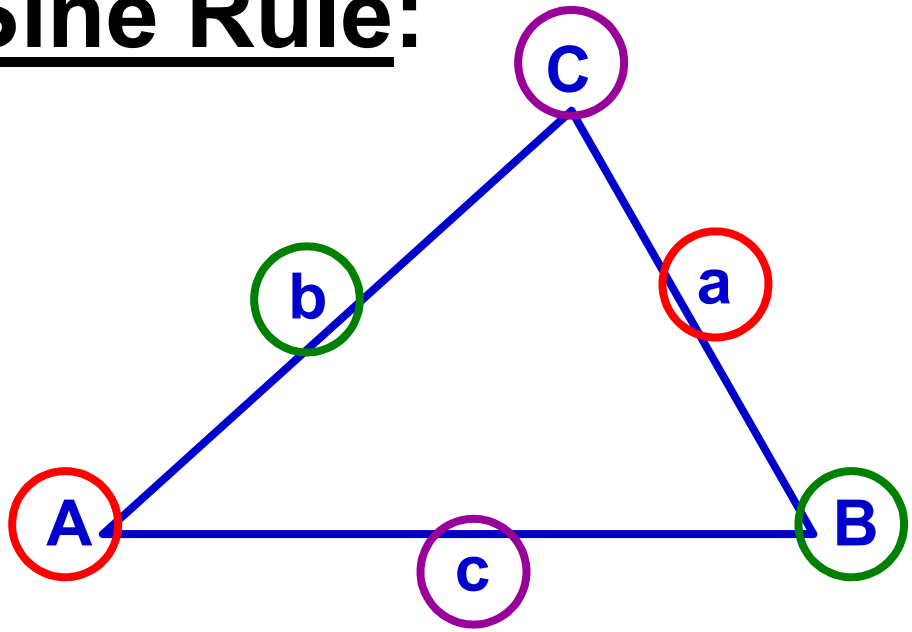
The Sine Rule:



You can only use the Sine Rule if you have a “matching pair”.

You have to know one angle, and the side opposite it.

The Sine Rule:



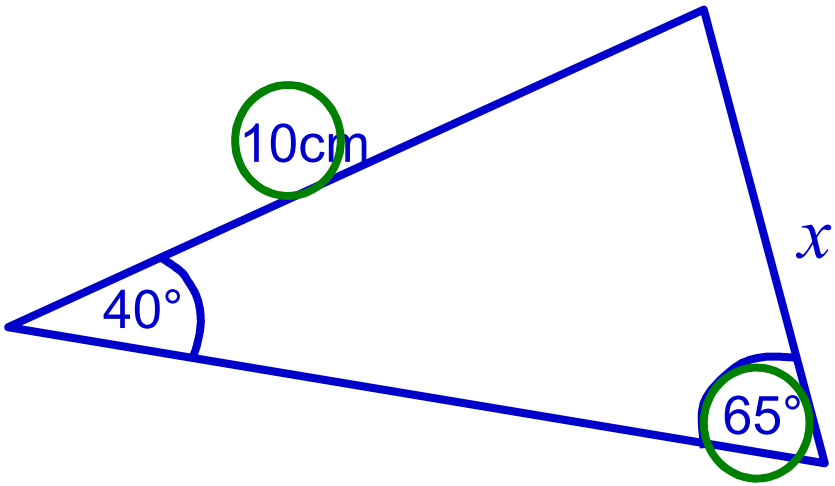
You can only use the Sine Rule if you have a “matching pair”.

You have to know one angle, and the side opposite it.

Then if you have just one other side or angle, you can use the **Sine Rule** to find any of the other angles or sides.

Finding the missing side:

Not to scale

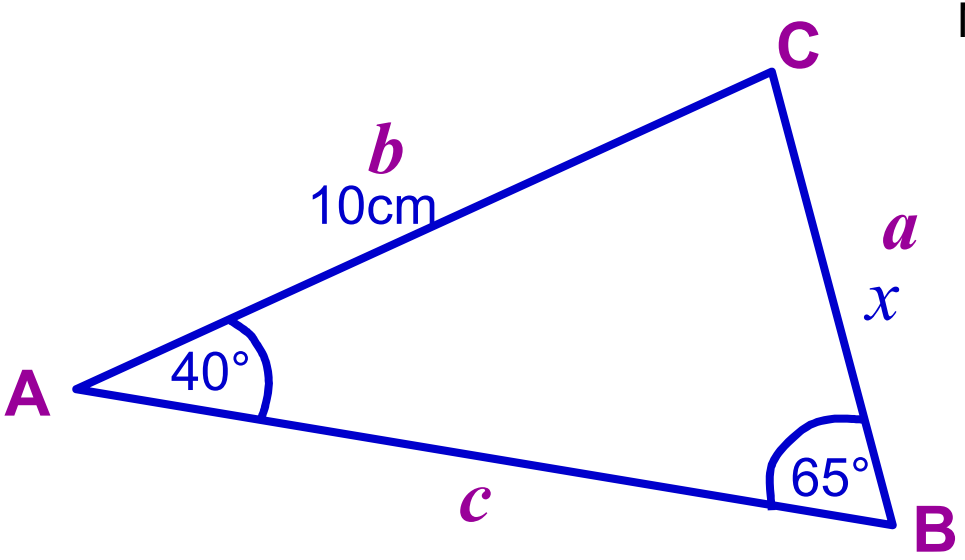


Is it a right-angled triangle? No

Is there a matching pair? Yes

Finding the missing side:

Not to scale



Is it a right-angled triangle? No

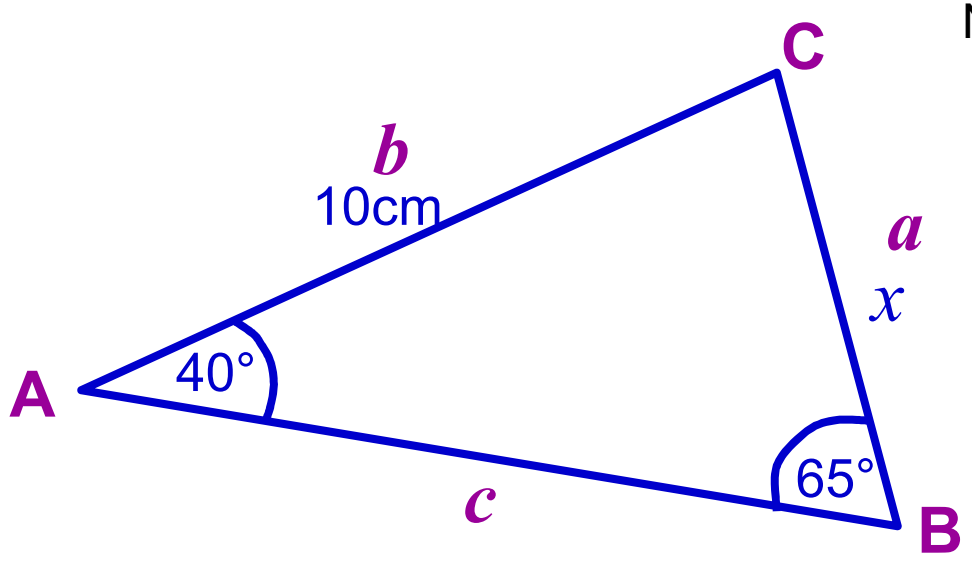
Is there a matching pair? Yes

Use the Sine Rule

Label the sides and angles.

Finding the missing side:

Not to scale



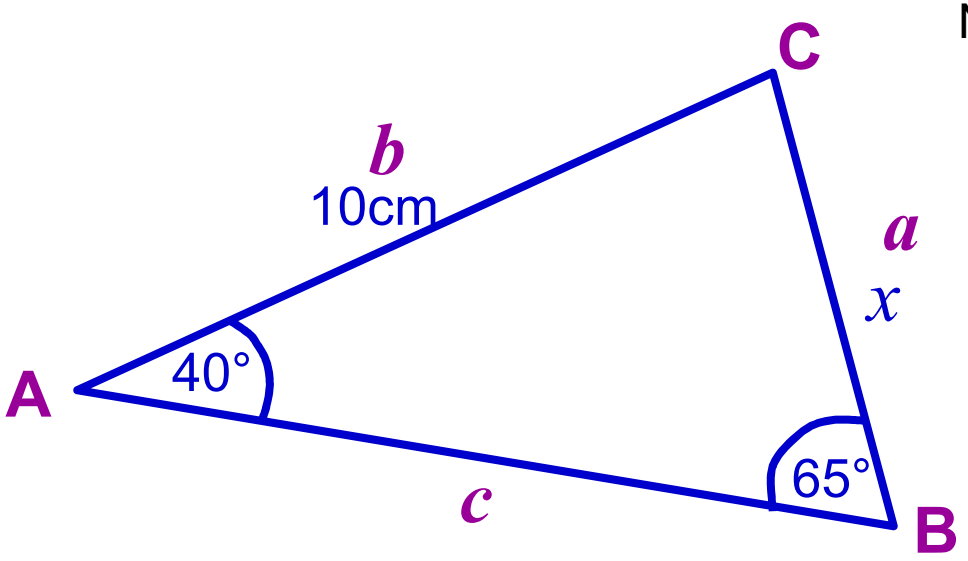
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Because we are trying to find a missing length of a side, the little letters are on top

We don't need the "C" bit of the formula.

Finding the missing side:

Not to scale



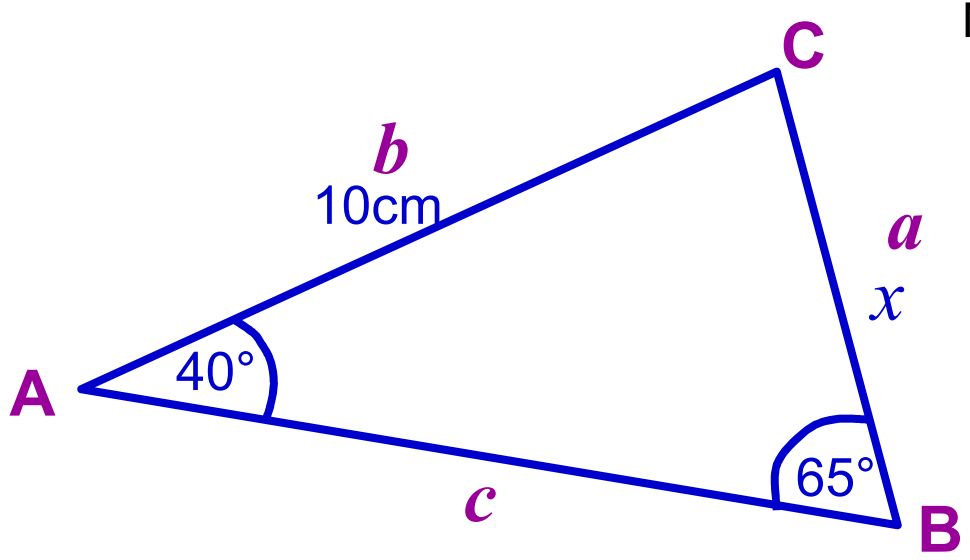
$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

Because we are trying to find a missing length of a side, the little letters are on top

Fill in the bits you know.

Finding the missing side:

Not to scale

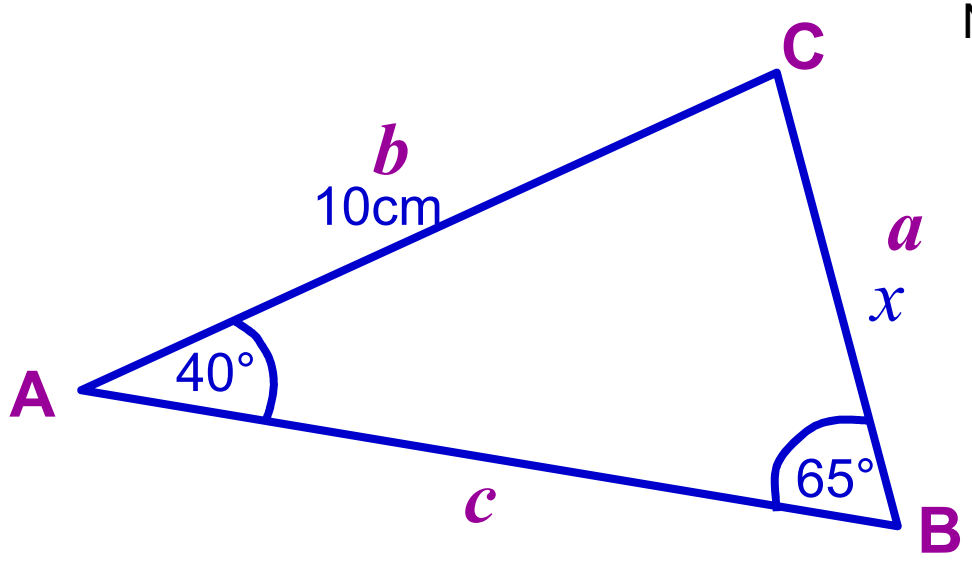


$$\frac{a}{\sin A} = \frac{b}{\sin B} \qquad \frac{x}{\sin 40°} = \frac{10}{\sin 65°}$$

Fill in the bits you know.

Finding the missing side:

Not to scale



$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

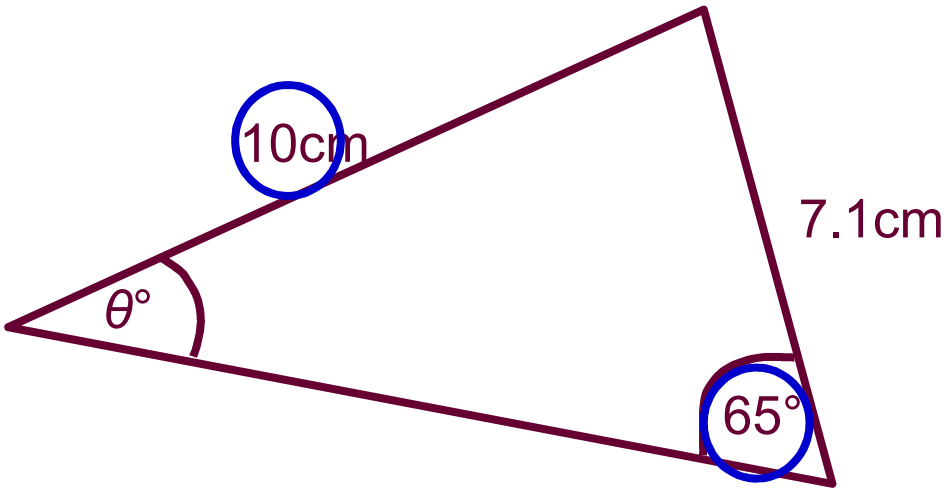
$$\frac{x}{\sin 40°} = \frac{10}{\sin 65°}$$

$$x = \frac{10}{\sin 65°} \times \sin 40°$$

$$x = 7.09\,\text{cm}$$

Finding the missing angle:

Not to scale

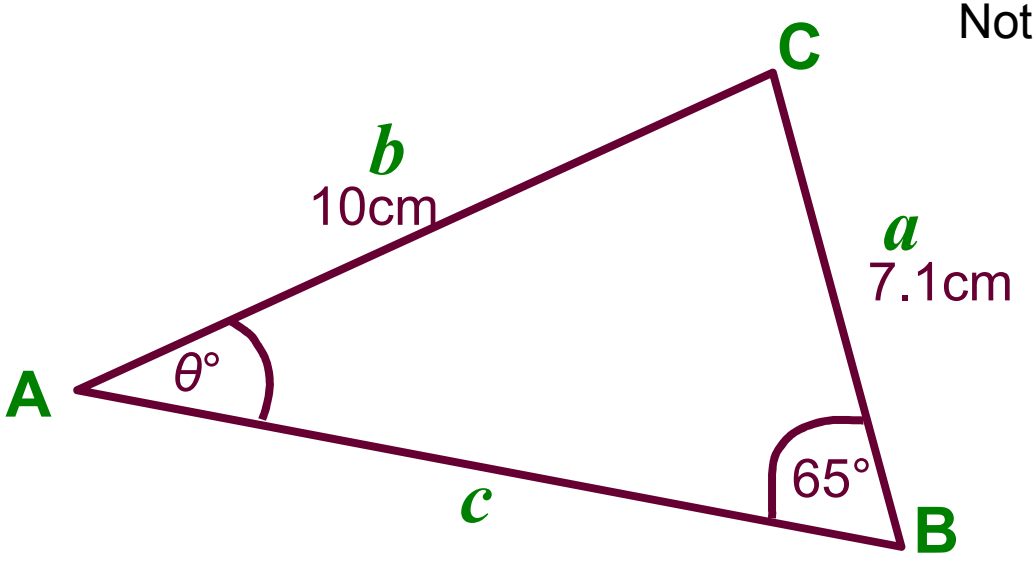


Is it a right-angled triangle? No

Is there a matching pair? Yes

Finding the missing angle:

Not to scale



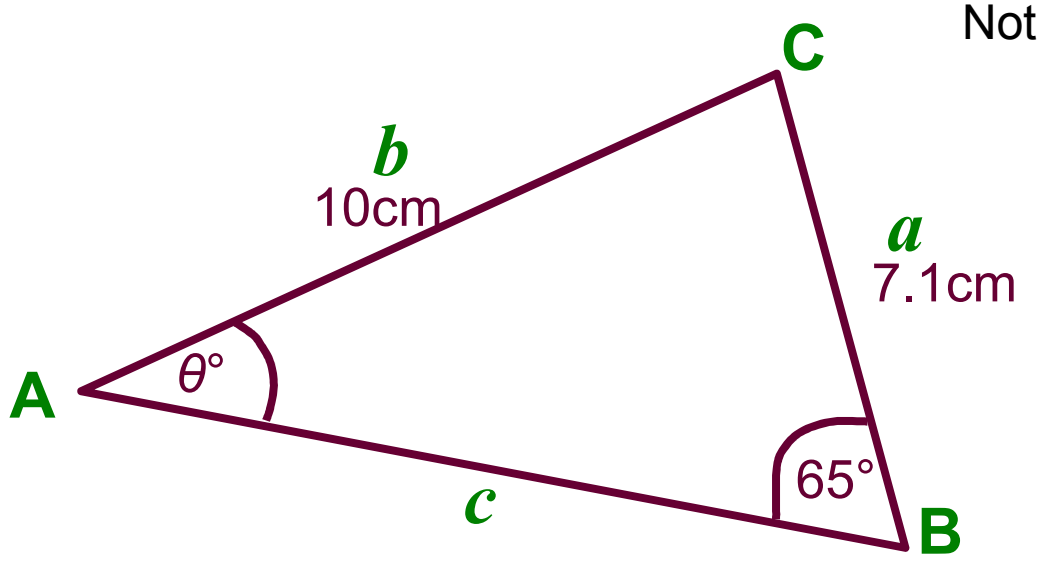
Is it a right-angled triangle? No

Is there a matching pair? Yes

Use the Sine Rule

Label the sides and angles.

Finding the missing angle:

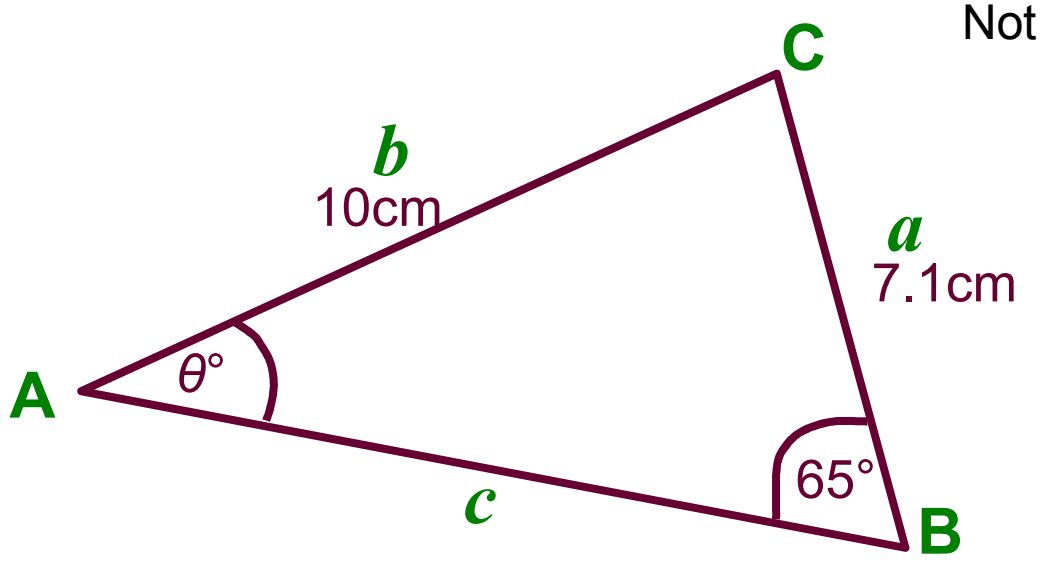


$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Because we are trying to find a missing angle, the formula is the other way up.

We don't need the "C" bit of the formula.

Finding the missing angle:



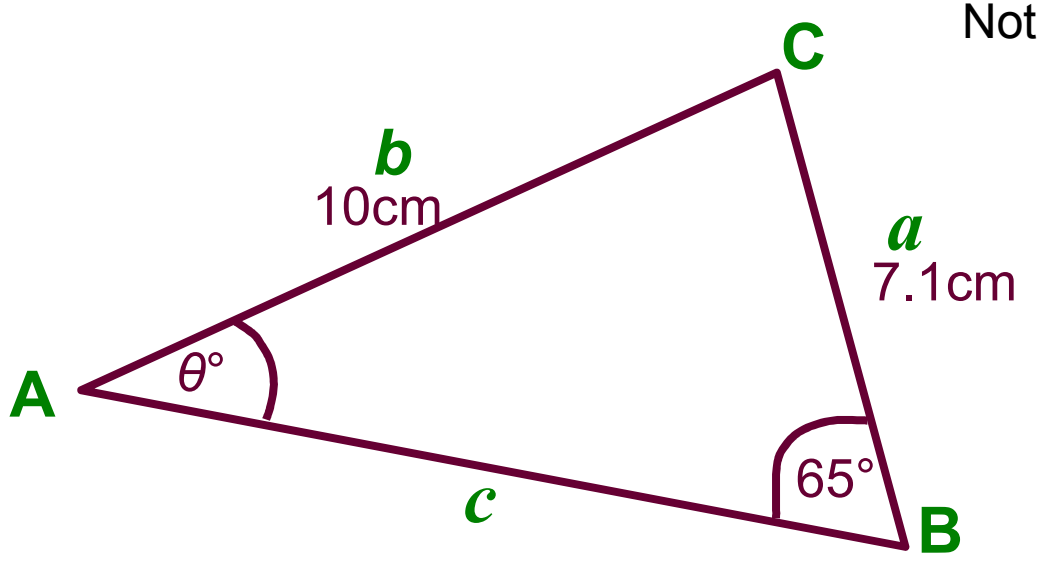
$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

Because we are trying to find a missing angle, the formula is the other way up.

Fill in the bits you know.

Finding the missing angle:

Not to scale

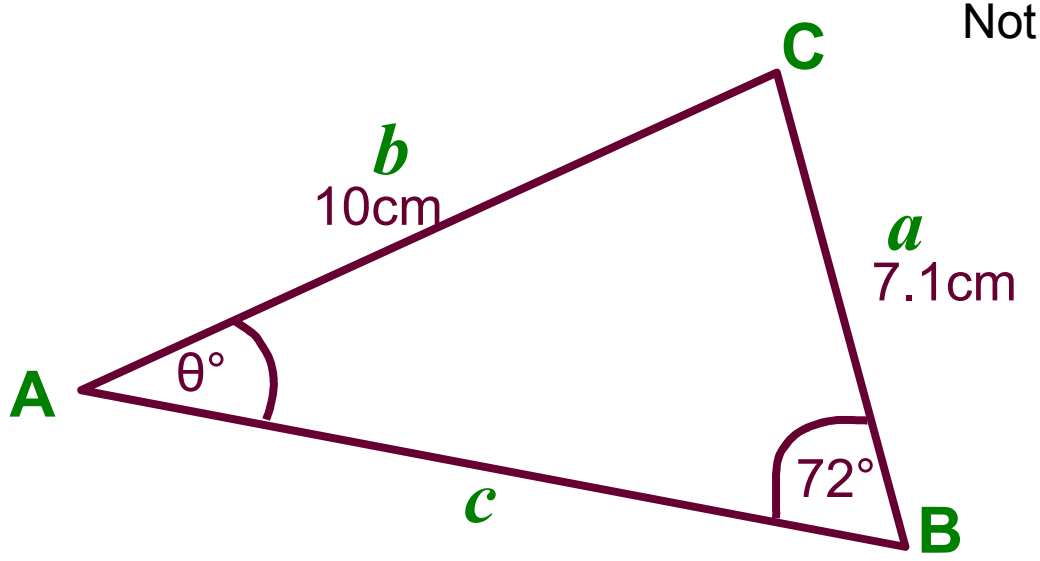


$$\frac{\sin A}{a} = \frac{\sin B}{b} \qquad \frac{\sin \theta}{7.1} = \frac{\sin 65°}{10}$$

Fill in the bits you know.

Finding the missing angle:

Not to scale



$$\frac{\sin A}{a} = \frac{\sin B}{b} \qquad \frac{\sin\theta}{7.1} = \frac{\sin 65°}{10}$$

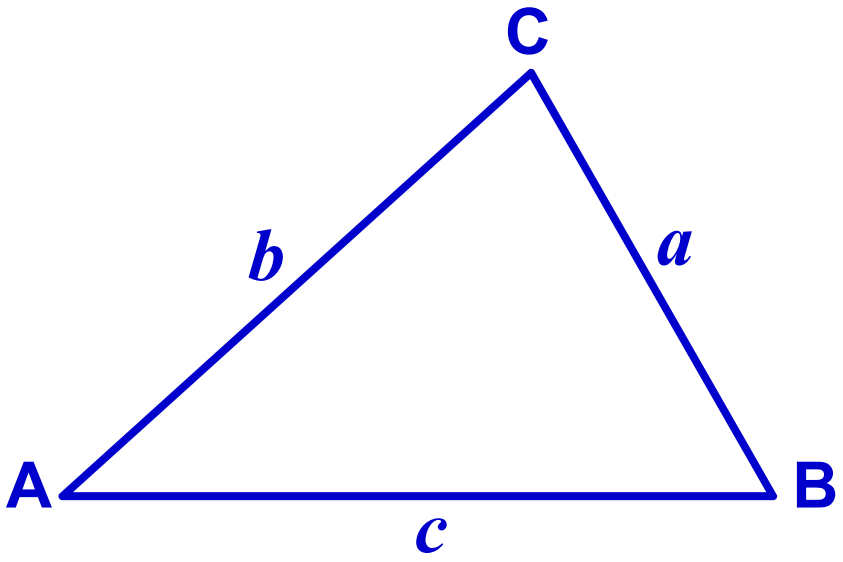
$$\sin\theta = \frac{\sin 65°}{10} \times 7.1$$

Shift Sin =

$$\sin\theta = 0.6434785..... \quad \theta = 40.05°$$

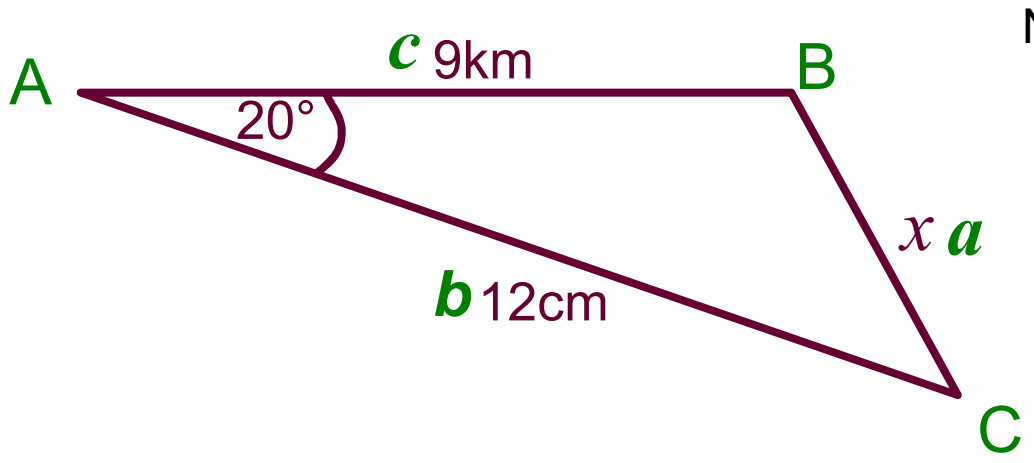
The Cosine Rule:

If the triangle is not right-angled, and there is not a matching pair, you will need then Cosine Rule.



In any triangle *ABC* $a^2 = b^2 + c^2 - 2bc\cos A$

Finding the missing side:



Not to scale

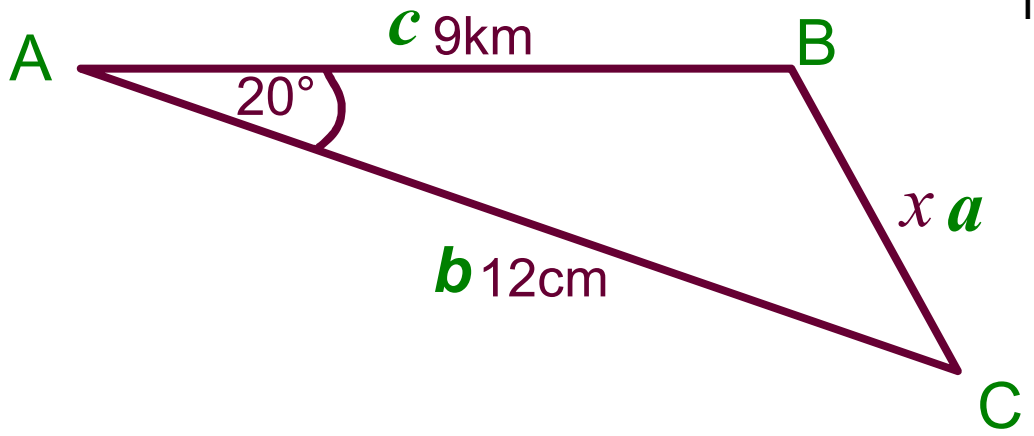
Is it a right-angled triangle? No

Is there a matching pair? No

Use the Cosine Rule

Label the sides and angles, calling the given angle “A” and the missing side “a”.

Finding the missing side:



Not to scale

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

Fill in the bits you know.

$$a^2 = 12^2 + 9^2 - 2\times 12\times 9\times \cos 20°$$

$$a^2 = 12^2 + 9^2 - (2\times 12\times 9\times \cos 20°)$$

$$a = \sqrt{22.026.....}$$

$$a = 4.69$$

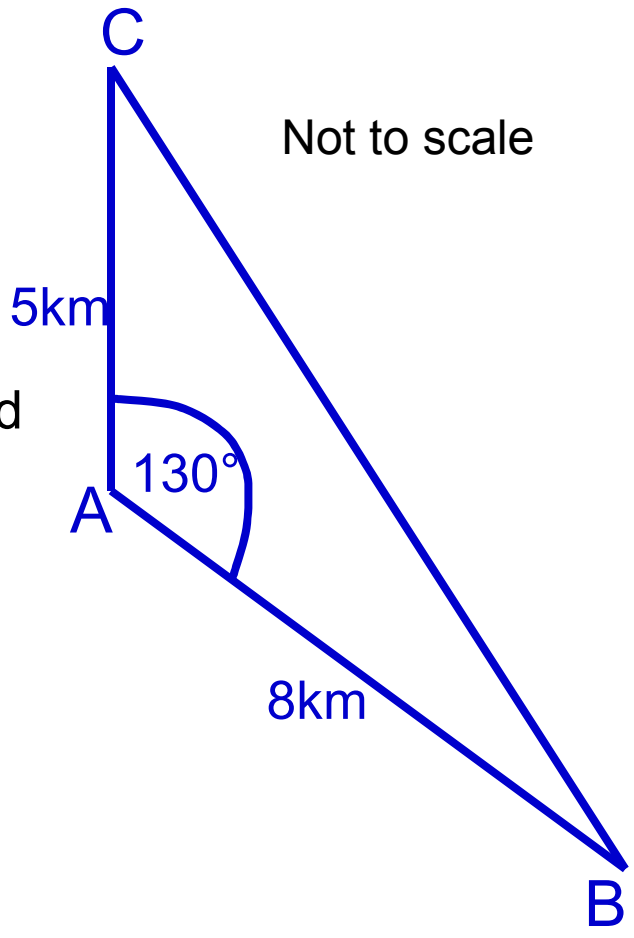
x = 4.69cm

Finding the missing side:

A man starts at the village of Chartham and walks 5 km due South to Aylesham. Then he walks another 8 km on a bearing of 130° to Barham.

What is the direct distance between Chartham and Barham, in a straight line?

First, draw a sketch.



Is it a right-angled triangle? No

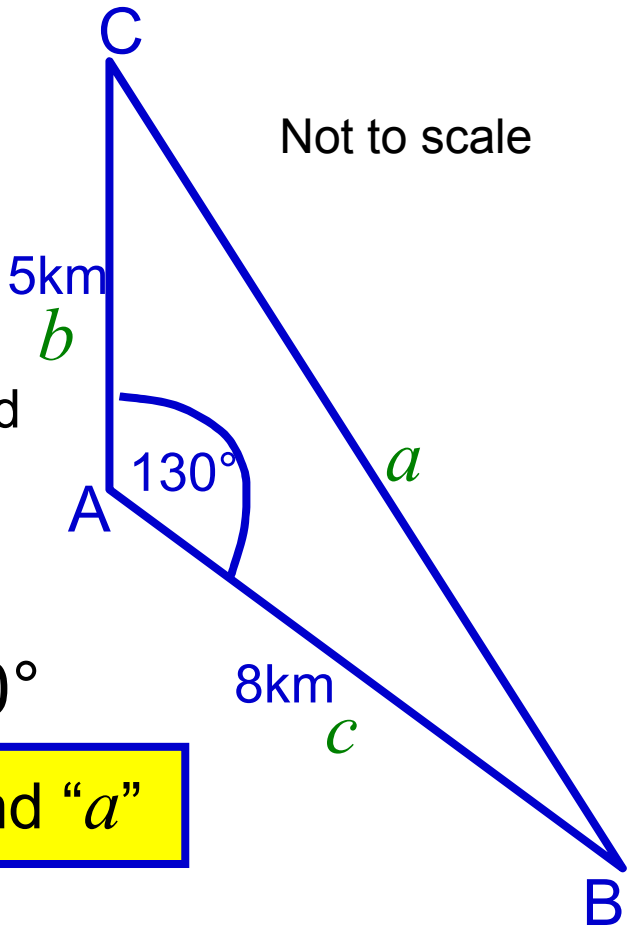
Is there a matching pair? No

Use the Cosine Rule

Finding the missing side:

A man starts at the village of Chartham and walks 5 km due South to Aylesham. Then he walks another 8 km to on a bearing of 130° to Barham.

What is the direct distance between Chartham and Barham, in a straight line?



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

$a^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \times \cos 130°$

Label the other sides you want to find "a"

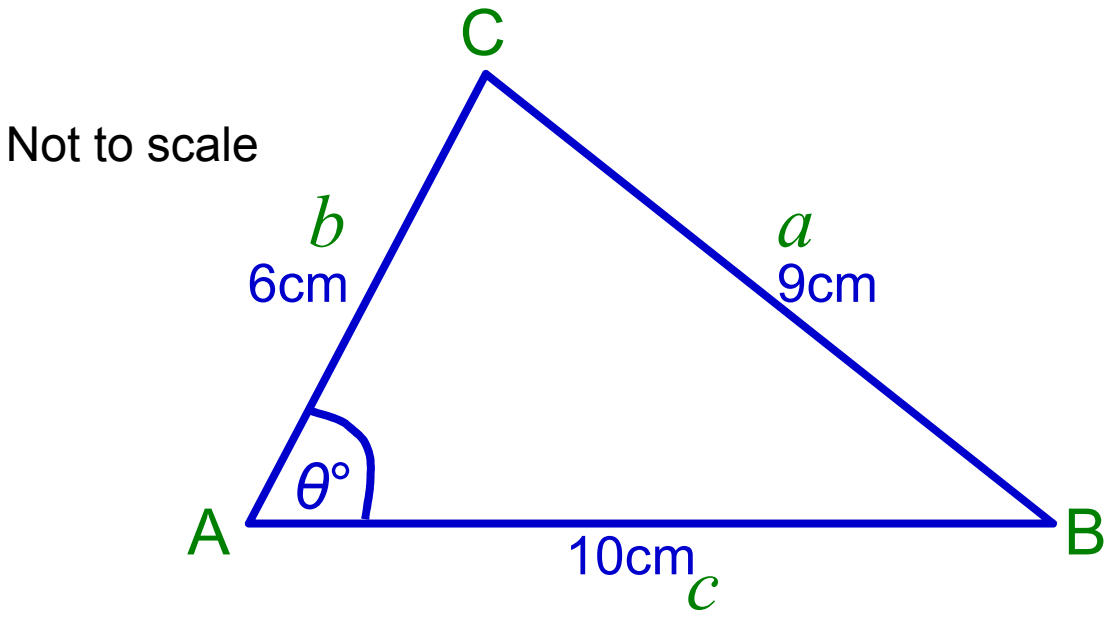
$a^2 = 25 + 64 - 80\cos 130°$

$a^2 = 140.42$

$a = 11.85$

11.85km

Finding the missing angle θ:



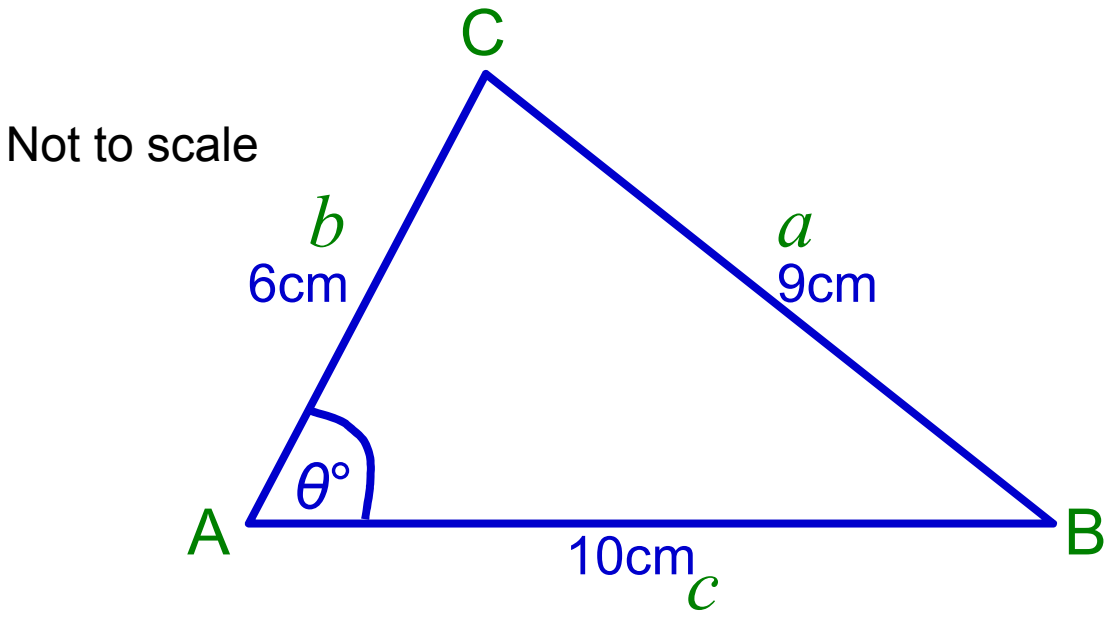
Is it a right-angled triangle? No

Is there a matching pair? No

Use the Cosine Rule

Label the sides and angles, calling the missing angle “A”

Finding the missing angle θ:



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

$$9^2 = 6^2 + 10^2 - 2\times 6\times 10\times \cos\theta$$

$$81 = 36 + 100 - 120\times\cos\theta$$

$$81 = 136 - 120\times\cos\theta$$

$$\cos\theta = \frac{136-81}{120}$$

$$\cos\theta = 0.4583333....$$

Shift Cos =

$$\theta = 62.72°$$