



The sine rule

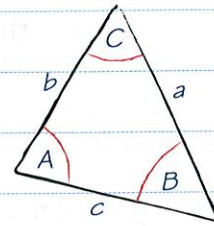
The SINE RULE applies to any triangle. You don't need a right angle. You label the angles of the triangle with capital letters and the sides with lower case letters. Each side has the same letter as its OPPOSITE angle.

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

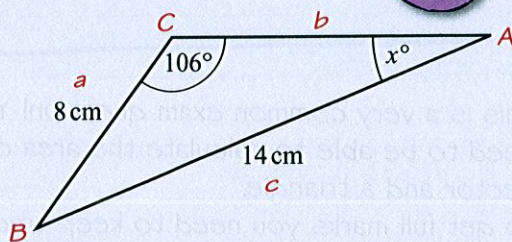
This version is given on the formula sheet. Use it to find a missing side.

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

Learn this version. It's useful for finding a missing angle.



Worked example



Work out the size of the angle marked x .

$$\begin{aligned} \frac{\sin A}{a} &= \frac{\sin C}{c} \\ \frac{\sin x^\circ}{8} &= \frac{\sin 106^\circ}{14} \\ \sin x^\circ &= \frac{8 \times \sin 106^\circ}{14} \\ &= 0.5492923977 \\ x^\circ &= 33.31848\dots^\circ = 33.3^\circ \text{ (to 3 s.f.)} \end{aligned}$$

Golden rule

To use the sine rule, you need to know either two angles and a side (ASA) or two sides and a non-included angle (SSA).

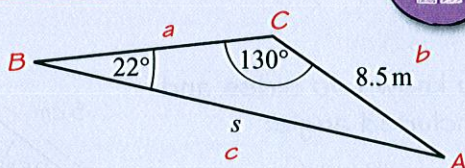
This is not a right-angled triangle so you can't use $S^O_H C^A_H T^O_A$. You know two sides and a non-included angle (SSA) so you can use the sine rule.

You need to find an angle so use the 'upside down' version of the sine rule:

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

You are not interested in side b or angle B so ignore this part of the rule. Substitute in the values you know and solve the equation to find x . Use the \sin^{-1} function on your calculator.

Worked example



Work out the length of the side marked s .

$$\begin{aligned} \frac{c}{\sin C} &= \frac{b}{\sin B} \\ \frac{s}{\sin 130^\circ} &= \frac{8.5}{\sin 22^\circ} \\ s &= \frac{8.5 \times \sin 130^\circ}{\sin 22^\circ} \\ &= 17.381909\dots \end{aligned}$$

The length is 17.4 m (to 3 s.f.).

You know two angles and a side (ASA) so you can use the sine rule.

Check it!

The greater side length is opposite the greater angle. ✓

Now try this

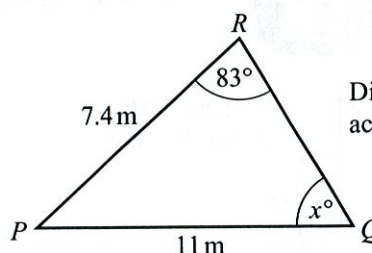


Diagram NOT accurately drawn



Work out the value of x .

(3 marks)