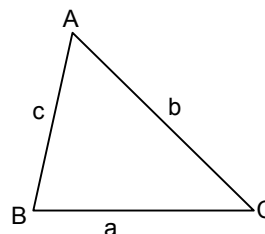


**Sine and Cosine Rules:** For triangles which are *not* right-angled we use the sine and cosine rules. The triangle on the right has the conventional notation of small letters for the lengths of sides and capital letters for the angles opposite. To find lengths and angles, use:



- The sine rule if 2 sides and 2 angles are involved
- The cosine rule if 3 sides and 1 angle are involved

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

COSINE RULE	
$a^2 = b^2 + c^2 - 2bc \cos A$	(for a side)
$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$	(for an angle)

It is perhaps worth having programs for the two forms of the cosine rule, but the sine rule is very easy to use.

Don't be put off by the letters. Basically, the sine rule says the ratio of side/sine is the same for each pair of sides and angles. And in the cosine rule, ensure that the side on the LHS of the equation matches the angle on the RHS.

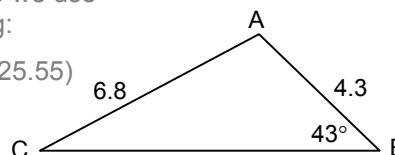
In triangle ABC, angle B = 43°, AC = 6.8 cm and AB = 4.3cm. Find the size of angle A, giving your answer to the nearest degree.

It is essential to draw a rough diagram which will show you how to proceed. We know 2 sides and 1 angle and we want another angle, so we use the sine rule. We can only find angle C at the moment, using:

$$\frac{4.3}{\sin C} = \frac{6.8}{\sin 43}$$

which gives C = 25.55°. So A = 180 - (43+25.55)

**A = 111.45° = 111° to the nearest degree**



**Town A is 48km from town B and 32km from town C. If B is 56km from town C, find the size of angle CAB to the nearest degree.**

Use the cosine rule (in its second form), making sure that the side opposite angle A is also on the left hand side of the formula.

YOU SOLVE

**CAB = 86°**

**Area of a non-right angled triangle:** If you know two sides of a triangle, and the size of the angle between the two sides, then the area of the triangle can be found using:

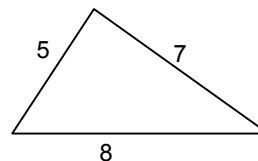
$$\text{Area} = \frac{1}{2} ab \sin C$$

**The diagram shows a triangle with sides 5, 7 and 8. Find the size of the smallest angle and the area of the triangle.**

The smallest angle is opposite the smallest side, 5.

$$\cos x = \frac{7^2 + 8^2 - 5^2}{2 \times 7 \times 8} = 0.786$$

So the angle is **38.2°**



Area =  $\frac{1}{2} \times 7 \times 8 \times \sin 38.2^\circ = \mathbf{17.3}$

(Remember that the angle used in the area formula must be between the two sides used).