

Trigonometry

Secondary 4 CST
Vision 5

Trigonometric ratios in right Triangles

SOHCAHTOA

$$\sin A = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos A = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan A = \frac{\textit{opposite}}{\textit{adjacent}}$$

Trigonometric ratios for any Triangles

Sine law

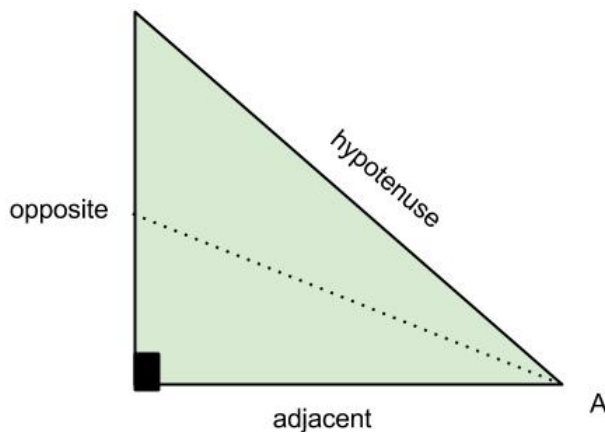
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

where,

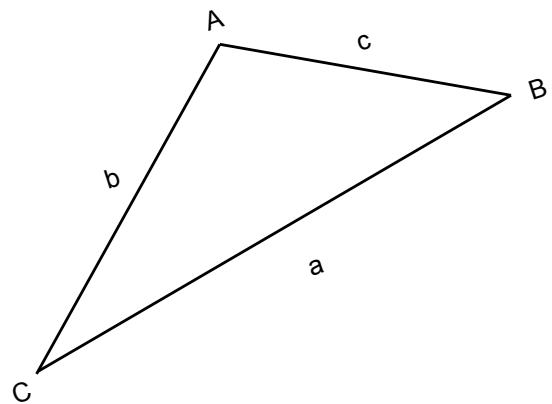
side a is opposite angle A

side b is opposite angle B

side c is opposite angle C



The sides are labelled with respect to angle A.



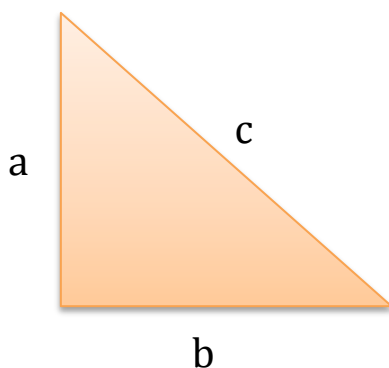
Only the opposite and the adjacent sides vary depending on the angle of interest. The hypotenuse is always the side opposite the right angle (also the longest side).

You are already familiar with ways of finding missing measurements in right triangles.

Pythagorean theorem

$$a^2 + b^2 = c^2$$

where c is always the hypotenuse



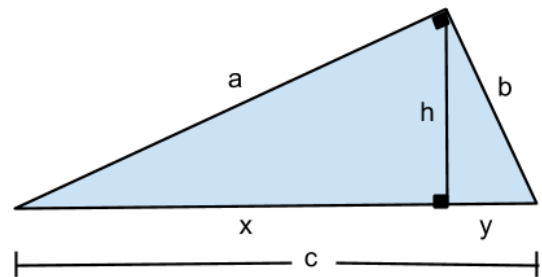
Metric Relations

$$h^2 = xy$$

$$a^2 = xc$$

$$b^2 = yc$$

$$ab = hc$$



Both of these methods will allow you to find missing measurements in right-angle triangles. Which method you use depends on the information that you are provided with.

The trigonometric ratios (SOHCAHTOA) will allow you to find missing measurements in a triangle if you are provided with an angle and a side OR it will allow you to find missing angles if you know at least two side measurements.

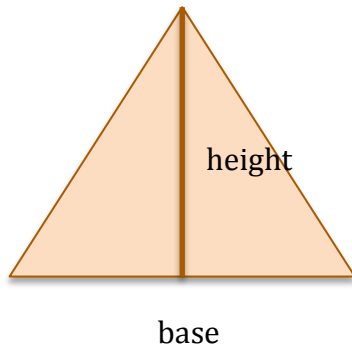
Remember: the trigonometric ratios will only work for right-angle triangles.

Sine law can also be used to find missing measurements in any triangle provided that you have two sides and an angle or two angles and a side.

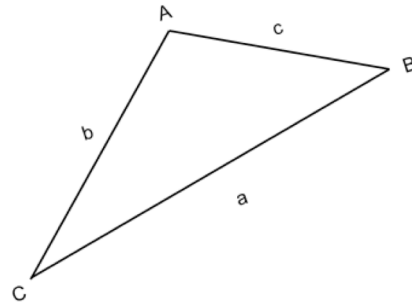
Determining the Area of Triangles

Right-Angle Triangles ONLY!

$$\text{Area} = \frac{b \times h}{2}$$



Any Triangle



Hero's Formula

$$\text{Area} = \sqrt{p(p-a)(p-b)(p-c)}$$

where,

$$p = \frac{a + b + c}{2}$$

In order to use Hero's law, you must have all three side measurements (SSS).

Trigonometric Formula

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

In order to use the trigonometric formula to find the area of a triangle you must have the measurements of two adjacent sides and the measure of the contained angle (SAS).

Note: instead of $ab \sin C$, you could also have $bc \sin A$ OR $ac \sin B$.