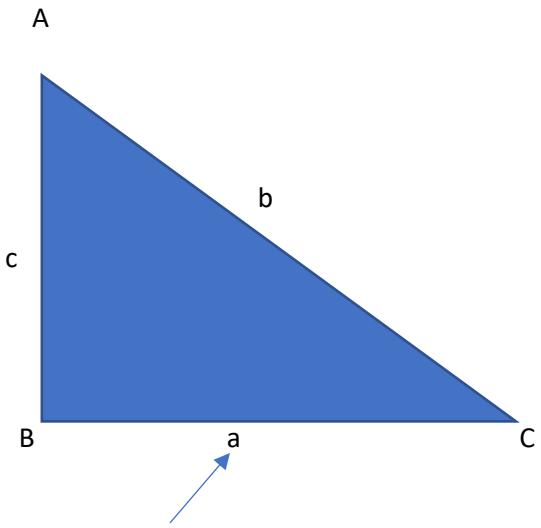
Solving for a Side Using Trig Ratios

*Given an angle and a given side, one can solve for a missing side using trig ratios.

* Example 1: What is the length of the indicated side of the following triangle? The measurement of angle A is 39˚ and the length of side b is 65 cm.



What is the length of this side?

The sides involved in this calculation are the opposite side (from angle A) and the hypotenuse. The trig ratio that relates the opposite side and hypotenuse is sine (opposite/hypotenuse).

Here is how the problem is set up: $\sin 39 = \frac{opposite\ side\ length}{hypotenuse\ length} = \frac{a}{65}$

By consulting a trig ratio table or by using a calculator to determine the sin 39˚, one can be see that the sin 39˚ = 0.963795.

Substituting that value in for sin 39 gives the following equation:

$$0.963795 = \frac{a}{65}$$

Solving for the variable *a* yields an answer of 63 cm.

Note: restrict the trig ratios you are using to sine, cosine, and tangent.

Example 2: Using the same triangle from the previous problem, find the length of side c given that angle A is 39˚ and the length of side a is 63 cm (the length of the hypotenuse is the same as the previous problem – 65 cm).

Side c is the adjacent side to angle A, so the trig ratio used will by cosine. Here is how the problem will be set up.

$$\cos 39 = \frac{adjacent\ side\ length}{hypotenuse} = \frac{c}{65}$$

By consulting a trig ratio table or by using a calculator to determine the cos 39°, one can see that the

cos 39° = 0.266643

Substituting that value in for cos 39° gives the following equation.

$$0.266643 = \frac{c}{65}$$

Solving for the variable *c* yields an answer of 17 cm.