Solving for an Angle Using Trig Ratios

*If the lengths of any two sides of a right triangle are known, one (and more) angle measurements can also be determined. To do this, you must have access to trig tables or have a calculator with inverse trig functionality.

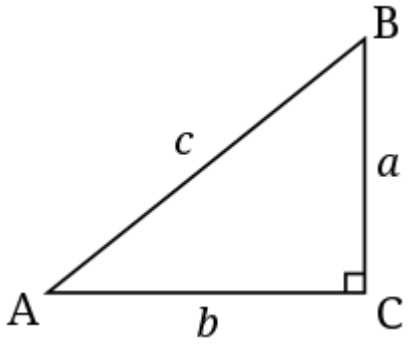
*Using Trig Tables

Take the lengths of any two sides of a right triangle. Determine one of the following ratios:

$\frac{opposite}{hypotenus}$ $\frac{adjacent}{hypotenuse}$ $\frac{opposite}{adjacent}$

These are the trig ratios known as sine, cosine, and tangent, respectively.

After determining the ratio, one can look at a trig table under the appropriate column (sine, cosine, tangent) and read "out" to determine the measure of the angle.



If the length of side *a* is 57 inches and the length of the hypotenuse is 75 inches, the side lengths ratio is:

From angle A = $\frac{opposite}{hypotenuse}$ = $\frac{57}{75}$ = 0.76

Because this trig ratio is sine, one would look at the interior of a trig table to find the closest number to a value of 0.76 in the sine column. The closest angle measurement that corresponds to this value is 49˚.

*Using Calculators with Inverse Trig Functionality

In your calculator, select the inverse trig function you want to utilize. It is usually an alternate function for the sine, cosine, or tangent functions.

After the parenthesis that opens at the end of the inverse function, type your side ratio. Then press ENTER. The display should give you the measurement of the angle. Using the example above, my calculator gave me a value of 50˚(very close to the value obtained using the other method).

Note: Be sure your calculator is either DEGREE or RADIAN mode, whichever one you are using.

*Example 2: Using the same triangle, assume side *a* has a length of 25 m and side *b* has a length of 31 m. Using angle A as our reference, determine the ratio of the opposite side (a) over the adjacent side (b).

$$\frac{opposite}{adjacent} = \frac{25}{31} = 0.8065$$

Since this ratio is the tangent function, we will look up that number in the tangent column and read "out" to the angle measurement. The closest anglel to that ratio is 39°.

Using the calculator, the inverse tangent function is selected and 0.8065 is typed in the field after the inverse tangent designation. This also yields a value of 39°.