Math 3

7.1 Right Triangle Trig

Unit 7

SWBAT solve for unknown side lengths and angle measures in a right triangle using trigonometry.

Trig Functions

There are three trig functions found on your calculator: Sine (SIN), Cosine (COS), and Tangent (TAN). These trig functions help us solve for missing angle measures or side lengths. Make sure your calculator is in DEGREE mode.

Example 1: Evaluate the following.

a) $\sin 78^\circ =$ 0.9781 b) $\cos 78^\circ =$ 0.2079 c) $\tan 78^\circ =$ 4.7046

You Try! Evaluate the following.

a) $\cos 45^\circ =$ 0.7071 b) $\sin 45^\circ =$ 0.7071 c) $\tan 45^\circ =$ 1

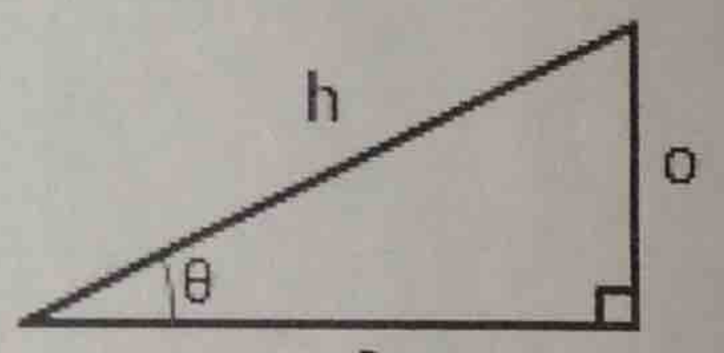
The Trig Functions

To use the three trig functions, we need to know the opposite side length of a specific angle, the adjacent side length of a specific angle, and/or the hypotenuse. The formula for the sine function is:

Sin Θ= $\frac{\text{opposite}}{\text{hypotenuse}}$ Csc Θ= $\frac{\text{hypotenuse}}{\text{opposite}}$

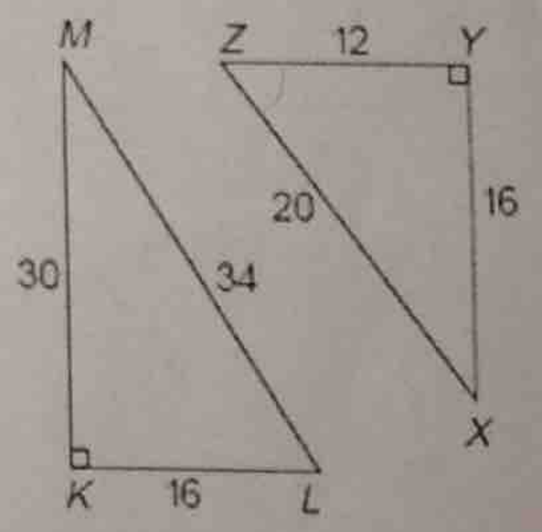
Cos Θ= $\frac{\text{adjacent}}{\text{hypotenuse}}$ Sec Θ= $\frac{\text{hypotenuse}}{\text{adjacent}}$

Tan Θ= $\frac{\text{opposite}}{\text{adjacent}}$ Cot Θ= $\frac{\text{adjacent}}{\text{opposite}}$

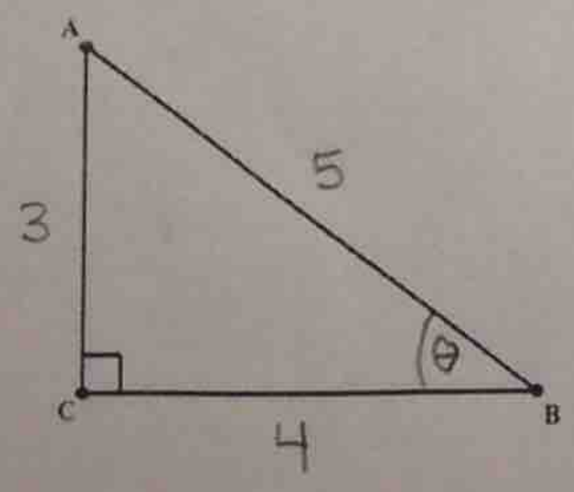


Example 2: Find the indicated trigonometric ratio as a fraction and as a decimal rounded to the nearest ten-thousandth.

1. $\sin M = \frac{16}{34} = \frac{8}{17}$
2. $\csc Z = \frac{h}{o} = \frac{20}{16} = \frac{5}{4}$
3. $\tan L = \frac{30}{16} = \frac{15}{8}$
4. $\sec X = \frac{h}{a} = \frac{20}{16} = \frac{5}{4}$
5. $\cos L = \frac{16}{34} = \frac{8}{17}$
6. $\cot Z = \frac{a}{o} = \frac{12}{16} = \frac{3}{4}$



Example 3: Solve the following triangle.



$4^2 + b^2 = 5^2$

$b^2 = 9$

$b = 3$

$\sin\theta = \frac{3}{5}$ $\csc\theta = \frac{5}{3}$

$\cos\theta = \frac{4}{5}$ $\sec\theta =$ 5/4 n/a

$\tan\theta = \frac{3}{4}$ $\cot\theta = \frac{4}{3}$

Inverse Functions

We can also find an angle measure if we are given a trig decimal - we just use the inverse trig function (2^{nd}, trig function, decimal).

Example 4: Find the missing angle measure.

a) $\cos A = 0.7431$ $\quad \measuredangle A = 42°$

b) $\sin B = 0.4848$ $\quad \measuredangle B = 29°$

c) $\tan W = 0.5317$ $\quad \measuredangle W = 28°$

You Try! Find the missing angle measure.

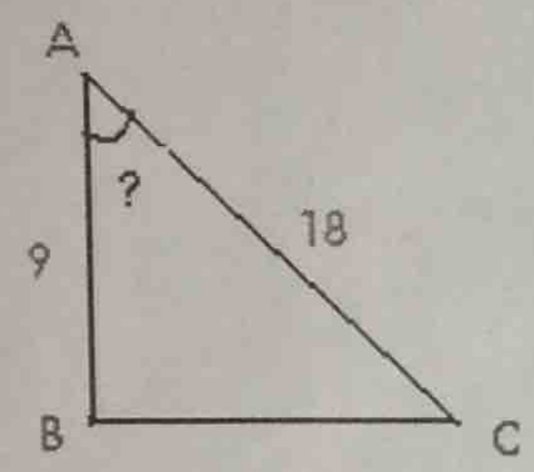
a) $\tan G = 0..4672$ $\quad \measuredangle G = 25°$

b) $\cos Q = 0.8208$ $\quad \measuredangle Q = 34.8°$

c) $\sin R = 0.6932$ $\quad \measuredangle R = 43.9°$

Example 5: Find the missing angle measure.

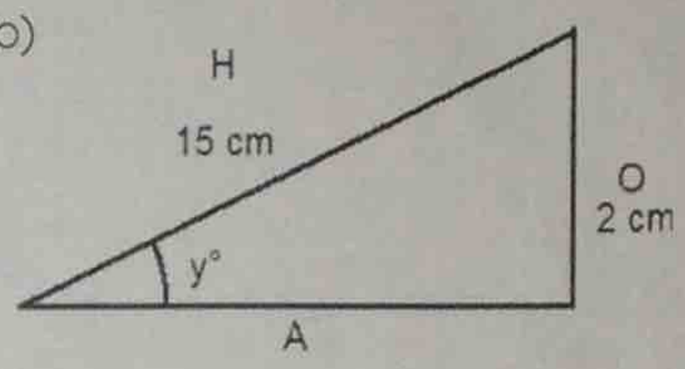
a)



$\cos A = 9/18$

$\measuredangle A = 60°$

b)



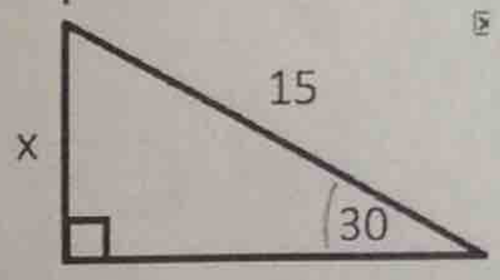
$\sin y = 2/15$

$\measuredangle y = 7.7°$

Using Trig to Find a Missing Side Length

Example 6: Find the missing side length.

a)

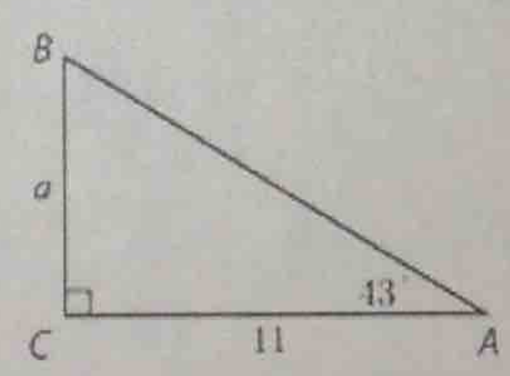


$\sin 30 = \frac{x}{15}$

$x = 15 \sin 30$

$x = 7.5$

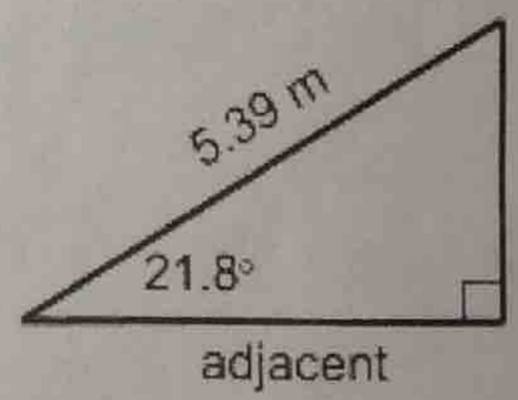
b)



$\tan 43 = \frac{a}{11}$ $\quad a = 10.3$

$a = 11 \tan 43$

c)



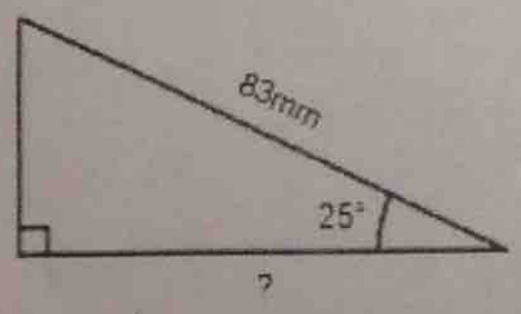
$\cos 21.8 = \frac{a}{5.39}$

$a = 5.39 \cos(21.8)$

$a = 5$

You Try! Find the missing length.

a)

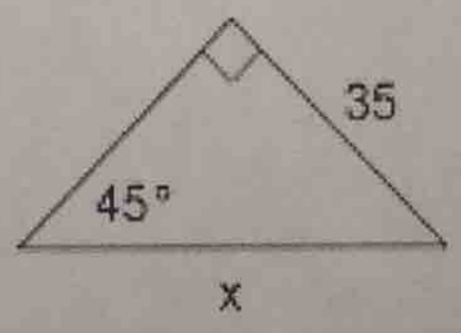


$\cos 25 = \frac{x}{83}$

$x = 83 \cos 25$

$x = 75.2 \text{ mm}$

b)

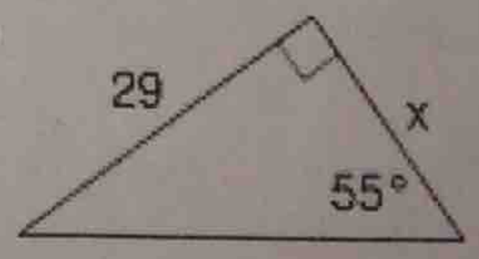


$\sin 45 = \frac{35}{x}$

$x = \frac{35}{\sin 45}$

$x = 49.5$

c)



$\tan 55 = \frac{29}{x}$

$x = \frac{29}{\tan 55}$

$x = 20.3$