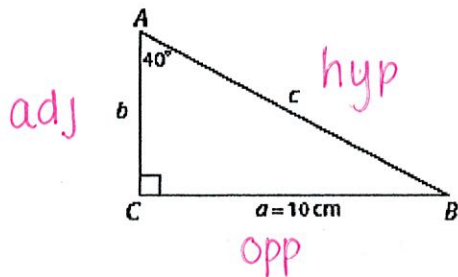


### Day 6 – Trig Ratios: Missing Sides

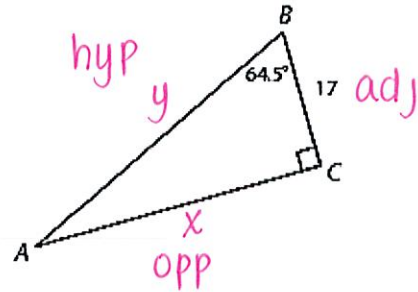
We can use trig ratios to also create equations that allow us to find missing sides or angles. It is extremely **IMPORTANT** to label your triangle with the types of sides you have on the diagram (opp, adj, or hyp). By labeling your sides, you see which trig ratio you can use to solve the problem.

**Example 1:** Label each of the sides as opposite, adjacent, or hypotenuse. Then create a trig ratio equation that can be used to find both missing sides.

SOHCAHTOA



$$\sin(40) = \frac{10}{c} \quad \tan(40) = \frac{10}{b}$$



$$\tan(64.5) = \frac{x}{17} \quad \cos(64.5) = \frac{17}{y}$$

**Example 2:** Create a trig ratio equation that can be used to find the missing side. Then solve for x.

a.  $\tan(40) = \frac{x}{2}$   
 $2(\tan(40)) = x$   
 $x \approx 1.68 \text{ ft}$

b.  $\sin(45) = \frac{6}{x}$   
 $x(\sin(45)) = 6$   
 $x \approx 8.49$

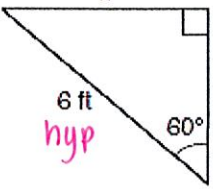
c.  $\cos(20) = \frac{15}{x}$   
 $x(\cos(20)) = 15$   
 $x \approx 15.96 \text{ m}$

d.  $\tan(32) = \frac{9}{x}$   
 $x = \frac{9}{\tan(32)}$   
 $x \approx 14.40$

e.  $\tan(48) = \frac{x}{5}$   
 $5(\tan(48)) = x$   
 $x \approx 5.55$

f.  $\cos(29) = \frac{7}{x}$   
 $7(\cos(29)) = x$   
 $x \approx 6.12$

g. opp  
x

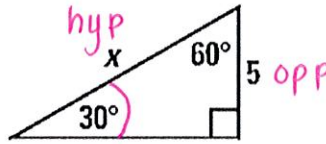


$$\frac{\sin(60) \times x}{x} = \frac{6}{6}$$

$$6(\sin(60)) = x$$

$$x \approx 5.20$$

h. COS or Tan works!

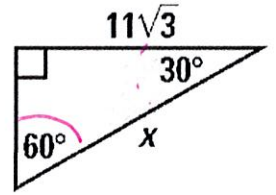


$$\frac{\tan(30) \times x}{x} = \frac{5}{5}$$

$$x = \frac{5}{\tan(30)}$$

$$x \approx 8.66$$

i. Sin or Cos works!

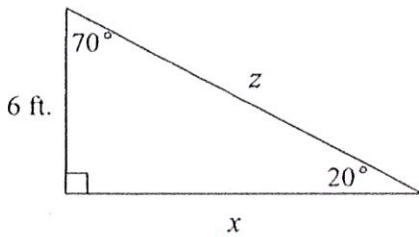


$$\frac{\sin(60) \times x}{x} = \frac{11\sqrt{3}}{11\sqrt{3}}$$

$$x = \frac{11\sqrt{3}}{\sin(60)}$$

$$x = 22$$

**Example 3:** Create a trig ratio equation that can be used to find the missing sides. Then solve for the missing variables.



$$\tan(70) = \frac{x}{6}$$

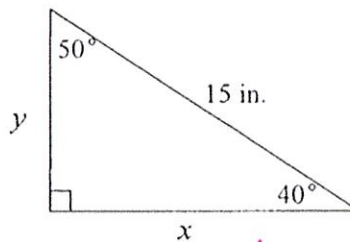
$$6(\tan(70)) = x$$

$$x \approx 16.48$$

$$\cos(70) = \frac{6}{z}$$

$$z = \frac{6}{\cos(70)}$$

$$z \approx 17.54$$



$$\sin(50) = \frac{x}{15}$$

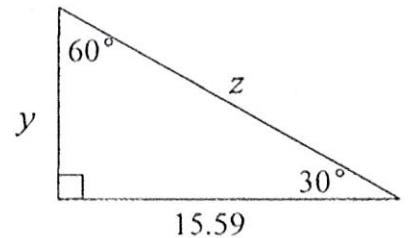
$$15(\sin(50)) = x$$

$$x \approx 11.49$$

$$\cos(50) = \frac{y}{15}$$

$$15(\cos(50)) = y$$

$$y \approx 9.64$$



$$\tan(30) = \frac{y}{15.59}$$

$$15.59(\tan(30)) = y$$

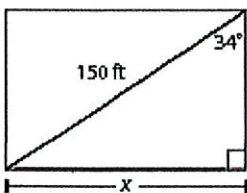
$$y \approx 9.00$$

$$\sin(60) = \frac{15.59}{z}$$

$$z = \frac{15.59}{\sin(60)}$$

$$z \approx 18.00$$

**Example 4:** Create a trig ratio equation that can be used to find the missing side. Then find the missing side. Michael is building a concrete pathway 150 feet long across a rectangular courtyard, as shown below. What is the length of the courtyard, x, to the nearest thousandth?



$$\sin(34) = \frac{x}{150}$$

$$150(\sin(34)) = x$$

$$x \approx 83.879$$

The length of the courtyard is about 83.879 feet.