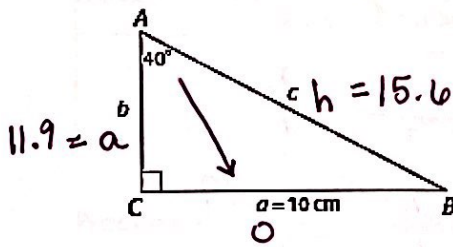# Day 7 – Solving Equations with Trig Ratios – Notes

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.

$$\frac{\sin 40°}{1} = \frac{10}{h}$$

$$\frac{10 = h \cdot \sin 40°}{\sin 40° \quad \sin 40°}$$

$$h = \frac{10}{\sin 40}$$

$$\boxed{h = 15.6}$$

$$\frac{\tan 40°}{1} = \frac{10}{a}$$

$$\frac{10 = a \cdot \tan 40°}{\tan 40° \quad \tan 40°}$$

$$a = \frac{10}{\tan 40°}$$

$$\boxed{a \approx 11.9}$$
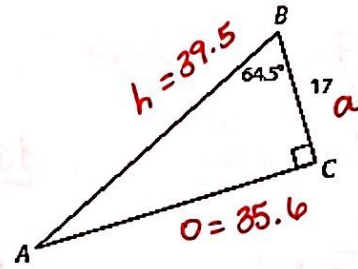
$$\frac{\tan 64.5}{1} = \frac{Opp}{17}$$

$$Opp = 17 \cdot \tan 64.5$$

$$\boxed{Opp = 35.6}$$

$$\frac{\cos 64.5}{1} = \frac{17}{h}$$

$$\frac{h \cdot \cos 64.5 = 17}{\cos 64.5 \quad \cos 64.5}$$

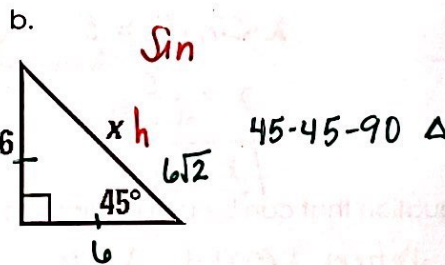$$h = \frac{17}{\cos 64.5}$$

$$\boxed{h = 39.5}$$

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

a.   Tan

$$\frac{\tan 40}{1} = \frac{x}{2}$$

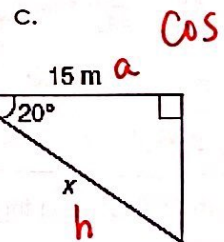$$x = 2 \cdot \tan 40$$

$$\boxed{x \approx 1.7 \, ft}$$

b.   Sin

45-45-90 △
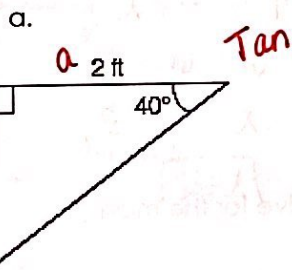
$$\frac{\sin 45}{1} = \frac{6}{x}$$

$$\frac{x \cdot \sin 45 = 6}{\sin 45 \quad \sin 45}$$

$$x = \frac{6}{\sin 45}$$

$$\boxed{x \approx 8.5} \text{ or } \boxed{6\sqrt{2}}$$

c.   Cos

$$\frac{\cos 20°}{1} = \frac{15}{x}$$

$$\frac{x \cdot \cos 20 = 15}{\cos 20 \quad \cos 20}$$

$$x = \frac{15}{\cos 20}$$

$$\boxed{x \approx 16}$$

27