

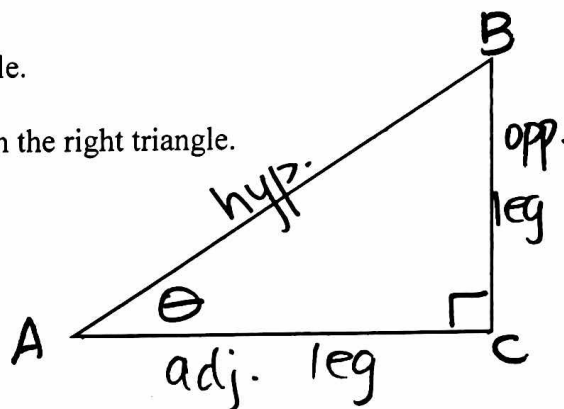
The Tangent Ratio

Lesson Objective: IWBAT use the tangent ratio in right Δ s to find side lengths.

A trigonometric is a ratio of two sides of a right triangle.

The sides that we compare are all in relation to an acute angle in the right triangle.

These sides are called opposite leg, adjacent leg, and hypotenuse.



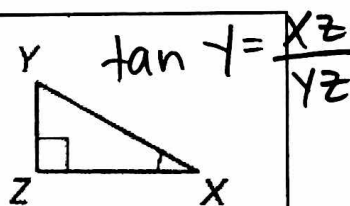
There are ways in which we can compare combination of these two sides in a triangle, and each of these ratios have a specific name.

The Tangent Ratio

The tangent ratio of an acute angle compares the legs of the right triangle in the following way:

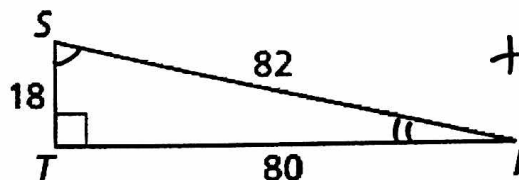
$$\tan \theta = \frac{\text{opp. leg}}{\text{adj. leg}}$$

$$\tan X = \frac{YZ}{XZ}$$



Example:

1. Find $\tan S$ and $\tan R$. Leave each answer as a fraction simplified completely.



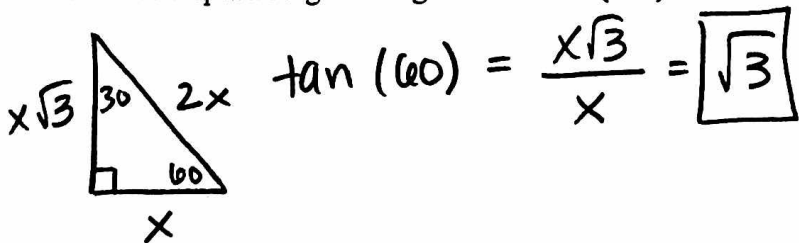
$$\tan S = \frac{80}{18} = \frac{40}{9}$$

$$\tan R = \frac{18}{80} = \frac{9}{40}$$

Tangent Ratios in Special Right Triangles

Example:

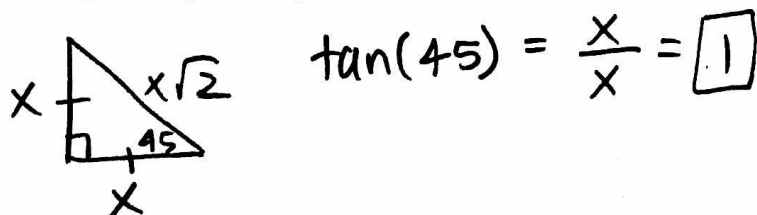
2. Use a special right triangle to find $\tan(60^\circ)$.



3. Use a special right triangle to find $\tan(30^\circ)$.

$$\tan(30) = \frac{x}{x\sqrt{3}} = \frac{1}{\sqrt{3}} \left(\frac{\sqrt{3}}{\sqrt{3}} \right) = \frac{\sqrt{3}}{3}$$

4. Use a special right triangle to find $\tan(45^\circ)$.

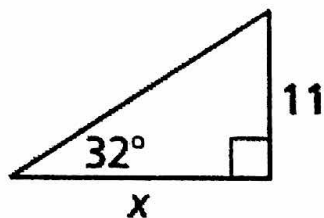


All right triangles with a given acute angle are similar by AA~. So, regardless of the size of the triangle, the tangent ratios will ALWAYS be the same for any given acute angle measure.

We can use this fact to find missing side lengths in right triangles.

Examples:

5. Find the value of x . Round your answer to the nearest hundredth.



$$\tan(32) = \frac{11}{x}$$

$$\frac{0.6249}{1} = \frac{11}{x}$$

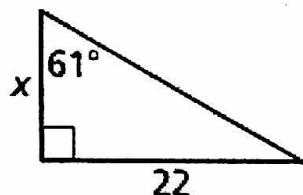
$$11 = x(0.6249)$$

$$\rightarrow x = \frac{11}{0.6249}$$

$$\boxed{x \approx 17.6028}$$

$$\boxed{x \approx 17.60}$$

6. Find the value of x . Round your answer to the nearest hundredth.



$$\tan(61) = \frac{22}{x}$$

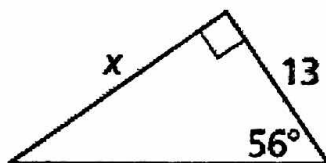
$$1.8040 = \frac{22}{x}$$

$$\rightarrow x = \frac{22}{1.8040}$$

$$\boxed{x \approx 12.20}$$

$$x \approx 12.1951$$

7. Find the value of x . Round your answer to the nearest hundredth.



$$\tan(56) = \frac{x}{13}$$

$$1.4826 = \frac{x}{13}$$

$$\rightarrow x = 13(1.4826)$$

$$\boxed{x \approx 19.27}$$

$$x \approx 19.2738$$