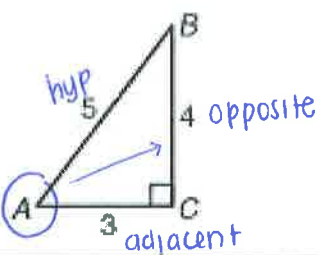
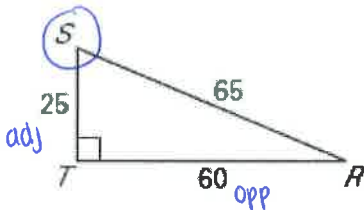


Tangent Ratio	
<p>Let <math>\triangle ABC</math> be a right triangle with acute <math>\angle A</math>, then the tangent of <math>\angle A</math> (abbreviated <math>\tan A</math>) is defined as:</p> $\tan A = \frac{\text{length of leg opposite } \angle A}{\text{length of leg adjacent to } \angle A}$	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <math display="block">\tan A = \frac{\text{opp}}{\text{adj}} = \frac{4}{3}</math> <p>OR</p> <math display="block">\tan A = 1.333</math> </div> </div>

**Example 1 :**

Find  $\tan S$  and  $\tan R$ . Write each answer as a fraction and as a decimal rounded to four places.



$$\tan S = \frac{\text{side opposite } \angle S}{\text{side adjacent to } \angle S} = \frac{60}{25} = \frac{12}{5}$$

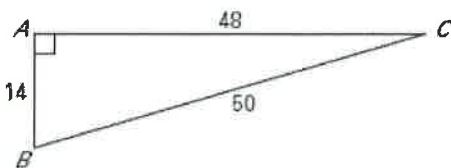
← simplify  
or  $\tan S = 2.4$

$$\tan R = \frac{\text{side opposite } \angle R}{\text{side adjacent to } \angle R} = \frac{25}{60} = \frac{5}{12}$$

or  $\tan R = 0.4167$

**Example 2 :**

Find  $\tan B$  and  $\tan C$ . Write each answer as a fraction.



$$\tan B = \frac{\text{side opposite } \angle B}{\text{side adjacent to } \angle B} = \frac{48}{14} = \frac{24}{7}$$

$\tan B = 3.4286$

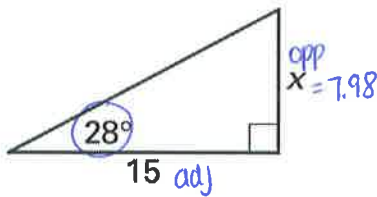
$$\tan C = \frac{\text{side opposite } \angle C}{\text{side adjacent to } \angle C} = \frac{14}{48} = \frac{7}{24}$$

$\tan C = 0.2917$

When given an acute angle in a right triangle along with the length of one leg, we can use the tangent ratio to find the length of a missing leg ☺ *\* make sure your calc is in DEGREE mode!*

**Example 3: Find a leg length**

Find the value of x.



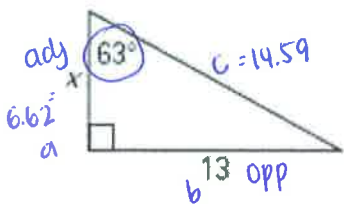
$$\frac{\tan 28^\circ}{1} = \frac{x}{15} \quad \leftarrow \text{cross multiply}$$

$$x = 15 \tan 28^\circ$$

$$x = 7.98$$

**Example 4: Find the perimeter and area**

Find the perimeter and area of the triangle. Round to the nearest tenth.



Find x:  $\tan 63^\circ = \frac{13}{x}$

$$\frac{13}{\tan 63^\circ} = \frac{x \cdot \tan 63^\circ}{\tan 63^\circ}$$

$$x = (13) \div (\tan(63))$$

$$x = 6.62$$

To find hyp: use Pythag

Thm

$$a^2 + b^2 = c^2$$

$$(6.62)^2 + (13)^2 = c^2$$

$$218.8244 = c^2$$

$$c = \sqrt{218.8244}$$

$$c = 14.59$$

$$P = 6.62 + 14.59 + 13 = 34.21 \text{ units}$$

$$A = \frac{1}{2} (13)(6.62) = 43.03 \text{ units}^2$$

**Example 5: Estimate height using tangent**

Find the height h of the lighthouse to the nearest foot.

$$\frac{\tan 62^\circ}{1} = \frac{h}{100}$$

$$h = 100 \cdot \tan 62$$

$$h = 188.1 \approx 188 \text{ ft tall}$$

