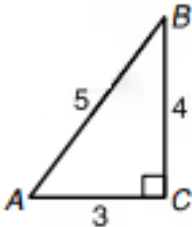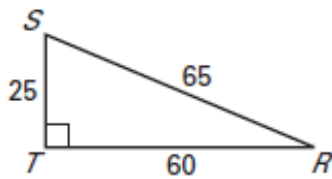| Tangent Ratio | |
|---|---|
| Let $\triangle ABC$ be a right triangle with acute $\angle A$, then the tangent of $\angle A$ (abbreviated tan$A$) is defined as: $$\tan A = \frac{length\ of\ leg\ opposite\ \angle A}{length\ of\ leg\ adjacent\ to\ \angle A}$$ |  |

**Example 1 :**

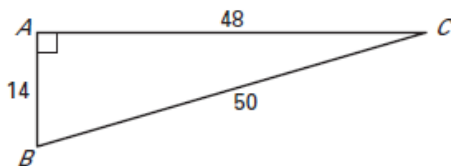Find tan $S$ and tan $R$. Write each answer as a fraction and as a decimal rounded to four places.



$$\tan S = \frac{side\ opposite\ \angle S}{side\ adjacent\ to\ \angle S}$$

$$\tan R = \frac{side\ opposite\ \angle R}{side\ adjacent\ to\ \angle R}$$

**Example 2 :**
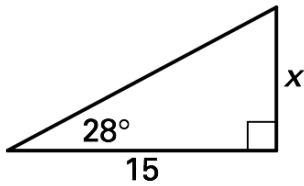
Find tan $B$ and tan $C$. Write each answer as a fraction.



$$\tan B = \frac{side\ opposite\ \angle B}{side\ adjacent\ to\ \angle B}$$

$$\tan C = \frac{side\ opposite\ \angle C}{side\ adjacent\ to\ \angle C}$$

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 ☺
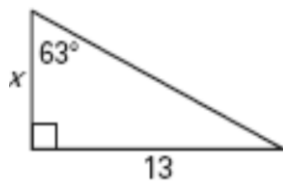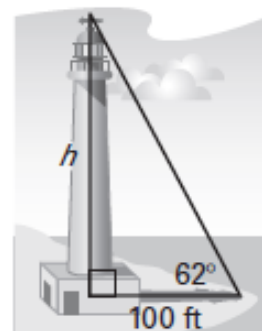
**Example 3:  Find a leg length**

Find the value of x.



28°
15
*x*

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

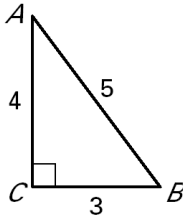Find the perimeter and area of the triangle. Round to the nearest tenth.



63°
*x*
13

**Example 5 : Estimate height using tangent**
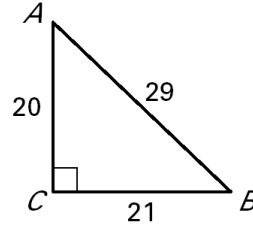
Find the height h of the lighthouse to the nearest foot.



*h*
62°
100 ft

**Find tan *A* and tan *B*. Write each answer as a fraction _and_ as a decimal rounded to four places.**

**1.**

A  
4  
5  
C  
3  
B

**2.**

A  
20  
29  
C  
21  
B

**3.**

B  
48  
C  
14  
50  
A

**4.**

C  
16  
30  
B  
34  
A
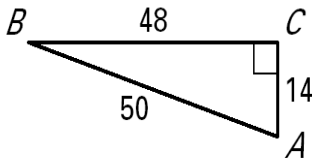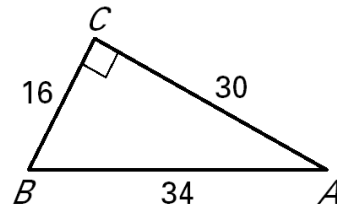
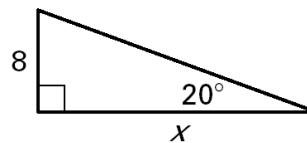**Find the value of x to the nearest tenth.**

**5.**

15  
60°  
$x$

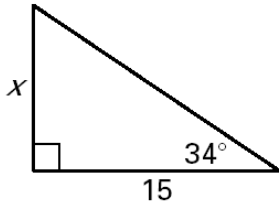**6.**

8  
20°  
$x$
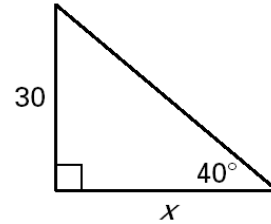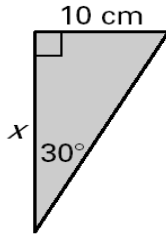
**7.**

20  
40°  
$x$

**8.**
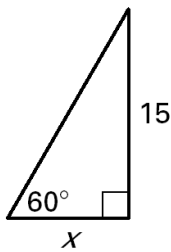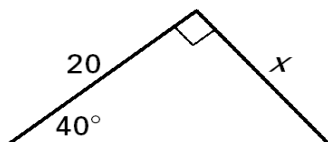
25°  
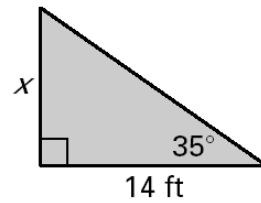$x$  
28
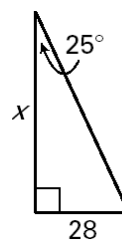
**9.**



**10.**



**Find the area of the triangle. Round to the nearest tenth.**
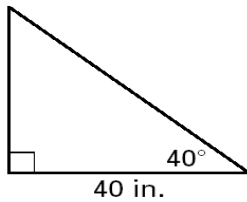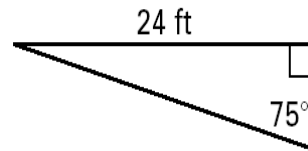
**11.**



**12.**



**Find the perimeter of the triangle. Round to the nearest tenth.**

**13.**



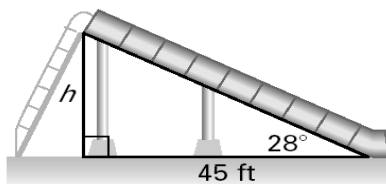**14.**



**15. Water Slide** The angle of elevation from the base to the top of a water slide is about 28°. The horizontal length of the slide is about 45 feet. Find the height $h$ of the slide.



Answers: 1) $\tan A = \frac{3}{4}$ or $0.75$, $\tan B = \frac{4}{3}$ or $1.333$  2) $\tan A = \frac{21}{20}$ or $1.05$, $\tan B = \frac{20}{21}$ or $0.9524$

3) $\tan A = \frac{24}{7}$ or $3.4286$, $\tan B = \frac{7}{24}$ or $0.2917$     4) $\tan A = \frac{8}{15}$ or $0.5333$, $\tan B = \frac{15}{8}$ or $1.875$

5) 8.7    6) 22    7) 16.8    8) 60    9) 10.1   10) 35.8          11) 86.5cm²        12) 68.6 ft²        13) 125.8 in

14) 55.2 ft          15) 23.9 ft