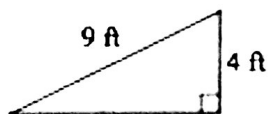


11.2 Missing Sides

1) Find the missing side of each right triangle.

a.



$$a^2 + 4^2 = 9^2$$

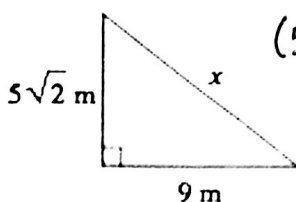
$$a^2 + 16 = 81$$

$$a^2 = 65$$

$$a = \boxed{\sqrt{65}}$$

$$\sqrt{65} \approx 8.1$$

b.



$$(5\sqrt{2})^2 + 9^2 = c^2$$

$$131 = c^2$$

$$c = \boxed{\sqrt{131}}$$

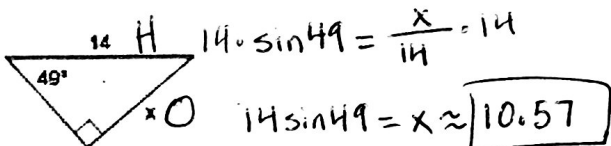
When you have two sides of the triangle, you can find the missing side by using the Pythagorean Theorem.

What happens when we need to find a missing side, but we are only given a side and an angle? This is where we can use trig to help us. Because trig ratios are set values that apply to any right triangle, we can use trig ratios to solve for a missing side.

$\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$	$\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$	$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$
--	--	--

2) Solve for x. Round to the nearest hundredth.

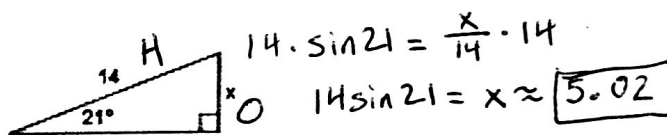
a.



$$14 \cdot \sin 49 = \frac{x}{14} \cdot 14$$

$$14 \sin 49 = x \approx \boxed{10.57}$$

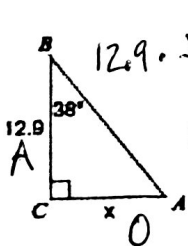
b.



$$14 \cdot \sin 21 = \frac{x}{14} \cdot 14$$

$$14 \sin 21 = x \approx \boxed{5.02}$$

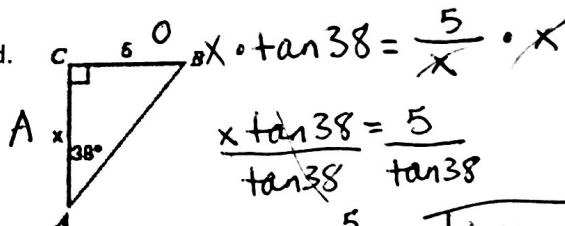
c.



$$12.9 \cdot \tan 38 = \frac{x}{12.9} \cdot 12.9$$

$$12.9 \tan 38 = x \approx \boxed{10.08}$$

d.

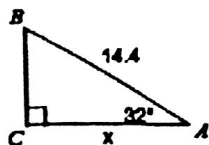


$$x \cdot \tan 38 = \frac{5}{x} \cdot x$$

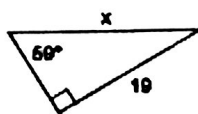
$$\frac{x \tan 38}{\tan 38} = \frac{5}{\tan 38}$$

$$x = \frac{5}{\tan 38} \approx \boxed{6.40}$$

e.



f.



When x is in the denominator:

- 1) Multiply both sides by x
- 2) Multiply

g.

$$x \cdot \cos 51 = \frac{11}{x} \cdot x$$

$$\frac{x \cos 51}{\cos 51} = \frac{11}{\cos 51}$$

$$x = \frac{11}{\cos 51} \approx \boxed{17.48}$$

h.

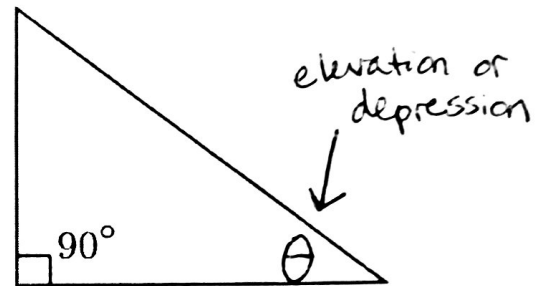
$$x \cdot \sin 27 = \frac{10}{x} \cdot x$$

$$\frac{x \sin 27}{\sin 27} = \frac{10}{\sin 27}$$

$$x = \frac{10}{\sin 27} \approx \boxed{22.03}$$

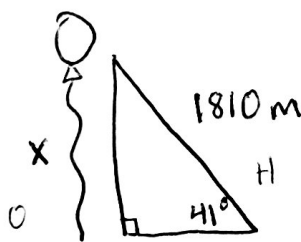
Word Problems

When you are asked about an **angle of elevation** or an **angle of depression**, it is referring to the angle in the bottom corner of the triangle. There is a difference between angle of elevation and angle of depression, but for our class, we are going to treat them as if they are the same thing (because they're congruent anyway).



Remember, the best way to tackle a word problem is to draw it.

c. meteorologist reads radio signals to get information from a weather balloon. The last alert indicated that the angle of depression of the weather balloon to the meteorologist was 41° and the balloon was 1,810 meters away from his location on the diagonal. To the nearest meter, how high above the ground was the balloon?

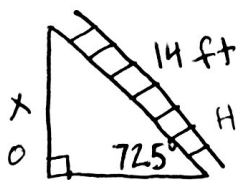


$$1810 \cdot \sin 41 = \frac{x}{1810} \cdot 1810$$

$$1810 \sin 41 = x \approx \boxed{1187.47 \text{ m}}^*$$

* Don't forget units

4) A ladder manufacturer recommends that its ladders be used on level ground at an angle of 72.5° to the horizontal. At that angle, how far up the side of a building will the top of a 14-foot ladder reach?



$$14 \cdot \sin 72.5 = \frac{x}{14} \cdot 14$$

$$14 \sin 72.5 = x \approx \boxed{13.35 \text{ ft}}$$

5) A tree has a shadow that is 16.5 ft long. If the angle of elevation from the end of the shadow to the top of the tree is 58° , how tall is the tree?



$$16.5 \cdot \tan 58 = \frac{x}{16.5} \cdot 16.5$$

$$16.5 \tan 58 = x \approx \boxed{26.41 \text{ ft}}$$