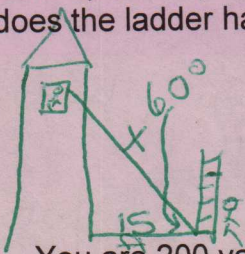


Key

Word Problems Using Right Triangle Trig

Draw pictures, write equations and show work. Estimate all answers to the nearest hundredth.

1. A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is 60 degrees. How long does the ladder have to be?

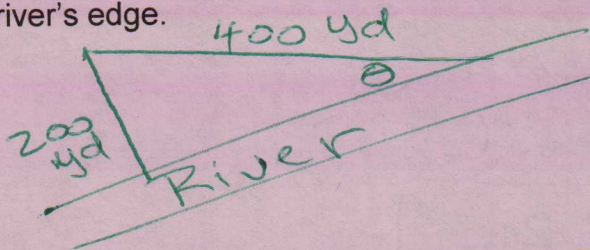


$$\cos 60^\circ = \frac{15}{x}$$

$$x = \frac{15}{\cos 60^\circ}$$

$$x = 30 \text{ ft}$$

2. You are 200 yards from a river. Rather than walking directly to the river, you walk 400 yards along a straight path to the river's edge. Find the acute angle between path and the river's edge.



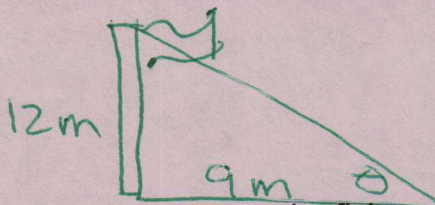
$$\sin \theta = \frac{200}{400}$$

$$\sin \theta = .5$$

$$\theta = \sin^{-1} .5$$

$$\theta = 30^\circ$$

3. A 12 meter flagpole casts a 9 meter shadow. Find the angle of elevation of the sun.

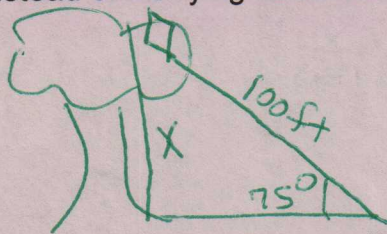


$$\tan \theta = \frac{12}{9}$$

$$\theta = \tan^{-1} \left(\frac{12}{9} \right)$$

$$\theta \approx 53.1^\circ$$

4. Suppose you're flying a kite, and it gets caught at the top of the tree. You've let out all 100 feet of string for the kite, and the angle that the string makes with the ground is 75 degrees. Instead of worrying about how to get your kite back, you wonder. "How tall is that tree?"

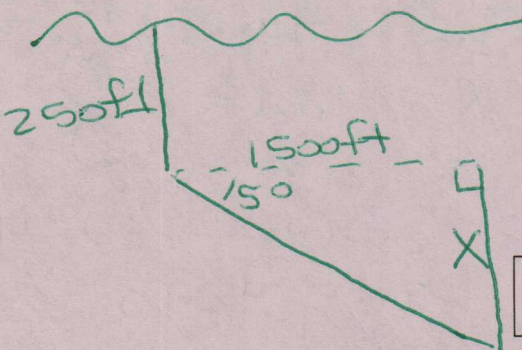


$$\sin 75^\circ = \frac{x}{100}$$

$$100(\sin 75^\circ) = x$$

$$x \approx 96.6 \text{ ft}$$

5. A submersible traveling at a depth of 250 feet dives at an angle of 15 degrees with respect to a line parallel to the water's surface. It travels a horizontal distance of 1500 feet during the dive. What is the depth of the submersible after the dive?



$$\tan 15^\circ = \frac{x}{1500}$$

$$1500(\tan 15^\circ) = x$$

$$x \approx 401.92$$

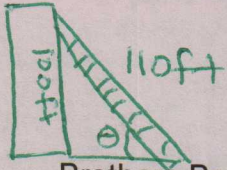
* add x to depth

250ft (initial)

$$401.92 + 250 \approx$$

$$651.92 \text{ ft}$$

6. A fire department's longest ladder is 110 feet long, and the safety regulation states that they can use it for rescues up to 100 feet off the ground. What is the maximum safe angle of elevation for the rescue ladder?

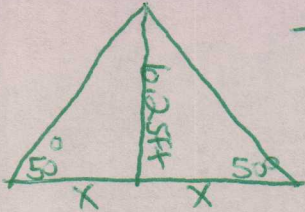


$$\sin \theta = \frac{100}{110}$$

$$\theta = \sin^{-1}\left(\frac{100}{110}\right)$$

$$\theta \approx 65.4^\circ$$

7. Brothers Bob and Tom Katz buy a tent that has a center pole 6.25 feet high. If the sides of the tent are supposed to make a 50° angle with the ground, how wide is the tent?



$$\tan 50^\circ = \frac{6.25}{x}$$

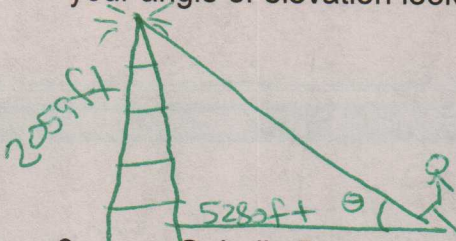
$$x = \frac{6.25}{\tan 50^\circ}$$

$$x \approx 5.2444$$

* x gives you half the width.

$$\text{width} \approx 10.5 \text{ ft} \text{ or } 10.49 \text{ ft}$$

8. The tallest television transmitting tower in the world is in North Dakota, and it is 2059 feet tall. If you are on level ground exactly 5280 feet (one mile) from the base of the tower, what is your angle of elevation looking up at the top of the tower?

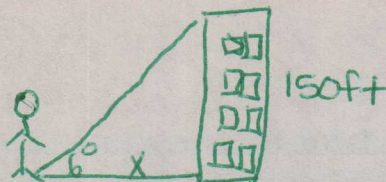


$$\tan \theta = \frac{2059}{5280}$$

$$\theta = \tan^{-1}\left(\frac{2059}{5280}\right)$$

$$\theta \approx 21.3^\circ$$

9. Ophelia Payne is walking to her office building which she knows is 150ft high. The angle to the top of the building from her current location is 6° . How much farther does she need to walk?

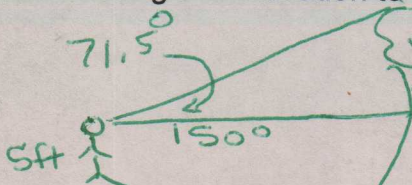


$$\tan 6^\circ = \frac{150}{x}$$

$$x = \frac{150}{\tan 6^\circ}$$

$$x \approx 1427.15 \text{ ft}$$

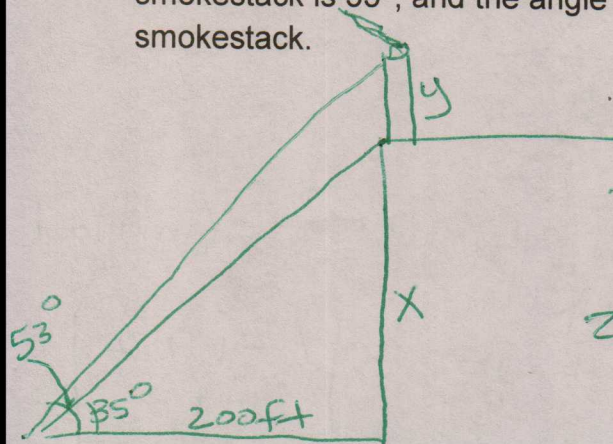
10. A 5 ft tall bird watcher is standing 50 feet from the base of a large tree. The person measures the angle of elevation to a bird on top of a tree as 71.5° . How tall is the tree?



$$\tan 71.5^\circ = \frac{x}{150}$$

Challenge: (You must attempt it!)

At a point 200 feet from the base of a building, the angle of elevation to the bottom of a smokestack is 35° , and the angle of elevation to the top is 53° . Find the height of the smokestack.



$$\tan 35^\circ = \frac{x}{200}$$

$$200(\tan 35^\circ) = x$$

$$200(\tan 35^\circ) = 200(\tan 53^\circ) - y$$

$$140.0415 = 265.4090 - y$$

$$y \approx 125.37 \text{ ft}$$

$$\tan 53^\circ = \frac{x+y}{200}$$

$$200(\tan 53^\circ) = x+y$$

$$200(\tan 53^\circ) - y = x$$