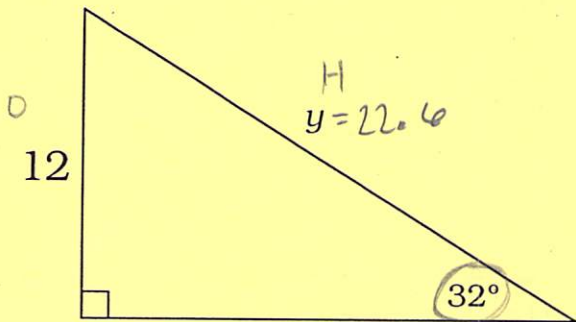


11-6 Trig and Pythagorean Theorem Word Problems

Sometimes we may have to use Trigonometry of Pythagorean Theorem twice to find the measures of sides and/or angles of right triangles. Consider the following example where it asks you to solve for both x and y to the nearest tenth.



H
 $y = 22.6$

$O = 12$

$A = x$

~~$\theta =$~~

$\theta = 32^\circ$

$\tan \theta = \frac{O}{A}$

$\tan 32 = \frac{12}{x}$

$x \cdot 0.625 = \frac{12}{x} \cdot x$

$0.625x = 12$

$x = 19.2$

A

$x = 19.2$

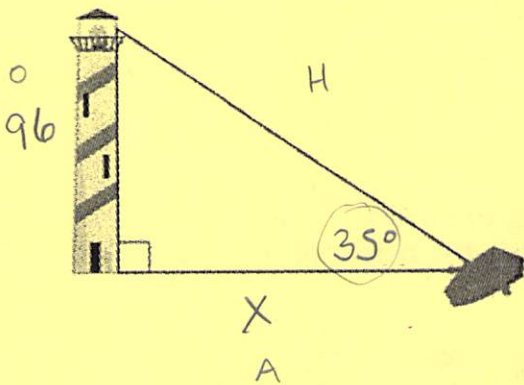
$a^2 + b^2 = c^2$
 $12^2 + 19.2^2 = c^2$
 $144 + 368.64 = c^2$

$\sqrt{512.64} = \sqrt{c^2}$

$22.6 = c$

To solve a word problem involving right triangles the most important thing is to find what the question is asking you to find. If a picture is not already drawn, you will need to draw and label it.

Suppose the angle of elevation from a rowboat to the light of a lighthouse is 35° . You know that the lighthouse is 96 ft. tall. How far from the lighthouse is the rowboat? Round your answer to the nearest foot.



$O = 96$

$A = X$

~~$\theta =$~~

$\theta = 35^\circ$

$\tan \theta = \frac{O}{A}$

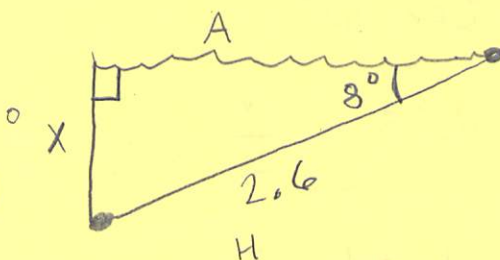
$\tan 35^\circ = \frac{96}{X}$

$X \cdot 0.700 = \frac{96}{X} \cdot X$

$\frac{0.700x}{0.700} = \frac{96}{0.700}$

$X = 137 \text{ ft}$

2. A submarine travels 2.6 miles diving at an angle of 8° . How deep is the submarine beneath the surface of the water to the nearest tenth of a mile?



$O = X$

$A =$

$H = 2.6$

$\theta = 8^\circ$

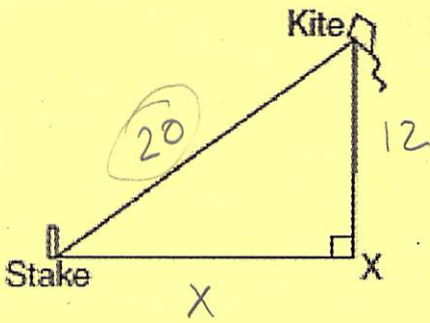
$\sin \theta = \frac{O}{H}$

$\sin 8^\circ = \frac{X}{2.6}$

$2.6 \cdot 0.139 = \frac{X}{2.6} \cdot 2.6$

$0.4 \text{ mi} = X$

3. The accompanying diagram shows a kite that has been secured to a stake in the ground with a 20-foot string. The kite is located 12 feet from the ground, directly over point X. What is the distance, in feet, between the stake and point X to the nearest tenth?



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

$$x^2 + 12^2 = 20^2$$

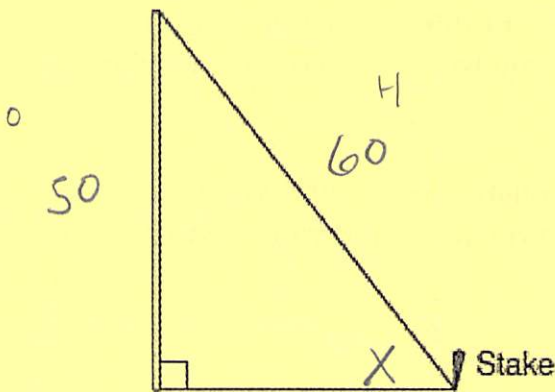
$$x^2 + 144 = 400$$

$$\begin{array}{r} -144 \\ \hline \end{array}$$

$$\sqrt{x^2} = \sqrt{256}$$

$$x = 16.0 \text{ ft}$$

4. A stake is to be driven into the ground away from the base of a 50-foot pole, as shown in the diagram below. A 60 ft-wire from the stake on the ground to the top of the pole is to be installed. Find the angle of elevation between the ground and the wire to the nearest degree?



$$O = 50$$
~~$$A = 60$$~~

$$H = 60$$

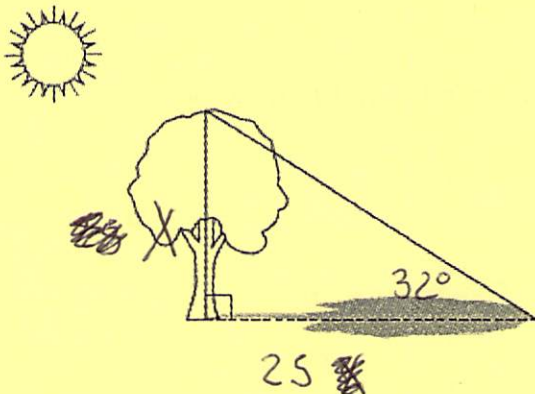
$$\theta = X$$

$$\sin \theta = \frac{O}{H}$$

~~$$\sin^{-1} \sin X = \left(\frac{50}{60}\right) \sin^{-1}$$~~

$$X = 56^\circ$$

4. A tree casts a 25-foot shadow on a sunny day, as shown in the diagram below. If the angle of elevation from the tip of the shadow to the top of the tree is 32° , what is the height of the tree to the nearest tenth of a foot?



$$O = X$$

$$A = 25$$

~~$$H =$$~~

$$\theta = 32^\circ$$

$$\tan \theta = \frac{O}{A}$$

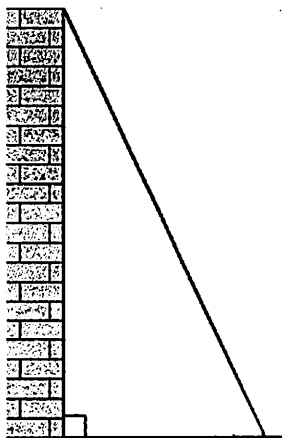
$$\tan 32^\circ = \frac{X}{25}$$

$$25 \cdot \tan 32^\circ = \frac{X}{25} \cdot 25$$

$$15.6 \text{ ft} = X$$

65°

1. As shown in the diagram below, a ladder 5 feet long leans against a wall and makes an angle of 65° with the ground. Find, to the nearest tenth of a foot, the distance from the wall to the base of the ladder.



2. If the length of a rectangular television screen is 20 inches and its height is 15 inches, what is the length of its diagonal, in inches?

3. The center pole of a tent is 8 feet long, and a side of the tent is 12 feet long as shown in the diagram below. If a right angle is formed where the center pole meets the ground, what is the measure of angle A to the nearest degree?

