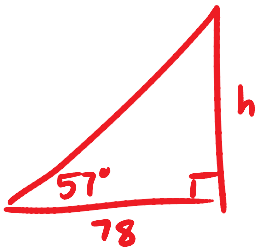
Word Problems
Angles of Elevation and Depression

1) A woman is standing on the ground at a point 78ft from the base of a building. The angle of elevation to the top of the building is 57°. To the nearest foot, how high is the building?

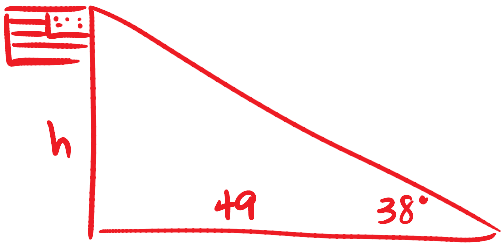


$\tan 57 = \frac{h}{78}$

$h = 78 \tan 57$

$\boxed{h \approx 120}$ ft

2) The sun shines on a flagpole, causing a shadow to be cast on the ground. The distance from the base of the pole to the tip of the shadow is 49 feet. At that time of day, the sun's rays make an angle of 38° with the ground. How tall is the flagpole?

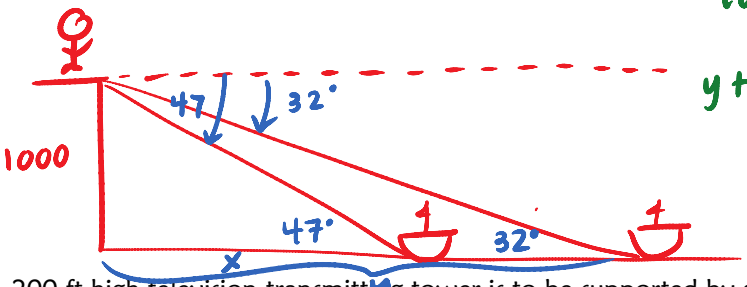


$\tan 38 = \frac{h}{49}$

$h = 49 \tan 38$

$\boxed{h \approx 38.3 \text{ ft}}$

3) An observer on a cliff 1000 dm above sea level sights two ships due east. The angles of depression of the ships are 47° and 32°. Find, to the nearest decimeter, the distance between the two ships.



$\tan 32 = \frac{1000}{y}$

$y \tan 32 = 1000$

$y = \frac{1000}{\tan 32}$

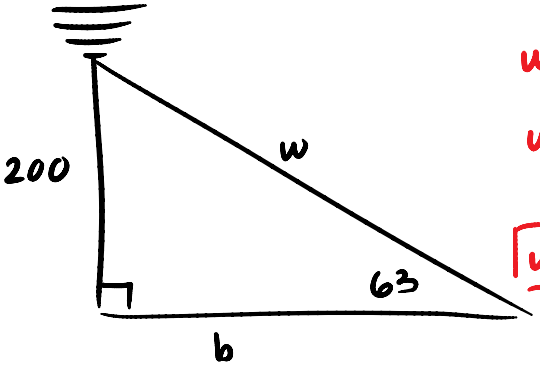
$\tan 47 = \frac{1000}{x}$

$x \tan 47 = 1000$

$x = \frac{1000}{\tan 47}$

$\boxed{\text{ans: } 668 \text{ dm}}$

4) A 200 ft high television transmitting tower is to be supported by guy wires running from the ground to the top of the tower. The wires make an angle of 63° with the ground.
a) How long is each wire?
b) How far from the base of the tower must they meet the ground?



a. $\sin 63 = \frac{200}{w}$

$w \sin 63 = 200$

$w = \frac{200}{\sin 63}$

$\boxed{w \approx 224.5 \text{ ft}}$

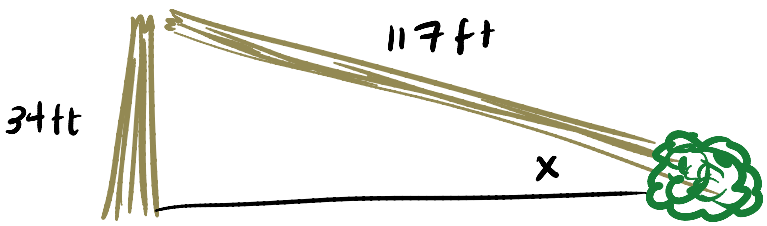
b. $\tan 63 = \frac{200}{b}$

$b \tan 63 = 200$

$b = \frac{200}{\tan 63}$

$\boxed{b \approx 101.9 \text{ ft}}$

5) A tree is struck by lightning and snaps off 34 feet above the ground. The top part of the tree, 117feet long, rests with the tip on the ground whole the broken end rests on the top of the stump. What angle does the top part of the tree make with the ground?



$$\sin x = \frac{34}{117}$$

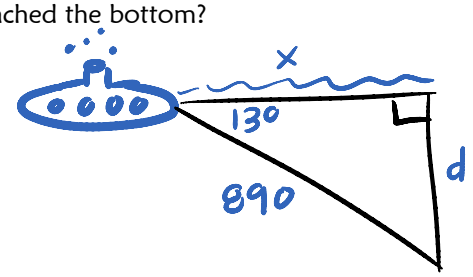
$$x = \sin^{-1}\left(\frac{34}{117}\right)$$

$$\boxed{x \approx 16.9}$$

6) A submarine starts on the surface, and dives at an angle of 13° to the surface. It goes diagonally a distance of 890 meters before reaching the bottom.

a) How deep is the water where the submarine reaches the bottom?

b) How far is it along the ocean surface from the point where the submarine started to the point directly above where it reached the bottom?



$$\cos 13 = \frac{d}{890}$$

$$d = 890\cos 13$$

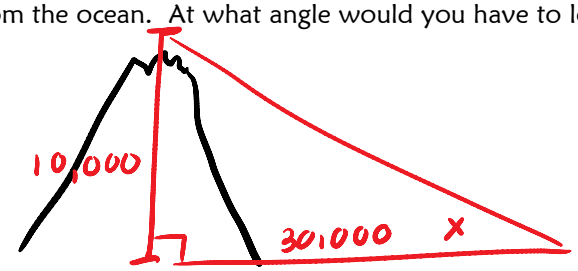
$$\boxed{d = 867.2\,m}$$

$$\sin 13 = \frac{d}{890}$$

$$d = 890\sin 13$$

$$\boxed{d = 200.2\,m}$$

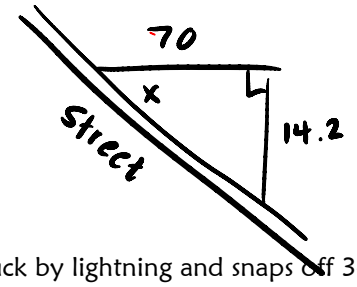
7) Haleakela is a 10,000 foot high dormant volcano on Maui, Hawaii. The peak is a horizontal distance of 30,000 feet from the ocean. At what angle would you have to look up to see the peak if you were standing at the edge of the ocean?



$$\tan x = \frac{10000}{30000}$$

$$x = \tan^{-1}\left(\frac{1}{3}\right) \approx \boxed{18.4^\circ}$$

8) One of the steepest streets in the United States is the 500 block of Highland Drive on Queen Ann Hill in Seattle. If you measure horizontally 70 centimeters from a point on the road surface, you must go down 14.2 centimeters to get back to the surface. What angle does Highland Drive make with the horizontal?



$$\tan x = \frac{14.2}{70}$$

$$x = \tan^{-1}\left(\frac{14.2}{70}\right)$$

$$x = 11$$

9) A tree is struck by lightning and snaps off 34 feet above the ground. The top part of the tree, 117feet long, rests with the tip on the ground whole the broken end rests on the top of the stump. What angle does the top part of the tree make with the ground?

Repeat :(