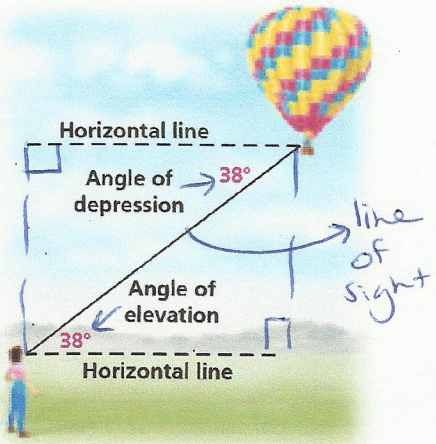
6.4 – Right Triangle Word Problems



– **angle of elevation** → an angle between a horizontal line and a line of sight where the angle is above the horizontal line.

– **angle of depression** → an angle between a horizontal line and a line of sight where the angle is below the horizontal line.

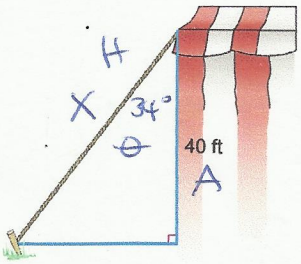
Couple of Things to Notice:

1.) The two horizontal lines are parallel to each other and the angle of elevation and depression are congruent. Angles that do this are called alternate interior angles.

2.) If you draw in a vertical line, then a right △ is formed.

Example 1 – Simple: Label or draw a right triangle then complete problem. Round to tenth place.

a.) A rope is pinned to a point on the ground and attaches 40 feet to the top of a tent. The angle the rope makes with the tent is 34°. How long is the rope?

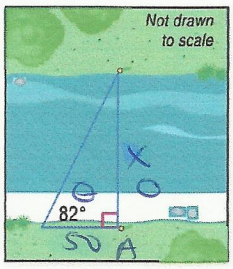


$\cos 34 = \frac{40}{x}$

$x = \frac{40}{\cos 34}$

$x = 48.2$ ft

b.) A bridge needs to be built across a river. A stake is planted 50 feet to the left of the bridge. The stake makes a 82° with the ground. What is the length of the bridge?

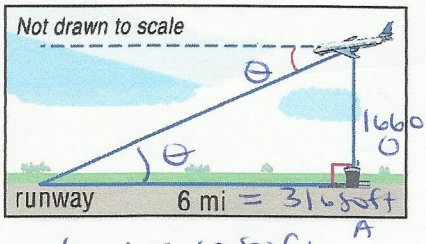


$\tan 82 = \frac{x}{50}$

$x = 50 \tan 82$

$x = 355.8$ ft

c.) A plane is 1,660 feet above an airport and is descending to a runway. The runway is 6 miles long. What is the angle of depression of the plane?



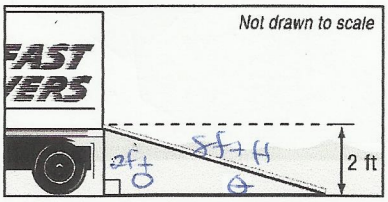
1 mi = 5280 ft

$\tan\theta = \frac{1660}{31680}$

$\theta = \tan^{-1}\left(\frac{1660}{31680}\right)$

$\theta = 3°$

d.) A moving truck as a 8-ft ramp that is 2 feet above the ground. What is the angle of inclination of the ramp?

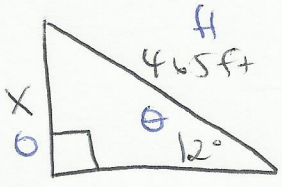


$\sin\theta = \frac{2}{8}$

$\theta = \sin^{-1}\left(\frac{2}{8}\right)$

$\theta = 14.5°$

e.) A truck is driving on a mountain road that is 465 feet long. The angle that which the truck is driving up the mountain is 12°. What is the altitude of the road?

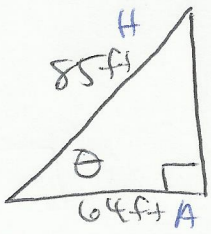


$\sin 12 = \frac{x}{465}$

$x = 465 \sin 12$

$x = 96.7$ ft

f.) A light pole has an 85 ft wire attached to the top and is fastened to the ground. The part of the wire that is on the ground is 64 feet from the base of the light pole. What is the angle of elevation of the wire?



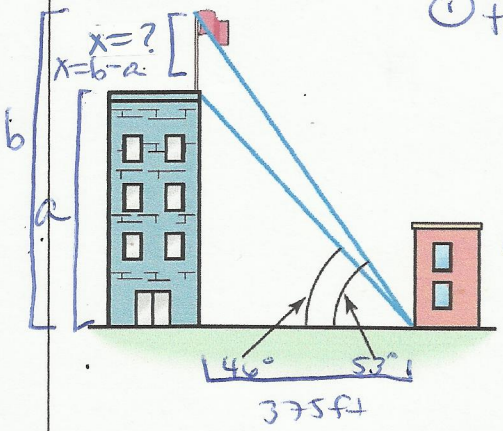
$\cos\theta = \frac{64}{85}$

$\theta = \cos^{-1}\left(\frac{64}{85}\right)$

$\theta = 41.2°$

Example 2 - Complex: Label or draw a right triangle then complete problem. Round to tenth place.

a.) Two buildings are 375 feet from each other. The taller building has a flagpole on top of it. From a point on the ground from the shorter building, it is observed that the angle of elevation to the top of the taller building is 46°. From the same point, the angle of elevation to the top of the flagpole is 53°. How tall is the flagpole?



① $\tan 46 = \frac{a}{375}$

$a = 375 \tan 46$

$a = 388.3$

② $\tan 53 = \frac{b}{375}$

$b = 375 \tan 53$

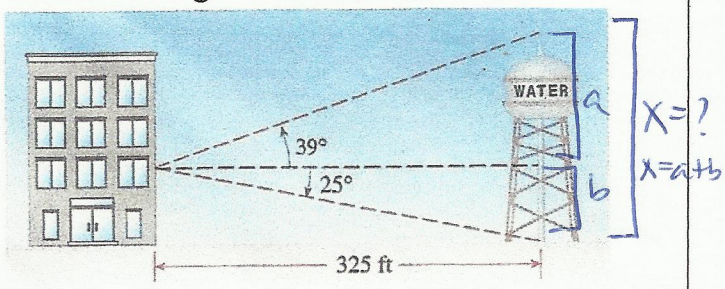
$b = 497.6 ft$

③ $x = b - a$

$x = 497.6 - 388.3$

$x = 109.3 ft$

b.) What is the height of the water tower?



① $\tan 39 = \frac{a}{325}$

$a = 325 \tan 39$

$a = 263.2$

② $\tan 25 = \frac{b}{325}$

$b = 325 \tan 25$

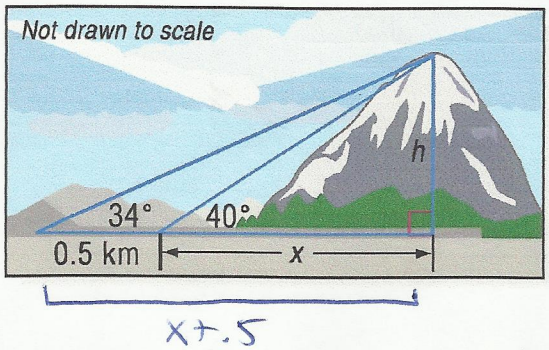
$b = 151.5$

③ $x = a + b$

$x = 263.2 + 151.5$

$x = 414.7 ft$

c.) What is the height of the mountain? h=?



① $\tan 40 = \frac{h}{x}$

$h = x \tan 40$

② $\tan 34 = \frac{h}{x+.5}$

$h = (x+.5) \tan 34$

③ $\frac{x \tan 40}{\tan 34} = \frac{(x+.5)\tan 34}{\tan 34}$

$1.244016x = x + .5$

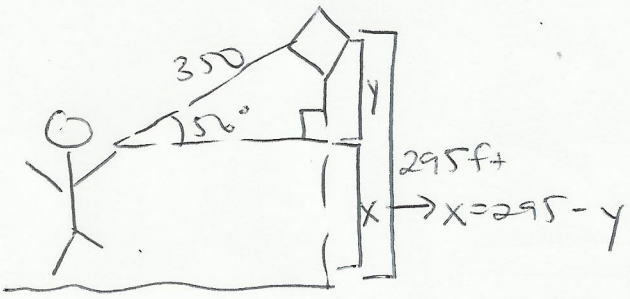
$-x \quad -x$

$\frac{.244016x}{.244016} = \frac{.5}{.244016} \rightarrow x = 2$

④ $h = x \tan 40$

$h = 2 \tan 40 \rightarrow h = 1.7 km$

d.) A person is flying a kite 295 feet high and holds the string a certain amount of feet above the ground. The kite has a 350 feet string that is taut and makes a 56° angle with the horizontal. How high is the person holding the kite from the ground?



① $\sin 56 = \frac{y}{350}$

$y = 350 \sin 56$

$y = 290.2$

② $x = 295 - y$

$x = 295 - 290.2$

$x = 4.8 ft$