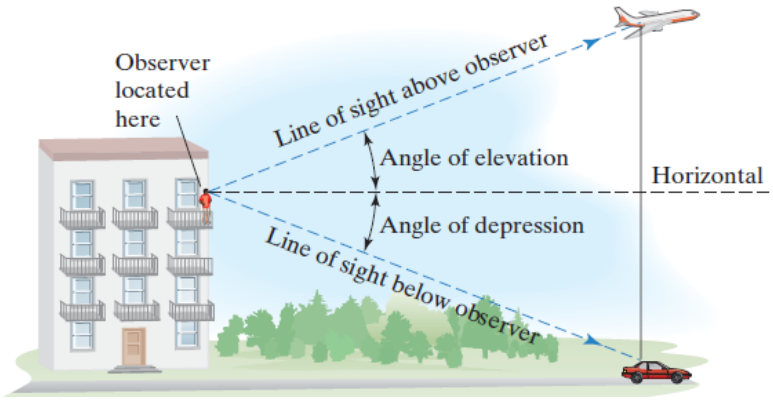
9.1 - Right Triangle Trig. - Day 2

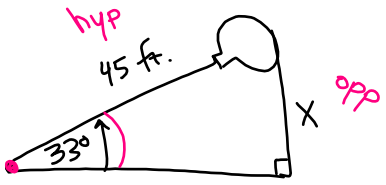
Applications

Many applications of right triangle trigonometry involve the angle made with an imaginary horizontal line. As shown in **Figure 4.37**, an angle formed by a horizontal line and the line of sight to an object that is above the horizontal line is called the **angle of elevation**. The angle formed by a horizontal line and the line of sight to an object that is below the horizontal line is called the **angle of depression**. Transits and sextants are instruments used to measure such angles.



Example 1

A balloon on a string is staked to the ground. The wind is blowing so an angle of elevation of 33° is formed with the ground. If the length of the string and balloon is 45 feet total, how high from the ground is the balloon?

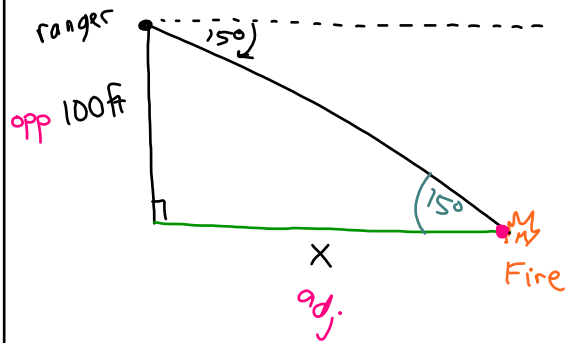


$\sin(33) = \frac{x}{45}$

$x = 24.5$ ft.

Example 2

A forest ranger looking out from a ranger's station can see a forest fire at a 15° angle of depression. The ranger's position is 100 ft. above the ground. How far from the base of the ranger's station is it to the fire?



$\tan(15) = \frac{100}{x}$

$x = \frac{100}{\tan(15)}$

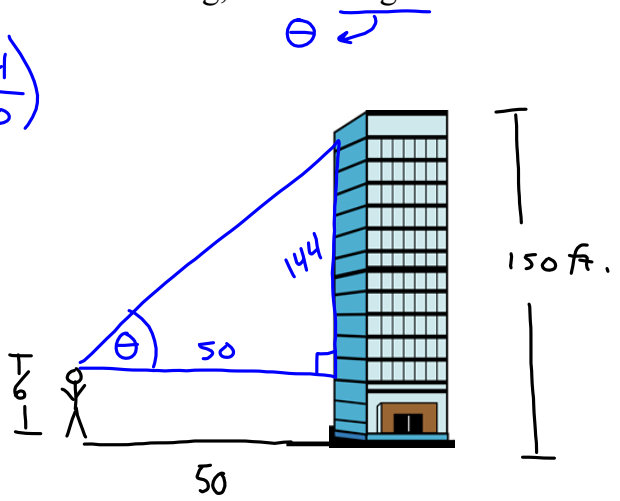
$x = 373.2$ ft.

Example 3

A 6 foot tall man is staring at the top of a building. If the building is 150 feet tall and the man is 50 feet away from the building, at what angle of elevation is the man lifting his head at?

$\theta = \tan^{-1}\left(\frac{144}{50}\right)$

$\theta = 70.9°$

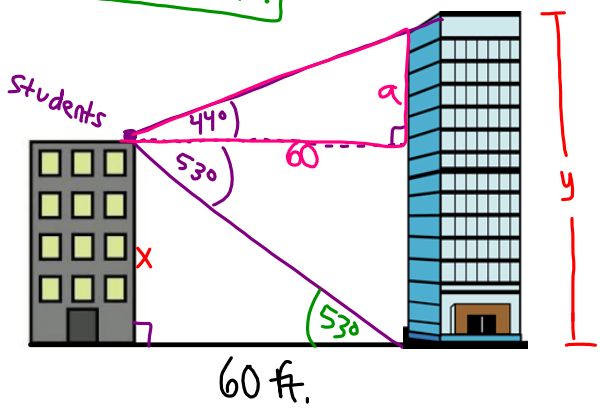


Example 4

Two students want to determine the heights of two buildings. They stand on the roof of the shorter building. The students use a clinometer to measure the angle of elevation of to top of the taller building. The angle is 44°. From the same position, the students measure the angle of depression to the base of the taller building. The angle is 53°. The students then measure the horizontal distance between the two buildings. The distance is 60 ft. How tall is each building?

$\tan(53) = \frac{x}{60}$

$x = 79.6$ ft.



$\tan(44) = \frac{a}{60}$

$a = 57.9$ ft.

$+ \quad x = 79.6$ ft.

Tall building $y = 137.5$ ft.