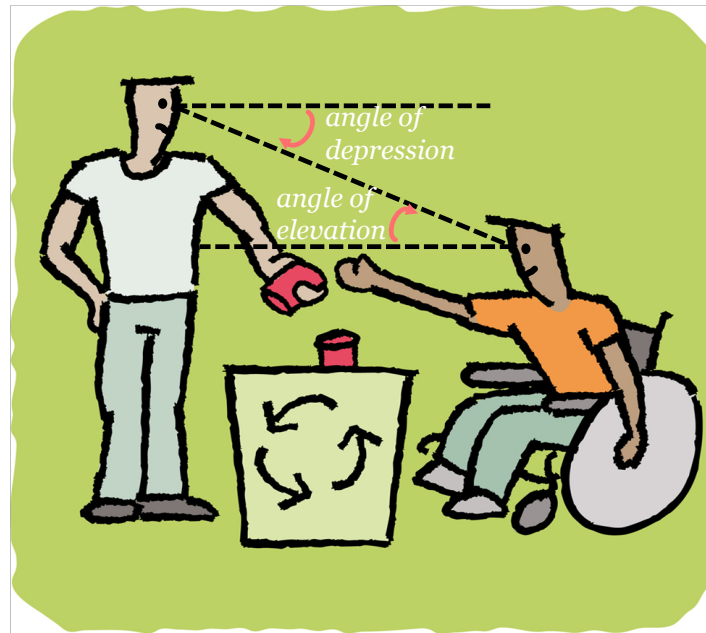


# ANGLES OF ELEVATION AND DEPRESSION

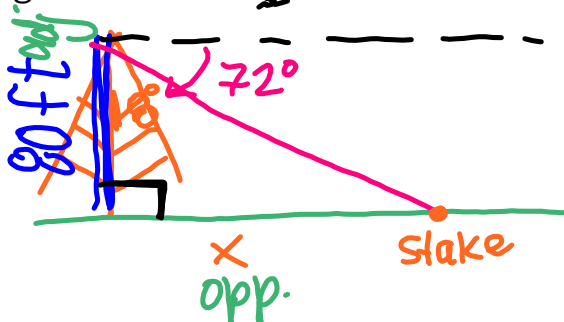


**angle of elevation** - starts from a horizontal line and goes up

**angle of depression** - starts from a horizontal line and goes down

## Example 1

From the top of a tower, the angle of depression to a stake on the ground is  $72^\circ$ . The top of the tower is 80 feet above the ground. How far is the stake from the foot of the tower?

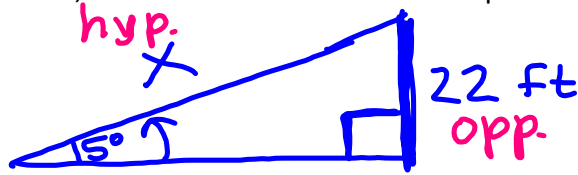


$$80 \cdot \tan 18^\circ = \frac{x}{80} \cdot 80$$

$$x \approx 26.0 \text{ ft}$$

## Example 2

A freeway entrance ramp has an elevation of  $15^\circ$ . If the vertical lift is 22 feet, what is the distance up the ramp?



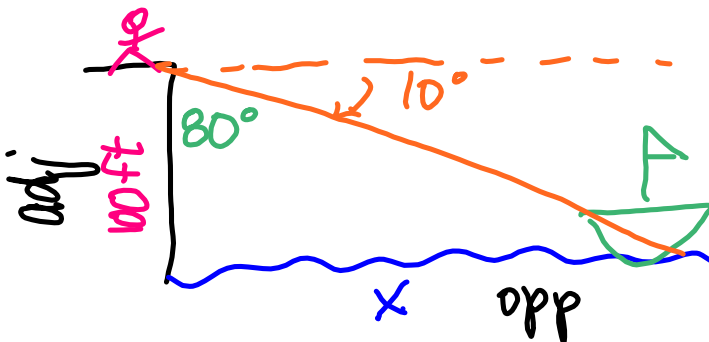
$$x \cdot \sin 15^\circ = \frac{22}{x} \cdot x$$

$$\frac{x \cdot \sin 15^\circ}{\sin 15^\circ} = \frac{22}{\sin 15^\circ}$$

$$x \approx 85.0 \text{ ft}$$

## Example 3

A person at the top of a cliff 100 feet tall see Gilligan's boat. His sighting of the boat is at an angle of depression of  $10^\circ$ . How far is the boat from the base of the cliff?

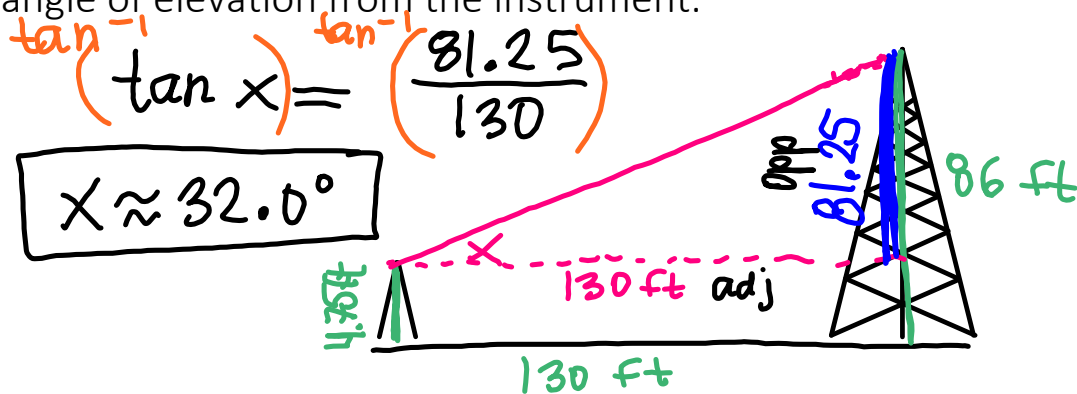


$$100 \cdot \tan 80^\circ = \frac{x}{100} \cdot 100$$

$$x \approx 567.1 \text{ ft}$$

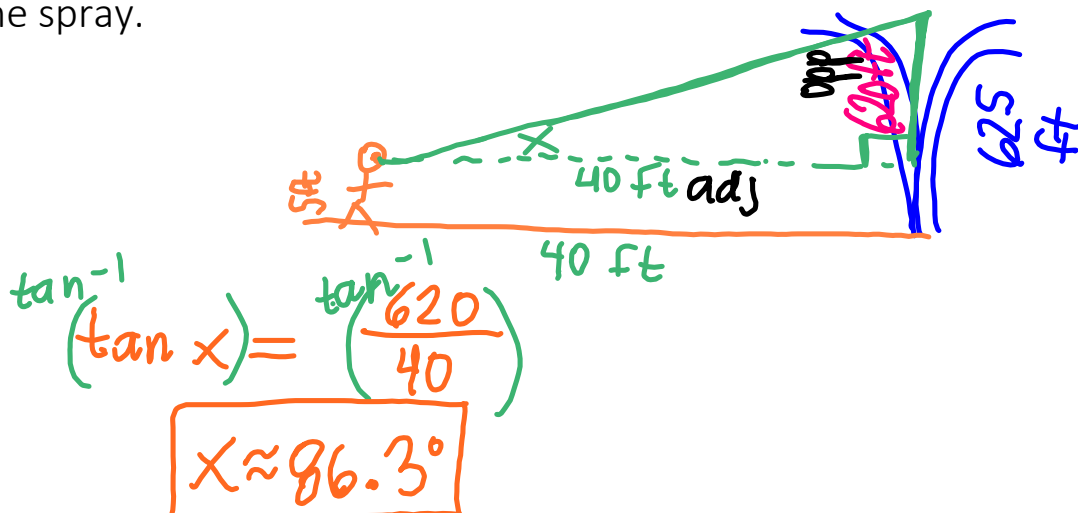
## Example 4

A surveyor is 130 feet from a tower. The tower is 86 feet high. The surveyor's instrument is 4.75 feet above the ground. Find the angle of elevation from the instrument.



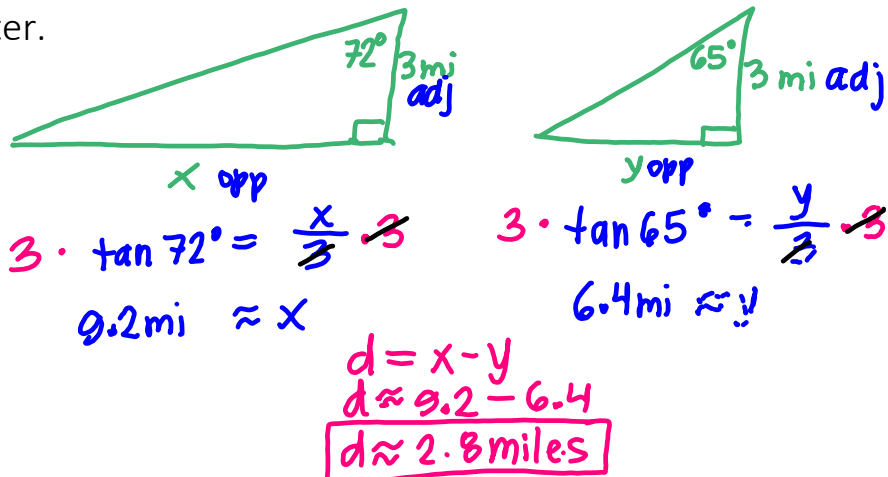
## Example 5

The tallest fountain in the world is located at Fountain Hills, Arizona. If weather conditions are favorable, the water column can reach 625 feet. Suppose Kevin visits the fountain on a perfect day and his eyes are 5 feet from the ground. If he stands 40 feet from the fountain, find the angle of elevation for his line of sight to the top of the spray.



## Example 6

On July 20, 1969, Neil Armstrong became the first human to walk on the moon. During this mission, the lunar lander *Eagle* traveled aboard *Apollo 11*. Before sending *Eagle* to the surface of the moon, *Apollo 11* orbited the moon three miles above the surface. At one point in the orbit, the onboard guidance system measured the angles of depression to the far and near edge of a large crater. The angles measured  $18^\circ$  and  $25^\circ$ , respectively. Find the distance across the crater.



## Example 7

A plane  $P$  is 2 miles above ground. The pilot sights the airport  $A$  at an angle of depression of  $15^\circ$ . He sights his house  $H$  at an angle of depression of  $32^\circ$ . What is the ground distance  $d$  between the pilot's house and the airport?

