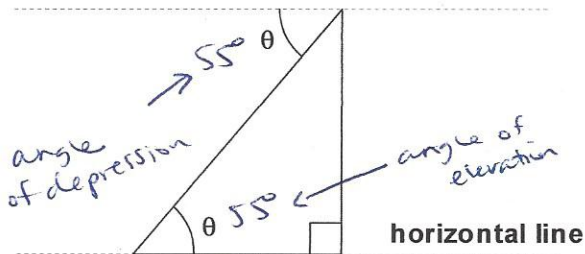


# Triangle Trigonometry – Right Triangle Word Problems

horizontal line



- **angle of elevation** → an angle between a horizontal line

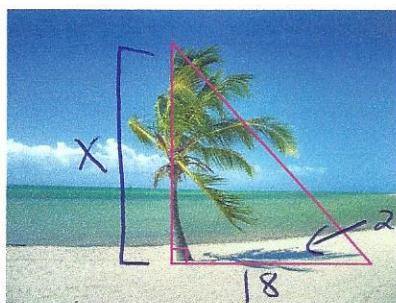
where the line of sight is above the horizontal line

- **angle of depression** → an angle between a horizontal line

where the line of sight is below the horizontal line

## Example 1: Finding the Height of a Palm Tree

A palm tree casts a shadow of 18 feet long. The angle of elevation of the sun is  $25.7^\circ$ . Find the height of the palm tree.



$$\tan 25.7 = \frac{X}{18}$$

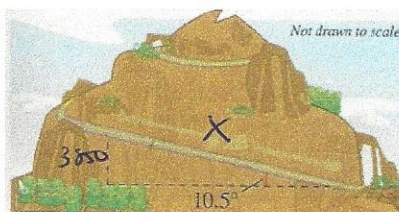
$$X = 18 \tan 25.7$$

$$\boxed{X = 8.7 \text{ ft}}$$

## Example 2: Finding the Length of a Mountain Road

A sign on a roadway at bottom of a mountain road indicates that the road will incline  $10.5^\circ$  with the ground. The altitude for a car ascending up the mountain road is 3,850 ft.

Find the length of the mountain road in miles.



$$1 \text{ mi} = 5280 \text{ ft}$$

$$\sin 10.5 = \frac{3850}{X}$$

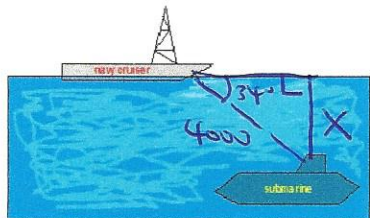
$$X = \frac{3850}{\sin 10.5}$$

$$X = 2126.5 \div 5280$$

$$\boxed{X = 4 \text{ miles}}$$

## Example 3: Depth of a Submarine

The sonar of a navy cruiser detects a submarine that is 4000 feet from the cruiser. The angle between the water line and the submarine is  $34^\circ$ . How deep is the submarine?



$$\sin 34 = \frac{X}{4000}$$

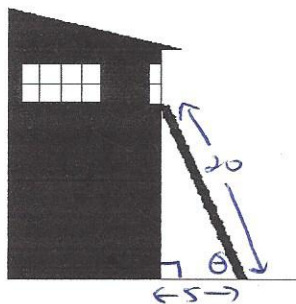
$$X = 4000 \sin 34$$

$$\boxed{X = 2236.8 \text{ ft}}$$

## Example 4: Finding the Angle Formed by Ladder

A 20-ft ladder leans against a house and the base of the ladder is 5 feet from the base of the house.

What is the angle formed by the ladder and the ground?



$$\cos \theta = \frac{5}{20}$$

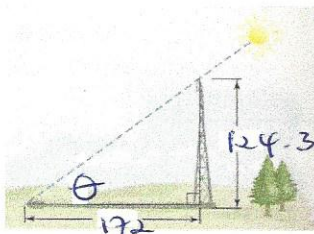
$$\theta = \cos^{-1}\left(\frac{5}{20}\right)$$

$$\boxed{\theta = 75.5^\circ}$$

## Example 5: Finding the Angle of Elevation of Sun

A cell phone tower is  $124'4"$  tall and casts a 172-foot shadow. What is the angle of elevation of the sun to the top of the tower?

$$124 + \frac{4}{12} = 124.3 \text{ ft}$$



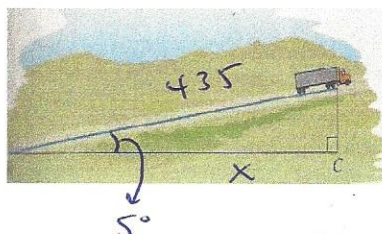
$$\tan \theta = \frac{124.3}{172}$$

$$\theta = \tan^{-1}\left(\frac{124.3}{172}\right)$$

$$\boxed{\theta = 35.9^\circ}$$

## Example 6: Horizontal Distance of a Road

A truck is driving on a road that is inclined at an angle of  $5^\circ$ . The distance the truck traveled on the road is 435 feet. Find the horizontal distance that the truck traveled.



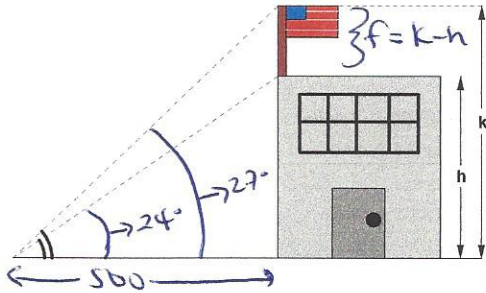
$$\cos 5 = \frac{X}{435}$$

$$X = 435 \cos 5$$

$$\boxed{X = 433.3 \text{ ft}}$$

**Example 7: Height of Flagpole on Top of Building**

From a point on the ground 500 feet from the base of the building, it is observed that the angle of elevation to the top of the building is  $24^\circ$  and the angle of elevation to the top of the flagpole atop of the building is  $27^\circ$ . Find the height of the flagpole.



$$\textcircled{1} \tan 27 = \frac{k}{500}$$

$$k = 500 \tan 27$$

$$k = 254.8$$

$$\textcircled{2} \tan 24 = \frac{h}{500}$$

$$h = 500 \tan 24$$

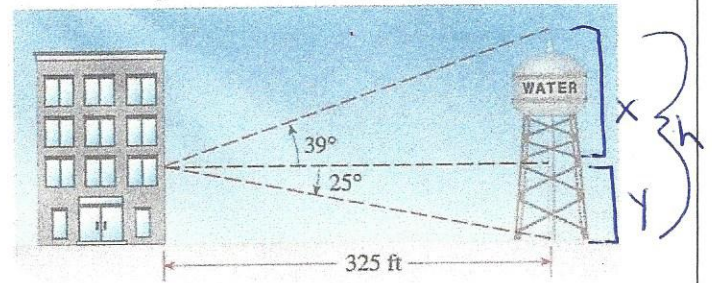
$$h = 222.6$$

$$\textcircled{3} f = k - h \rightarrow f = 254.8 - 222.6$$

$$f = 32.2 \text{ ft}$$

**Example 8: Height of a Water Tower**

What is the height of the water tower?



$$\text{height of tower}(h) = x + y$$

$$\textcircled{1} \tan 39 = \frac{x}{325}$$

$$x = 325 \tan 39$$

$$x = 263.2$$

$$\textcircled{2} \tan 25 = \frac{y}{325}$$

$$y = 325 \tan 25$$

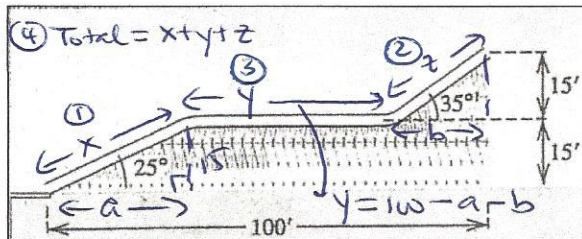
$$y = 151.5$$

$$\textcircled{3} h = x + y \rightarrow h = 263.2 + 151.5$$

$$h = 414.7 \text{ ft}$$

**Example 9: RT WP with Multiple Steps**

Shown in the figure is part of a design for a water slide. Find the total length of the slide.



$$\textcircled{1} \sin 25 = \frac{15}{x}$$

$$x = \frac{15}{\sin 25}$$

$$x = 35.5$$

$$a^2 + 15^2 = 35.5^2$$

$$a^2 = 1035.25$$

$$a = 32.2$$

$$\textcircled{2} \sin 35 = \frac{15}{z}$$

$$z = \frac{15}{\sin 35}$$

$$z = 26.2$$

$$b^2 + 15^2 = 26.2^2$$

$$b^2 = 461.44$$

$$b = 21.5$$

$$\textcircled{3} y = 100 - 32.2 - 21.5$$

$$y = 46.3$$

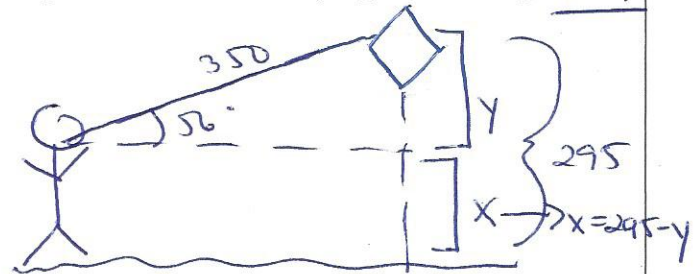
$$\textcircled{4} \text{Total} =$$

$$35.5 + 46.3 + 26.2$$

$$\text{Total} = 108 \text{ ft}$$

**Example 10: RT WP with NO picture**

A person is flying a kite and holds the string a certain amount of feet above the ground. The kite has a 350 feet string that is taut and makes  $56^\circ$  angle with the horizontal. Find how high the person is holding the kite above the ground if the kite is flying 295 feet high.  $x = ?$



$$\textcircled{1} \sin 56 = \frac{y}{350}$$

$$y = 350 \sin 56$$

$$y = 290.2$$

$$\textcircled{2} x = 295 - y$$

$$x = 295 - 290.2$$

$$x = 4.8 \text{ ft}$$