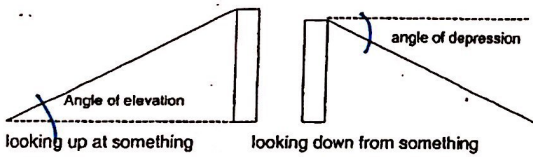


9-3 Angles of Elevation and Depression

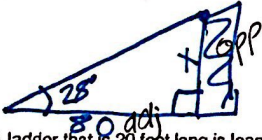
Angle of elevation: the angle formed by a horizontal line and the line of sight to an object above the horizontal line

Angle of depression: the angle formed by a horizontal line and the line of sight to an object below the horizontal line



Examples:

1. From a point 80m from the base of a tower, the angle of elevation to the top of the tower is 28°. How tall is the tower?

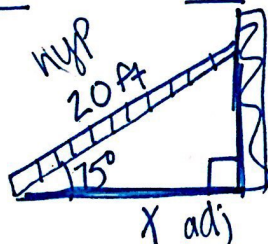


$$\tan 28^\circ = \frac{x}{80}$$

$$x = 80 \tan 28^\circ$$

$$x = 42.54 \text{ m}$$

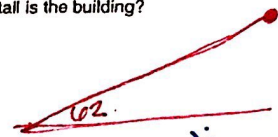
2. A ladder that is 20 feet long is leaning against the side of a building. If the angle formed between the ladder and the ground is 75°, how far is the bottom of the ladder from the base of the building.



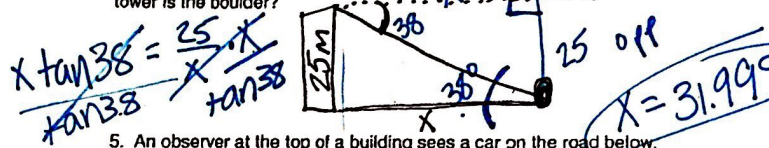
$$20 \cos(75^\circ) = \frac{x}{20}$$

$$x = 5.18 \text{ ft}$$

3. When the sun is 62° above the horizon, a building casts a shadow 18 m long. How tall is the building?



4. The angle of depression from the top of a tower to a boulder on the ground is 38°. If the tower is 25 m high, how far from the base of the tower is the boulder?



$$\frac{x \tan 38^\circ}{\tan 38^\circ} = \frac{25 \cdot x}{\tan 38^\circ}$$

$$x = 31.99 \text{ m}$$

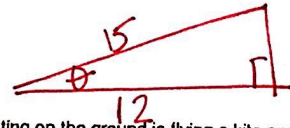
5. An observer at the top of a building sees a car on the road below. The angle of depression to the car is 28°. If the car is 50 m from the building when it is seen, how tall is the building?



$$\tan(28^\circ) = \frac{x}{50}$$

$$x = 26.59 \text{ m}$$

6. A ladder that is 15 feet long is leaning against a building. The ladder is 12 feet from the base of the building. What angle does the ladder make with the ground?



$$\cos \theta = \frac{12}{15}$$

$$\theta = \cos^{-1}\left(\frac{12}{15}\right)$$

7. A person sitting on the ground is flying a kite and has used all of the 50 feet of string. If the kite is 20 feet above the ground, what is the angle of elevation of the kite?

$$\theta = 36.9^\circ$$