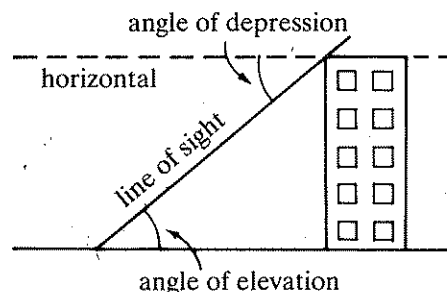


8-7 Applications of Right Triangle Trigonometry

Objective: Solve right triangle problems by correct selection and use of the tangent, sine, and cosine ratios.

If a person on the ground looks up to the top of a building, the angle formed between the line of sight and the horizontal is called the **angle of elevation**.

If a person standing on the top of a building looks down at a car on the ground, the angle formed between the line of sight and a horizontal line is called the **angle of depression**.



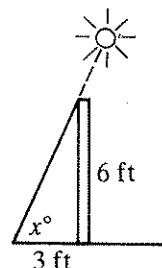
Example 1

At a certain time, a post 6 ft tall casts a 3 ft shadow. What is the angle of elevation of the sun?

Solution

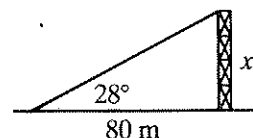
$$\tan x^\circ = \frac{6}{3} = 2$$

$$x \approx 63$$

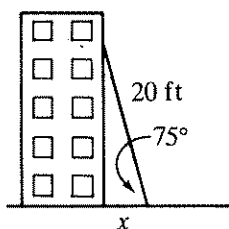


Express lengths correct to the nearest integer.

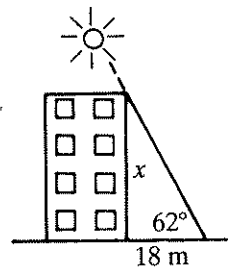
1. From a point 80 m from the base of a tower, the angle of elevation to the top of the tower is 28° . How tall is the tower?



2. A ladder that is 20 ft 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?

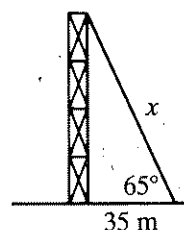
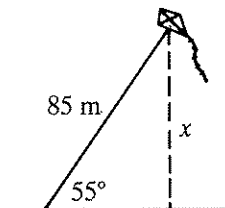


3. When the sun is 62° above the horizon, a building casts a shadow 18 m long. How tall is the building?

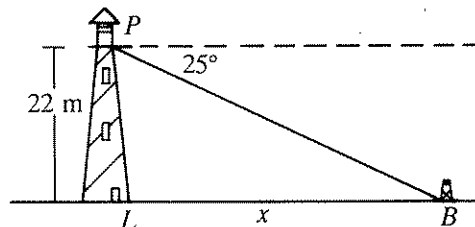


8-7 Applications of Right Triangle Trigonometry (continued)

4. A kite is flying at an angle of elevation of about 55° . Ignoring the sag in the string, find the height of the kite if 85 m of string have been let out.
5. A guy wire is attached to the top of a tower and to a point on the ground that is 35 m from the base of the tower. If the wire makes a 65° angle with the ground, how long is the wire?

**Example 2**

A person in a lighthouse 22 m above sea level sights a buoy in the water. If the angle of depression to the buoy is 25° , how far from the base of the lighthouse is the buoy?

**Solution**

The distance between the buoy and the lighthouse can be found in two ways.

Method 1

$$m\angle PBL = 25$$

$$\tan 25^\circ = \frac{22}{x}$$

$$x(\tan 25^\circ) = 22$$

$$x = \frac{22}{\tan 25^\circ}$$

$$\approx \frac{22}{0.4663}$$

$$\approx 47.1799$$

Method 2

$$m\angle BPL = 90 - 25 = 65$$

$$\tan 65^\circ = \frac{x}{22}$$

$$x = 22(\tan 65^\circ)$$

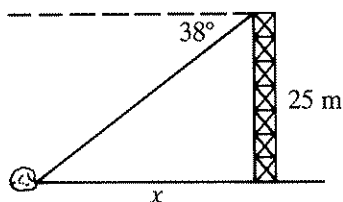
$$x \approx 22(2.1445)$$

$$\approx 47.1792$$

The buoy is about 47 m away.

Express lengths correct to the nearest integer.

6. 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?



7. 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 about 50 m from the building when it is seen, how tall is the building?

