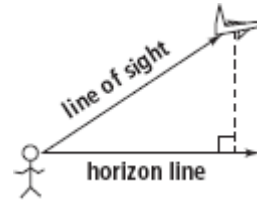


8-4 Reteaching

Angles of Elevation and Depression

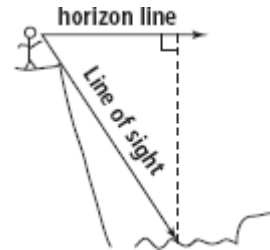
Angle of Elevation

Suppose you are looking up at an airplane. The angle formed by a horizontal line and your line of sight to the airplane is called the *angle of elevation*.



Angle of Depression

Now suppose you are standing on a cliff and looking down at a river below. The line stretches horizontally from your point of view on the cliff. Your angle of sight to the river below forms an *angle of depression* with the horizontal line.

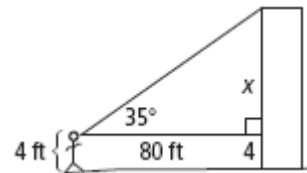


You can use your knowledge of trigonometric ratios to determine distances and lengths using angles of elevation and depression.

Using the Angle of Elevation

Problem

Suppose you are looking up at the top of a building. The angle formed by your line of sight and a horizontal line is 35° . You are standing 80 ft from the building and your eyes are 4 ft above the ground. How tall is the building, to the nearest foot?



Look at the diagram and think about what you know. You can see that a right triangle is formed by a horizontal line, your line of sight, and the building. You know an angle and one length.

Remember: $\tan A = \frac{\text{opposite length}}{\text{adjacent length}}$

Let the opposite length be x .

$$\tan 35 = \frac{x}{80}$$

$$80 \tan 35 = x$$

$$x \approx 56 \text{ ft}$$

Your eyes are 4 ft above the ground, so add 4 to the value of x to find the total height of the building: $56 \text{ ft} + 4 \text{ ft} = 60 \text{ ft}$.

8-4

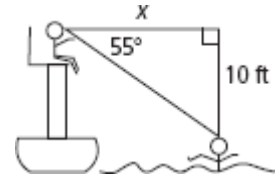
Reteaching (continued)

Angles of Elevation and Depression

Using the Angle of Depression

Problem

Suppose you are a lifeguard looking down at a swimmer in a swimming pool. Your line of sight forms a 55° angle with a horizontal line. You are 10 ft up in your seat. How far is the swimmer from the base of the lifeguard stand?



Look at the diagram and think about what you know. You can see that a right triangle is formed by the horizon line, your line of sight, and a vertical distance that is the same as your height in the seat. You know an angle and one length.

Remember: $\tan A = \frac{\text{opposite length}}{\text{adjacent length}}$

Let the unknown side length be x .

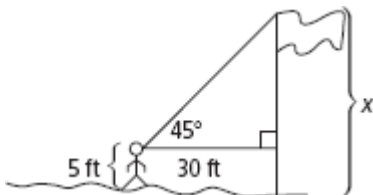
$$\begin{aligned} \tan 55 &= \frac{10}{x} \\ x &= \frac{10}{\tan 55} \\ x &\approx 7 \text{ ft} \end{aligned}$$

The swimmer is 7 ft from the base of the lifeguard stand.

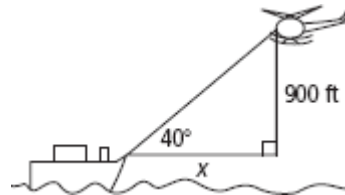
Exercises

Find the value of x . Round the lengths to the nearest tenth of a unit.

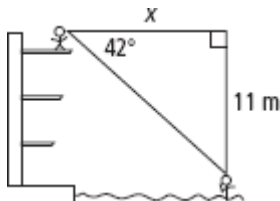
1.



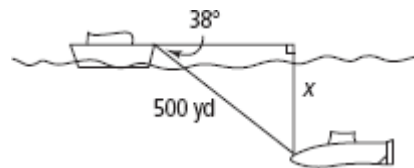
2.



3.



4.



8-4

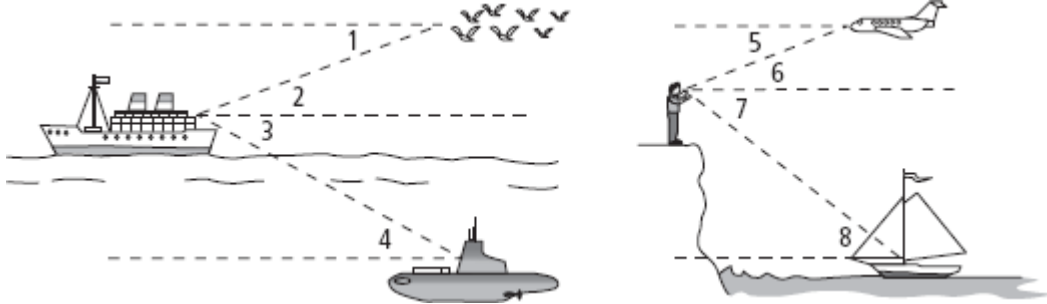
Practice

Form G

Angles of Elevation and Depression

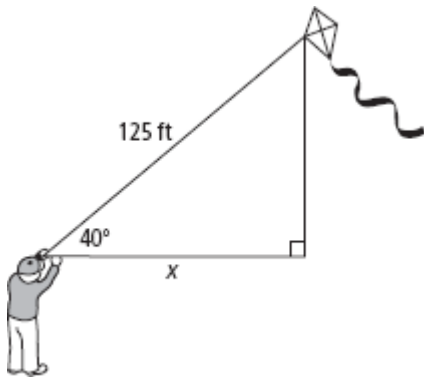
Describe each angle as it relates to the situation in the diagram.

1. $\angle 1$ 2. $\angle 2$ 3. $\angle 3$ 4. $\angle 4$
5. $\angle 5$ 6. $\angle 6$ 7. $\angle 7$ 8. $\angle 8$

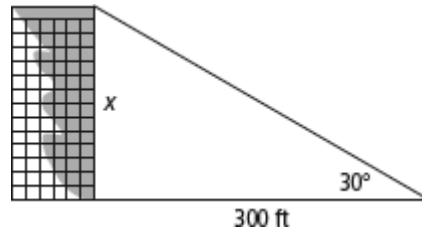


Find the value of x . Round to the nearest tenth of a unit.

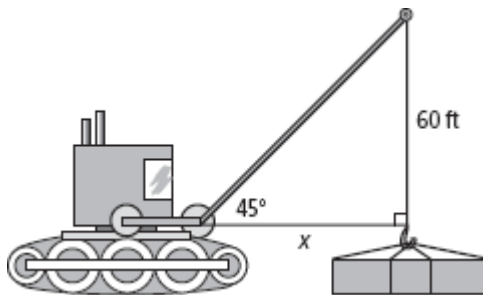
9.



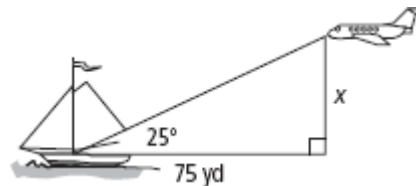
10.



11.



12.



13. A person is standing 40 ft from a flagpole and can see the top of the pole at a 35° angle of elevation. The person's eye level is 4 ft from the ground. What is the height of the flagpole to the nearest foot?

14. An eagle perched 40 ft up in a tree looks down at a 35° angle and spots a vole. How far is the vole from the eagle to the nearest tenth of a foot?

8-4

Practice (continued)

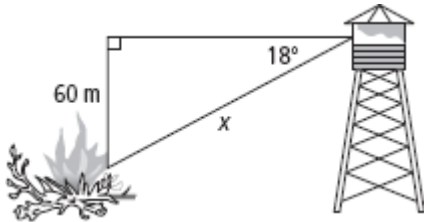
Form G

Angles of Elevation and Depression

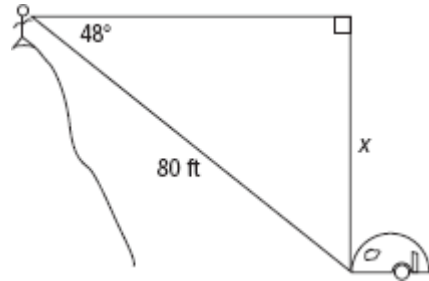
15. You stand 40 ft from a tree. The angle of elevation from your eyes (5 ft above the ground) to the top of the tree is 47° . How tall is the tree? Round your answer to the nearest foot.

Find the value of x . Round to the nearest tenth of a unit.

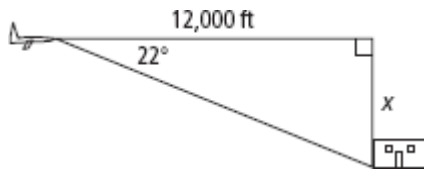
16.



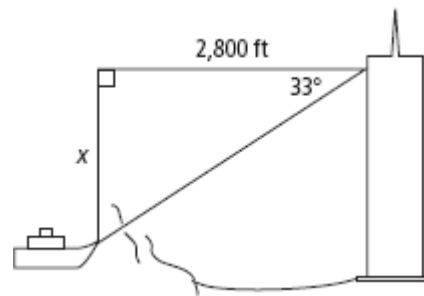
17.



18.



19.



20. An airplane is flying at an altitude of 10,000 ft. The airport at which it is scheduled to land is 50 mi away. Find the average angle at which the airplane must descend for landing. Round your answer to the nearest degree.
21. A lake measures 600 ft across. A lodge stands on one shore. From your point on the opposite shore, the angle of elevation to the top of the lodge is 4° . How high above the lake does the lodge stand? Round your answer to the nearest foot.
22. A library needs to build an access ramp for wheelchairs. The main entrance to the library is 8 ft above sidewalk level. If the architect designs the slope of the ramp in such a way that the angle of elevation is 5° , how long must the access ramp be? Round your answer to the nearest foot.

Algebra The angle of elevation e from A to B and the angle of depression d from B to A are given. Find the measure of each angle.

23. $e: (3x + 6)^\circ, d: (x + 20)$

24. $e: (6x + 3)^\circ, d: 3(x + 6)$

25. $e: (3x - 4)^\circ, d: 2(x + 7)$

26. $e: (5x - 8)^\circ, d: 3(x + 4)$