

1. A \_\_\_\_\_ measures the acute angle that a path or line of sight makes with a fixed north-south line.
2. A point that moves on a coordinate line is said to be in simple \_\_\_\_\_ when its distance  $d$  from the origin at time  $t$  is given by either  $d = a \sin \omega t$  or  $d = a \cos \omega t$ .
3. The time for one complete cycle of a point in simple harmonic motion is its \_\_\_\_\_.
4. The number of cycles per second of a point in simple harmonic motion is its \_\_\_\_\_.

**Solving a Right Triangle** In Exercises 5–14, solve the right triangle shown in the figure for all unknown sides and angles. Round your answers to two decimal places.

5.  $A = 30^\circ$ ,  $b = 3$

6.  $B = 54^\circ$ ,  $c = 15$

14.  $B = 65^\circ 12'$ ,  $a = 14.2$

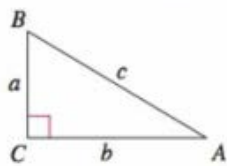


Figure for 5–14

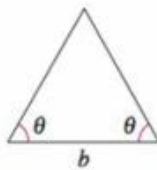
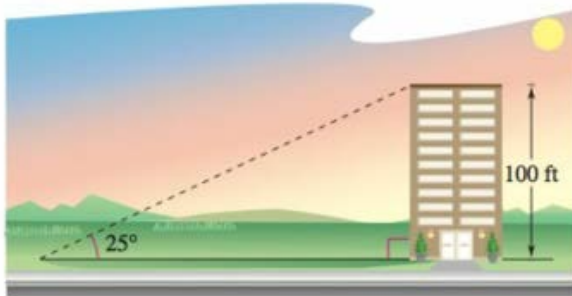


Figure for 15–18

19. **Length** The sun is  $25^\circ$  above the horizon. Find the length of a shadow cast by a building that is 100 feet tall (see figure).

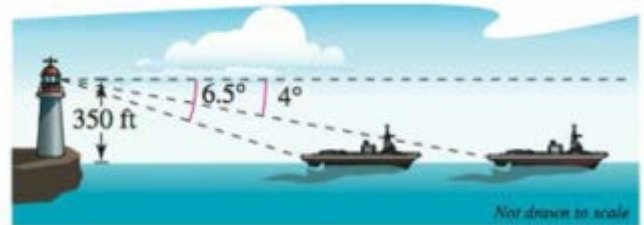


**Finding an Altitude** In Exercises 15–18, find the altitude of the isosceles triangle shown in the figure. Round your answers to two decimal places.

15.  $\theta = 45^\circ$ ,  $b = 6$

22. **Height** The length of a shadow of a tree is 125 feet when the angle of elevation of the sun is  $33^\circ$ . Approximate the height of the tree.

24. **Distance** An observer in a lighthouse 350 feet above sea level observes two ships directly offshore. The angles of depression to the ships are  $4^\circ$  and  $6.5^\circ$  (see figure). How far apart are the ships?



7.  $B = 71^\circ$ ,  $b = 24$

8.  $A = 8.4^\circ$ ,  $a = 40.5$

9.  $a = 3$ ,  $b = 4$

#7 NA

10.  $a = 25$ ,  $c = 35$

11.  $b = 16$ ,  $c = 52$

#12 NA

12.  $b = 1.32$ ,  $c = 9.45$

**32. Waterslide Design** . . . . .

The designers of a water park are creating a new slide and have sketched some preliminary drawings. The length of the ladder is 30 feet, and its angle of elevation is  $60^\circ$  (see figure).

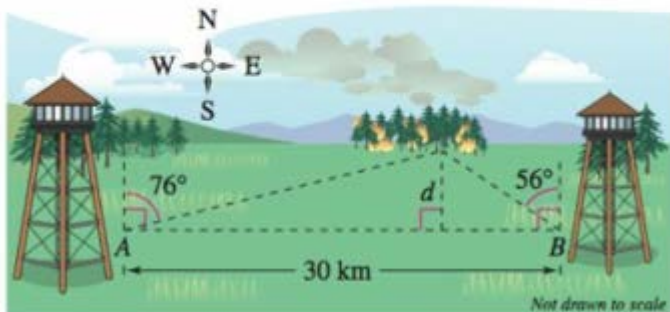


- (a) Find the height  $h$  of the slide.
- (b) Find the angle of depression  $\theta$  from the top of the slide to the end of the slide at the ground in terms of the horizontal distance  $d$  a rider travels.

- (c) Safety restrictions require the angle of depression to be no less than  $25^\circ$  and no more than  $30^\circ$ . Find an interval for how far a rider travels horizontally.



- 42. Location of a Fire** Fire tower  $A$  is 30 kilometers due west of fire tower  $B$ . A fire is spotted from the towers, and the bearings from  $A$  and  $B$  are  $N 76^\circ E$  and  $N 56^\circ W$ , respectively (see figure). Find the distance  $d$  of the fire from the line segment  $AB$ .



- 36. Navigation** A jet leaves Reno, Nevada, and is headed toward Miami, Florida, at a bearing of  $100^\circ$ . The distance between the two cities is approximately 2472 miles.

- (a) How far north and how far west is Reno relative to Miami?
- (b) The jet is to return directly to Reno from Miami. At what bearing should it travel?

**Harmonic Motion** In Exercises 47–50, find a model for simple harmonic motion satisfying the specified conditions. #47 NA

Displacement ( $t = 0$ )	Amplitude	Period
47. 0	4 centimeters	2 seconds
48. 0	3 meters	6 seconds
49. 3 inches	3 inches	1.5 seconds

51. **Tuning Fork** A point on the end of a tuning fork moves in simple harmonic motion described by  $d = a \sin \omega t$ . Find  $\omega$  given that the tuning fork for middle C has a frequency of 264 vibrations per second.

**Harmonic Motion** In Exercises 53–56, for the simple harmonic motion described by the trigonometric function, find (a) the maximum displacement, (b) the frequency, (c) the value of  $d$  when  $t = 5$ , and (d) the least positive value of  $t$  for which  $d = 0$ . Use a graphing utility to verify your results. #53 NA

53.  $d = 9 \cos \frac{6\pi}{5}t$

54.  $d = \frac{1}{2} \cos 20\pi t$