

**Distance Between Cities** In Exercises 87–90, find the distance between the cities. Assume that the earth is a sphere of radius 4000 miles and that the cities are on the same longitude (one city is due north of the other).

City	Latitude
87. Dallas, Texas	$32^{\circ} 47' 9''$ N
Omaha, Nebraska	$41^{\circ} 15' 42''$ N
88. San Francisco, California	$37^{\circ} 46' 39''$ N
Seattle, Washington	$47^{\circ} 36' 32''$ N
89. Miami, Florida	$25^{\circ} 46' 37''$ N
Erie, Pennsylvania	$42^{\circ} 7' 15''$ N
90. Johannesburg, South Africa	$26^{\circ} 10'$ S
Jerusalem, Israel	$31^{\circ} 47'$ N

91. **Difference in Latitudes** Assuming that the earth is a sphere of radius 6378 kilometers, what is the difference in latitude of two cities, one of which is 400 kilometers due north of the other?
92. **Difference in Latitudes** Assuming that the earth is a sphere of radius 6378 kilometers, what is the difference in latitude of two cities, one of which is 500 kilometers due north of the other?
93. **Instrumentation** The pointer on a voltmeter is 6 centimeters in length (see figure). Find the angle through which the pointer rotates when it moves 2.5 centimeters on the scale.

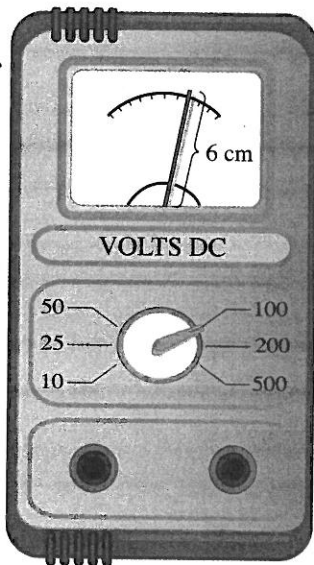


FIGURE FOR 93

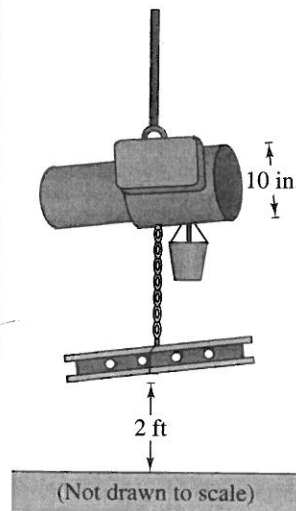
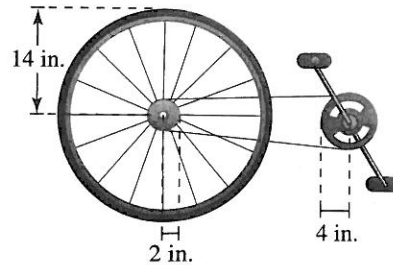


FIGURE FOR 94

94. **Electric Hoist** An electric hoist is being used to lift a beam (see figure). The diameter of the drum on the hoist is 10 inches, and the beam must be raised 2 feet. Find the number of degrees through which the drum must rotate.
95. **Angular Speed** A car is moving at a rate of 65 miles per hour, and the diameter of its wheels is 2.5 feet.
- Find the number of revolutions per minute the wheels are rotating.
  - Find the angular speed of the wheels in radians per minute.
96. **Angular Speed** A 2-inch-diameter pulley on an electric motor that runs at 1700 revolutions per minute is connected by a belt to a 4-inch-diameter pulley on a saw arbor.
- Find the angular speed (in radians per minute) of each pulley.
  - Find the revolutions per minute of the saw.
97. **Floppy Disk** The radius of the magnetic disk in a 3.5-inch diskette is 1.68 inches. Find the linear speed of a point on the circumference of the disk if it is rotating at a speed of 360 revolutions per minute.
98. **Speed of a Bicycle** The radii of the sprocket assemblies and the wheel of the bicycle in the figure are 4 inches, 2 inches, and 14 inches, respectively. If the cyclist is pedaling at a rate of 1 revolution per second, find the speed of the bicycle in (a) feet per second and (b) miles per hour.



### Synthesis

**True or False?** In Exercises 99 and 100, determine whether the statement is true or false. Justify your answer.

99. A measurement of 4 radians corresponds to two complete revolutions from the initial to the terminal side of an angle.