Solutions 6.2.1

8 **a.** The length of the arc is pr cm.

b. The linear velocity is pr cm/min.

c. Each radian intercepts an arc of length $r = 10$ cm, so the angular velocity is $80 \cdot 10 = 800$ cm/sec.

d. The circumference of the circle is $2 \cdot 10 \cdot \pi = 20\pi$. So in one second, the point moves through an angle of $\frac{30\pi}{20\pi} \cdot 360°$, or $\frac{30\pi}{20\pi} \cdot 2\pi$ radians. Therefore, the angular velocity of the point is 3π radians/sec, or $540°$/sec.

e. In one second, a point moving at an angular velocity of v radians/sec will travel vr centimeters. Therefore, the linear velocity of the point is the product of the angular velocity and the radius of the circle, that is, vr cm/sec.

21 Student responses will vary but should include the idea that linear velocity is equal to angular velocity times circumference. Furthermore, since the points are moving at the same number of revolutions per minute (which is angular velocity) and the circumference of an inner circle will be less than the circumference of an outer circle, it must be that the linear velocity of a point on the smaller circle will be less than the linear velocity of a point on the larger circle.