Precalculus Sec 6.2 Name:

Angular and Linear Velocity WS Date:

Find the missing arc length, central angle, or radius.

1. $s = 10$; $r = 15$

2. $\theta = 37\pi$; $r = 21$ in.

3. $\theta = 4\pi$; $s = 3\pi$ cm

Calculate the linear velocity, V, of an object rotating at angular velocity, ω, at a distance r from the center.

4. $r = 12$ cm; $\omega = 5\pi$ rad/sec

5. $r = 49$ cm; $\omega = 7\pi$ rad/sec

6. The radius of a soccer ball is 18 cm. What is the length of an arc of the ball for a central angle of 45°.

7. If a ball is traveling in a circle of diameter 10 m with a velocity of 20 m/s, find the angular velocity of the ball.

8. Suppose a car tire rotates 8 times per second. The tire has a diameter of 8 inches. Find the angular velocity in radians per second.

9. A 20 inch diameter tire on a car makes 9.3 revolutions per second. Find the angular speed of the car.

10. What is the angular velocity of a spinning top if it travels π radians in a third of a second?

11. A car wheel of radius 20 inches rotates at 8 revolutions per second on the highway. What is the angular speed of the tire?

12. A pulley is turned 120^{o} per second.

(a) Find the number of revolutions per minute (rpm).

(b) If the radius of the pulley is 5 inches, find the linear velocity.

13. The diameter of a Ferris wheel is 80 feet.

(a) If the Ferris wheel makes one revolution every 45 seconds, find the linear velocity of a person riding on the Ferris wheel.

(b) Suppose the linear velocity of a person riding on the Ferris wheel is 8 feet per second. What is the time for one revolution of the Ferris wheel?

14. An object is moving in a circular path. How will its linear velocity change if the diameter of the circular path was decreased by one half?

15. Find the linear velocity in meters per second of an object if it took 2 hours to travel a distance of 30 kilometers. Round to the nearest integer.

16. The second hand of a clock is 10.2cm long. Find the linear speed of the end of this second hand.

17. A clock has a second hand measuring 12cm. What is the linear speed of the tip of the second hand?

18. A record is spinning at the rate of 25 rpm. If a ladybug is sitting 10 cm from the center of the record:

(a) What is the angular velocity of the ladybug (in radians per second)?

(b) What is the linear velocity of the ladybug (in cm/sec)?

(c) After 20 seconds, how far has the ladybug traveled (in cm)?

(d) After 20 seconds, what angle has the ladybug turned through (in radians)?

19. Determine the angular velocity, in radians per second, of a wheel turning 124 revolutions per minute.

20. Determine the linear velocity, in centimeters per second, of a point on a circle 1.2m from the center that moves 250° in one minute.

21. A skater is skating around the edge of a circular pond at a distance of 6 m from the center. Her linear velocity is 7.3m/s .

(a) Determine her angular velocity in radians/second.

(b) How many revolutions per minute does she go around the pond?

22. A belt connects two pulleys. The larger has a radius 40 cm and the smaller has radius 20 cm. The smaller pulley revolves at a rate of 48 rpm.

(a) Determine the linear velocity of the belt in cm/minute.

(b) What is the angular velocity of the larger pulley in radians per minute?

23. An electric hoist is used to lift a piece of equipment, by rotating a cable around a drum that has a diameter of 16in.

(a) Find the number of degrees the drum must rotate to lift the equipment 2 feet.

(b) How far off the ground will the piece of equipment be after the hoist makes 10 complete rotations?

24. A flywheel rotates with an angular velocity of 2 rps. Find the linear velocity if the radius is 15 in.

25. Calculate the linear velocity of a reflector located 10 in. from the center of a bicycle wheel rotating 7π rad per sec.

26. Calculate the angular velocity of an LP record spinning at 133.3 rotations per minute.

27. Find the length of a pendulum if it oscillates through an angle of 10°, and swings a distance of 6π in. from one end to the other.

28. The carousel at the county fair makes 3 revolutions per minute.

(a) Find the linear velocity in feet per second of someone riding a horse that is $22\frac{1}{2}$ feet from the center.

(b) Suppose the linear velocity of a person riding on the inside of the carousel is 3.1 feet per second. How far from the center is of the carousel is that person?

(c) How much faster is the rider on the outside going than the rider on the inside? Without using the specific numbers obtained in parts (a) and (b), explain how this is possible.

29. A bicycle wheel is 30 inches in diameter.

(a) To the nearest revolution, how many times will the wheel turn if the bicycle is ridden for 3 miles?

(b) Suppose the wheel turns at a constant rate of 2.75 revolution per second. What is the linear speed, in miles per hour, of a stone lodge in the tread of the tire?

30. Assume a person is running around a circular track. The person runs 3 laps, or 6π radians in 8 minutes. What is the person's angular velocity?

31. A back wheel on a tricycle has a radius of 8cm and rotates at a rate of 200 times per minute. Approximately what are the angular velocity of the wheel in radians per second and the linear velocity of a point on the wheel in centimeters per second?

32. A satellite orbits 22,300 miles above the equator. It completes one revolution in 24 hours. Assume that the radius of the Earth is 3960 miles.

(a) How far will the satellite travel in one day?

(b) What is the satellite's linear velocity in miles per hour?