Date: _____ Name: _____

EXTRA PRACTICE Radian Problems

1. A bicycle traveled a distance of 100 meters. The diameter of the wheel of this bicycle is 40 cm. Find the number of rotations of the wheel.

2. Find the length of an arc of a circle with 10-cm radius and a central angle of measure of $\frac{11\pi}{6}$.

3. Find the angular velocity in R.P.M. of a microwave turntable if it turns through an angle of 36° each second.

4. The wheel of a car made 100 rotations. What distance has the car traveled if the diameter of the wheel is 60 cm?

5. A wheel with 12-cm diameter is rotating at a speed of 10 revolutions per second. What is the linear velocity in cm/min? velocity in m/min?

6. A small pulley 6 cm in diameter is connected by a belt to a larger pulley 15cm in diameter. The small pulley is turning at 120 rpm.
   a) Find the angular velocity of the small pulley in radians per second.
   b) Find the linear velocity of the rim of the small pulley.

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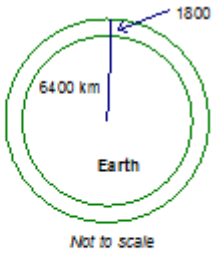
7. The Earth rotates about its axis once every 24 hours (approximately). The radius R of the equator is approximately 4000 miles. Find the angular (radians / second) and linear (feet / second) speed of a point on the equator.

8. The cable lifting a garage door turns around a pulley at a rate of 20 cm per second. How long will it take to lift the door 2.2 meters?

9. Find the radian measure of a rotation where a point 24 in. from the center of rotation travels 3 ft.

10. The wheel of a machine rotates at the rate of 300 rpm (rotation per minute). If the diameter of the wheel is 80 cm, what are the angular (in radian per second) and linear speed (in cm per second) of a point on the wheel?

11. A satellite traveling in a circular orbit approximately 1800 km. above the surface of Earth takes 2.5 hrs. to make an orbit. The radius of the earth is approximately 6400 km.



a) Approximate the linear speed of the satellite in kilometers per hour.

b) Approximate the distance the satellite travels in 3.5 hrs.

12. Find Joe's linear velocity (in feet per min) on a Ferris Wheel turning 4 R.P.M. with a radius of 30 feet.

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EXTRA PRACTICE Radian Problems

1. A bicycle traveled a distance of 100 meters. The diameter of the wheel of this bicycle is 40 cm. Find the number of rotations of the wheel.

$a = 100\text{ m}$, $r = 20\text{ cm}$, $\theta = ?\ (\text{rev})$

$\theta = \frac{a}{r}$

$\theta = \frac{100\text{m}}{20\text{cm}} \times \frac{100\text{cm}}{1\text{m}} \times \frac{1\text{rev}}{2\pi}$

$\theta = 79.6\text{ rev}$

2. Find the length of an arc of a circle with 10-cm radius and a central angle of measure of $\frac{11\pi}{6}$.

$a = ?$, $r = 10\text{ cm}$, $\theta = \frac{11\pi}{6}$

$a = \theta r$

$a = \frac{11\pi}{6}(10\text{ cm})$

$a \doteq 57.6\text{ cm}$

3. Find the angular velocity in R.P.M. of a microwave turntable if it turns through an angle of 36° each second.

$w = ?\ \frac{\text{rev}}{\text{min}}$

$\theta = 36°$, $t = 1\text{ sec}$ } or $w = \frac{36°}{\text{sec}} \times \frac{1\text{rev}}{360°} \times \frac{60\text{sec}}{\text{min}}$

$w = 6\ \frac{\text{rev}}{\text{min}}$

4. The wheel of a car made 100 rotations. What distance has the car traveled if the diameter of the wheel is 60 cm?

$\theta = 100\text{ rev}$, $a = ?$, $r = 30\text{ cm}$

$a = \theta r$

$a = (100\text{ rev})(30\text{cm}) \times \frac{2\pi}{1\text{rev}}$

$a \doteq 18850\text{ cm}$

5. A wheel with 12-cm diameter is rotating at a speed of 10 revolutions per second. What is the linear velocity in cm/min? velocity in m/min?

$r = 6\text{cm}$, $w = 10\ \frac{\text{rev}}{\text{sec}}$, $v = ?\ (\text{cm/min})$

$v = wr$

$v = \left(10\ \frac{\text{rev}}{\text{sec}}\right)(6\text{cm}) \times \frac{2\pi}{1\text{rev}} \times \frac{60\text{sec}}{1\text{min}}$

$v = 22619.5\ \frac{\text{cm}}{\text{min}}$

$v = 22619.5\ \frac{\text{cm}}{\text{min}} \times \frac{1\text{m}}{100\text{cm}}$

$= 226.195\ \text{m/min}$

6. A small pulley 6 cm in diameter is connected by a belt to a larger pulley 15cm in diameter. The small pulley is turning at 120 rpm.

a) Find the angular velocity of the small pulley in radians per second.

b) Find the linear velocity of the rim of the small pulley.

a) $w = 120\ \frac{\text{rev}}{\text{min}} \times \frac{2\pi}{1\text{rev}} \times \frac{1\text{min}}{60\text{sec}}$

$\doteq 12.6\ \frac{\text{rad}}{\text{sec}}$

b) $v = ?\ \frac{\text{cm}}{\text{min}}$

$v = wr = \left(12.6\ \frac{\text{rad}}{\text{sec}}\right)(3\text{cm})$

$= 37.7\ \frac{\text{cm}}{\text{sec}}$

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7. The Earth rotates about its axis once every 24 hours (approximately). The radius R of the equator is approximately 4000 miles. Find the angular (radians / second) and linear (feet / second) speed of a point on the equator.

$w = \frac{1 rev}{24 hr}$

$r = 4000$ miles

$w = ?$ $\frac{radians}{sec}$

$v = ?$ $\frac{feet}{sec}$

$w = 1 rev \times \frac{2\pi}{1 rev} \times \frac{1 hr}{3600 sec} \approx 0.0000727 / sec$

$v = wr = 0.0000727 \times 4000 miles \times \frac{5280 feet}{1 mile}$

$= 1535.9 \frac{feet}{sec}$

8. The cable lifting a garage door turns around a pulley at a rate of 20 cm per second. How long will it take to lift the door 2.2 meters?

$v = 20 \frac{cm}{sec}$

$a = 2.2 m$

$t = ?$

$t = \frac{a}{v}$

$t = 2.2 m \times \frac{1 sec}{20 cm} \times \frac{100 cm}{1 m}$

$t = 11 sec$

9. Find the radian measure of a rotation where a point 24 in. from the center of rotation travels 3 ft.

$r = 24 in$

$a = 3 feet$

$\theta = ?$

$\theta = \frac{a}{r}$

$\theta = 3 feet \times \frac{12 in}{24 in} \times \frac{1}{1 foot}$

$\theta = 1.5$ radians

10. The wheel of a machine rotates at the rate of 300 rpm (rotation per minute). If the diameter of the wheel is 80 cm, what are the angular (in radian per second) and linear speed (in cm per second) of a point on the wheel?

$w = 300 \frac{rev}{min}$

$r = 40 cm$

$w = ?$ $/sec$

$w = 300 \frac{rev}{min} \times \frac{2\pi}{1 rev} \times \frac{1 min}{60 sec}$

$w \approx 31.4 /sec$

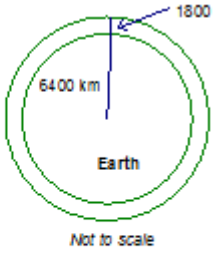
$v = ?$ $\frac{cm}{sec}$

$v = wr$

$= \frac{31.4}{sec} \cdot 40 cm$

$\approx 1256.6 \frac{cm}{sec}$

11. A satellite traveling in a circular orbit approximately 1800 km. above the surface of Earth takes 2.5 hrs. to make an orbit. The radius of the earth is approximately 6400 km.



a) Approximate the linear speed of the satellite in kilometers per hour.

b) Approximate the distance the satellite travels in 3.5 hrs.

a) $r = 8200 km$

$t = 2.5 hr$ or $w = \frac{1 rev}{2.5 hr}$

$v = ?$ $\frac{km}{hr}$

$v = wr$

$= \left(\frac{1 rev}{2.5 hr}\right)(8200 km) \times \frac{2\pi}{1 rev} \approx 20608.8 \frac{km}{hr}$

b) $a = ?$

$t = 3.5 hr$

$a = vt$

$a = 20608.8 \frac{km}{hr} \times 3.5 hr$

$a \approx 72131 km$

12. Find Joe's linear velocity (in feet per min) on a Ferris Wheel turning 4 R.P.M. with a radius of 30 feet.

$v = ?$ $\frac{feet}{min}$

$w = \frac{4 rev}{min}$

$r = 30 feet$

$v = wr$

$= \left(\frac{4 rev}{min}\right)(30 feet) \times \frac{2\pi}{1 rev}$

$\approx 754 \frac{feet}{min}$