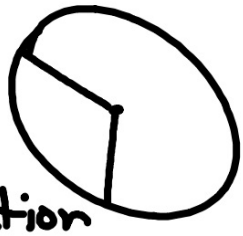
Trig 6.2

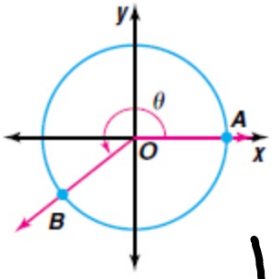
Find linear and angular velocity

revolution – one complete turn
2π 360°

central angle

radians $\frac{180}{\pi} = \frac{d}{r}$





angular displacement

θ amount of rotation

angular velocity

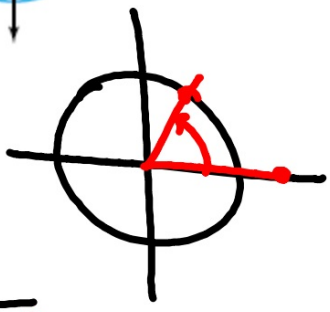
ω speed of rotation

linear velocity v $\frac{mi}{hr}$ $\frac{ft}{s}$

$31\text{in} \cdot \frac{2.54\text{cm}}{1\text{in}} \cdot \frac{1\text{m}}{100\text{cm}}$

dimensional analysis

$v = r \cdot \omega$



13-35

activity: parking lot
bicycle wheel
whiteboards

Determine each angular velocity. Round to the nearest tenth.

8. 3.2 revolutions in 7 seconds

9. 700 revolutions in 15 minutes

$$\frac{\text{rotation (rad)}}{\text{time}} \quad (8) \quad = \frac{3.2 \text{ rev}}{7 \text{ s}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}}$$

$$2.9 \ \frac{\text{rad}}{\text{s}}$$

(9) $2932 \frac{\text{rad}}{\text{min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}}$

Linear Velocity

If an object moves along a circle of radius of r units, then its linear velocity, v is given by

$$v = r\frac{\theta}{t},$$

where $\frac{\theta}{t}$ represents the angular velocity in radians per unit of time.

$v = r \cdot \omega$

$v = r \cdot \frac{\theta}{t}$

how big is the circle?
how fast is it rotating?
radius*angular velocity
Must use RADIANS

4 Determine the linear velocity of a point rotating at an angular velocity of 17π radians per second at a distance of 5 centimeters from the center of the rotating object. Round to the nearest tenth.

how big is the circle?
how fast is it rotating?
radius*angular velocity

$\omega = 17\pi \frac{rad}{s}$

$r = 5\,cm$

$V = 5\,cm \cdot 17\pi \frac{rad}{s}$

$= 267.0 \frac{cm}{s}$

v

Determine the linear velocity of a point rotating at the given angular velocity at a distance r from the center of the rotating object. Round to the nearest tenth.

10. $\omega = 36$ radians per second, $r = 12$ inches

how big is the circle?
how fast is it rotating?
radius*angular velocity

$$V = 12\text{ in}\cdot\frac{36\text{ rad}}{1\text{ s}} = 432\frac{\text{in}}{\text{s}}$$

mph

$$432\frac{\text{in}}{\text{s}}\cdot\frac{60\text{ s}}{1\text{ min}}\cdot\frac{60\text{ min}}{1\text{ hr}}\cdot\frac{1\text{ ft}}{12\text{ in}}\cdot\frac{1\text{ mi}}{5280\text{ ft}} = \frac{(1555200)}{(63360)}\frac{\text{mi}}{\text{hr}} = 24.5\frac{\text{mi}}{\text{hr}}$$

6 CAR RACING **The tires on a race car have a diameter of 30 inches. If the tires are turning at a rate of 2000 revolutions per minute, determine the race car's speed in miles per hour (mph).**

how big is the circle?
how fast is it rotating?
radius*angular velocity
dimensional analysis