Trig 6.2

Find linear and angular velocity (linear → line; rotation (angle))

revolution 1 rev = 360° = 2π rad.

central angle

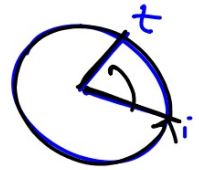
radians

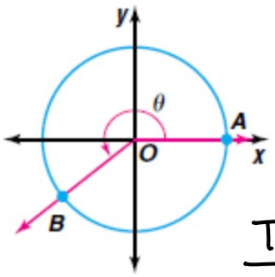
angular displacement initial → terminal

angular velocity $\frac{1\text{ rev}}{18\text{ sec}} = \frac{360^\circ}{18\text{ s}} = \frac{2\pi}{18\text{ s}}$

linear velocity $= \frac{\text{dist}}{\text{time}}$

dimensional analysis





$\frac{30^\circ}{10} = 3^\circ$ sec.

$\frac{\frac{\pi}{6}}{10}$ $\frac{\pi}{60}$ sec

activity: parking lot
bicycle wheel
whiteboards

$\frac{700 \text{ rev}}{15 \text{ min}} \cdot \frac{2\pi}{1 \text{ rev}} = 2932 \frac{\text{rad}}{\text{min}}$ (radians)

Ω ω

Determine each angular velocity. Round to the nearest tenth.

8. 3.2 revolutions in 7 seconds

9. 700 revolutions in 15 minutes

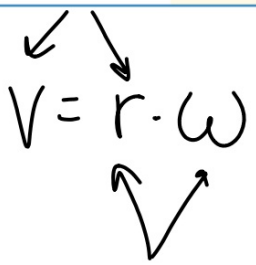
$\frac{3.2 \text{ rev}}{7 \text{ s}} \cdot \frac{2\pi}{1 \text{ rev}}$ $\frac{6.4\pi}{7} \approx 2.9 \frac{\text{rad}}{\text{s}}$

Linear Velocity

If an object moves along a circle of radius 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.



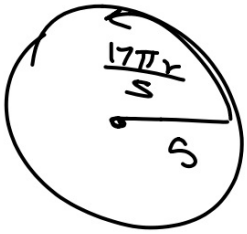
how big is the circle?
how fast is it rotating?
radius*angular velocity
Must use RADIANS

$V = r \cdot w$

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.**

w r

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



$$V = r \cdot w$$

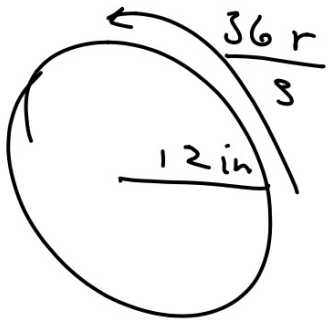
$$= 5\,cm \cdot \frac{17\pi}{s}$$

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

$V =$

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

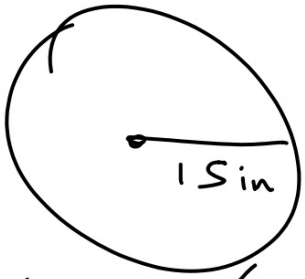


$432 \frac{in}{s}$

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

$r = 15$ in

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

$$v = 15\text{ in} \cdot \frac{2000 \text{ rev}}{\text{min}} \cdot \frac{2\pi}{\text{rev}}$$

$$18849.56 \frac{\text{in}}{\text{min}}$$

$$18849.56 \frac{\text{in}}{\text{min}} \cdot \frac{1\text{ ft}}{12\text{ in}} \cdot \frac{1\text{ mile}}{5280\text{ ft}} \cdot \frac{60\text{ min}}{1\text{ hr}}$$

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13-33 words