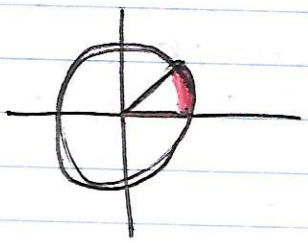
4.1 Day 3

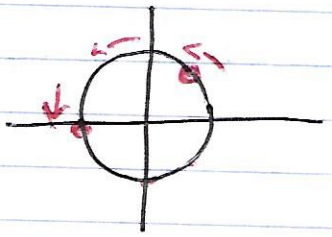
Arc Length



$s = r \cdot \theta$

- s: arc
- r: radius
- θ: angle (must be in radians)

Linear Speed

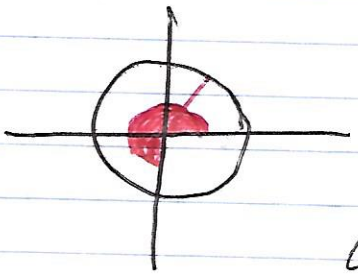


$v = \frac{s}{t}$ ← arc length

↖ time

v: linear speed

Angular Velocity



$\omega = \frac{\theta}{t}$ ← angle

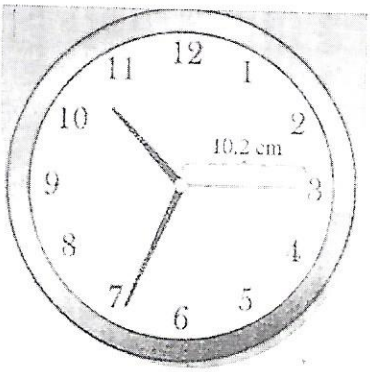
↖ time

ω: angular velocity

* Linear speed measures how fast a particle moves, and angular speed measures how fast the angle changes.

Linear Speed

The second hand of a clock is 10.2 centimeters long, as shown in the figure. Find the linear speed of the tip of this second hand.



$$S = r \cdot \theta$$

$$S = 10.2\,(2\pi)$$

$$V = \frac{S}{t}$$

$$V = \frac{20.4\pi}{60\,\text{sec}}$$

$$\boxed{V = 1.07\,\text{cm/sec.}}$$

Angular Speed

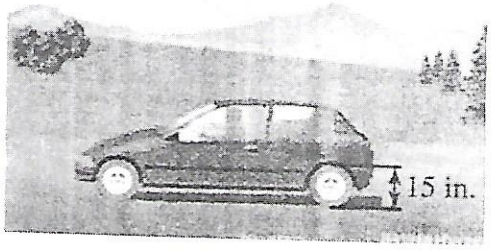
A 15-inch diameter tire on a car makes 9.3 revolutions per second.

a) Find the angular speed of the tire in radians per second.
b) Find the linear speed of the car.

a) $\omega = \frac{\theta}{t}$

$$\omega = \frac{9.3\,(2\pi)}{1\,\text{sec.}}$$

$$\boxed{\omega = 18.6\pi\,\text{/sec}}$$



$$S = r \cdot \theta$$

$$S = 7.5\,(18.6\pi)$$

$$V = \frac{438.252\,\text{in.}}{1\,\text{sec}}$$

$$\boxed{V \approx 438.25\,\text{in/sec}}$$