

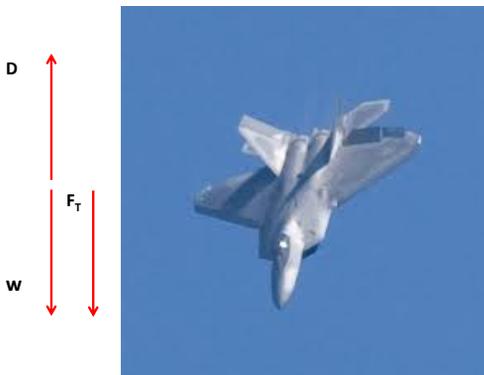
Chapter 6

2/26/14

Terminal velocity

Is it possible for an object to travel in air faster than its terminal speed?

- A. Yes
- B. No

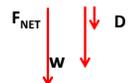


Ball Toss

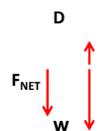
Taking drag force into account, the acceleration on the way up is

- A. the same as on the way down
- B. Less than on the way down
- C. More than on the way down

Way up



Way down



Ball Toss

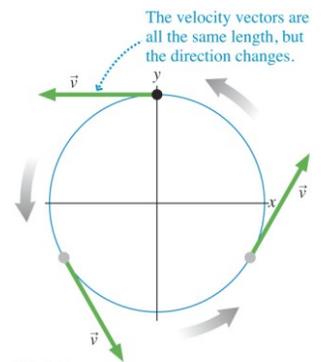
Taking the drag force into account, does it take longer for the ball to travel to the top of its motion or for it to fall back down again?

- A. Longer to top
- B. Longer back down
- C. Equal

Uniform circular motion

Why is it called "Uniform"?

- A. Velocity is constant
- B. Acceleration is constant
- C. Speed is constant
- D. None of these



Linear

Δx – displacement
 v – velocity

$$v = \Delta x / \Delta t$$

Angular

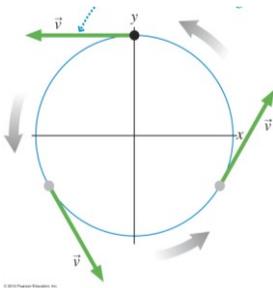
$\Delta\theta$ – angular displacement
 ω – angular velocity (omega)

$$\omega = \Delta\theta / \Delta t$$

What are the units of angular velocity?

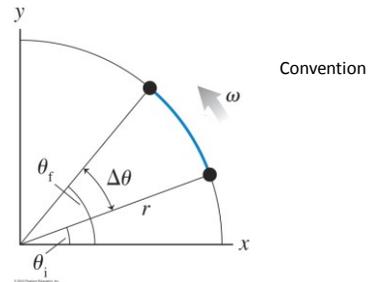
- A. m/s
- B. rad/s
- C. m/s²
- D. rad/s²

$$\omega = \Delta\theta / \Delta t$$



- A. + ω
- B. - ω
- C. can't tell

Increasing θ counterclockwise



Also just convention!



what does your shadow do morning to night?



Which way is this person facing?



- A. North
- B. East
- C. South
- D. West

If they are in Colorado?

Where is the person's shadow in the morning



- A. In front of them
- B. To their right
- C. To their left
- D. Behind them

Where is the person's shadow in the afternoon.



- A. In front of them
- B. To their right
- C. To their left
- D. Behind them

Which way is this person facing?



- A. North
- B. East
- C. South
- D. West

If they are in Melbourne, Australia?



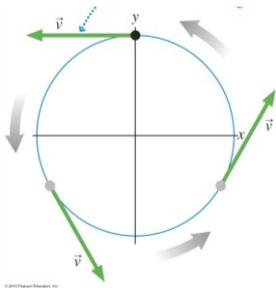


Depends on hemisphere

[Motion of the Sun simulation](#)

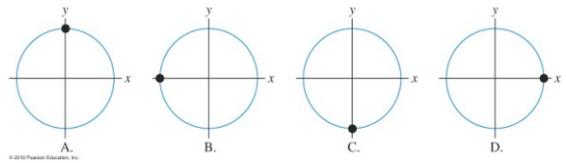
Convention: positive angular velocity is counter clockwise.

$$360^\circ = 2\pi \text{ rad}$$



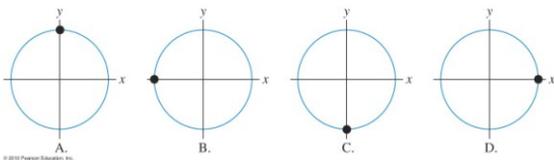
- A. $+\omega$
- B. $-\omega$
- C. can't tell

Which particle has angular position $7\pi/2$?



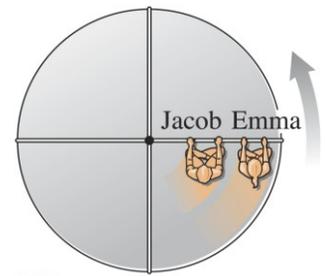
$$360^\circ = 2\pi \text{ rad}$$

Which particle has angular position $5\pi/2$?



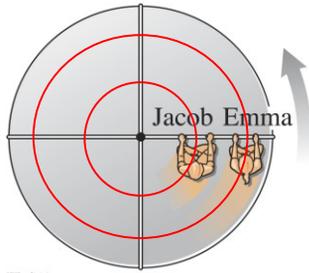
Who has a higher angular velocity, ω ?

- A. Jacob
- B. Emma
- C. Same



Who has a higher linear velocity, v ?

- A. Jacob
- B. Emma
- C. Same



Linear

Δx – displacement
 v – velocity

$$v = \Delta x / \Delta t$$

Angular

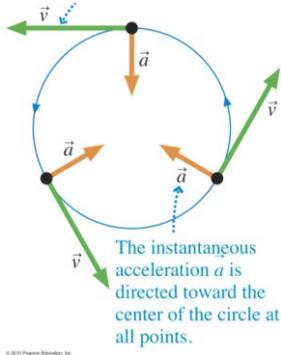
$\Delta \theta$ - angular displacement
 ω – angular velocity (omega)

$$\omega = \Delta \theta / \Delta t$$

$$v = \omega r$$

Centripetal acceleration

Chapter 3
 $a = v^2 / r$



Linear

Δx – displacement
 v – velocity

$$v = \Delta x / \Delta t$$

Angular

$\Delta \theta$ - angular displacement
 ω – angular velocity (omega)

$$\omega = \Delta \theta / \Delta t$$

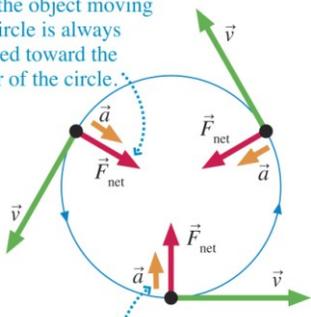
$$v = \omega r$$

$$F = ma$$

$$a = v^2 / r = \omega^2 r$$

$$F = ma = m v^2 / r$$

The net force required to keep the object moving in a circle is always directed toward the center of the circle.



The net force causes a centripetal acceleration.

Weight $w = mg$

In orbit, in the space shuttle, an astronaut is

- A. Weightless
- B. The same weight as on earth
- C. Less than on earth but not weightless
- D. More than on earth

Apparent Weight = normal force

- Weight is force of gravity $w = mg$
- Even if you're falling
- Astronauts are not weightless, they are apparently weightless

What is your true weight on the moon?

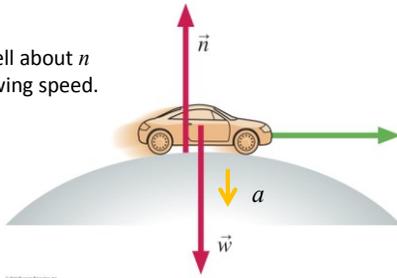
Say you have a mass of 60kg

Your weight on the moon is

- A. 60 kg $9.8 \text{ m/s}^2 = 590 \text{ N}$
- B. 60 kg $1.6 \text{ m/s}^2 = 98 \text{ N}$
- C. 0 N

A car is rolling over the top of a hill at a constant speed. At this instant,

- A. $n > w$
- B. $n < w$
- C. $n = w$
- D. we can't tell about n without knowing speed.



A car is rolling through the bottom of a valley at a constant speed. At this instant,

- A. $n > w$
- B. $n < w$
- C. $n = w$
- D. we can't tell about n without knowing speed.

