Physics questions?
Announcements

(1) Read Ch. 4 – Forces and Newton's laws
(1) Mass and weight
(2) Newton's Laws
(3) Applying Newton's Laws
The SI unit of weight is the:

-a- candela (cd)
-b- pound (lb or #)
-c- kilogram (kg)
-d- newton (N)
-e- ohm (Ω)
Compared to your mass on Earth, your mass on the moon is:

- a- smaller
- b- larger
- c- the same
- d- zero
Newton's Laws

-1- A body in uniform motion remains in uniform motion, and a body at rest remains so, unless acted on by a non-zero net force.

\[ \vec{F}_{\text{net}} = m \vec{a} \]

-2- For every action there is an equal and opposite reaction.

\[ \vec{F}_{12} = -\vec{F}_{21} \]
Here there’s a nonzero net force acting on the car, so the car’s motion is changing.
The three forces sum to zero, so the plane moves in a straight line with constant speed.

\[ \vec{F}_{\text{net}} = \vec{0} \]

\[ \vec{F}_{\text{air}} \]

\[ \vec{F}_{\text{engine}} \]

\[ \vec{F}_{g} \]

(b)
Third law couple – example 1

**Book pushes on hand with force** $\vec{F}_{BA}$.

**Hand pushes on book with force** $\vec{F}_{AB}$.
Third law couple – example 2
You are standing at rest and begin to walk forward. What force pushes you forward?

A. the force of your feet on your ground
B. the force of your acceleration
C. the force of your velocity
D. the force of your momentum
E. the force of the ground on your feet
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A. the force of your feet on your ground  
B. the force of your acceleration  
C. the force of your velocity  
D. the force of your momentum  
E. the force of the ground on your feet
1. Identify all forces acting on the object.

2. Elevator and contents reduce to dot.

3. Both forces act on the dot.

(a) Physical situation

(b) Free-body diagram
1. Identify all forces acting on the object.

2. Skier reduces to dot.

3. Both forces act on the dot.

Physical situation

Free-body diagram

(b)
Astronauts in orbit are weightless because:

-a- gravity ends at the edge of Earth's atmosphere.

-b- they are too far from the center of Earth for gravity to affect them much.

-c- they are closer to the moon which mostly balances Earth's pull.

-d- they aren't weightless, they're just falling.

-e- there are good special effects on that “space set” in Arizona that NASA has been using for years.
Science teachers ride the vomit comet

http://www.youtube.com/watch?v=iCAzo-wTxiU&NR=1
A woman pulls on a 6.00-kg crate, which in turn is connected to a 4.00-kg crate by a light rope. The light rope remains taut.

Compared to the 6.00–kg crate, the lighter 4.00-kg crate

A. is subjected to the same net force and has the same acceleration
B. is subjected to a smaller net force and has the same acceleration
C. is subjected to the same net force and has a smaller acceleration
D. is subjected to a smaller net force and has a smaller acceleration
E. none of the above
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E. none of the above
The motion diagram shows an object moving along a curved path at constant speed. At which of the points A, C, and E does the object have zero acceleration?

A. point A only
B. point C only
C. point E only
D. points A and C only
E. points A, C, and E
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A. point A only
B. point C only
C. point E only
D. points A and C only
E. points A, C, and E
Outline

(1) Acceleration on curved paths

(2) Projectile Motion
An object moves at a constant speed in a clockwise direction around a circular track. The geometrical center of the track is at point $O$. When the object is at point $P$, which arrow shows the direction of the object’s acceleration vector?

A. arrow #1 (directly away from $O$)
B. arrow #2 (perpendicular to track)
C. arrow #3 (in direction of motion)
D. arrow #4 (directly toward point $O$)
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- D. arrow #4 (directly toward point \( O \))