AP Physics 1 Review Session 1

Kinematics, Forces,
Uniform Circular Motion

General Suggestions

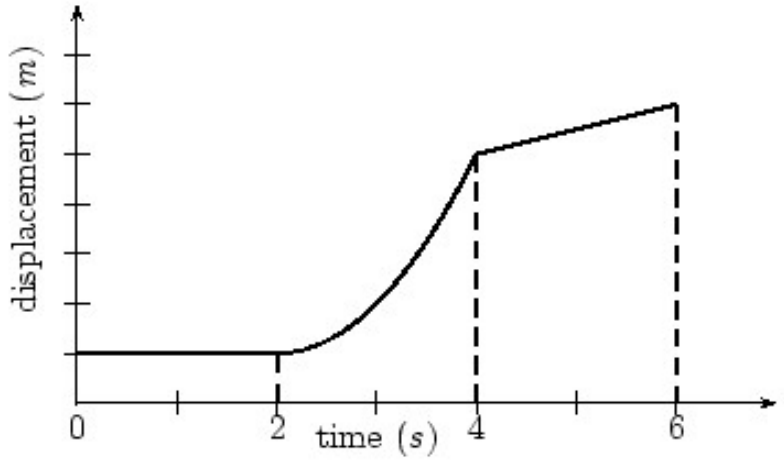
- Be an active test taker
- Use your formula sheet, even on conceptual
- Know what the question is asking
- Pace yourself
  - 50 MC questions in 90 minutes
  - 5 FR questions in 90 minutes

Graph Questions

- One of three things:
  - Trend/Shape
  - Slope
    - Does y / x equal something?
  - Area under the curve
    - Does y * x equal something?

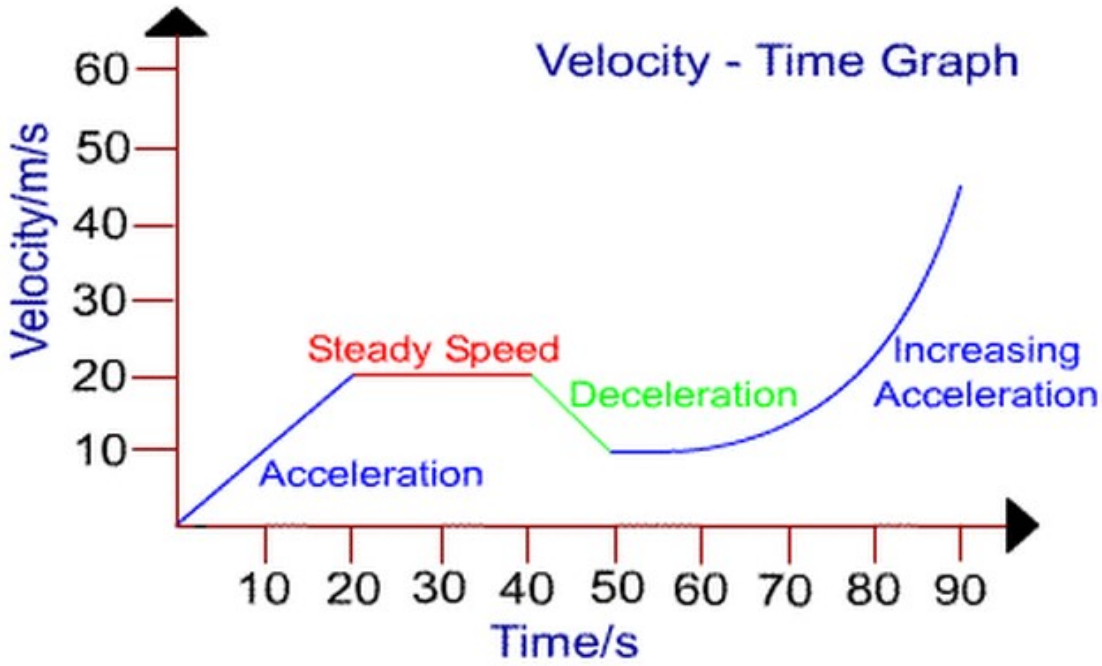
Motion Graphs

- Position vs. Time
  - Slope
    - Equals velocity
    - Positive or negative
  - Shape
    - Flat
      - Zero velocity
    - Linear
      - Constant velocity
    - Curved
      - Accelerated motion

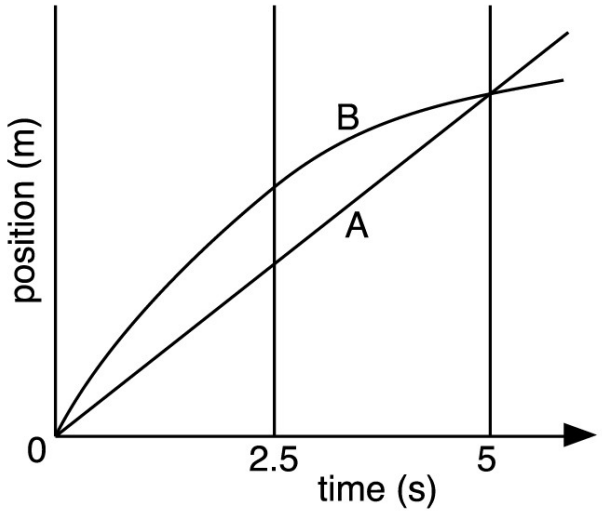


Motion Graphs

- Velocity vs. Time
  - Slope
    - Equals acceleration
    - Positive or negative
  - Shape
    - Flat
      - Constant velocity
    - Linear
      - Constant acceleration
  - Area Under Curve
    - Equals displacement



Consider the **position vs time** graph for objects A and B below.

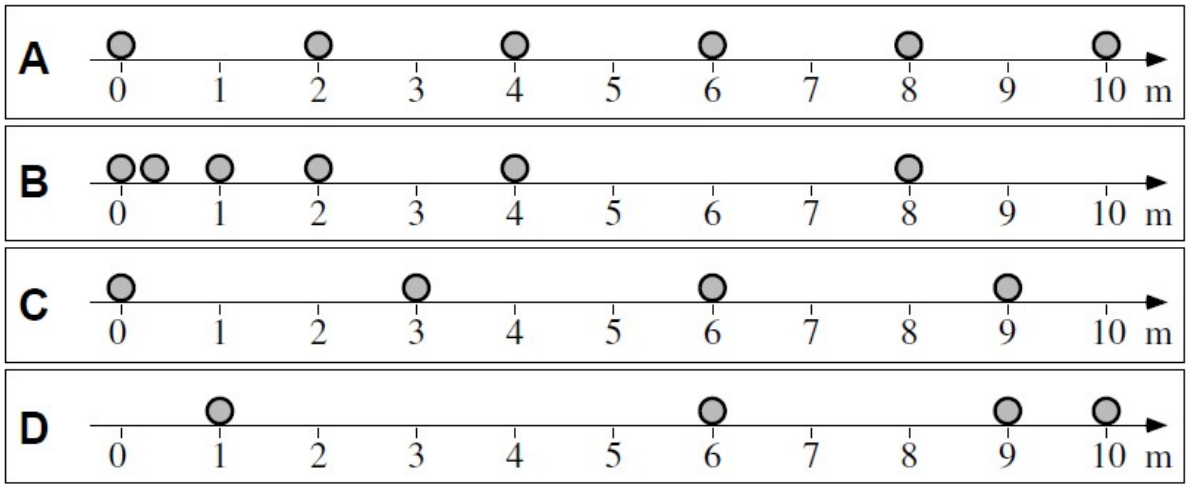


Describe how the motion of object A is different from that of object B.

-Car A is traveling with a constant velocity
-At t=0 car B is traveling faster than car A but slowing down.
-At t=5sec car A catches up to car B

B1-RT02: STROBE PHOTOGRAPHS OF SPHERES—DISPLACEMENT II

In each case, a sphere is moving from left to right next to a tape marked in meters. A strobe (flash) photograph is taken every second, and the location of the sphere is recorded. The total time intervals shown are not the same for all spheres.



Rank the magnitude of the displacement over the first 3 seconds.

				OR			
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

Equations Provided

- Constant Acceleration

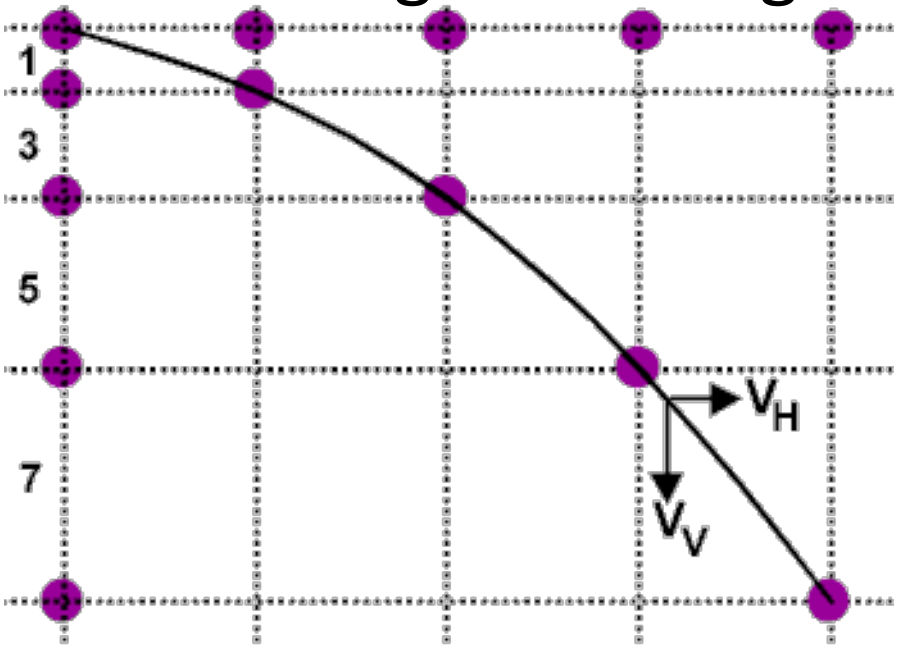
$$v_x = v_{x0} + a_x t$$

$$x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$$

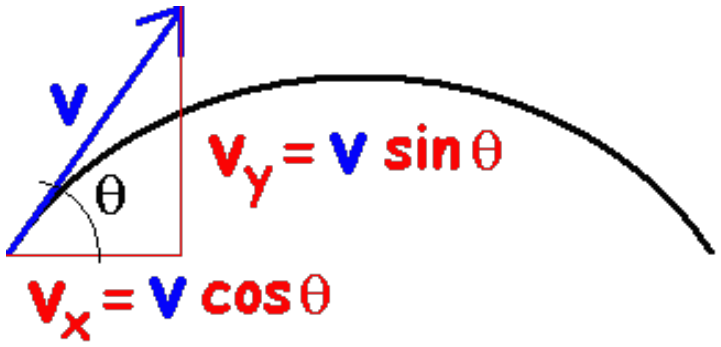
$$v_x^2 = v_{x0}^2 + 2a_x (x - x_0)$$

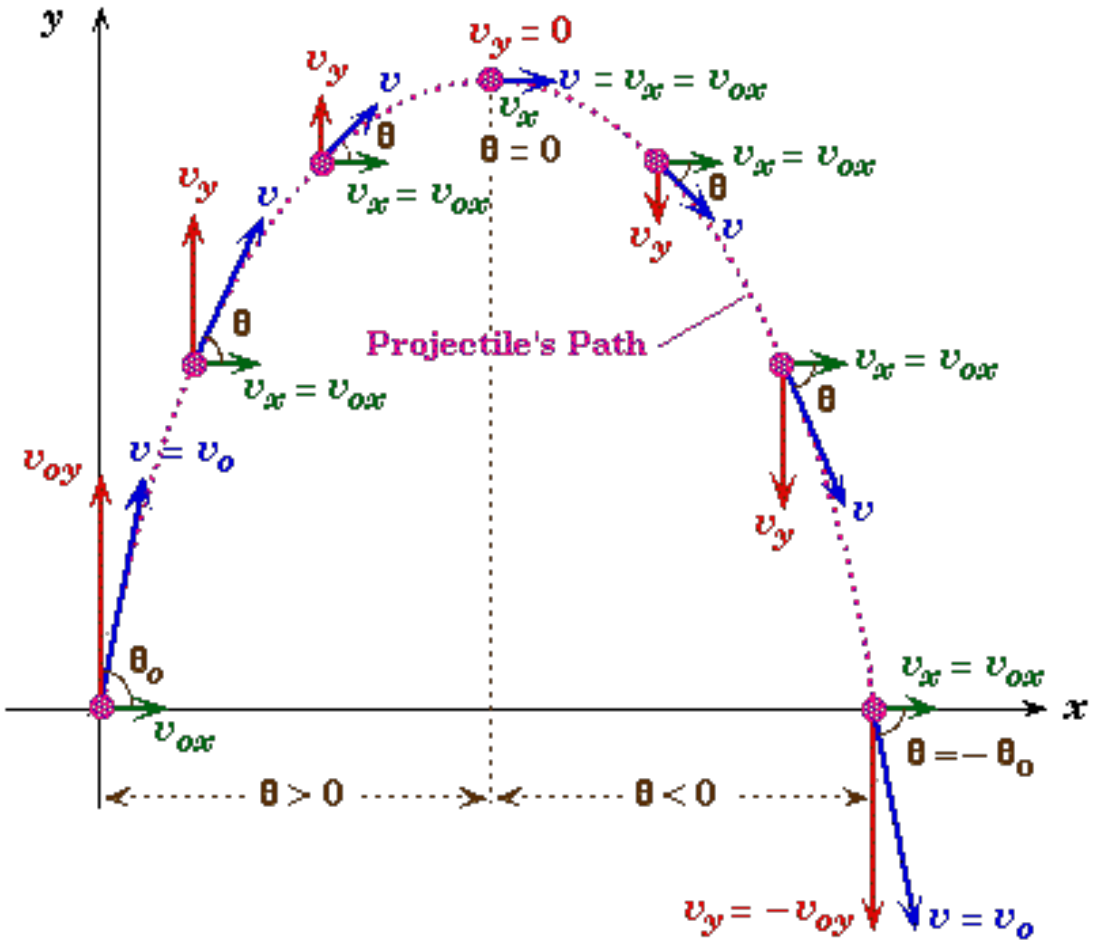
2-D Motion

- Horizontal and vertical components are independent of each other
  - Horizontal motion is constant, non-accelerated
  - Vertical motion changes due to gravity



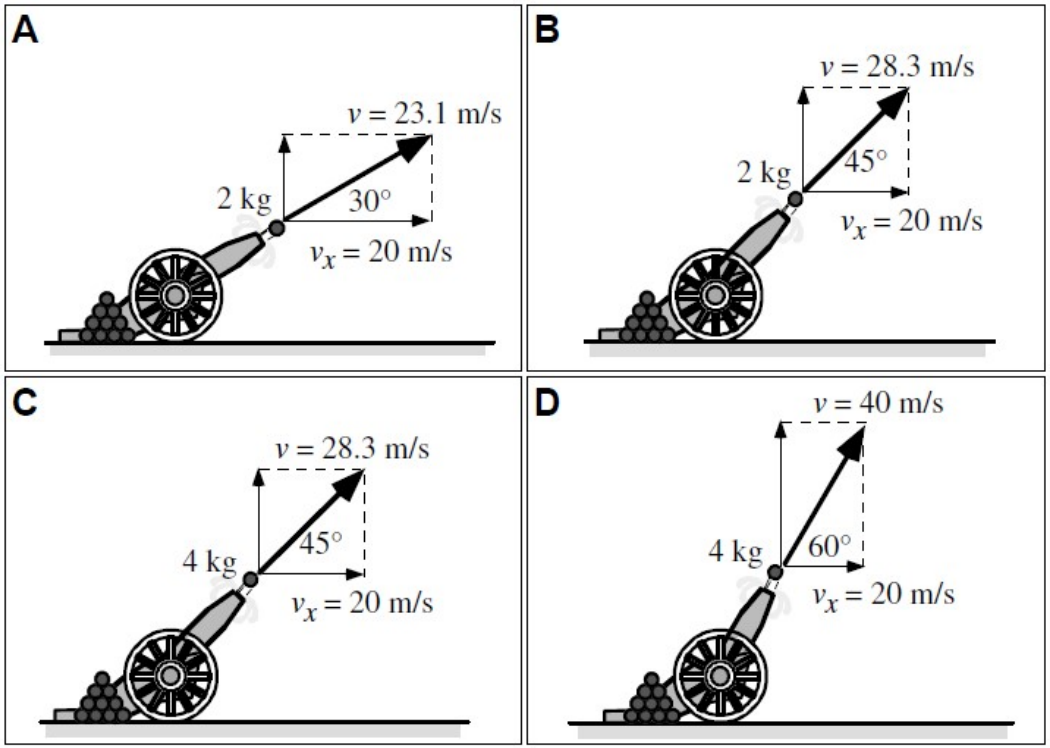
Angled Launch





B2-RT19: CANNONBALLS—HORIZONTAL DISTANCE

Cannonballs of different masses are shot from cannons at various angles above the horizontal. The velocity of each cannonball as it leaves the cannon is given, along with the horizontal component of that velocity, which is the same.



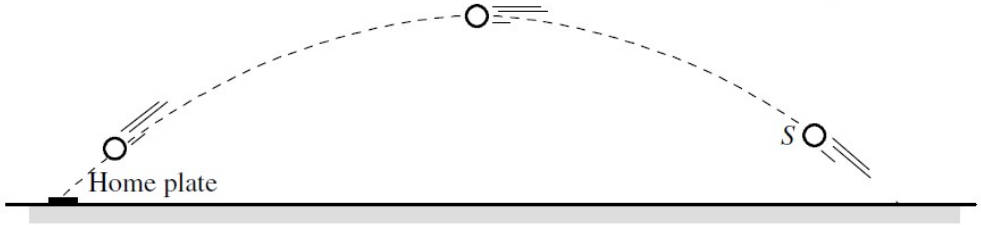
Rank the horizontal distance traveled by the cannonballs.

				OR			
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Answer: D > C = B > A.

B2-QRT11: BASEBALL PROJECTILE MOTION—VELOCITY-TIME AND ACCELERATION-TIME GRAPHS

A baseball is thrown from point *S* in right field to home plate. The dashed line shows the path of the ball.



Use a coordinate system with up as the positive vertical direction and to the left as the positive horizontal direction, and with the origin at home plate.

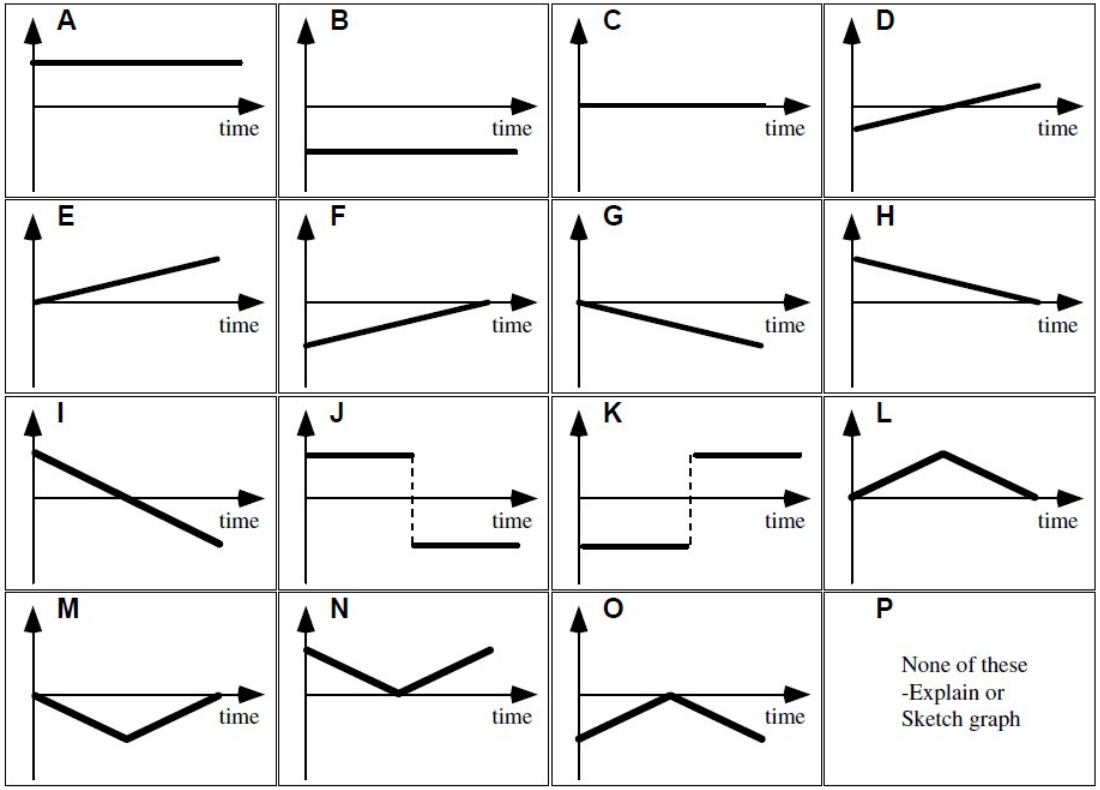
Select the graph from the choices below that best represents:

(i) horizontal velocity versus time graph ____ Explain your reasoning.

(ii) horizontal acceleration versus time graph____ Explain your reasoning.

(iii) vertical velocity versus time graph____ Explain your reasoning.

(iv) vertical acceleration versus time graph____ Explain your reasoning.

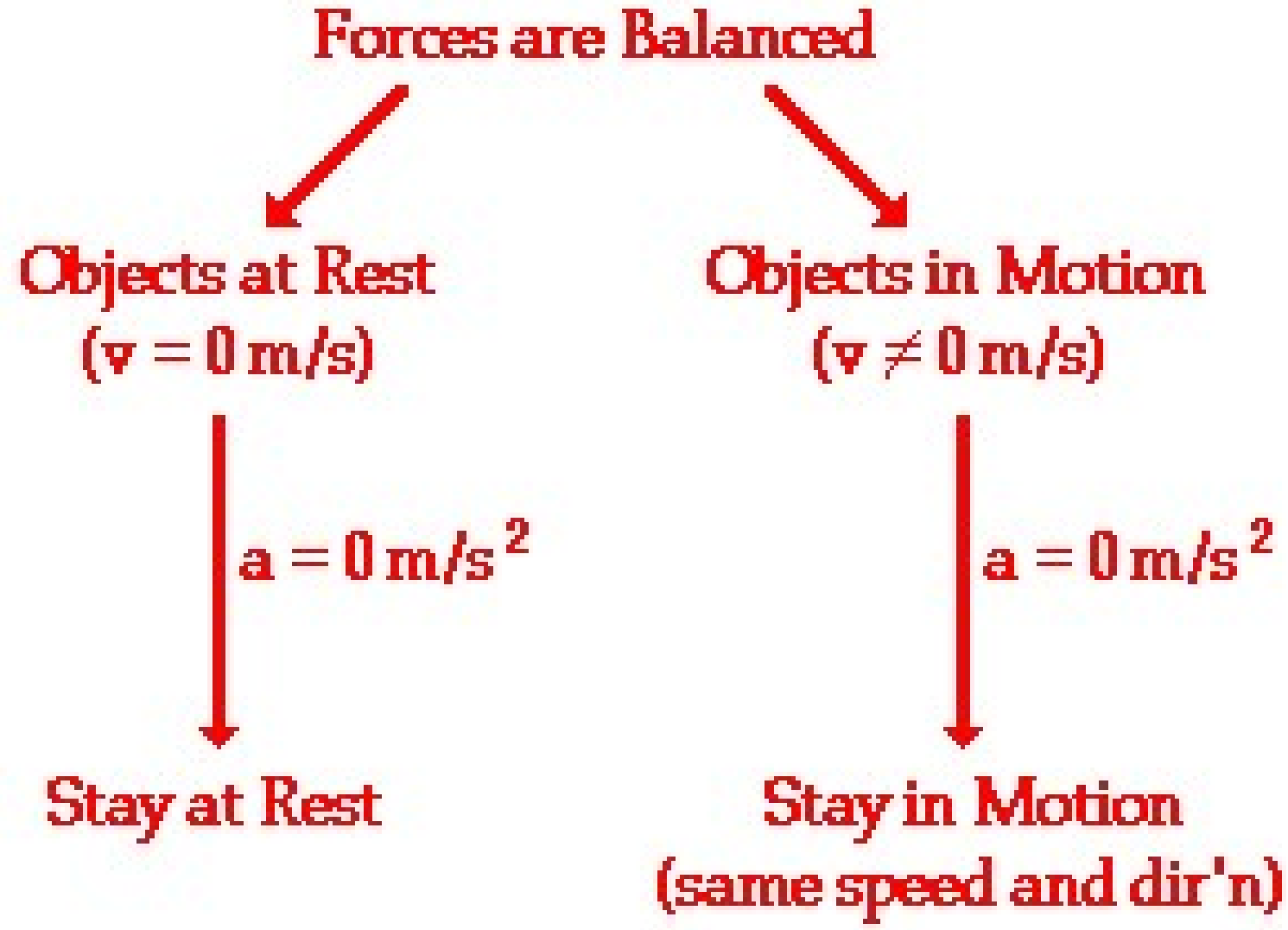


Answer: (1) A; (2) C; (3) I; and (4) B.

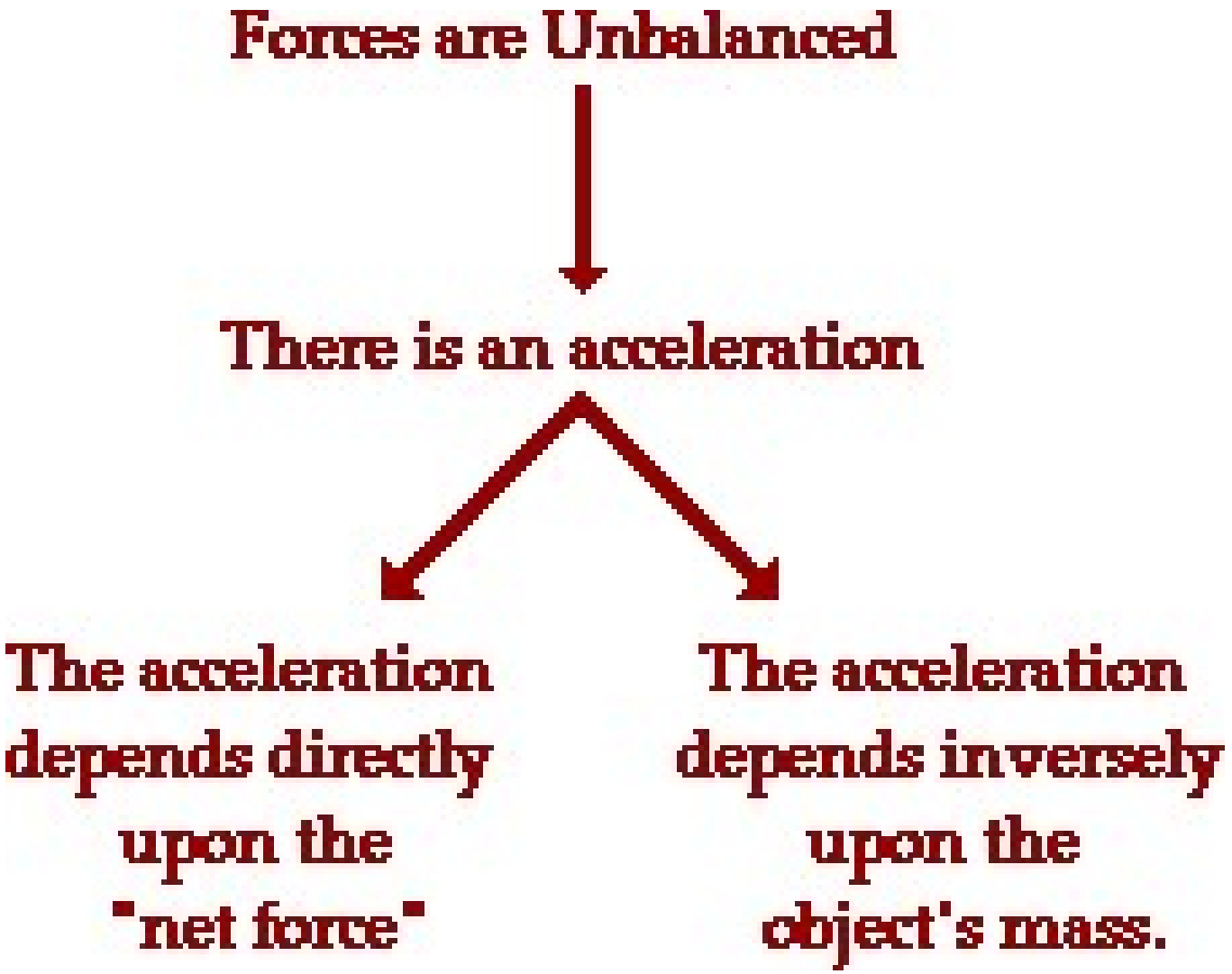
Force Questions

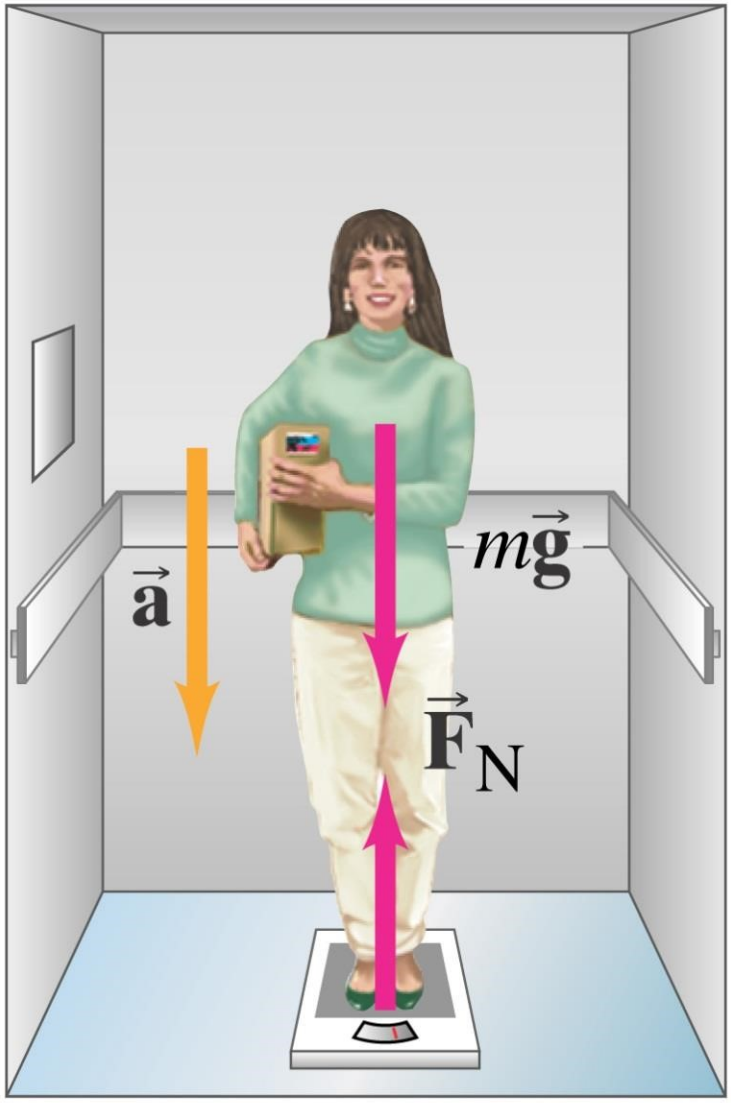
- Draw Free Body Diagrams on MC
- Write Summation Equations
  - Vector quantities!
    - Break into components
    - Signs with directions

Newton's 1st Law "Inertia"

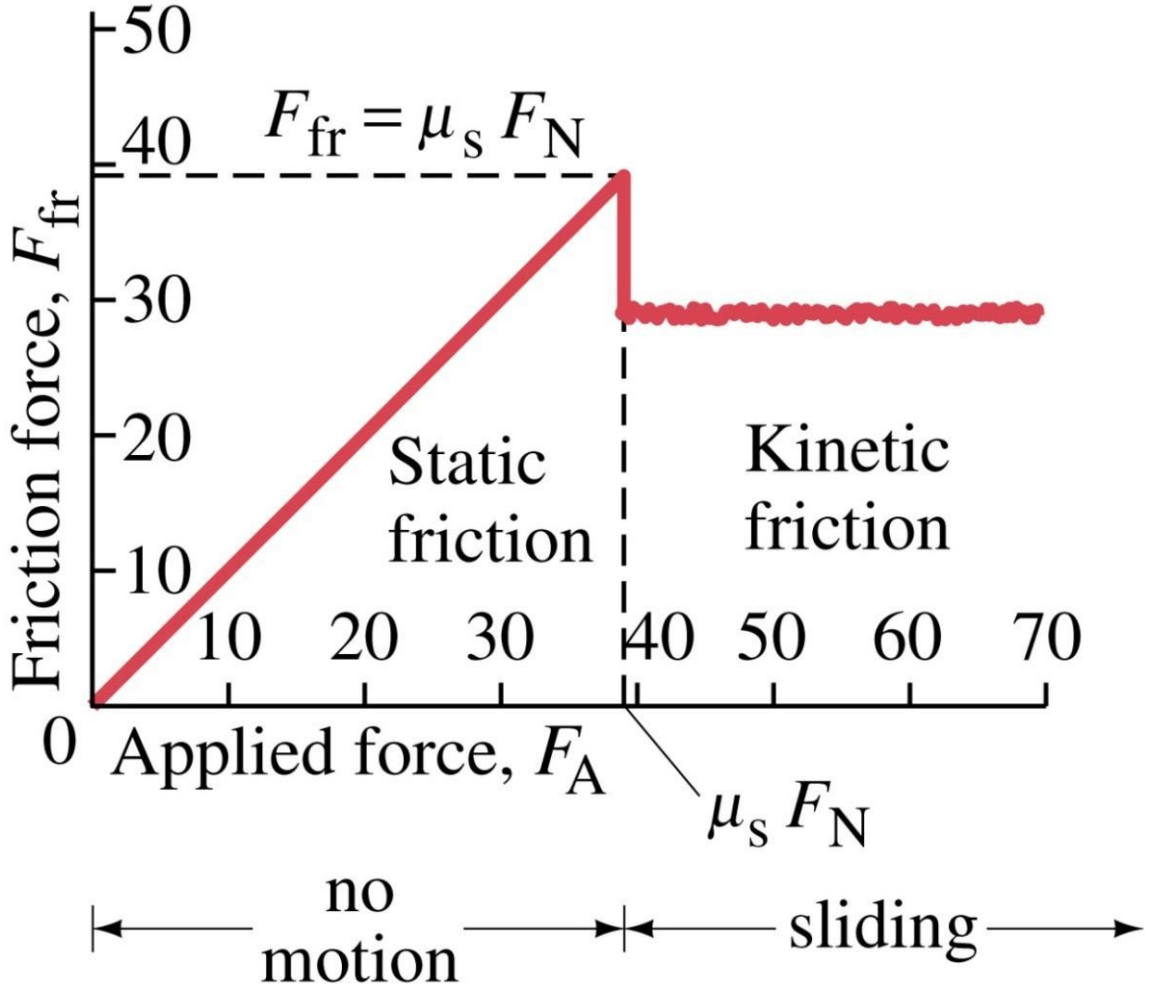


Newton's 2nd Law F=ma

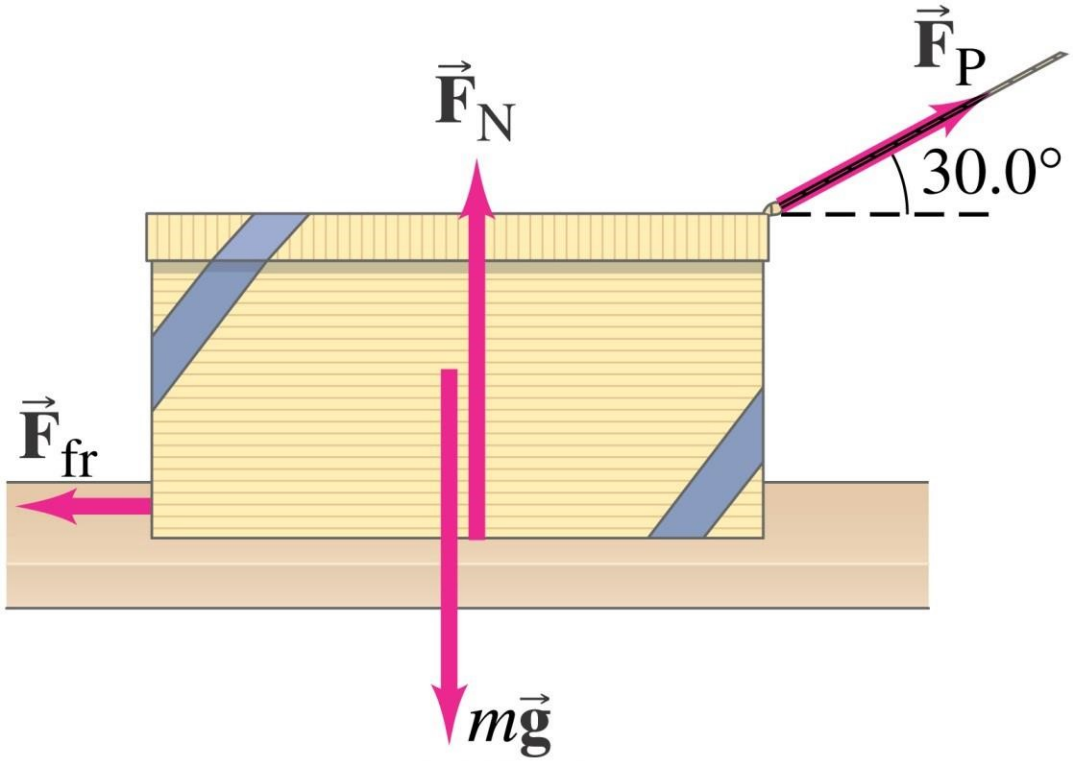


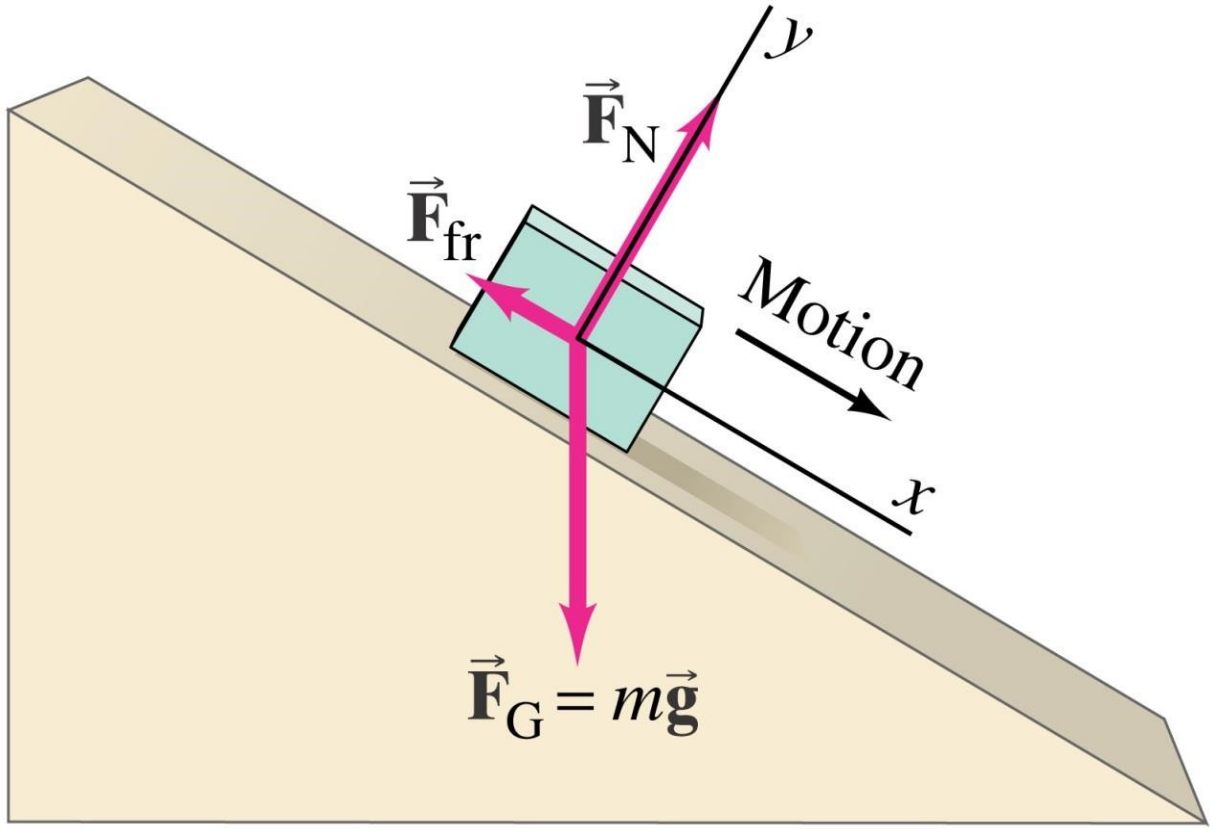


Frictional Forces

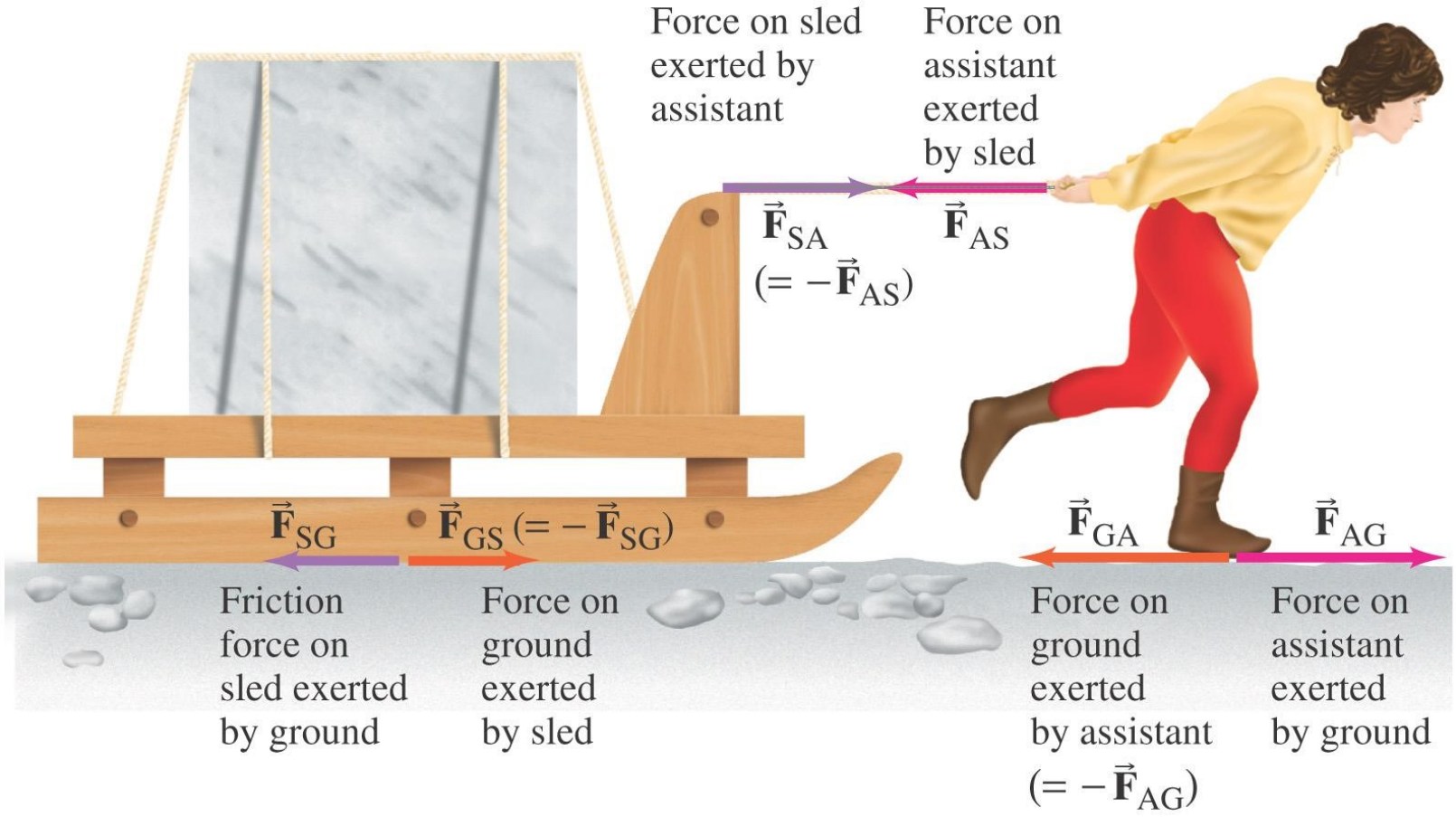


$$F_{fr} \leq \mu_s F_N \qquad F_{fr} = \mu_k F_N$$

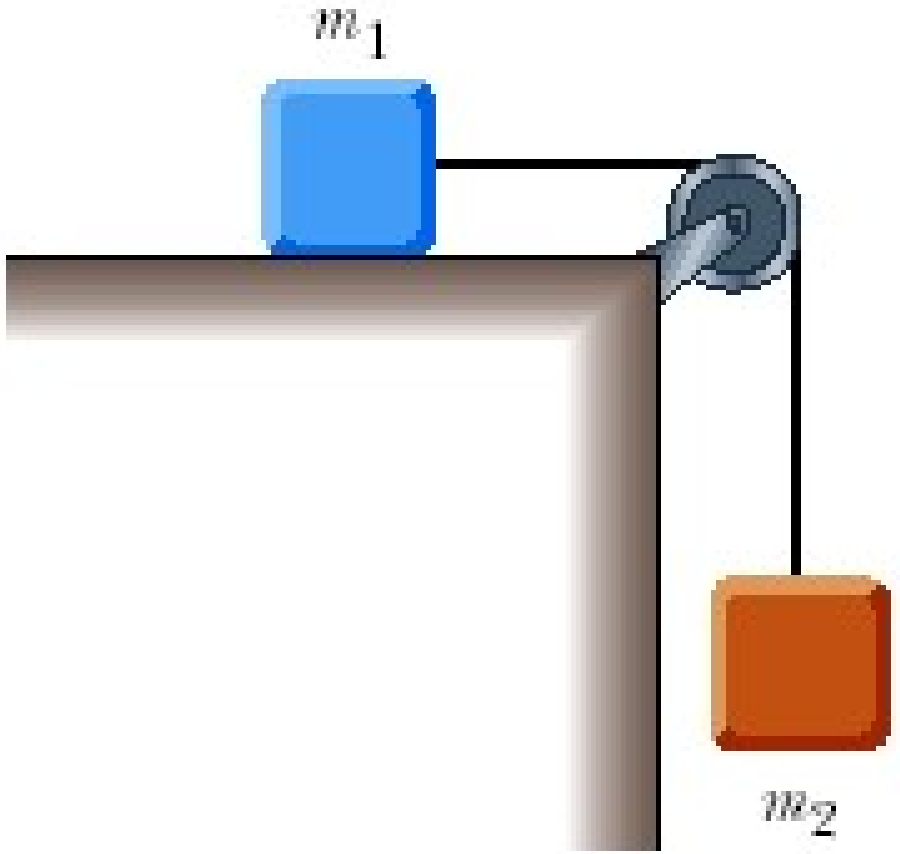




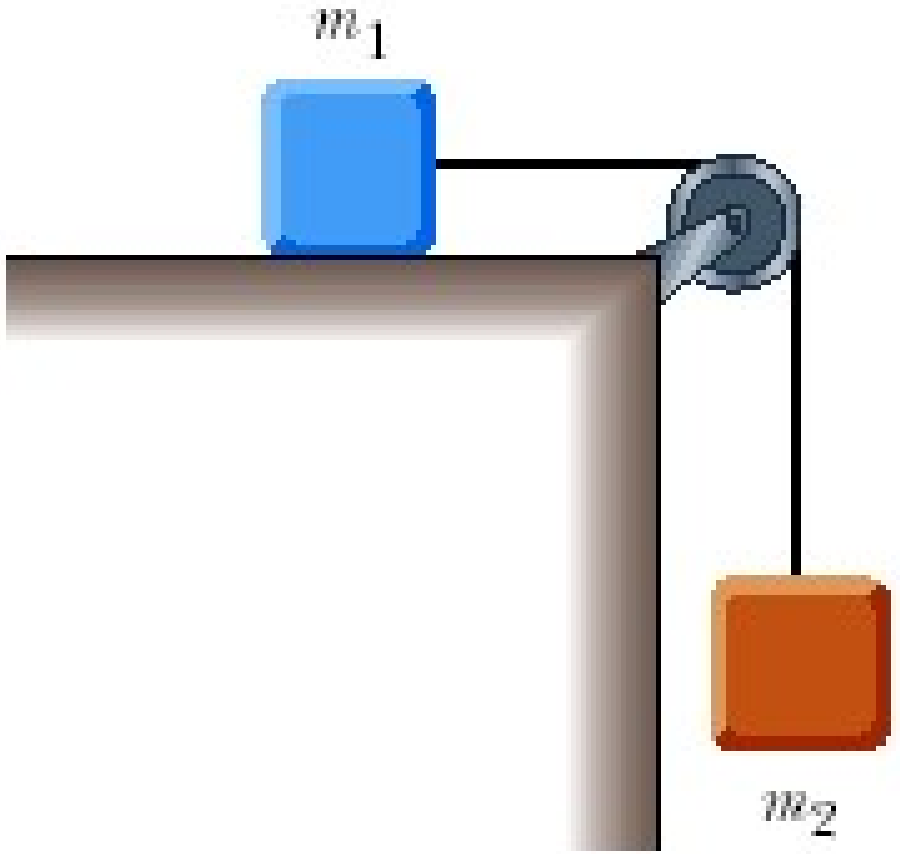
Newton's Third Law



Stationary



Accelerating



Equations Provided

$$\vec{a} = \frac{\sum \vec{F}}{m} = \frac{\vec{F}_{net}}{m}$$

$$\left|\vec{F}_f\right| \leq \mu \left|\vec{F}_n\right|$$

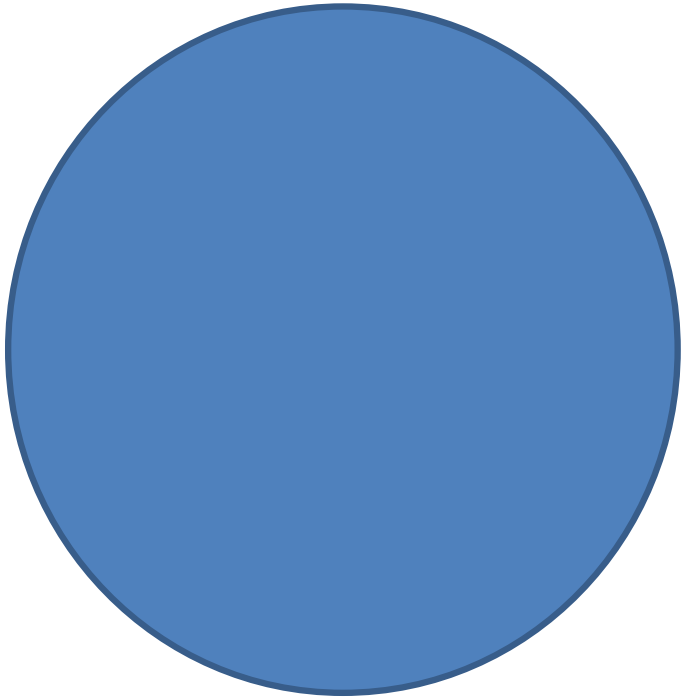
Uniform Circular Motion

- Constant speed, but changing direction
- Acceleration is to the center of the circle
  - Centripetal acceleration
- Net force is to the center of the circle
  - Centripetal force is NOT an applied force
    - Result of friction, normal, tension, gravity, etc.

One Revolution

- Distance = 1 circumference ($2\pi r$)
- Time = 1 period (T)

- Speed = $\frac{2\pi r}{T}$



Equations Provided

$$a_c = \frac{v^2}{r}$$

Universal Gravitation

- Directly proportional to the product of the masses
- Inversely proportional to the distance between their centers squared

Gravitational Field Strength

- Acceleration due to gravity on a planet

Circular Orbits

- Can set gravitational force equal to centripetal force equation

Equations Provided

$$\left|\vec{F}_g\right| = G\frac{m_1 m_2}{r^2}$$

$$\vec{g} = \frac{\vec{F}_g}{m}$$

$$U_G = -\frac{Gm_1 m_2}{r}$$