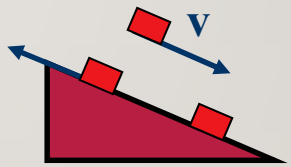
FRICTION

- When surfaces slide or tend to slide over one another, a force of friction acts.
  - No friction exists on a crate that sits at rest on a flat floor.
- The direction of the friction force is always in a direction opposing motion.
  - When you apply a force to an object, a force of friction usually reduces the net force and reduces the resulting acceleration.

An object sliding down an incline experiences friction directed up the incline.



COEFFICIENT OF FRICTION

- μ represents the coefficient of friction
  - It can not be larger than 1
- Factors that affect how much friction are
  - Type of surface the object is on
  - Normal force
- The equation for friction is
  - $F_f = (\mu)(F_N)$

AN EXAMPLE-FRICTION 1

- Example: A jumbo jet cruises at a constant velocity of 1000 km/h when the thrusting force of its engines is a constant 100,000 N. What is the acceleration of the jet? What is the force of air resistance.
- Answer:
  - Constant velocity → acceleration is zero → net force is zero → the air resistance is balanced out by the thrusting force.
  - So, force of air resistance on the jet = 100,000 N.

AN EXAMPLE-FRICTION 2

- Calculate the force of friction acting on a 2kg block sliding across a surface that has a coefficient of friction of 0.10
- Answer
  - $F_g = mg = F_N$ and $F_f = (\mu)F_N$
  - $F_g = 20N = F_N$
  - $F_f = (0.10)(20N) = 2N$
  - Force of friction equals 2N in the opposite direction of the motion of the object.

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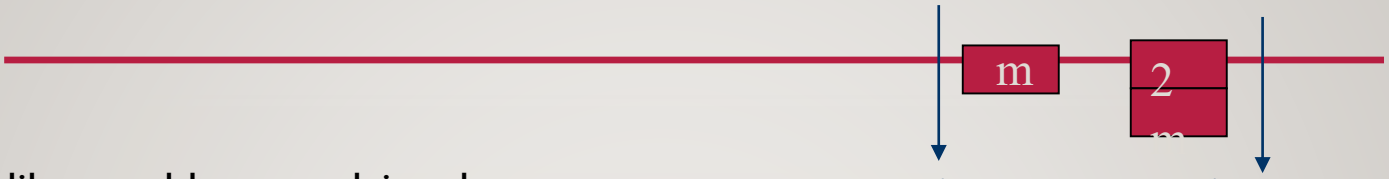
FREE FALL



F/m = g 2F/2m = g

The acceleration of free fall is independent of an object's mass.

- Galileo could not explain why objects of various masses fall with equal accelerations.
- Newton's second law provides the explanation:
  - A falling object accelerates toward the Earth because of the gravitational force of attraction (gravity) between the object and the Earth.
  - The acceleration due to gravity is a constant *g*, for the same locality.

Question: In a vacuum, a coin and a feather fall equally, side by side, would it be correct to say that equal force of gravity act on both the coin and the feather when in a vacuum?

NON-FREE FALL

- In the presence of air resistance, the net force on a falling object is less than the gravity-it is the gravity minus air drag, the force arising from air resistance.

- Air drag is opposing the direction of motion and decreases the net force. Thus, $a < g$.