From Our Inquiry:

- Objects accelerate when a net force is applied on the object

- The greater the net force, the greater the acceleration.

- The more massive the object, the smaller the acceleration.

Newton's Second Law:

In the presence of a net force, an object will accelerate in the same direction of the net force, proportionally to the magnitude of the force and inversely proportional to the mass of the object.

Mathematically we write Newton's Second Law as

$\sum F = ma$.

Units for force:

$$\Sigma F = ma$$

$$1N = (1kg)(1m/s^2)$$

$$1N = 1kgm/s^2$$

What this means:

If a net force is applied on an object, the object WILL accelerate.

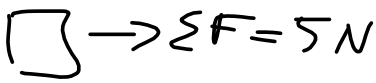
If an object is accelerating, there MUST be a net force present on the object.

If there is no net force, the object WILL NOT experience an acceleration.

If an object is not accelerating, there must be NO net force applied on the object.

Newton's Second Law in 1D:

Ex. A net force of 5 N is applied to a 10 kg object. What is the acceleration?



$\Sigma F = ma$

$5N = (10kg)a$

$a = 0.5 m/s^2$

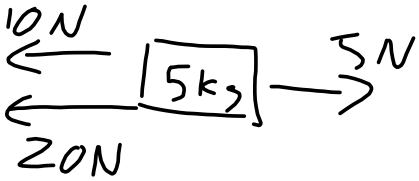
Ex. A 3 N force is applied to the left on an object and a 4 N force is applied to the right. What is the object's acceleration if the object has a mass of 2 kg?

$\Sigma F = ma$

$4N - 3N = (2kg)a$

$a = 0.5 m/s^2$ [Right]

Ex. A 5 N force acts to the east on a 5 kg object, a 10 N force acts to the west, and a 20 N force acts west. What is the acceleration of the object?



$\Sigma F = ma$

$(10N + 20N) - 5N = (5kg)a$

$25N = (5kg)a$

$a = 5 m/s^2$ [W]

Force of Gravity: (AKA. gravitational force or weight)

Draw a diagram of an object in free fall and include all forces acting on the object (neglect air drag).

$$\Sigma F = ma$$

$$F_g = mg$$

Difference between mass and weight.

Mass is a measure of how much matter (stuff) an object is made up of. Mass is also a measure of how difficult it is to change an object's motion.

Weight is a measure of how much force the earth applies on an object to keep the object on or around the earth.

Mass and weight are related to each other as an object's weight depends on the mass of an object.

$F_g = mg$

Ex.

What is the weight of the following:

A 1 kg book $F_g = mg = (1kg)(9.81m/s^2) = 9.81N$

A 5 dollar bill that weighs 1 g $F_g = mg = (0.001kg)(9.81m/s^2) = 0.00981N$

A 2000 kg car

Homework:

- Forces Box sheet **(to be passed in Friday for marks)**

- Textbook pg 137 Q1-4 (use tables on pg 132-133 for questions)