**Net Force and FBD’s**

**Force** is a vector quantity, not a scalar.
Every force (in Newton’s) has a magnitude and a direction.

**Net force** – The sum of all force vectors acting on an object.

**Equilibrium** – Occurs when the net force equals zero Newtons.

**Balanced Force** – whenever an exerted force is paired with a force of equal magnitude in the opposite direction, then both forces are balanced.

**Weight**- a downward force caused by gravity

* Mass is measured in kilograms, weight is measured in Newtons
* The weight of an object depends on its location (Earth, Moon, Space, etc.), the mass never changes.
* To find your weight, find Newton’s second law: F = ma

Example of weight:

 Find the weight of a 2kg bowling ball:

 F = ma

 F = (2kg)(-9.8m/s2)

 F = -19.6 N

**Normal Force**- the force exerted by a surface on an object in the direction perpendicular to the surface.

**Free Body Diagrams (FBD’s)**

FN

 Fw = mg

0.5 kg FW = (0.5kg)(-9.8m/s2)

FW

 Fw = -4.9 N

A free body diagram shows all of the forces acting upon the object. In this case, we have a 0.5kg ball sitting on a desk. The ball is not moving. We can find the ball’s downward force, which is its weight, and its normal force using the formula Fw = mg.

Fw means Forceweight and is measured in Newtons.

m means mass and is measured in kg.

g means gravity and is measured using 9.8 m/s2.

What is a net force?

The net force is 0 N.
That means the tennis ball is in equilibrium.
Are all of the forces balanced? Yes.

**Another FBD Example:**

FW = 9800 N

Weight
FW = mg
FW = (1000kg)(9.8m/s2)
FW = 9800 N

800 N

FW = 9800 N

The Net Force of the FBD above is 800 N to the right.
Are the forces balanced? No.
What is the car’s acceleration?

F= ma

a= F/m a = 800 N / 1000kg a = 0.8 m/s2