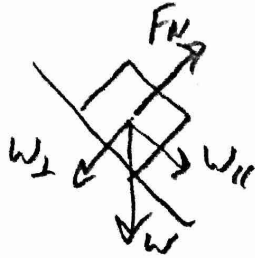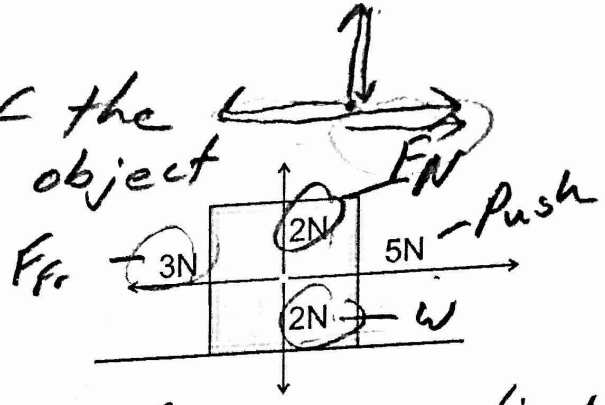Name: _____

Net force (F$_{net}$): Vector sum of all of the forces acting on an object

ΣF

What is the net force that is acting on the box to the right?

$+2N = 2N$ rightward

Normal Force: Outward force exerted by a surface, perpendicular to that surface ~~(the component of the force)~~

Newton's 1st Law:

- Usual version: Objects in motion remain in motion in a straight line and at a constant speed, and objects at rest stay at rest, unless they are acted upon by an outside (or unbalanced) force.

- Simpler version: Objects have zero acceleration unless there is a ___net___ force.

If there is no net force acting on an object (i.e. any applied forces are balanced), what might that object be doing? What are the options?

— Sitting still
— Moving with constant Velocity

What are the options for what an object might be doing if there is a net force acting on an object?

— slowing down   — changing direction
— speeding up

Newton's 1st Law is called the "Law of Inertia." Inertia is: Resistance to ~~change in motion.~~ acceleration

What kinds of objects have the most inertia?

Massive objects

The basic metric unit of force is the ___Newton___. 1 ___N___ ≈ 0.224 pounds.

Newton's 2nd Law:

$$F_{Net} = ma$$

mass, acceleration

$$kg \cdot m/s^2 = N$$

Mass: A measure of an object's inertia

The unit we will use for Mass = ___kilogram___ , which is abbreviated ___Kg___

On Earth, a 1kg mass weighs about 9.8 Newtons or about 2.2 pounds.

Weight: Force of gravity

accel. due to grav.

$$\Sigma F = ma \Rightarrow W = mg$$

weight

Calculating forces using Newton's 2nd law:

1.   A 2kg mass accelerates at a rate of 3m/s². What net force caused this acceleration?

$$F_{Net} = ma$$
$$F_{Net} = 2kg (3m/s^2) = \boxed{6N}$$

2.   A 91N net force is applied to an object. If the object accelerates at a rate of 8m/s², what is the object's mass?
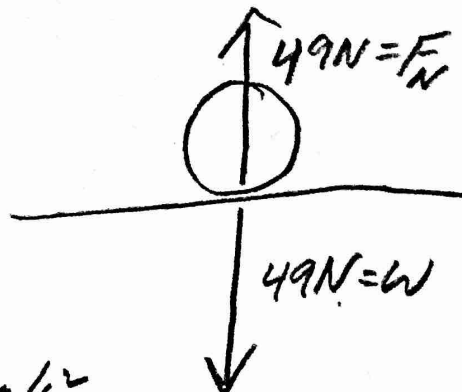
$$91N = m (8m/s^2)$$
$$m = 11.4 kg$$

3.   A bowling ball is sitting motionless on the ground. The ground is applying a 49N upward force to the bowling ball. What is the bowling ball's mass?

$$a = 0$$
$$F = ma = 0$$
$$\Sigma F = 0$$

↑ 49N = F_N

49N = W

Normal Force

$$W = mg$$
$$49N = m \cdot 9.8m/s^2$$
$$\boxed{m = 5kg}$$