Newton's Laws Test

8.PS2.3) Create a demonstration of an object in motion and describe the position, force, and direction of the object.

8.PS2.4) Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

8.PS2.5) Evaluate and interpret that for every force exerted on an object there is an equal force exerted in the opposite direction.

Remember to write two facts from each slide

OR

Answer the questions on the slide

Once you are finished, watch the video on Ms. Bullock webpage titled Newton's Laws Video

Forces

- A force is a push or a pull
- Force is measured in **N**ewtons (kg x m/s^2)

- Balanced forces do not cause an object to change its motion
  - Moving objects will keep moving and stationary objects will stay stationary

- Unbalanced forces cause an object to change its motion
  - Moving objects may increase or decrease in speed and/or change direction
  - Stationary objects will becoming moving objects

- Net force is the difference in the forces acting on an object
  - Ex.

Net force: 20 N to the left

Inertia

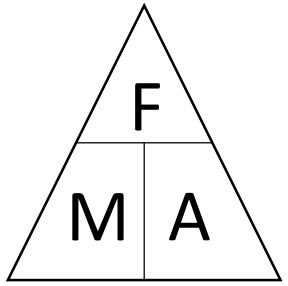
- Newton's 1st Law of Inertia: an object at motion stays in motion and an object at rest stays at rest until acted upon by an unbalanced force.

- Inertia is a resistance to change
  - Example: a ball still remain at rest in the grass until someone comes to kick the ball. The kick is an unbalanced force causing the ball to change motion.

- The more mass the more inertia
  - Example: a full grocery cart requires more force to move compared to an empty cart. The full cart has more mass and more resistance to change.

Acceleration

- Newton's 2nd Law of Acceleration: an objects acceleration depend on the mass of the object and the force acting on the object.
- Acceleration is any increase or decrease in speed.
- Formula:



- Question: What force is require to move a 20kg box at a rate of $2m/s^2$?

F= M x A 20kg x $2m/s^2$

- Question: What is the mass of an object accelerating at a rate of 3 m/s^2 caused by a force of 15N?

M = F/A 15N/$3m/s^2$

Acceleration

- An objects acceleration will increase as an objects mass decreases.
- An objects acceleration will increase as the force on the object increases.
- Question: What is the acceleration of a 5 kg object with a force applied of 10N?

A = F/M 10N / 5 kg =

- Question: What is the acceleration of a 10 kg object with a force applied of 10 N?

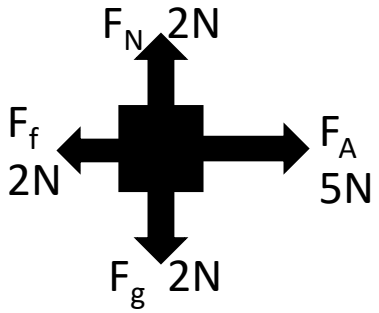
A = F/M 10N / 10 kg =

Action and Reaction

- Newton's 3rd Law of Action and Reaction: for every action there is an equal and opposite reaction.
- The reaction force will be equal in strength, but opposite in direction.
- Example: You throw a ball at the wall. The ball applies a force of 10N on the wall and the wall applies a force of 10N on the ball in the opposite direction. The ball bounces backwards.
- Example: A student on skates pushes against the wall with 5N of force to the left and the wall pushes on the student with 5N of force to the right. The student slowly rolls to the right.

Free Body Diagrams

- The purpose of a free body diagram is to show the forces acting on an object.
- A ball has been pushed across the table with 5 N of applied force. The ball experiences 2 N of friction and 2 N of gravity.



Free Body Diagram **AND** Net Force

1. A boy applies 20N of force to a bowling ball. The ball rolls down the lane and experiences 2N of friction. Gravity pulls down on the ball with 5 N of force.

Calculate the Net force acting on the ball? (Force applied – Force friction=?)

Complete the Free body diagram for the ball and boy?