Newton's Laws of Motion and Force

UNIT 2

- Newton's Laws
  - 1st-Inertia
  - 2nd -F=m*a
  - 3rd- Equal and Opposite Forces
  - Weight
  - Acceleration due to Gravity
  - Apollo 13
- Simple Machines and Mechanical Advantage
  - Levers, Pulleys and Incline Planes
  - Gravity, Gears and Friction
- 3 Quizzes
- Test around first week of March!

Sir Isaac Newton

- 1642-1727

Newton's Laws of Motion

- Law One: Inertia
  - An object at rest will stay at rest unless acted on by an unbalance force
  - An object in motion will stay in motion unless acted upon by an unbalanced force

or

An object will keep moving or stay at rest

unless a net force acts on it

Newton's Laws of Motion

- Law Two: F=ma
  - The acceleration of an object is proportional to the force acting on it and inversely proportional to its mass

or

More force causes more acceleration:

more mass causes less acceleration

Newton's Laws of Motion

- Law Three:
  - Whenever one object exerts a force on another object, the second exerts an equal and opposite force on the first

or

For every action, there is an equal and opposite reaction

Word/Term: FORCE

Drawing:

Describe in own words:

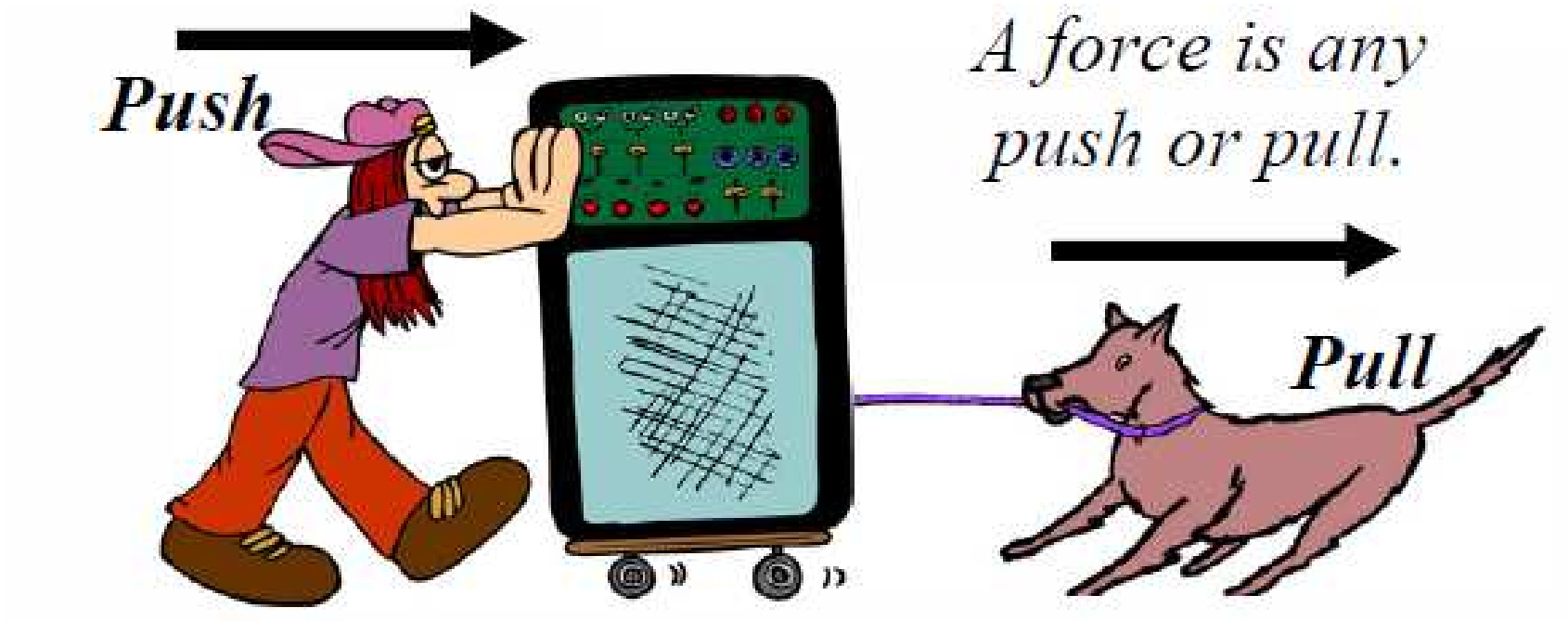
Textbook Definition:

Rate my Understanding: 1 2 3 4

How I remember it:

Reflections:

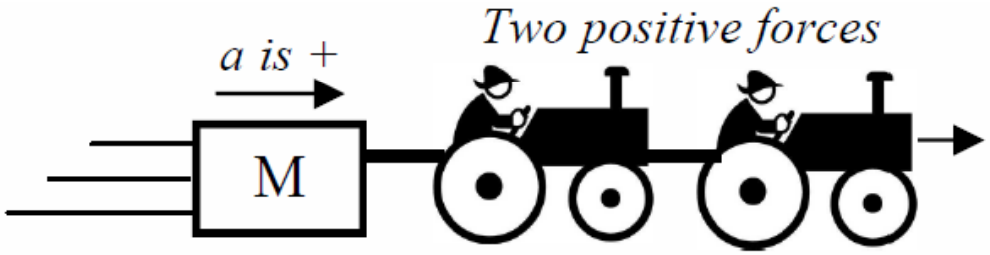
Forces



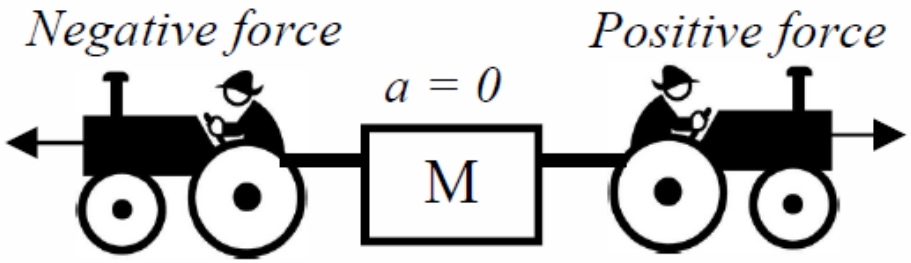
- A force is any action that can change or cause motion
- Forces are measured in **Newtons (N)**

Forces are Vectors

- We care which direction the Forces are being applied
- Forces can add together or cancel each other out



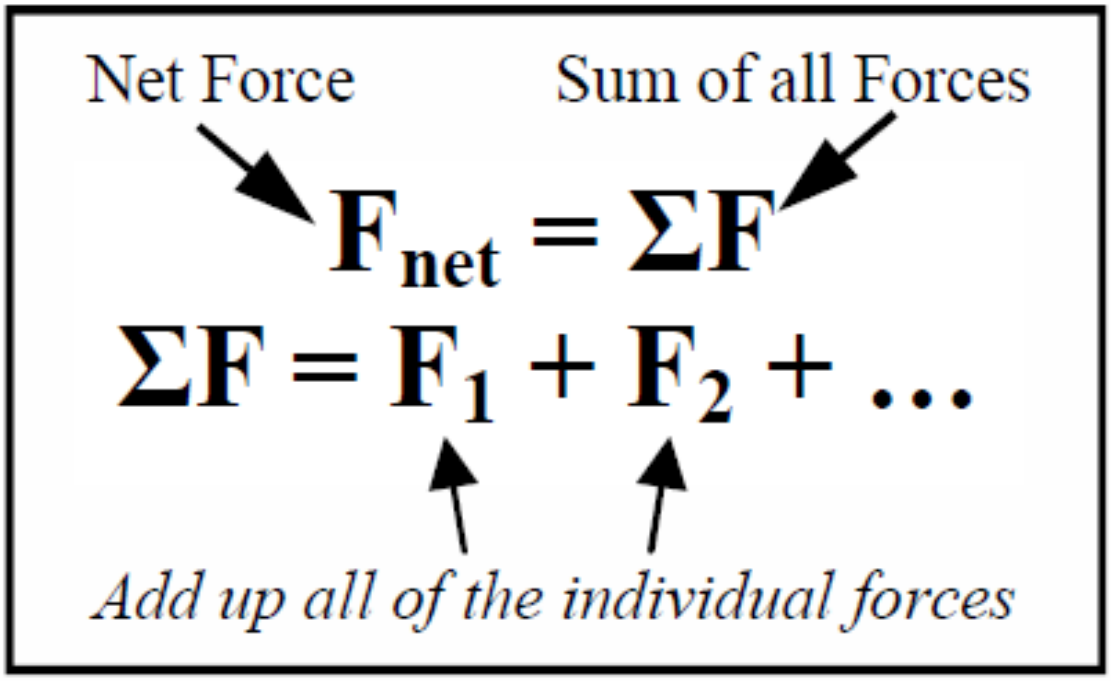
Forces acting in the same direction add together.



Opposing forces can cancel each other.

NET FORCE

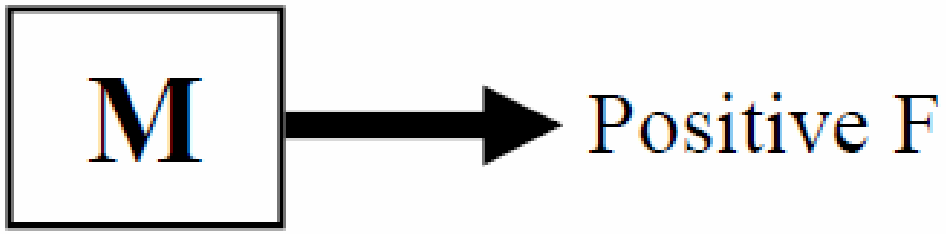
- The net force (F_{net}) is the result of all the forces acting on an object
- There can be many forces, but the object will act as if there is only one force: the net force



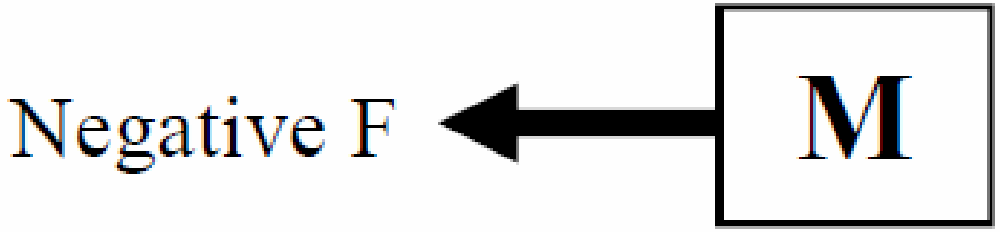
Direction Matters

- Remember that Forces are Vectors?

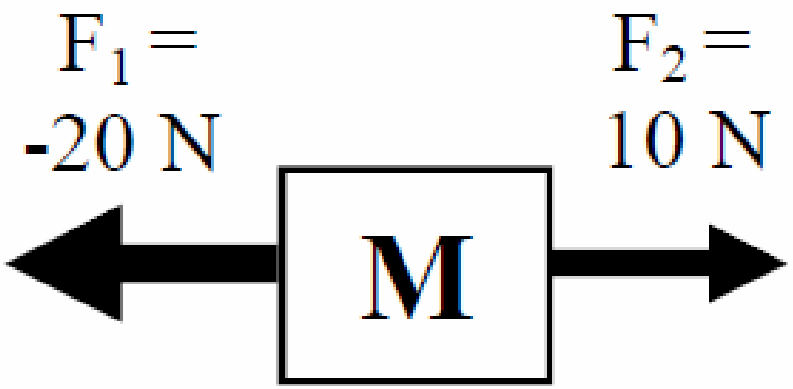
Forces to the right are positive.



Forces to the left are negative.



Finding F_{NET}



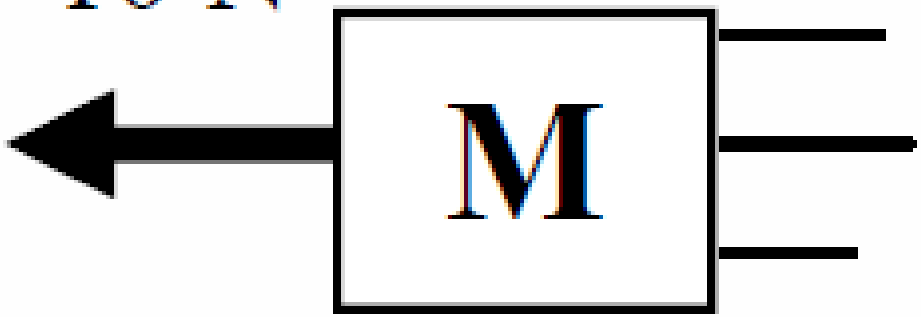
$$F_{net} = \Sigma F = F_1 + F_2$$

$$\Sigma F = -20 + 10 = -10 \text{ N}$$

Resulting Motion

$F_{net} =$

-10 N



The object accelerates left since F_{net} is left.

INERTIA MASTERS

- **GUIDELINES FOR MEMBERSHIP**

  - All students are eligible for membership.

  - You must perform the Inertia Demo in order to upgrade your membership level.

  - Demos should be performed in front of the class.
    - You may practice, but your qualified attempt has to be in front of Mr. Neddo

  - If you do not pass a level, you can try again the following day.

  - Be careful with items at home, I will not pay for broken dishes!

Become a 10th Level Inertia Master

LEVEL 1

Flicking a playing card out from under a penny using your finger tip

LEVEL 2

Pulling an embroidery ring out and dropping a coin into a container

LEVEL 3

Remove three coins from under a stack of coins by hitting each with a ruler

LEVEL 4

Pulling out a dollar bill from between two soda bottles, the top bottle is full of water

LEVEL 5

Same as two but the top bottle is empty

LEVEL 6

Pulling a sheet of paper out from under a container of water

LEVEL 7

Pulling a tablecloth out from under some dishes

LEVEL 8

Drop one egg into a glass of water by knocking an aluminum plate with a broom stick

LEVEL 9

Drop two eggs into a glass of water by knocking an aluminum plate with a broom stick

LEVEL 10

Drop three eggs into a glass of water by knocking an aluminum plate with a broom stick

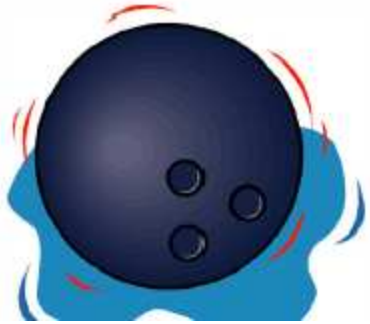
Word/Term: Inertia	Drawing:
Describe in own words:	
Textbook Definition:	Rate my Understanding: 1 2 3 4
How I remember it:	Reflections:

Mass is the Only Thing

- All objects have mass = All objects have inertia

More Mass= More Inertia!

Something that is harder to move has more inertia



Bowling ball: more mass, more inertia: hard to move and hard to stop.

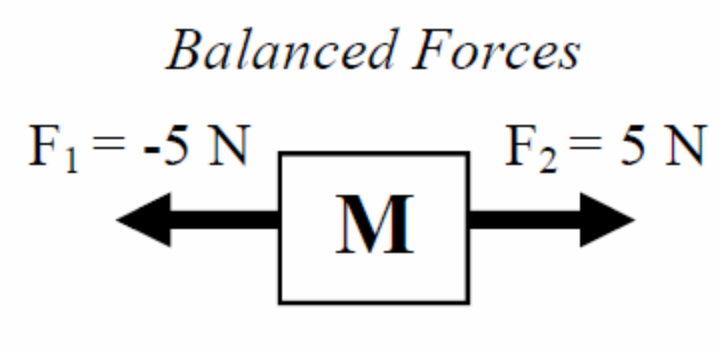
Golf ball: less mass, less inertia: easy to move and easy to stop.

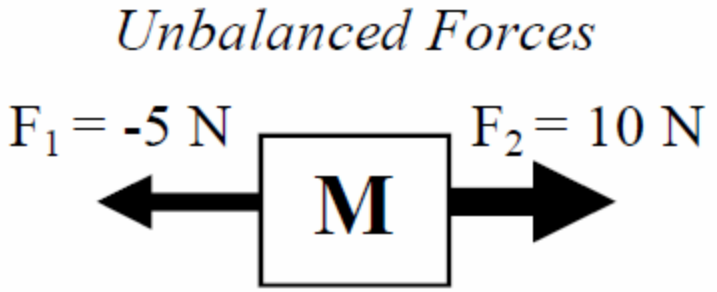
Inertia is <u>not</u> affected by velocity. A fast object has the same inertia as a slow object: same mass = same inertia!


INERTIA
YOU LOSE

Balanced and Unbalanced Forces

- Forces are balanced if they are equal in magnitude (amount) and opposite in direction
- Forces are unbalanced if one of them is stronger
- Only unbalanced forces change an object's motion





Homework and Video

- We will grade the worksheet next class