

Newton's Laws

The cause of it all...

What causes acceleration (a change in velocity) to occur?

(In other words... what must be applied?)

A FORCE!!!

(specifically, an unbalanced force)

Force

Force can be measured by taking an object's mass and multiplying it by the acceleration.

$$\mathbf{F = m * a}$$

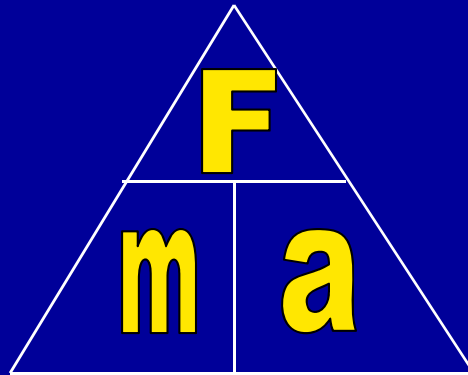
(Units for Force are Newtons: N)

(Units for mass are kg)

(Units for acceleration are m/s²)

Force

How would you plug the force equation into a power triangle??? ($F=ma$)



Force

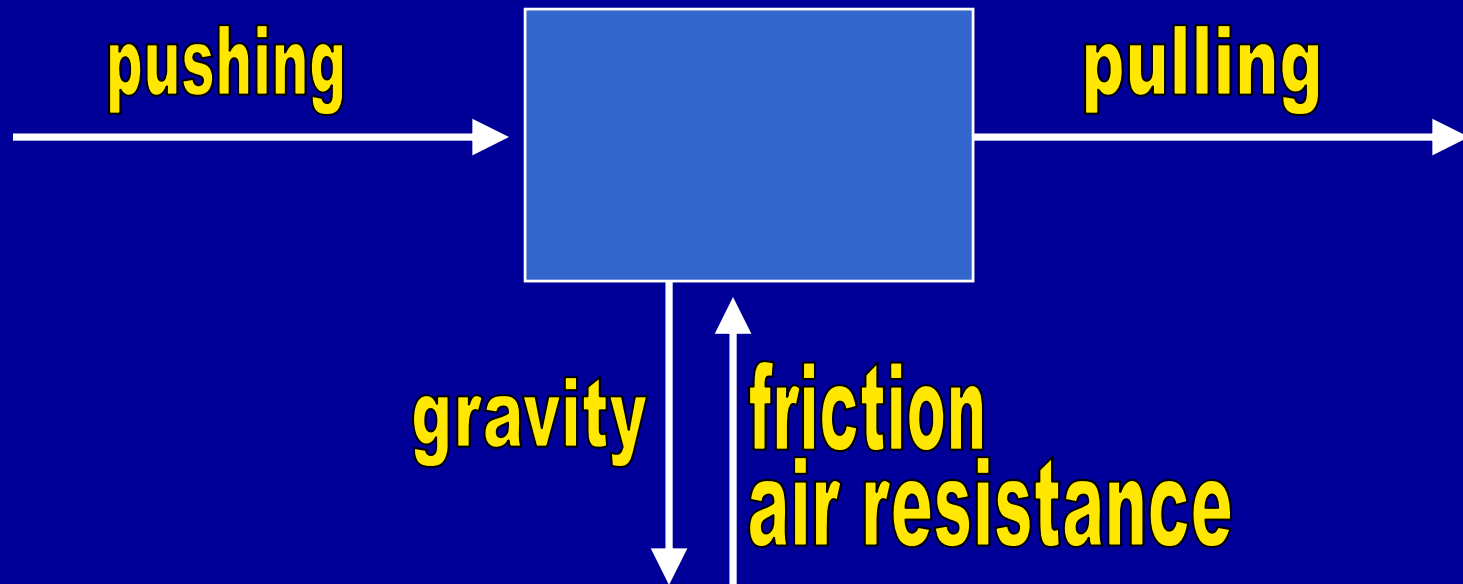
Re-arrange the Force equation ($F=ma$) to solve for mass and acceleration...

$$m = F/a$$

$$a = F/m$$

Force

There are several types of forces...



Force

Friction: A force that opposes the motion between two objects in contact with each other.

Q: Is it easier to push something across concrete or ice? (WHY?)

A: Ice b/c there are less frictional forces.

Force



What would be the NET force (overall force) on the box?

= 30 N

What direction will the box move?

Left

Force

Force problems on

- Pg. 270 Practice #(1-3)
- Pg. 276 #(22-24)
- Pg. 697 #(76-80)

Net Force Practice Problems

1. A 1200kg truck that is traveling at 50 m/s^2 has a head-on collision with a 400kg car that is traveling at 30 m/s^2 . What is the net force of the collision and which direction will the crash go?
2. Josh and I are pushing a T.V. cart down the hallway... Josh pushes with a force of 25N and I push with a force of 15N. What is the net force?
3. I am playing tug of war with my dog... she is pulling on the rope with a force of 13N and I am pulling with a force of 23N. What is the net force and which direction is the rope going?

Newton's 3 LAWS

LAW 1: An object at rest will remain at rest and an object in motion maintains its velocity unless it experiences an unbalanced force.

Inertia: The property of an object to resist changes in the velocity unless acted upon by an unbalanced force.

Unbalanced force: A net force that is not equal to zero.

Newton's 3 LAWS

LAW 2: The unbalanced force acting on an object equals the object's mass times its' acceleration. $F=ma!!!$

Newton's 3 LAWS

LAW 3: For every action force, there is an equal and opposite reaction force.

Examples of Newton's Laws

LAW 1: If you are riding on the bus and your books are on the seat next to you... if the bus driver stomps on the brakes...where do your books go???

A: onto the floor... An object in motion stays in motion until acted on by an unbalanced force.

Examples of Newton's Laws

LAW 2: If you are pushing an empty grocery cart with 20N of force... will the grocery cart have the same acceleration if you continue to push it at the same force of 20N when it is full.

A: NO...the acceleration will be less once the cart is full b/c you have added mass, and $a = F/m$

Examples of Newton's Laws

LAW 3: When you hit something does it hit you back?

What would happen if you were standing on a skateboard and threw a really heavy ball?

A: YES... you cannot touch without being touched. For every action there is an equal and opposite reaction.

A: You will go backwards on the skateboard b/c the ball is pushing you with an equal and opposite force.