Newton's Third Law

For every action there is an equal and opposite reaction.

What this means:

An object cannot push/pull on another object without being pushed/pulled on by the other object.

Forces Come in Pairs

https://www.epicurious.com/ingredients/types-and-varieties-of-pears-delicious-recipes-article

An interaction pair is a pair of forces that is created by two objects pushing or pulling on each other.

For two forces to be considered an interaction pair the forces must be:

- of the same type *(gravity, normal, friction)*

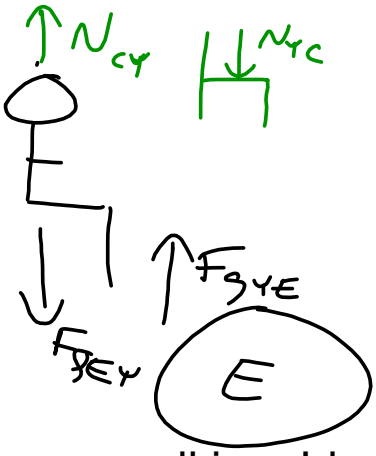
- exerted from one object on the other object *(A onto B and B onto A)*

- equal in magnitude

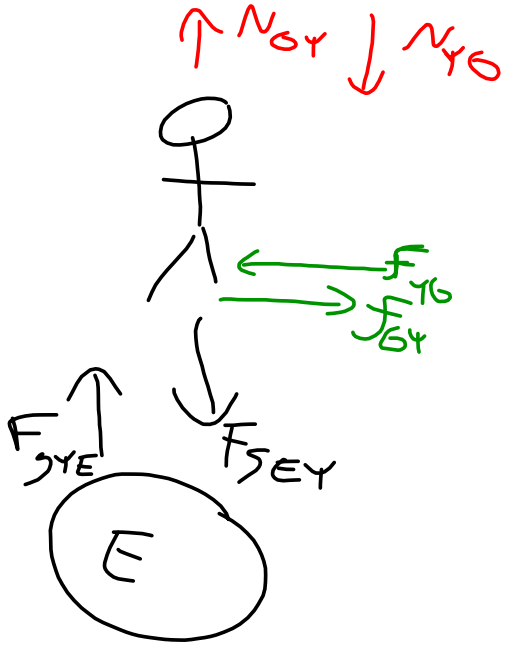
- Opposite in direction

Example.

Consider a person sitting on a chair. Identify all the interaction pairs from the forces the person is experiencing.



Consider a person walking. Identify all the interaction pairs from the forces the person is experiencing. Explain how the person moves forward.



A 2000 kg blue car, moving 15 m/s [East], crashes into a stationary 2500 kg red car. After the collision the cars stick together.

Based on the information given,

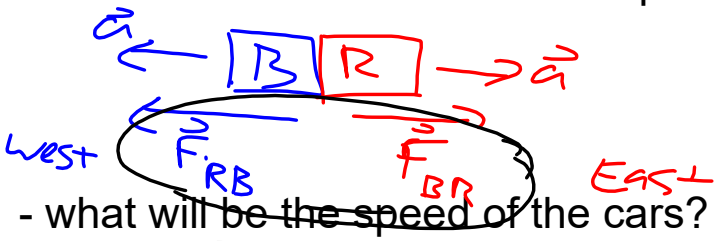
- what will happen to the motion of the red car?

will begin to move East

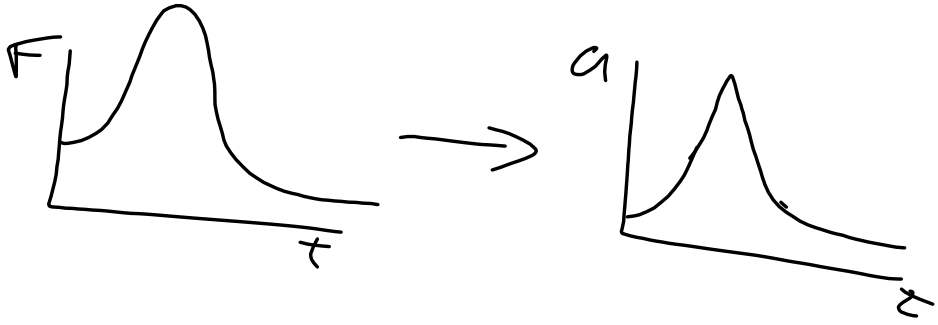
- what will happen to the motion of the blue car?

Slow down. Accelerates West

- during the collision, will each car experience a force? If so, in what direction will each car experience a force?



- what will be the speed of the cars?



Mathematically Newton's Law Looks Like:

$$\sum F = ma \qquad a = \frac{\Delta v}{\Delta t}$$

$$= m\frac{\Delta v}{\Delta t}$$

$$= m\frac{(v_f - v_i)}{\Delta t} \qquad \underbrace{mv} = p \text{ momentum}$$

$$= \frac{mv_f - mv_i}{\Delta t}$$

Momentum:

Is a byproduct of Newton's Second Law. Newton's Third Law makes momentum an incredibly powerful physics tool!

Homework: