Warm Up

List the ways you can move a paper clip around the table without lifting it.

- shake the table (or tilt it)
- push it around
- blow on it
- use a magnet
- pull it
- slide something into it

Objective: SWBAT describe an object's motion using inertia and Newton's Laws of Motion

Agenda:

- Warm Up
- Notes
- Practice
- Reflection

Notes: Force and Inertia

A force is a push or pull on an object. All forces are applied *by an agent* onto a system. They can be classified as one of two types:

- contact force: when the agent and system are touching
- field (non-contact) force: when the agent and system are not touching

Inertia is a system's tendency to resist change.

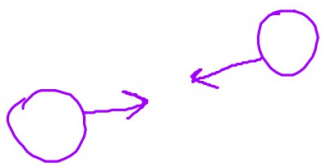
Notes: Newton's Laws

Newton's First Law: An object will continue its original state of motion (at rest or moving at constant speed) unless an outside force acts on it

Newton's Second Law: The acceleration an object feels is proportional to the net force acting on it

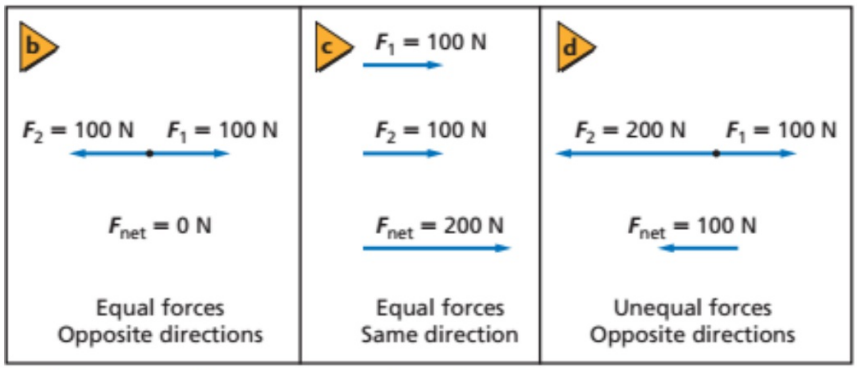
$\mathbf{F}_{net} = m\mathbf{a}$ — m: mass; $\mathbf{a}$: acceleration; $\mathbf{F}_{net}$: sum of all external forces

Newton's Third Law: Forces come in pairs, of equal magnitude and exactly opposite in direction

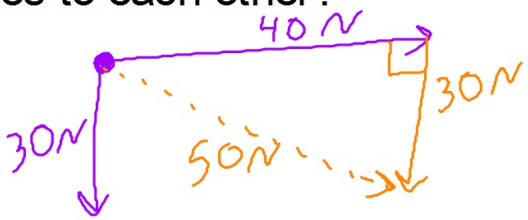


Combining Forces

Forces are vector quantities, so they combine the way vectors do.



What if forces are at right angles to each other?



Notes: Mass vs. Weight

An object's mass is a measure of how much a force will change its motion (SI unit: kilogram). English: slug

An object's weight, which is what we usually measure on a scale, is how strongly a gravitational force acts on it (SI unit: Newton). English: Pounds

$$w = mg$$

$g = 9.8\ m/s^2$

$1N = 1\ kg \cdot 1\ m/s^2$

$1N = 1\ \frac{kg \cdot m}{s^2}$

Practice

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Physics section 4.1 practice & review

Reflection

Give an example to explain how an object's weight and mass are different.