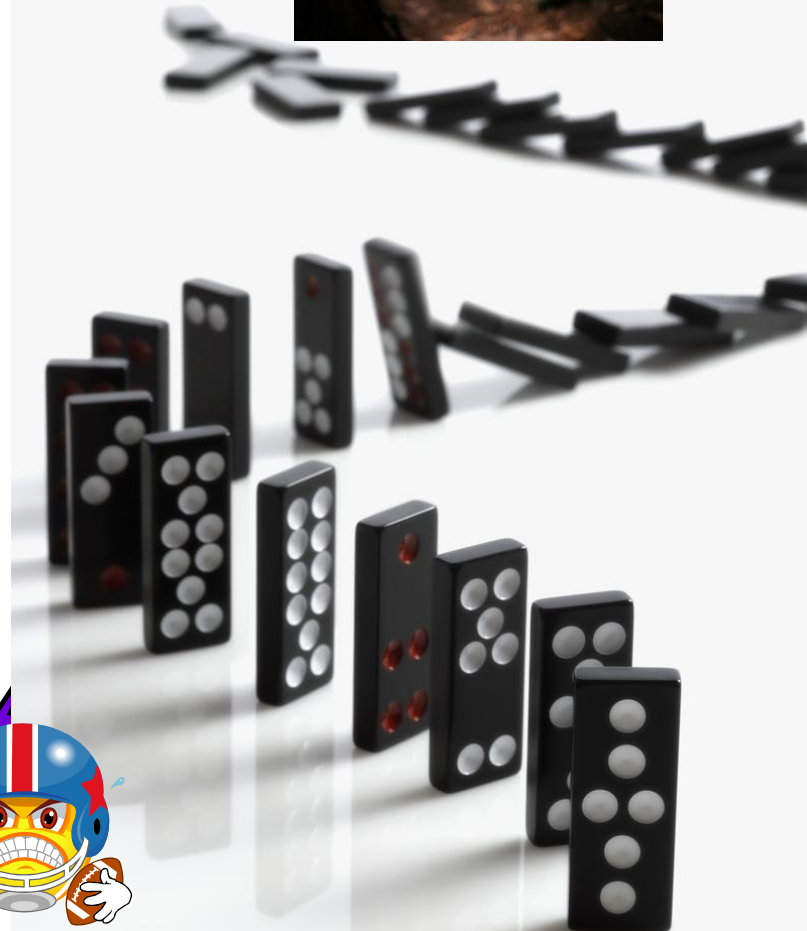


FORCES

What is a force?

<https://www.youtube.com/watch?v=GmlMV7bA0TM>



FORCE – A PUSH OR PULL upon an object resulting from the object's *interaction* with another object.



A Force is considered a vector quantity meaning...

– it is defined by both the size (magnitude) of the force and its direction

Push



...or a pull



- Use both **magnitude** (how much force) and **direction** to define a force.

- In the SI system, force is measured in **newtons (N)**





MEASURING FORCES

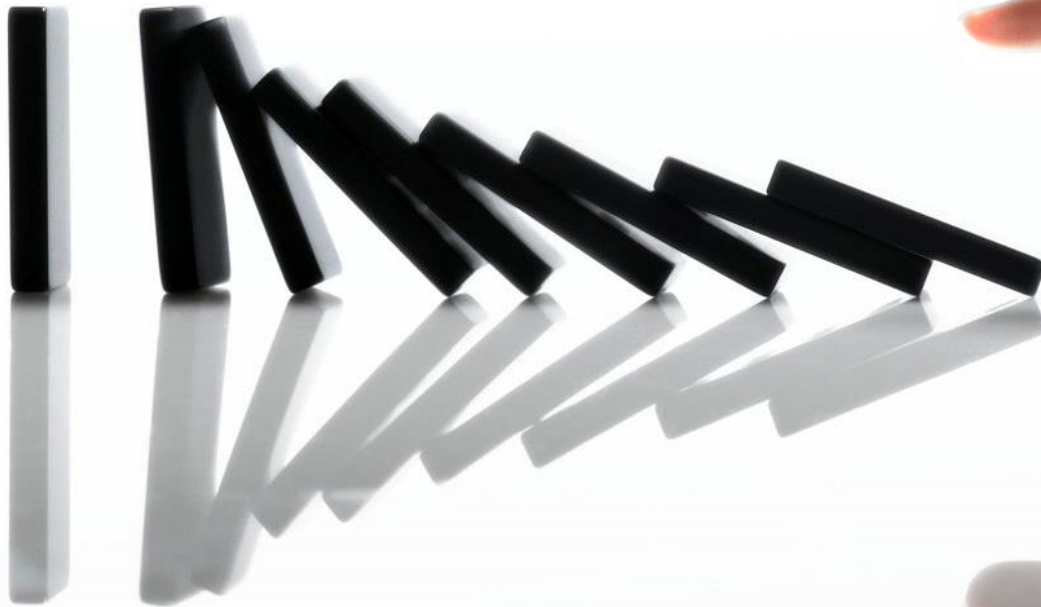
UNIT OF MEASURE

- Forces are measured in newtons
- One Newton is the amount of force required to give a 1-kg mass an acceleration of 1 m/s^2 or 1 m/s/s .
- *A Newton is abbreviated by an "N."
If you say "10.0 N," you mean 10.0 Newton's of force.*

- A vector quantity is a quantity that has both magnitude and direction. To fully describe the force acting upon an object, you must describe both the magnitude (size or numerical value) and the direction. Thus, 10 Newton is not a full description of the force acting upon an object. In contrast, 10 Newton, downward is a complete description of the force acting upon an object; both the magnitude (10 Newton) and the direction (downward) are given.

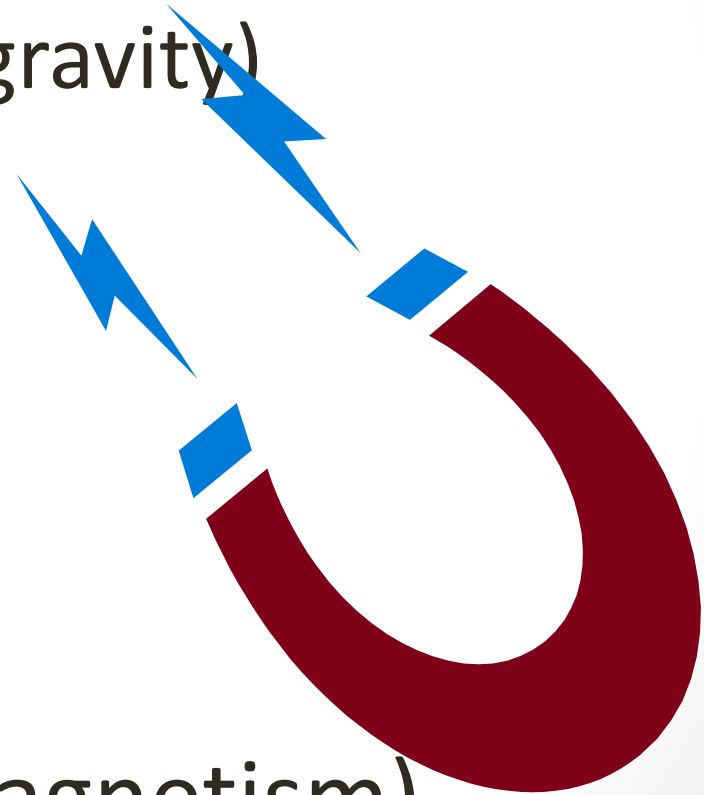
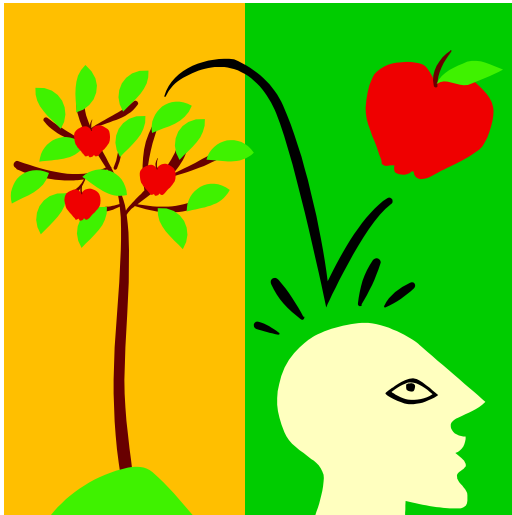
Contact Force (Direct force)

- Direct contact between objects
- Can be a push



Action at a distance (Indirect Force)

- Some forces can act over a distance
- Gravitational force (gravity)



- Magnetic force (magnetism)



Earth

Gravity



Gravity

Moon

Moon's speed

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WHAT TYPE OF FORCE?

THE FOUR ELEMENTARY FORCES

- ❑ **GRAVITY** – Force which causes all masses to attract each other. Your weight is a measure of the force of gravitational attraction between you and the Earth.
 - ❑ **ELECTROMAGNETIC** force – The force that acts between opposite charges and holds atoms together into molecules.
 - ❑ **STRONG** nuclear force - Holds the nucleus of an atom together
 - ❑ **WEAK** force – Causes some forms of radioactivity
-
- **In this unit, we will be studying only Gravity and Electromagnetic Forces**
 - **You will study strong and weak forces in nuclear physics and quantum mechanics**

GRAVITY

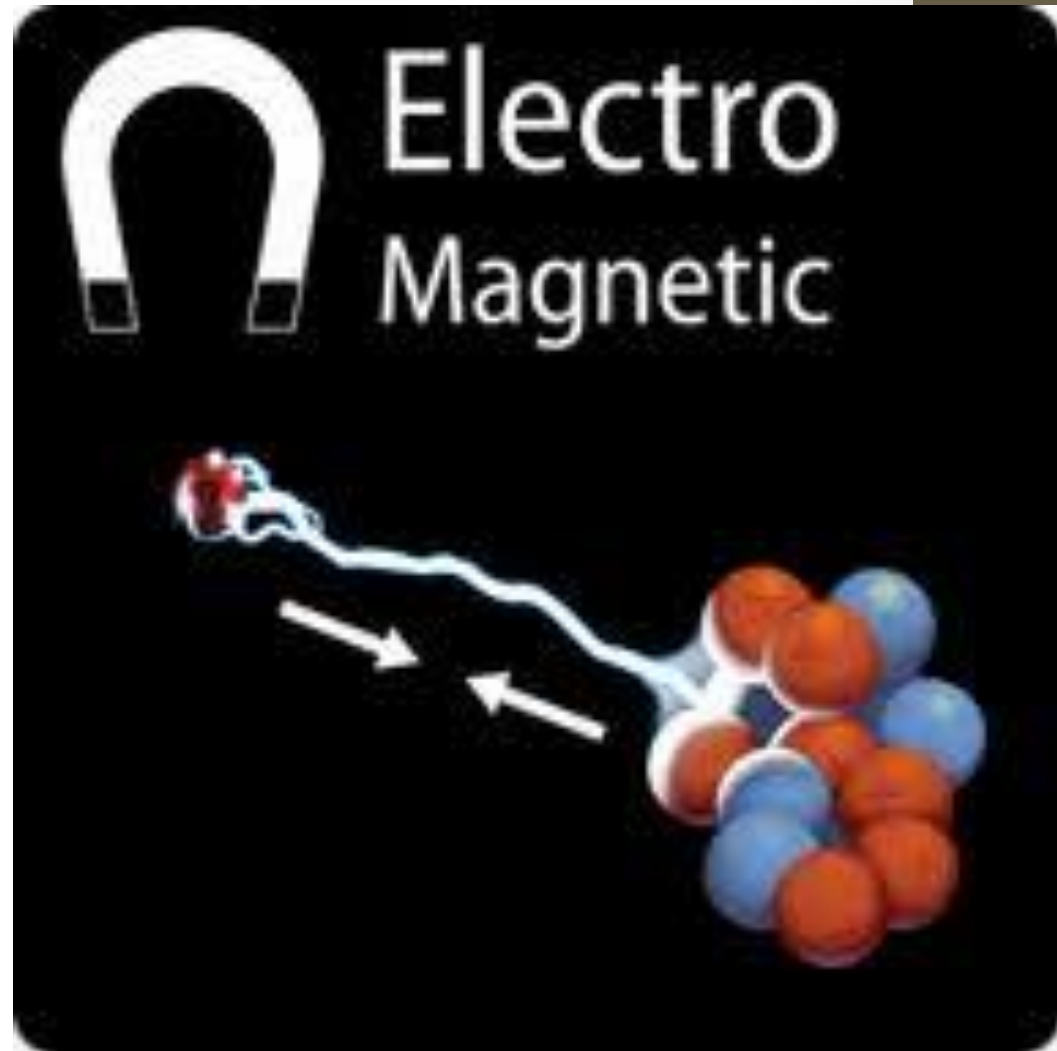
- - Force which causes all masses to attract each other.

Example: Your weight is a measure of the force of gravitational attraction between you and the Earth.



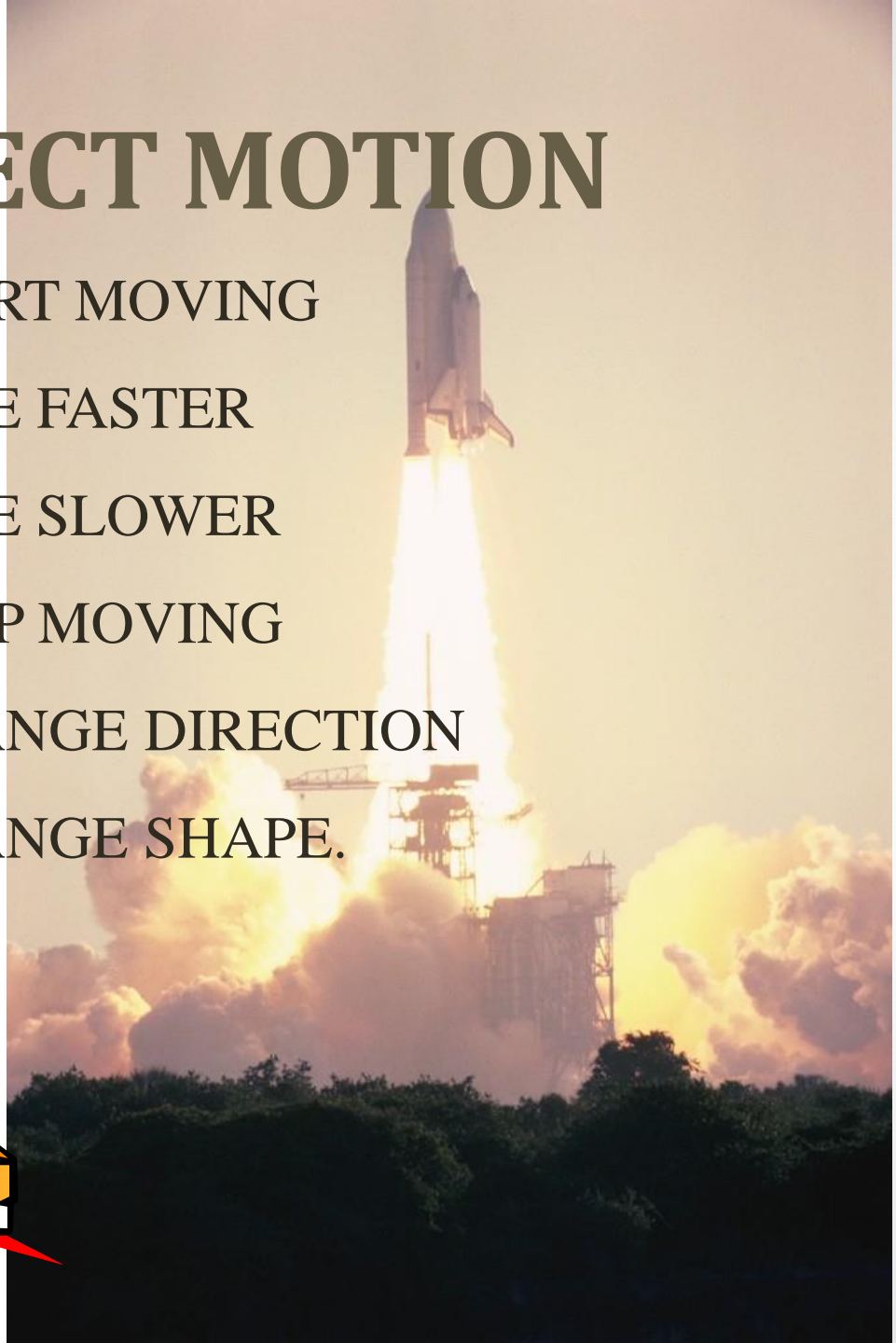
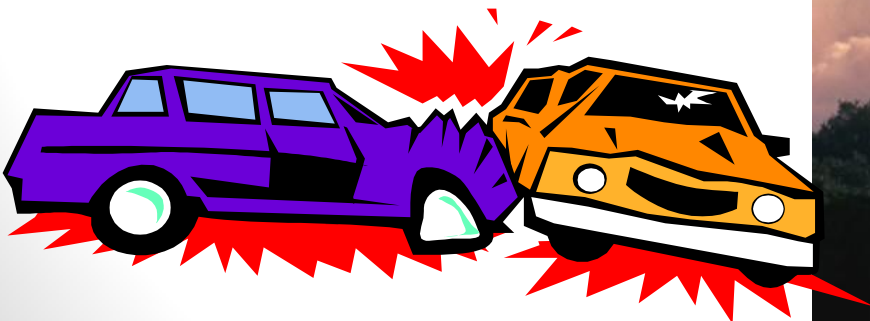
ELECTROMAGNETIC force

The force that acts between opposite charges and holds atoms together into molecules.



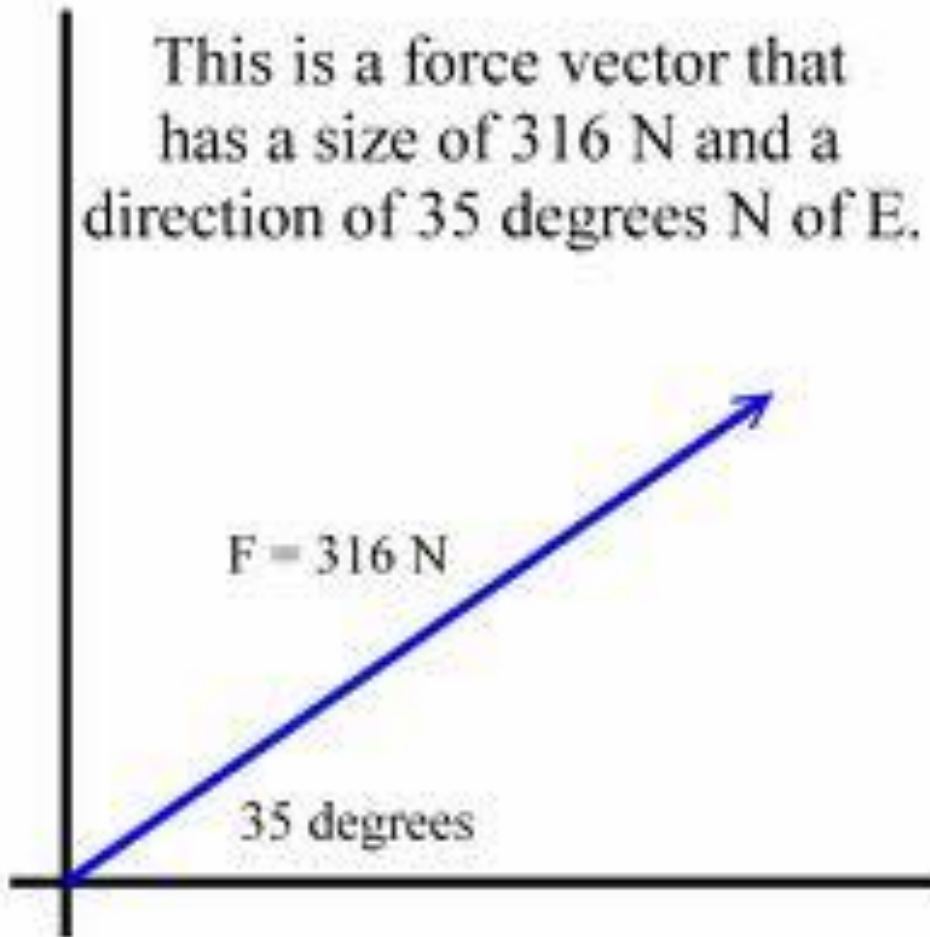
FORCES AFFECT MOTION

- MAKE OBJECTS START MOVING
- MAKE OBJECT MOVE FASTER
- MAKE OBJECT MOVE SLOWER
- MAKE OBJECTS STOP MOVING
- MAKE OBJECTS CHANGE DIRECTION
- MAKE OBJECTS CHANGE SHAPE.
- MAKE OBJECTS SPIN



Representing force as a vector

This is a force vector that has a size of 316 N and a direction of 35 degrees N of E.



A force vector describes a specific amount of force that is applied in a specific direction.