THE FORCES OF NATURE AND THE UNIVERSE

FORCES

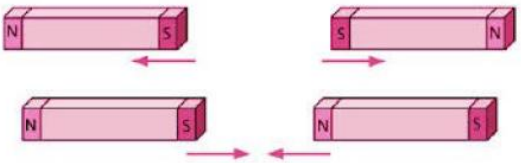
A force is any interaction (a push or a pull) that can produce changes in motion (direction of movement or speed) and deformations.

Forces are **measured in Newton (N).**

Forces can be classified into:

- **Contact Forces.** Objects must touch each other to exert a force.

- **Non-contact forces:** Object do not have touch each other, such as gravity, magnetism or electricity.



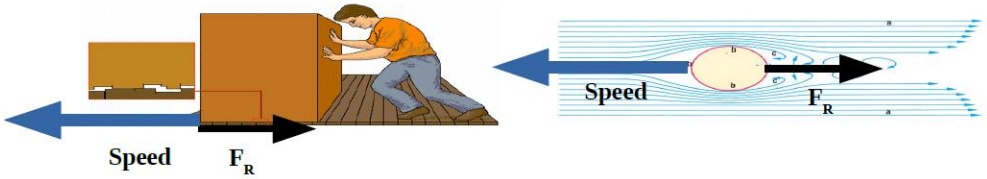
TYPES OF FORCES

a) Weight (W). It is a force exerted on a body by gravity. It is expressed in the formula: **W = m·g**

m is the mass of the body and g is the gravitational acceleration $g = 9{,}8\ m/s^2$

b) Friction or Frictional force. This force acts in the opposite way to the movement. Frictional force is smaller on smooth surfaces than on rough surfaces. Friction makes things move more difficult. However, friction can be useful. For example:

- Without friction between our shoes and the floor we can´t walk.
- Without friction between tyres and the road stop cars can't drive.
- Without friction between the brakes and wheels bikes and cars can´t stop.

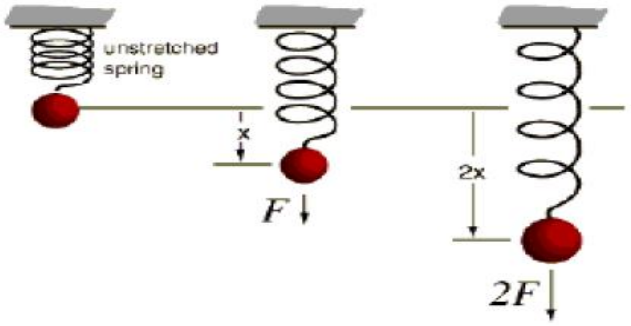


c) Elastic Forces. The lenght of some materials or a spring is bigger when is pulled. **Hooke's Law** says that the extension of an elastic object is directly proportional to the force applied to it. **F = k·x**

In other words:

- If the force applied is doubled, the extension doubles.

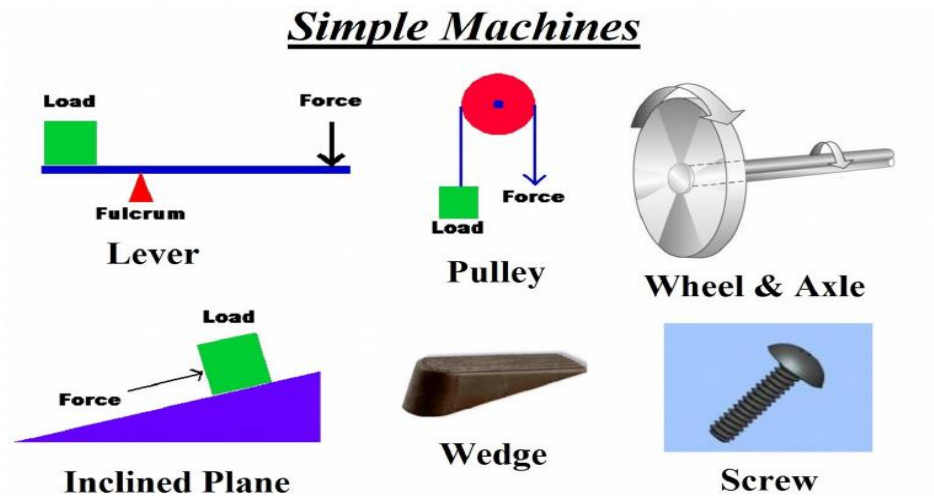
- If no force is applied, there is no extension.



SIMPLE MACHINES

They are machines with few or no moving parts. They change the direction of a force and make work easier.

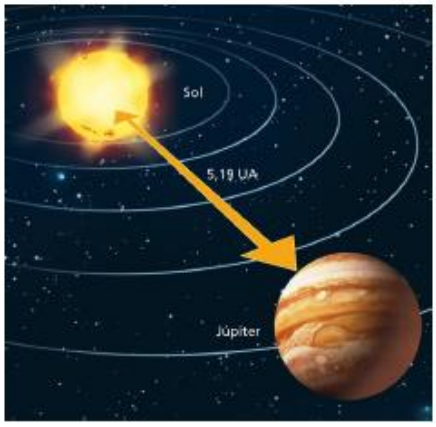
The main simple machine are lever, pulley, wheel, inclined plane, wedge, screw, etc...

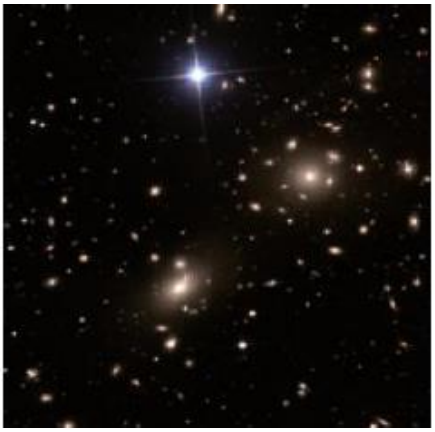


THE OBSERVABLE UNIVERSE

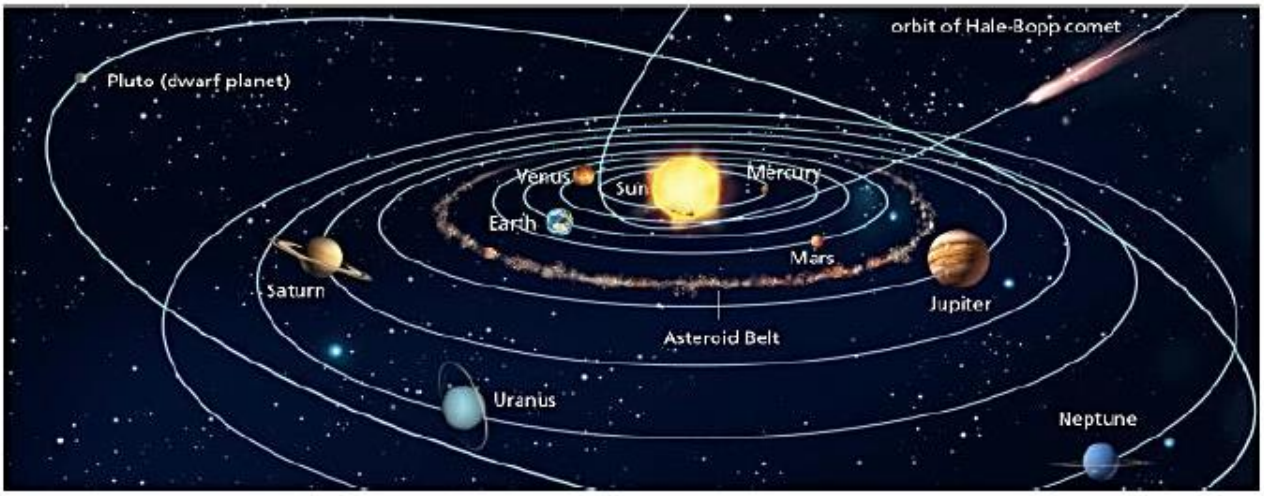
For distances in the Solar System, we use the **astronomical unit (AU).**

For distances to stars or galaxies, we use **light year (ly).**





The **observable Universe** is mostly made up of **galaxies**. Galaxies contain **stars**, **nebulae** and **star clusters**. Our galaxy is called the **Milky Way**. The **Solar System** is a group of **planets**, **dwarf planets**, **satellites**, **asteroids** and **comets** orbiting the Sun.



FINAL ACTIVITIES

1. Match the words to their definitions

1. FORCE	**A.** To move something away from you
2. MOTION	**B.** The action of moving or changing position.
3. PULL	**C.** The action of changing the shape of something
4. PUSH	**D.** To move something towards yourself
5. DEFORMATION	**E.** A push or a pull

2. Match the force to its definition:

1. ELASTIC FORCE	**A.** is a force that makes movement more difficult
2. FRICTION	**B.** is a force exerted on a body by gravity
3. **WEIGHT**	**C.** is a force that increases the length of a spring when pulled

3.Indicate if the following sentences are true or false.

a. Weight is the amount of matter in a body.
b. The unit of mass in the SI is the newton.
c. Simple machines have few or no moving parts.
d. Simple machines make work more difficult.

4. Join these words with their definitions:

1. Galaxies	a. Clouds of interstellar gas and dust.
2. Stars	b. Compact groups of stars.
3. Nebulae	c. Enormous spheres that give enery.
4. Star clusters	d. Groups of celestial bodies orbiting the Sun.
5. Solar System	e. Enormous clusters of stars, interstellar gas and dust

5. The following concept maps are proposed to organise the content of the unit. Complete them.