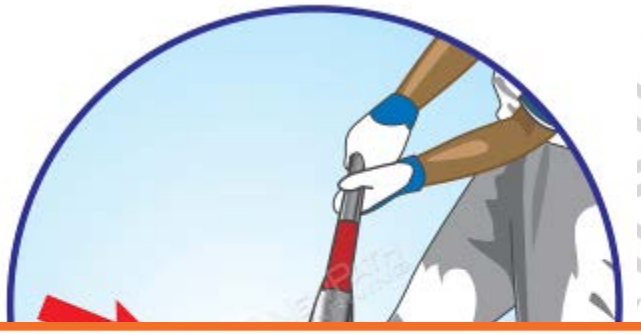
FORCES

Force is a pull or a push and its strength is measured in units called **newtons**. Forces can act in combination and produce what is referred to as **net force**. When two forces are exerted in the same direction, net force can be calculated by adding the two forces together. On the other hand, if two forces are opposed to each other, they tend to cancel each other out.



Lesson Checkpoint:
What do forces that act in combination produce?

Friction

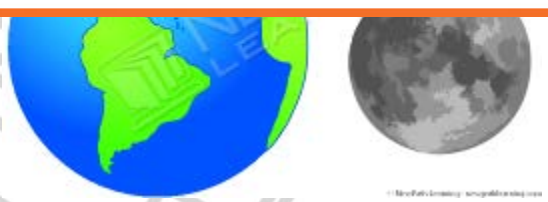
When a force is used to move an object, the resisting force of **friction** must be overcome. The factors that determine how much friction there is are the amount of contact between the two objects and the types of surfaces that are in contact. As everyone knows, lubrication of a surface makes sliding much easier.

Friction can take various forms:

- One would be the initial friction of trying to start to move an object
- Then there is the friction involved during the movement
- There is even friction between a solid and a liquid as the solid moves through the liquid.

Gravity

Gravity is a type of force that pulls objects towards each other and toward the earth. The amount of gravitational force depends upon the mass of the objects that are interacting and the distance between them. While **mass** is the amount of matter an object has, **weight** is a measure of the effect of gravity on the mass. An astronaut has less weight on the moon because the moon has



Lesson Checkpoint: What is the definition of weight?

Newton's Laws

The scientist we usually think of when we talk about gravity and falling objects is Isaac Newton. Newton is credited with the development of three laws dealing with the movement of objects.

Newton's first law, simply phrased, is that an object that is at rest will remain at rest and that an object in motion will continue in motion. This is only true, of course, until another force acts to either move or stop the object. The resistance to this force is referred to as **inertia**.

A good example of this is the difficulty you have trying to stop a moving object once it gets going.

Newton's second law states that the acceleration of an object depends on the net force affecting that object and the mass of the object. The formula for calculating acceleration is shown below:

Acceleratic

Newton's action there is an of saying that when econd object resp rce exerted by e forces heat out one way, the jet is pushed in the opposite direction.

Lesson Checkpoint:
State one of Newton's Laws and give an example of it in action.

Momentum

The amount of motion that takes place is **momentum**. To calculate momentum, you multiply the **mass** of an object by its **velocity**. Since velocity is involved, this means that momentum is affected not only by the mass and speed of an object but also by the direction the object is moving. When groups of objects are involved, if there is no outside force, the total momentum of the group does not change. For example, in a collision between two cars, momentum may be transferred from one car to the other but not lost. This is referred to as the Law of Conservation of Momentum.

Lesson Checkpoint:
What are the two attributes of an object used to calculate momentum?