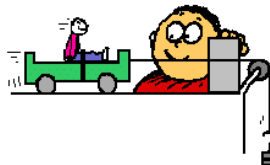


Flight Unit/ Newton's Laws of Motion



In 1687, Isaac Newton came up with some good rules about motion. These rules are known as Newton's three Laws of Motion.

The First Law of Motion:

An object at rest stays at rest, and an object in motion stays in motion, unless an outside force acts upon the object.

Examples:

The sleeping dog (object at rest) illustrated below will continue to sleep unless perhaps, you (outside force) bring him a dog biscuit! The running dog (object in motion) will stay in motion until you (outside force) call him to come to you to receive his dog biscuit.



A soccer ball sitting on the ground could stay there for years unless someone comes along and kicks it. Once it is kicked, it will move in a straight line until another force affects it. This first law describes the state of inertia. **Inertia** means that things usually keep on doing what they are doing, whether they are moving or still, until something happens to them. The clown in the picture above illustrates the state of inertia as he juggles some colored balls. The balls will keep on moving over his head as long as the clown keeps them going. As soon as he stops juggling them, the balls will fall.

The Second Law of Motion:

When an object is acted upon by a force, it will either start to move, speed up or slow down, or change direction.

Examples:

When a soccer ball is rolling, grass can slow it down by rubbing against it, exerting **friction**. Or, if the ball hits someone's foot, it might roll faster or change direction. In the illustrations below, the soccer balls and baseball when hit by each person (force), the balls will either start to move, speed up, slow down, or change direction.



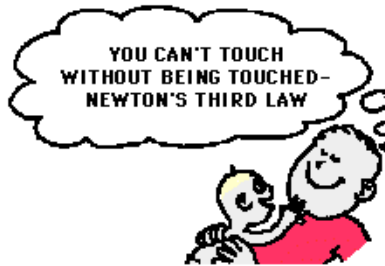
(Please turn over)

The Third Law of Motion:

When a force is applied to an object, the object applies an equal and opposite force.
In other words: For every action, there is an equal and opposite reaction.

Examples:

When you kick a soccer ball, your foot pushes into the ball. You might not notice it, but the ball also pushes back at you before it flies off. Everything you touch touches you back. When your Dad holds your little brother, they are touching each other.



Imagine a rocket is being launched from the earth. Hot gases are pushed out from the bottom of the rocket as the rocket is thrust upward. The force of the gases pushing against the surface of the earth is equal and opposite to the force with which the rocket moves upward. The motion of the rocket can be explained by **Newton's third law, for every action there is an equal and opposite reaction**. In other words, when one object exerts a force on another object, the second object exerts a force of equal strength in the opposite direction on the first object. Likewise, when a skeet shooter fires his shotgun at a clay disc flying through the air, he experiences the recoil upon the shotgun. The "kick" felt by the shooter is the reaction force upon the shotgun, which is equal in magnitude to the force that pushes the pellets.

