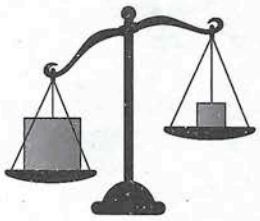
Gravity

Why does a chair rest on the floor instead of floating in the air? The answer is gravity. **Gravity** is the force of attraction (also called "pull") between two objects. Gravity exists among all objects, even objects in space. Without gravity, the moon would spin away from the earth. The word "gravity" comes from the Latin word for "heavy."



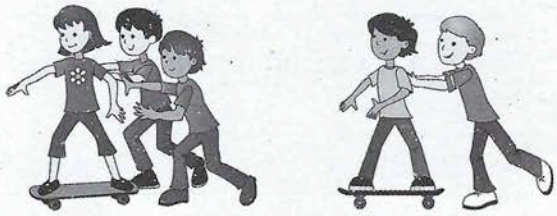
Isaac Newton, who was born in the 1600s and lived into the 1700s, discovered gravity. He found that gravity decreases as the mass of an object decreases and as the distance between objects increases. The heavier an object is, the more gravity it experiences. The farther apart two objects are, the less gravitational pull they have on each other. This explanation of gravity is called **Newton's law of universal gravitation**.

Newton figured out his laws by studying balanced and unbalanced forces. A **balanced force** exists when a force acts on an object but does not change the object's motion. For example, a painting placed on a wall will fall, but if a string is attached to the painting and to a nail in the wall, the force of the string pulling the painting up is equal to the force of gravity pulling the painting down. When a car is driven down a road, the engine forces the car forward, but friction from the tires on the road—along with drag (air resistance)—exerts force in the opposite direction. The car will continue at the same speed in the same direction as long as these opposing forces are balanced.

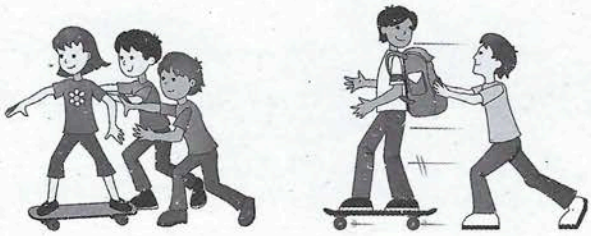
Newton also determined three other laws of physics. The first law, often called **Newton's first law** or the **law of inertia,** explains that an object does not change its position (move) unless it is forced to move. The word "inertia" means idle, not moving, or not able to move. If someone is inert, he or she is not moving. The **law of inertia** states that an object at rest will stay at rest and an object in motion will stay in motion unless something acts on it.

Newton's second law explains how a force acts on an object. The object speeds up in the same direction as the force that hits it. Think about skateboards. If two children with the same mass each ride a skateboard at the same speed, they will go the same distance in the same time.

This will change if people push the children. If one boy is pushed by one person and one girl is pushed by two people, the girl pushed by two people will travel a greater distance in the time it takes the boy to travel a lesser distance.



What happens if a boy wears a heavy backpack and is pushed by one person while a girl holds nothing and is pushed by two people? This time, the girl will travel even farther than the boy can because he is carrying more weight and has thereby been pushed with less force.



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