

# Force & Motion

## Section 4: Newton's Laws of Motion



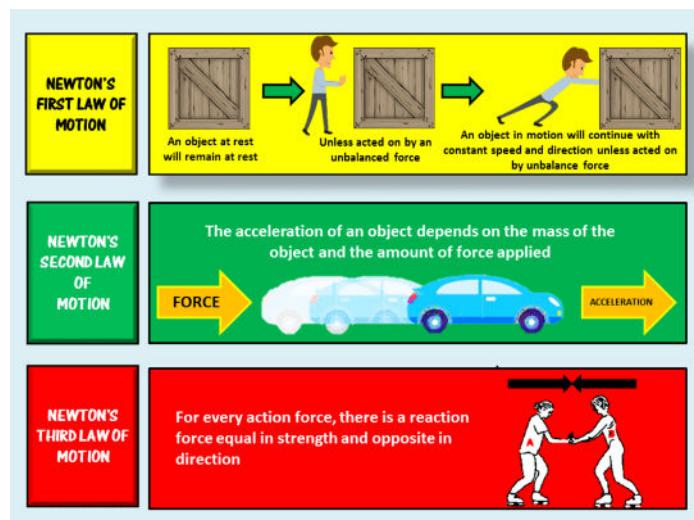
Scientist Sir Isaac Newton established laws of motion that show how forces can change an object in motion. Newton's **first law of motion** states that an object moving at a constant velocity will continue moving until another force acts on it. **Inertia** is the tendency of an object to resist change in its motion. Things in motion tend to stay in motion, while things at rest tend to remain at rest.

For example, when a car travels at a certain speed and collides with a solid object, the car will stop while the passengers continue to move forward until their seatbelts stop them. If that passenger is not wearing a seatbelt, they will be blocked by the next solid object they encounter, which is usually the dashboard or windshield.

Newton's **second law of motion** states that an object accelerates in the same direction as the net force on the object. In other words, a net force acting on an object causes the object to accelerate in the direction of the force. The acceleration is determined by the size of the force and the mass of an object.

Newton's **third law of motion** states that there is an equal and opposite reaction or force for every action or force. A moving object has **momentum**, which is determined by mass and velocity. The momentum of an object doesn't change unless its mass, velocity, or both change. Momentum, however, can be transferred from one object to another. When a pool cue hits a tennis ball, the momentum that the pool cue

loses is equal to the momentum the tennis ball gains. When the tennis ball hits the pool cue, it doesn't move as much since it has more mass and will need more momentum to change position. When balls with the same mass and velocity fall toward each other, they have the same momentum but in opposite directions. When they collide, each would reverse direction and move at the same speed.



### Review:

1. Explain Newton's first law of motion.
2. Define inertia.
3. Explain Newton's third law of motion.