

## Newton's Laws of Motion (Three Different Ways)

**1. An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force.**

This law is often called "the law of inertia".

This means that there is a natural tendency of objects to keep on doing what they're doing. All objects resist changes in their state of motion. In the absence of an unbalanced force, an object in motion will maintain this state of motion.

**2. Acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated) the greater the amount of force needed (to accelerate the object).**

Everyone unconsciously knows the Second Law. Everyone knows that heavier objects require more force to move the same distance as lighter objects.

**3. For every action force there is an equal and opposite re-action force.**

This means that for every force there is a reaction force that is equal in size, but opposite in direction. That is to say that whenever an object pushes another object it gets pushed back in the opposite direction equally hard.

From <http://teachertech.rice.edu/Participants/louviere/Newton/>

## Newton's Laws of Motion from Newton

**1. "Every object persists in a state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it"**

**2. "Force is equal to the change in momentum ( $mV$ ) per change of time. For a constant mass, Force equals mass times acceleration."  $F = m a$**

**3. "For every action, there is an equal and opposite re-action."**

From <http://www.grc.nasa.gov/WWW/K-12/airplane/newton.html>

## Newton's Laws of Motion from College Class Astronomy 161

**1. Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.**

**2. The relationship between an object's mass  $m$ , its acceleration  $a$ , and the applied force  $F$  is  $F = ma$ . Acceleration and force are vectors (as indicated by their symbols being displayed in slant bold font); in this law the direction of the force vector is the same as the direction of the acceleration vector.**

**3. For every action there is an equal and opposite reaction.**

From <http://csep10.phys.utk.edu/astr161/lect/history/newton3laws.html>

**Great Interactive Website for More Depth** <http://hyperphysics.phy-astr.gsu.edu/hbase/newt.html>