# Newton's First Law

Newton's first law of motion is often referred to as the law of inertia. It states that a resting object stays at rest and a moving object stays in motion unless acted on by external forces. This description is derived from the equation F = m * a. If there are no external forces, then F must equal zero. Mass is constant, so if F is zero, then the acceleration also must equal zero. If the acceleration is zero, the velocity of the object does not change. Thus, an object with no velocity will always have no velocity unless acted on by an external force. Similarly, an object with a velocity of 100m/s in a situation with no external forces will always move at 100m/s.

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**A resting object stays at rest without external force**

Fig at Rest Beside Fig acted upon by the Force

If an object is at rest, it will stay at rest until acted on by some external force. A pen sitting on the ground will continue to sit there until some external force moves it from that position. That external force could be from my hand picking it up or someone's foot accidentally kicking it.

**A moving object stays in motion without external force**

Fig in Motion Beside Fig acted upon by the Force

If an object is already in motion, it stays in motion unless an external force stops it. If no external forces are acting on that object, it will continue at the same velocity forever. If there was a never-ending patch of ice that was perfectly frictionless, a person could slide on that ice forever unless an external force stopped them or changed their velocity.