Regents Physics

Dynamics

Newton's 1st Law

APlusPhysics

Objectives

- Define force.
- Define mass and inertia.
- Explain the meaning of Newton's 1st Law.

Newton's 1st Law of Motion

An object at rest will remain at rest,

and an object in motion will remain in motion,

at constant velocity and in a straight line,

unless acted upon by a net force.

(Also known as the law of inertia)

Force

- (A force is a push or pull on an object.)
- A force is the cause of the acceleration of an object.
- Units of force are Newtons (N)
- $1\mathrm{N} = \frac{1\mathrm{kg} \times \mathrm{m}}{\mathrm{s}^2}$
- How much is a Newton?
  - A Newton is roughly equivalent to the weight of a medium-sized apple.

What is a Net Force?

- A net force is the vector sum of all the forces acting on an object.
- If all forces are balanced, there is no net force.
- An unbalanced force is a net force.

What Does It Mean?

- An object will continue in its current state of motion unless an unbalanced force acts upon it.
- Objects at rest will remain at rest unless an unbalanced force acts upon them.
- Objects in motion will remain in motion at a constant velocity unless acted upon by a net force.

Static Equilibrium

- Net force on an object is 0.
- We'll revisit this concept when we explore Newton's 2nd Law of Motion.

Inertia

- Inertia is the tendency of an object to resist a change in velocity.
- Mass actually has two aspects
  - Inertial mass is how hard it is to change an object's velocity.
  - Gravitational mass is how strongly a gravitational field affects a mass.
- For the purposes of basic introductory physics, mass and inertia are synonymous.