

# Newton's First Law of Motion

By

Dane Kurian

## Introduction

Isaac Newton, put forth three laws. The first of these laws, sometimes referred to as the law of inertia is that “an object at rest tends to stay at rest, unless acted upon by an unbalanced force”. This essentially means that an object that is still doesn't want to move, so something else will have to come along and make it move. An example of this would be when you are standing on the subway as the train is stationary, and then it abruptly starts to move, you feel like your body is being pulled backward. The reason for this is that your body is at rest and it doesn't want to start moving, and it attempts to stay at rest.

## Background

The easiest way to understand Newton's first law is that an object that's sitting still sits still because all the forces acting on that object are balanced. So now if the forces somehow become unbalanced, what happens is the object starts moving, and because it's moving it immediately has a displacement, a velocity, and acceleration.

## Equipment List

- Power Macintosh or Windows PC
- Logger Pro
- String or Twine
- Various Loads (they can be anything)
- LabPro or Universal Lab Interface
- 2 ring stands with clamps
- 2 Bi-Directional Force Sensors
- Scale

## Procedure

### Part I Preliminary Experiments

1. Stand the 2 ring stands an equal distance from each other. Make sure that they are fastened to the table so that they do not tip over.
2. Now fasten one bi-directional force sensor to each of the ring stands so that the hooks are downward. Make sure that they are perpendicular to the horizontal.
3. Position this setup at the edge of the table.
4. Attach a string to the mass so that you are now able to suspend it from one of the force sensors.

**Part II The Force Exerted On a Single Sensor**

1. Utilizing a scale measure the mass of your object. Make sure that you record the mass of the object.
2. Now hang your object from one of the force sensors and record the weight of the object. Make sure that you record the weight only after the readings have stabilized.
3. Repeat steps 7 and 8 for each of your objects, making sure each time to record the data.

**Part III The Force Exerted On Two Sensors**

1. Have it so that the object is loosely hanging from the string, giving it the ability to slide back and forth on the string
2. Now attach each of the ends of the string to each of the force sensors, remember to make sure that your force sensors are of the same height or you may inadvertently create torsion on the scale. If this happens the 2 readings will not be equal to each other, however the sum of the two readings will be approximately equal to the weight taken on a single scale.
3. Once you are sure that the mass is hanging in the center of the string record, the readings of each of the sensors
4. Repeat steps 13 through 15 for each of your objects, making sure to record the data each time.
5. When Part II and III are completed fill out the following table.

**Results**

Object #	Mass	Single Sensor Reading	Double: Sensor 1	Double: Sensor 2	Sum of Sensor 1 & 2

**Analysis**

1. What is the Relationship that exists between the single sensor reading and the double sensor reading
2. If the object does not sit exactly in the middle of the string, will the reading from both of the sensors be the same?

3. If the object sits in the middle of the string each force sensor will show you exactly half the weight of the object, if it is not in the middle of the string how do you find out what the weight of the object is?
  
4. When you take the weight of each object from the single sensor and divide by its mass from the scale, what is the approximate number you keep getting? What is the significance of this number?
  
5. What are some sources for error in this experiment?