Atwood’s Machine Mini Lab

**Purpose**: To use force diagrams, Newton’s laws of motion and measurements of mass and acceleration to calculate the tension force in the string of an Atwood’s Machine.

**Equipment**:

* Rotary Motion Sensor
* String
* Weights and hangers

**Procedure**:

1. Place a set number of weights on each hanger. NOTE: make sure the weights are different, but not VASTLY different.
2. Set the string on the biggest wheel of the Rotary motion sensor and move the weights so the more massive one is up top.
3. Start recording Data on the GLX and let the more massive weight fall while the other rises.
4. Find the average linear acceleration for the system during the time of the motion.

**Data**:

Mass 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mass 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Linear Acceleration: \_\_\_\_\_\_\_\_\_\_\_\_

**Force Diagrams for both weights**:

m2

m1

**Calculations**: Use the force diagrams to create an equation for the Net Force on each mass:

 Mass 1 Mass 2

Newton’s 2nd Law tells us that the Net Force on an object is equal to the product of mass and acceleration. With this knowledge, create an equation for the Tension force that each mass experiences from the string.

 Mass 1 Mass 2

Plug your data for the acceleration and the masses into your equations and determine how many Newtons the Tension force was applying to each hanger.

 Mass 1 Mass 2

How do these two Tensions compare? Which of Newton’s Laws would apply to this comparison?

**Theory**: Sometimes it is easier to view a system of objects as one whole object. Because both hangers are connected together, they can be treated as 1 object with the mass of m1+ m2.

Using this idea, what force is trying to speed up the system? What force is trying to slow down the system?

The difference between those is the Net Force for the whole system which would equal (m1+ m2)a.

Create an equation for the acceleration of the system in terms of g, m1 and m2.

**Percent error**: Plug in your 2 masses into the equation create above and compare your theoretical acceleration to your real acceleration from the data.