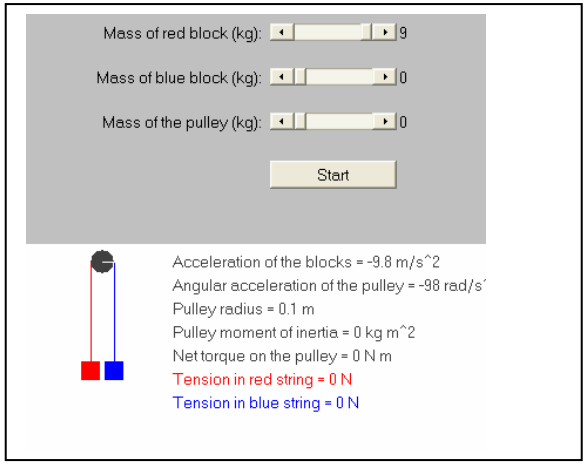
Newton's 2nd Law: Acceleration of a Pulley System
A "Virtual" Exercise

Go to the site http://physics.bu.edu/~duffy/java/Rotation2.html. You will see a box containing a figure identical to the one below. Run the simulation while adjusting the masses of the red and blue blocks in order to examine Newton's Second Law.

According to Newton's 2nd Law, the acceleration of an object is inversely proportional to its total mass and directly proportional to the net force acting on it.



For the first trials, you will keep a constant total mass of 10 kg. By "moving" mass from one side to the other, you will vary the net force.

Experimental Results: Constant Mass

Block Mass, kg		Total Mass, kg	Block Weight, N		Net Force, N	Acceleration, m/s/s
Red	Blue		Red	Blue		
1	9					
2	8					
3	7					
4	6					
5	5					
6	4					
7	3					
8	2					
9	1					

1. Run the simulation using the masses shown in the data table and using a mass of zero for the pulley.
2. Record the acceleration shown in the simulation.
3. Calculate the weights of the blocks. (Use g = 9.8 m/s/s.)
4. The net force will be the difference in the weights (Blue weight – Red weight).
5. Use MS Excel to make a graph of "***Acceleration vs Net Force: Constant Total Mass***."
6. Does the shape of your graph confirm the relationship between acceleration and net force that Newton's Law predicts?

For these next trials, you will keep a constant net force of 9.8 N. By "adding" mass to each side of the pulley, you can maintain the same net force while varying the total mass.

Experimental Results: Constant Net Force

Block Mass, kg		Total Mass, kg	Block Weight, N		Net Force, N	Acceleration, m/s/s
Red	Blue		Red	Blue		
1	0					
2	1					
3	2					
4	3					
5	4					
6	5					
7	6					
8	7					
9	8					

1. Run the simulation using the masses shown in the data table, using a mass of zero for the pulley.
2. Record the acceleration shown in the simulation.
3. Calculate the weights of the blocks. (Use g = 9.8 m/s/s.)
4. The net force will be the difference in the weights (Blue weight – Red weight).
5. Use MS Excel to make a graph of "***Acceleration vs Total Mass: Constant Net Force***."
6. Does the shape of your graph confirm the relationship between acceleration and total mass that Newton's Law predicts?