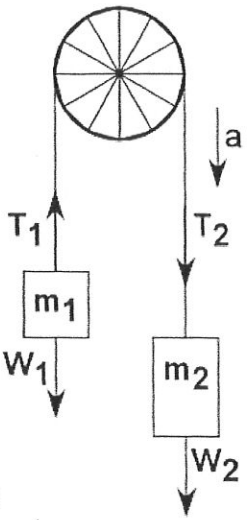
Name: _____ Mod: _____ Date: _____

ATWOOD LAB



Purpose:

1. To verify the derived equation for calculating the acceleration of an Atwood machine.
2. To gain hands-on experience working with forces.

Procedure:

1. Construct an Atwood machine, similar to the diagram shown here, using poles, 90° clamps, and the PASCO smart pulley and kit.
2. Open DataStudio on your computer and use the graph options to configure and display a velocity vs. time (V vs. T) graph for the smart pulley.
3. Use a balance to find the mass of the first holder (m1). Then, find the mass of the second holder (m2) with 1 penny, 2 pennies, … up to 5 pennies. Record all recorded data in your data table.
4. Begin recording data on DataStudio, add the first penny to m2, and release the weight.
5. A line should appear on your graph. Use the options to find the slope of this line. This is your experimental acceleration.
6. Open Interactive Physics and construct a virtual Atwood machine. Set m1 and m2 to the values of your experiment and measure the acceleration of the machine. Record this value as your theoretical acceleration.
7. Continue to add pennies to m2, one add a time, following the order and progression of the data table. Be sure to record the accelerations.
8. After every trial, plug your m1 and m2 values into your virtual weights on Interactive Physics and measure the theoretical accelerations.

Data/Observations:

Trial*	m_1 (g) (holder)	m_2 (g) (holder and pennies)*	Experimental Acceleration (m/s^2)	Theoretical Acceleration (m/s^2)
1				
2				
3				
4				
5				

*Trial number indicates the number of pennies to be placed on the m2 holder.

calc

Interactive Physics

Sample Calculations:

1. Derive the equation for the acceleration of an Atwood machine.
2. For one of your trials, use this equation to calculate the theoretical acceleration. See how your calculated value compares to the DataStudio and Interactive Physics values.
3. Show how your PASCO smart pulley measures acceleration by depicting a V vs. T graph for one of your trials.
4. Show the formula for calculating percent error.

Results: Use the percent error formula (% error = |got-get|/get*100) to find the percent error in acceleration between the experimental data (actual Atwood Machine) and the theoretical data (Interactive Physics). Also, use the formula you derived for acceleration to calculate the acceleration by hand in each trial. Produce a results table showing the theoretical (by hand), Interactive Physics, and experimental (Pasco) values for each trial, as well as the percent error. The hand-calculated and IP values should be the same, but your experimental values may vary due to experimental error.

Conclusion: Analyze your results. State whether or not the % error of the experimental data and theoretical data was high or low, (indicate whether or not your values were close). Also, note any sources of error that may have caused the % error to be high. For example, friction and rotational inertia on the pulley and horizontal swaying of the weights would cause experimental error.