

Constant Acceleration Lab

The objective of this lab is to use a constant force to illustrate the constant acceleration of an object.

When an object changes velocity or direction, an unbalance force is pushing or pulling on that object. The force in this lab will be controlled by gravity.

The acceleration due to the force of gravity is a constant 9.81 m/s^2 . The purists will argue that this number will change at the bottom of the ocean vs. sea level vs. the top of Mt. Everest. True but the amount of change is insignificant and I will not miss a meal worrying about it.

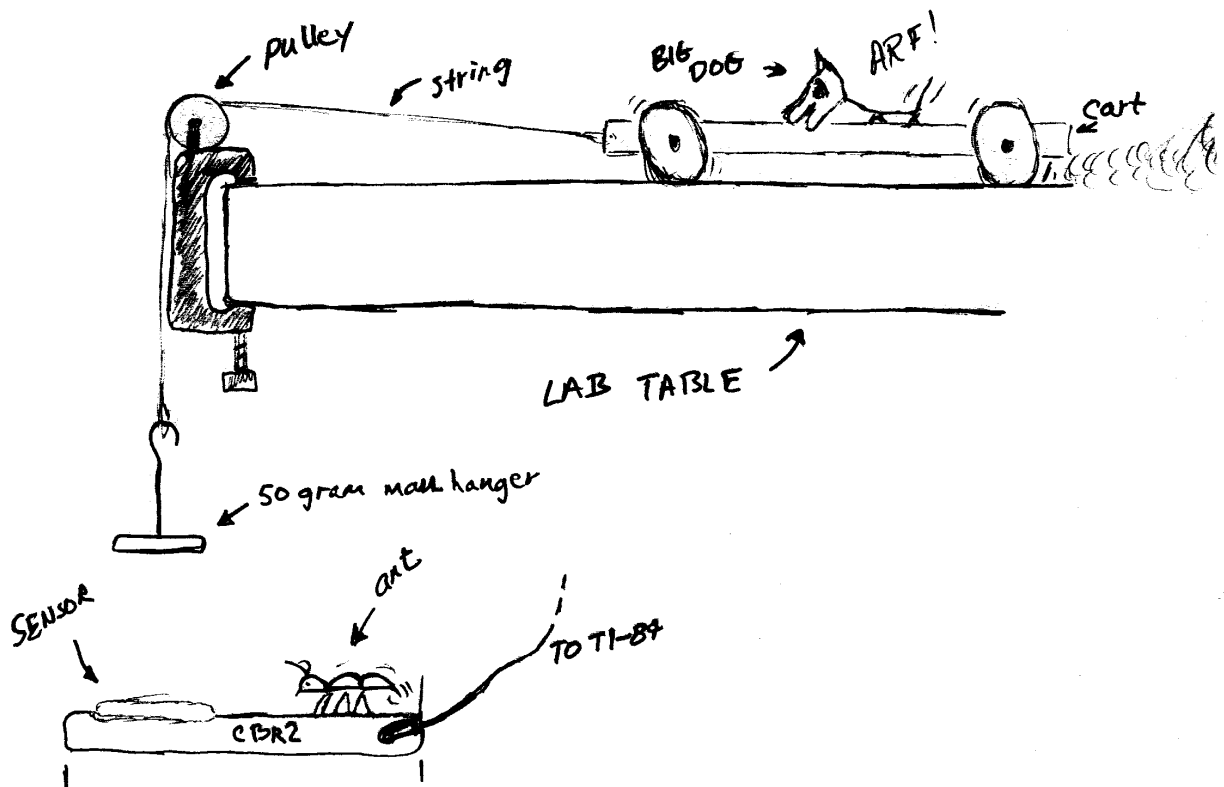
Materials:

blue cart	1.5 m of string	slotted mass holder (50g)
Table pulley TI84	set of 500g masses CBR2	Triple beam balance

Mass the cart and record in your composition book.

Setup:

1. Clamp the table pulley to the table.
2. Attach to string to the cart and the slotted mass holder.
3. With the cart on the table, place the string over the pulley so the mass holder hangs down to the floor.
4. Locate the CBR2 on the floor so the sensor is directly under the mass holder.
5. Connect the CBR2 to the TI84.



Procedures:

1. Place one 500g mass in the cart and record in the data table.
2. Initialize the TI84/CBR2.
3. Move the cart back until the mass holder is just at the pulley. Note the distance indicated on the TI84 and record in the data table. **Note: This will be for $t = 0$ sec.**
4. Release the cart allowing gravity to pull the mass holder down.
Note: Once the mass holder has contacted the CBR2, do not allow the cart to continue and roll off the table.
5. Observe the plot on the TI84. Record the data points for each second of time of the 50 gram mass as it is affected by the mass of the cart.
6. Increase the mass to 1000g and repeat the above steps.

Mass of cart: _____

Data table:

Cart \bar{D}	+500g	+1000g	+500g	+1000g	+500g	+1000g	+500g	+1000g
Time	\bar{A}_x	\bar{A}_x	\bar{A}_v	\bar{A}_v	a	a	p	p
0 sec								
1 sec								
2 sec								
3 sec								
4 sec								
5 sec								

Note: p is the symbol for the momentum of an object. At each second of time, calculate the momentum of the 50 gram mass.

You will notice that the cart stops on the sensor before the recording time is complete. Predict the values for seconds 4 and 5.

Analysis:

1. What are the constants in this lab?
2. What is the variable (that which you change) in this lab?
3. Draw and describe the shape of the $?x$ and $?t$ graph. What equation creates this display?
4. Draw and describe the shape of the v_{avg} and $?t$ graph. What equation creates this display?
5. How does adding mass to the cart affect the momentum of the 50g mass?
6. The length of the CBR2 is 15 cm. If that ant scrambles along at only 0.1 m/s when it climbs onto the CBR2, will it get off the other end before getting squashed?