Name:_____ **PHY 123 Workshop Week 7**
Partner Name:_____

Part I: Minilab

In this minilab you are going to investigate Newton's laws. To do this you will use two force probes connected to the computer. When you push or pull the hooks on the force probes, the force as a function of time is displayed on the computer screen. Each force probe's force reading is shown in a different color plot so you can differentiate between the two probes.

a) For each probe pull the hook and sketch the force you see on the computer. One probe should register a pull as a positive force while the other should register a pull as a negative force (this is an arbitrary sign choice). Check that this is the case.

b) Repeat part a) for the case where the hook is pushed in instead.

Make sure you understand how the force probes work before moving on. Attach the hooks on each force probe to one another.

c) Make a free-body diagram for each force probe if the probes are being pulled apart. Use the predetermined + and – settings in the software to define your positive and negative force directions.

d) Predict what you will see on the screen if you pull the probes apart. Explain how you made this prediction.

e) Now pull the probes apart and sketch the force plot you actually see. Does your sketch agree with your prediction?

f) Predict what you will see on the screen if you place both probes on the desk, and use one probe to pull the other one along the desk at a constant velocity. Draw a free-body diagram for each probe and sketch your prediction of the force plot.

g) Test your prediction from part f) by placing both probes on the desk, and using one probe to pull the other one along the desk at a constant velocity. Sketch the results. Do the results agree with your part prediction in part f)?

As a last test you will hang one probe from the other and record the results.

h) Draw a free-body diagram for each probe in the case that one probe is hanging from the other.

i) Based on this diagram predict what the force plot will look like. Make a sketch.

j) Compare your sketch in i) to the actual force plot made when you hang one probe from the other. Do the results agree with your part prediction in part i)? If not, why not?

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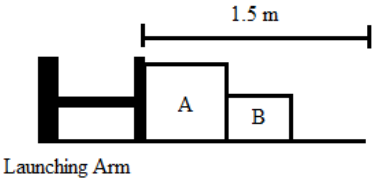
Part II: Collaborative Problem Solving

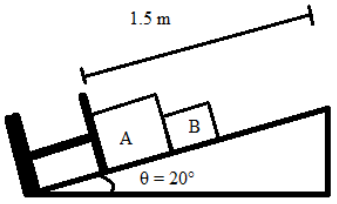
Two ice blocks, A and B, start from rest and are pushed out of a chute in an ice factory by a mechanical launching arm that exerts a constant 175 N force. The mass of block A is 25 kg and block B is 15 kg. Consider the motion while the mechanical arm is in contact with the ice. For each of the four situations (A, B, C, D) listed below, do the following:



1. Make a free-body diagram for each block of ice separately, and a free-body diagram for a system that treats them as one object.
2. Determine the acceleration of block A.
3. Determine the magnitude of the force exerted by block A on block B.
4. Determine how long it will take for block A to completely exit the 1.5 m chute.

A. First assume that the surface is level and the friction between the ice and the surface is negligible.

B. Next assume that the chute makes a 20° angle with the horizontal.



C. Then, relax the assumption that friction is negligible, and let the coefficient of friction between the ice and chute be $\mu_k = 0.1$. First assume again that the chute is level.

D. Finally, assume that the chute makes a 20° angle with the horizontal and that the coefficient of friction between the ice and chute be $\mu_k = 0.1$. Does your answer make sense?