Move Your Mass Preliminary Lab

Physics

For the final lab, you will determine how to set up a dynamics cart (pulled by a hanging mass over a pulley) so that it can "haul" a particular load at a specified constant acceleration up a ramp with a known angle. In order to do that, you need to first find the effective coefficient of friction of the cart. For this preliminary lab, your goal is to find the coefficient of friction and then use that value to set up an equation that will allow you to determine the proper amount of hanging mass in order to achieve the proper acceleration for any amount of towed mass at any track angle.

1. Set up a dynamics cart, load bars, a track, string, a pulley, and a hanging mass. Make sure that you know the angle of the track and that you can control the movement of the cart as it reaches the end of the track. Experiment with different amounts of hanging mass until you have a good feel for how changing the mass will affect the motion of the cart.

2. With your group, make free-body diagrams of the cart and the hanging mass. Verify your drawings with the teacher. *Make sure you have accurate diagrams in your notes.*

3. Using your drawings and the principles of Newton's second law, discuss with your group how you can use this system to accurately calculate the force of friction that is opposing the motion of your cart – and how you can then find the coefficient of friction. You can use motion sensors, force sensors, or both if they would be helpful. *In your notes, describe what you will do and write the equations you will need. Make sure to differentiate between similar variables (e.g., the mass of the hanging mass, the mass of the cart, and the mass of the load should be distinguishable in your equations).* **Verify your equations before moving to step 4!**

4. After verifying your idea in step 3, make the measurements and calculations necessary to determine the coefficient of friction of the cart. Show your work to the teacher. *Make sure you document your calculations, showing all your work, in your notes.*