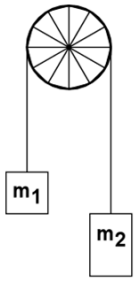
Physics 122: Acceleration of Multiple Masses

Objective: To learn how multiple masses connected by a string accelerate and what role friction plays. Use Chapter 10.2 (p. 476; also Ch. 6 p. 256) of your text as a guide for information and calculations.

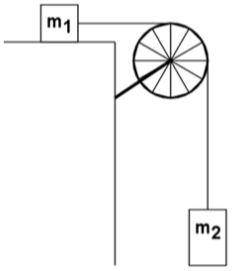
Materials: Wiimote, string, masses, PASCO cart, pulley, block of wood, paper towel.

Procedure Part I:



1. Connect the Wiimote to the PC (click on the CPU Devices shortcut on the desktop then click add a device)
2. Start *Wii Physics* and change the collection mode to measure the acceleration in the Wiimote's y-direction.
3. Right click on the blank Wii Physics screen and select *Show Point Values*.
4. Set up the wiimote and mass to resemble the image to the right so m_1 (wiimote) moves up and m_2 moves down.
5. Release m_2 and record the acceleration of the wiimote with Wii Physics.
6. *Note*: If the acceleration of the wiimote equals gravity then the program will show a y-axis acceleration of zero. The actual acceleration of the wiimote is 1.00 – program value.
7. Replace m_2 with two different masses and repeat.

Procedure Part II:



1. Create a setup similar to the image on the right. Your object of focus will be m_1. Use about 2m of string.
2. Record the mass of everything you will use except the string (even record the mass of m_2 as it may be different from what it says).
3. Start with the paper towel. Place the wood on the towel, attach the wiimote to the wood and attach one end of the string to the hook in the wood and the other to m_2. Make the travel distance as far as possible.
4. *Ensure the wiimote is parallel to the table (acceleration in y-axis should be very close to zero)*. Start collecting data.
5. Allow m_2 to fall – catch the wood and wiimote before it leaves the table!
6. Record the acceleration from Wii Physics (- look for a horizontal line section or take an average).
7. Calculate the force of friction (use Ch. 10 as a guide).
8. Repeat for the cart (with a silver mass on it) and the wood.

Analysis Questions

1. In part I, can the acceleration of the wiimote ever get larger than that of gravity? Explain.
2. For each mass, m_2, in Part I calculate what the acceleration of the wiimote should work out to be according to the formulas in your textbook.
    a. If there is a difference what could account for it?
3. Show the calculation for determining the force of friction for each run in Part II.

Summarize your data and calculations in a table.