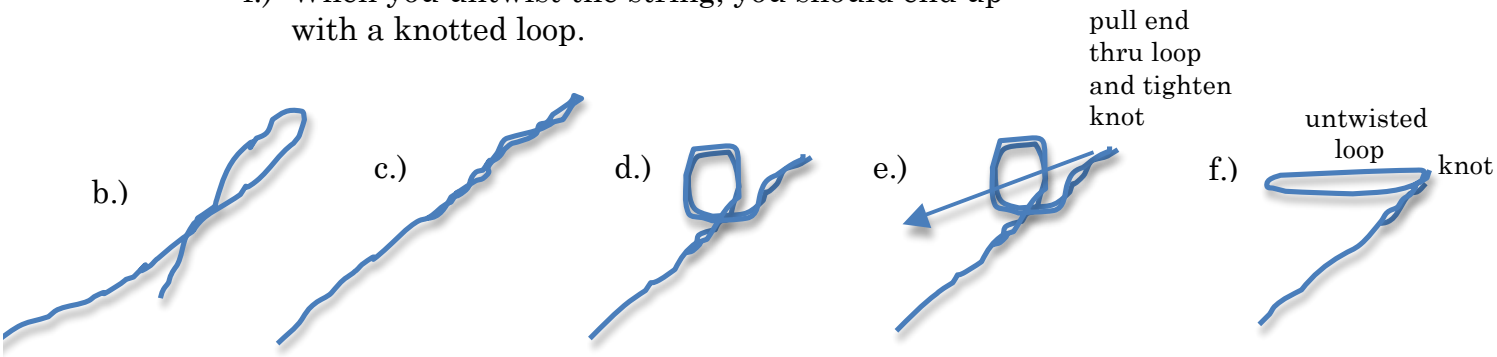
Hopefully helpful hints for doing the Newton's Second Laws (Double Atwood) lab.

1.) Everything you will need to do the lab is found in the plastic boxes on the lab tables.

2.) If your plastic box doesn't have a long string in it, you will need to cut an approximately 1.4 meter long string using the string and scissors found at the front table. When done, you will need to tie a non-slip loop in both ends. To do this, I would suggest the following:

a.) Cut the string to length.
b.) Make an untied loop in one end (see marvelous sketch below).
c.) Pull the loop tight so it looks like a single piece of string (you might want to twist the string to do this).
d.) Make a loop in the apparently single thread.
e.) Thread the end through the loop and pull tight.
f.) When you untwist the string, you should end up with a knotted loop.



3.) On the computer's desktop, I've placed a file titled "velocity versus time graph." That is the program you will be running. Be sure your smart pulley is plugged into the Logger Pro interface next to the computer before you open that program. Otherwise, the program won't appropriately register the presence of the smart pulley. Also, when the program opens a large window titled "Sensor Confirmation" will present itself. Be sure to click "OK" at the bottom of that window. If you don't, the program will not run properly.

4.) Look at the lab set-up. Notice that once everything is in position, you will have a weight at each end of the string with one weight on the ground (if the string is long enough). This should be designated m_1. The second mass, m_2, will be suspended from a hanging pulley. Once in this position, you are ready to take data.

5.) Here are some hints that should make the run go smoothly.

a.) Don't hold the string, hold the pulley. If you hold the string you will almost certainly displace its line so that m_1 at take-off will swings as it moves upward. This will produce a wavy velocity graph, which is not something you want.

b.) It is important that the string be in the vertical. To see if it is, rotate the pulley just slightly so that m_1 barely lifts up off the floor. If the string is in the vertical, m_1 won't swing as this happens. If it does swing, you have to reposition m_1 until it doesn't (again, you don't want m_1 swinging as it proceeds upward).

c.) Before you let the system freefall, you must click on the green START tab at the top of the computer screen. That will engage the data taking routine. Once it turns red (and says "STOP"), you can let fly.

d.) At the end of the run, you MUST PHYSICALLY STOP m_1 when it gets up close to the pulley. If you do not, it will slingshot up and over the pulley and, in all probability, kill the poor soul standing in the group next to yours. Even more horrifying, it will damage my equipment. Don't allow it to happen!

e.) You will end up with a *velocity versus time* graph on the computer. If the entire line is linear, then find and click on the REGRESSION LINE icon found at the top of the window. If the graph is not linear, select the linear part by highlighting it, then click on the Regression Line icon. In either case, the regression line will come with a box inside which will be found the SLOPE OF THE REGRESSION LINE. Assuming the regression line and the actual graph match up well, the slope of the regression line will be the same as the slope of the actual *velocity versus time* graph. This is the ACCELERATION of the system.

5.) I did runs with 100 grams (not including the mass of the pulley) and 120 grams attached to the pulley. My acceleration values were 1.92 m/s/s and 2.89 m/s/s respectively. That gave me a 6% and 5% deviation from what the theory predicted (you will do the theoretical side in the calculations), again respectively. Your values will be some different as you will probably not being using the same pulley I used, but in any case the point is that if you are careful, this experiment should match up nicely with the theoretical side of the problem.

6.) If you have questions or are confused, ask me. I'll give you a lollipop if you can come up with a question about the lab for which I don't have an answer.