Physics 4A

PLC Activity #15: Waves

To get credit for this activity, you must show your answers to a PLC tutor and have them initial the sign-out sheet before 4:00 pm on Tuesday.

Show all of your work for each question.

Part 1: Waves Physlets and Conceptual Questions

1) Go to [http://www.cabrillo.edu/~jmccullough/physlets/index.html](http://www.cabrillo.edu/~jmccullough/physlets/index.html). Click on Physlets Waves Problem 1 and answer the following:

What is the speed of the wave shown in the animation?

2) Go to [http://www.cabrillo.edu/~jmccullough/physlets/index.html](http://www.cabrillo.edu/~jmccullough/physlets/index.html). Click on Physlets Waves Problem 5 and answer the following:

What is the tension in the second string if the tension in the first string is 500 N?

3) Strings A and B have identical lengths and linear densities, but string B is under greater tension that string A. The figure below shows four situations (a) through (d) in which standing waves patterns exist on two strings. In which situations is there a possibility that strings A and B are oscillating at the same frequency? Explain your reasoning.

![Diagram of strings A and B in situations (a) through (d)]
Part 2: Standing Waves Experiment

- Attach one end of the cord to the Mechanical Wave Driver and pass the other end over a pulley attached to the end of the lab table. Attach 310 g (including the mass of the hanger) to the end of the cord.

- Attach the Mechanical Wave Driver to the function generator and drive the cord using a sine wave.

- Vary the frequency of the function generator until you produce a standing wave at the cord’s fundamental frequency (or first harmonic).

- Record the frequency of the function generator and hence the frequency of the wave. Measure the wavelength of the wave. From the frequency and wavelength, calculate the wave speed.

- Increase the frequency and produce standing waves at each of the higher harmonic frequencies (n = 2, 3, 4, …). Calculate the wave speed at each of these frequencies. **You should be able to get to at least the 8th harmonic.**

4) *How well do your wave speeds compare at the different frequencies?*

5) *Calculate the average and the standard deviation of the wave speed from your values.*

6) *From your average wave speed and the tension in the cord, calculate the linear mass density of the cord in kg/m.*