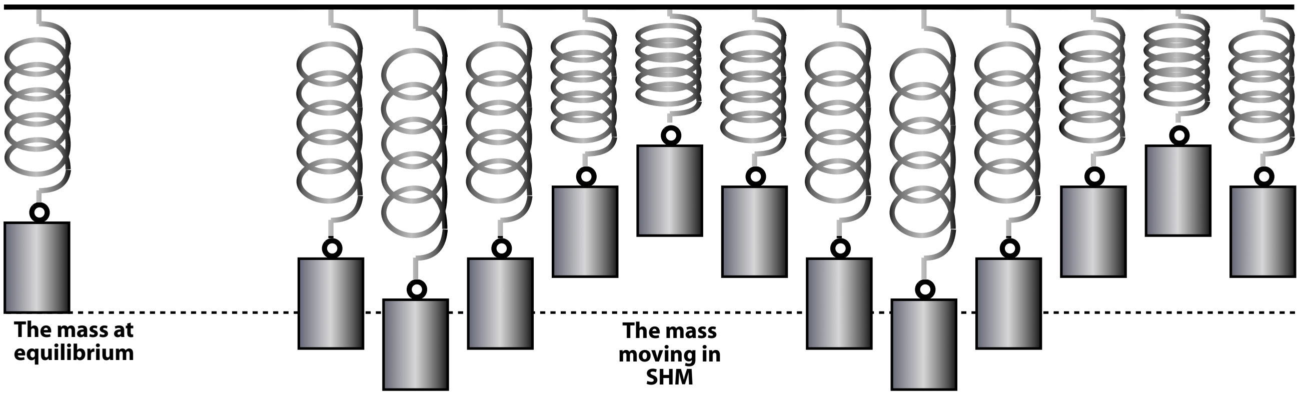
PhyzLab Springboard: Springs and Swings



1. a. Label the amplitude and mark off one complete cycle of the oscillator's motion as shown above.

b. If 1.0 cm on the picture represents 13 cm in reality, what is the amplitude of this oscillator?

c. The period represents the ______________________________________ for one complete cycle of motion. If each picture were taken 0.15 s after the last one, what would the period of this oscillator be?

2. a. Given a stopwatch, how can you determine the period of the spring-mass oscillator in the front of the room?

b. Reaction time introduces a significant error if you decide on a procedure like starting the stopwatch when the weight reaches the bottom of the motion and stopping it when it returns to the bottom of its motion. How can this error be "diluted"?

c. Record the period of the spring-mass oscillator. $T \approx$ ______________________

d. Arrange the spring-mass oscillator so that it has a period of 1.0 s.

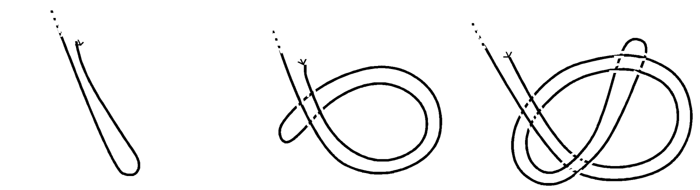
i. When the period was too short, we

ii. When the period was too long, we

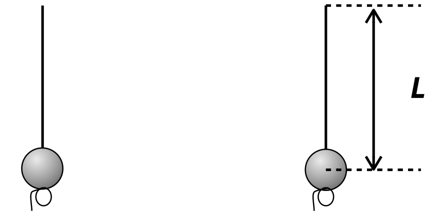
e. Describe the 1.00 s oscillator.

3. a. Obtain a drilled ball and a length of string. Construct a pendulum with the specific period assigned to your group as shown on the table below. ***Keep your pendulum's swings small!***

Attach a drilled ball to a string (if necessary)



Double one end of the string back on itself for a few centimeters. **Loop the doubled section.** **Thread the end through the loop; pull to make a loose knot.**



Thread the drilled ball onto the unknotted end of the string. Suspend the ball as a pendulum.

The length of the pendulum is measured from the point of suspension to the center of the ball.

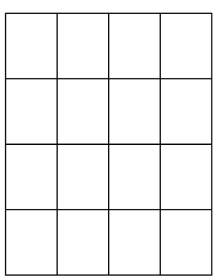
b. Once you have a winning design, share your design information with other groups and record their information on the data table below.

Group	Period T (s)	Length (cm)
A	0.50	
B	0.75	
C	1.00	
D	1.25	
E	1.50	
F	1.75	
G	2.00	
H	2.25	

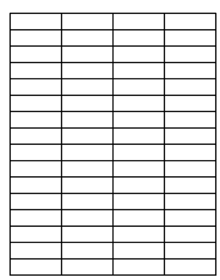
c. Plot the data on a sheet of graph paper. The title of your plot is *Period vs. Length*. Given that title, which quantity is the vertical axis and which is horizontal?

d. On the grids below, complete and plot the data sets given. One represents $y = x$, one represents $y = x^2$, and the other represents $y = \sqrt{x}$. Make lines (straight or curved) of best fit. Notice how each line is different from the other two.

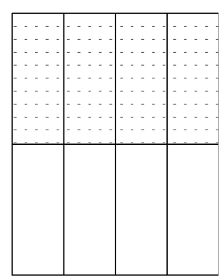
x	y=x
0	0
1	1
2	2
3	3
4	4



x	$y=x^2$
0	0
1	
2	4
3	
4	



x	$y=\sqrt{x}$
0	
1	
2	
3	
4	2



e. Compare the lines above to your plot of period vs. length. Which statement best describes the relationship between the period of a pendulum and its length?

___$T \propto L$ ___$T \propto L^2$ ___$T \propto \sqrt{L}$

f. Is your finding consistent with the equation for the period of a pendulum ($T = 2\pi\sqrt{(L/g)}$? Explain.