HARMONIC MOTION - PENDULUM

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Name Period

PROCEDURE:

You will make 3 runs for each of 6 different combinations of mass, length, and angle.

0. Make a table with six columns and the following headings: Trial, length (m), time (s), period (s), g (m/s^2), and % error. Leave four rows for each trial under 'time'. The first three are for the three runs you will make and the last row is for the average of the three.
1. Find the mass of a metal ball and RECORD. Thread at least 2.5 m of string through it.
2. Secure the string to the 2 outer clamps, making sure the metal plates are actually holding the string against the longer plate. The string should NOT be wrapped around the screw.
3. Adjust the length of the string until it is approximately 0.25 meters from the center of the mass to the point where the string goes under the clamp plate.
4. Measure this distance to the nearest 0.001 meter and RECORD.
5. Pull the mass back about 1 cm for each 10 centimeters of string length.
6. Let go of the mass. After a few oscillations, and when it is at maximum displacement, start the stop watch and count "zero".
7. Each time the mass returns to the starting point (one cycle or complete oscillation), count again.
8. When the count reaches 10, stop the watch. Read this value to the nearest 0.01 second and RECORD.
9. Make two more runs at this mass, length, and angle. RECORD the times.
10. Repeat steps 1 to 9 for each of the 5 remaining trials on the data table.
11. This is a summary of the 6 trials:

	mass	length	pull back	**or**	angle
1)	m_1	0.25 m	2.5 cm	or	5 degrees
2)	m_1	0.50 m	5 cm	or	5 degrees
3)	m_1	1.00 m	10 cm	or	5 degrees
4)	m_1	1.00 m			**90 degrees**
5)	m_1	____ m	1 cm per 0.10 meter length		
6)	$\mathbf{m_2}$	1.00 m	10 cm	or	5 degrees

CALCULATIONS:

12. Calculate the experimental period for each of the six pendulums tested.
13. Plot a graph using the periods as abscissa (x-axis) and the lengths as ordinate (y-axis). Make sure you include the 'zero length' pendulum. Plot the theoretical values on the graph, also. Since the graph is not linear, do a quadratic curve fit and find the coefficients.
14. Using the pendulum equation, $T = 2\pi \text{ sqrt } (L/g)$, determine the experimental value for gravity. Assume local gravity is 9.80 m/s^2. What does the value of your coefficient for the squared term mean?
15. Calculate the relative (percent) error of your experimental gravity values.