Drop Bounce Lab

Problem:

What is the relationship between the height from which a ball is dropped and the height to which it bounces?

Materials:

"Superball" or other balls, wall made of cinder blocks or bricks, (meter stick - optional)

Procedure:

1. The experiment should be done near a cinder block (or brick) wall so that the distances can be estimated to the nearest fourth (1/4, 1/2, 3/4, 1) of a cinder block. Some time should be spent in the beginning to practice estimating distances this way.
2. Divide the activities so that one student drops the ball, one student watches the bounce and estimates the height to which it bounces, and one student records the data.
3. Drop a superball from various heights. The height to which the ball bounces is to be estimated as carefully as possible. Both the height of drop and the height of bounce should be recorded in data table A.
4. Drop the ball at least two times from each height with the average of the bounce heights used asthe final measurement. If there is too much variation in these two measurements, take a third measurement.
5. Drop the ball from at least six different heights beginning at about two blocks. Increase the height of drop by at least one block at a time until six or more drops have been completed.
6. Care must be taken in doing the estimations. Drop the ball from the line between cinder blocks/bricks to make the measurements more accurate. Use the same point on the ball (top) or (bottom) when judging both the height of the drop and the height of the bounce.

Data Table A: Drop Height and Bounce Height

	Drop Height	Bounce Height	Bounce Height	Bounce Height	Average of Bounce Ht.
Trial 1					
Trial 2					
Trial 3					
Trial 4					
Trial 5					
Trial 6					

7. Draw a graph of bounce height Vs drop height.

8. Draw a best fit line for the data points. Note: This is NOT a line drawn to connect each point. It is a line which best shows the relationship involved - in this case a straight line.
9. Compute the slope of the best fit line. Note: This is NOT the slope between the first and last data points.
10. Write the equation for the graph using the slope-intercept form ($y = mx + b$). The line of the graph may not go through the origin as the bottom cinder block may be elevated above the floor.
11. Use the graph to predict the height of the bounce for a ball dropped half way between two drop heights. This is called interpolation. Record your prediction in data table B.
12. Use your graph to predict the height of the bounce for a ball dropped from twenty or thirty bricks high. This is called extrapolation. Record your prediction in data table B.
13. Test the predictions by dropping the ball from the chosen heights and measuring the bounce. Compare your predictions with the results from testing. Check with other groups and see if their results are similar to yours.

Data Table B: Interpolation and Extrapolation Predictions

	Prediction	**Test Results**	**Difference**	**% Error**
Value between data points				
Value beyond data points				

Summing Up:

1. Were your measurements that you took during the lab precise? Were they accurate? What's the difference? Describe how your measurements were or were not precise or accurate.

2. After reading over the information on sources of error from handout H012, identify all sources of error for the **Drop Bounce Lab**. List each and label it as one of the three types of error given in the handout. Then explain how each of the sources of error in the lab could be minimized

3. Identify the dependent and independent variables in this lab. Explain what the rule is for graphing independent versus dependent variables.

4. What happens to the bounce height as the drop height increases? What relationship does this suggest?

5. Calculate the bounce height for a 3.5 meter drop. First convert your units of brick/blocks to meters. (Show your conversion process)

6. How does your answer for the above compare with that of other groups? Is it larger, smaller the same?

7. If there is a difference, explain in detail what you believe accounts for the difference.

8. After you graphed your data you were asked to interpolate and extrapolate information from your graph. What do you conclude about the accuracy of information found from a graph by interpolating between data points and extrapolating beyond them? Explain your answer.