Lab 10: Gravity, Part One

Thanks to your legendary skill at designing clown launchers, you have recently been hired by a famous Hollywood movie studio to design some special effects. They are going to film a giant meteor crashing into the Earth, but in order to make it look realistic, they have to know an accurate value of the acceleration due to gravity.

For most physics problems, we sometimes use 9.8 or 10 m/s^2 for our *g* value. This is an approximation. The actual value of *g* can vary depending on your global latitude, altitude, and the geography of the area. For this stunt, you will need to be able to determine *g* in several different filming locations, and to alter the safety nets and wires accordingly. In this lab, you've been given the task of measuring *g* in your lab room in the physics building well enough that you could tell if *g* changed by 1 percent or less.

Question:

What is *g* in this room?
How precise is this figure?

This week will be devoted to data-taking. Design an appropriate experiment to measure *g* and determine how well you can measure this figure. Next week you will pool your data together with the rest of the class.

I. Introduction — 5 min — Whole class

A group of students has decided to measure the speed of a battery powered toy car. It takes the car an average of 6.34 seconds to travel 1 meter, so they report a speed of 15.8 cm/sec. Another group measures the speed of the same car to be 14.6 cm/sec. Do the results of these two groups agree or disagree? (Hint: Use your experience from lab to estimate the range of each group's uncertainty.)

II. Brainstorm and plan — 15 min — Groups of 4

III. Carry out the experiment — 80 min — Groups of 4

IV. Evaluate your experiment — 20 min — Groups of 4

Next week, you will combine your data with the rest of the class's results to do a comprehensive analysis. Don't submit a lab report today.

MAJOR GOALS:

- *Be able to estimate the uncertainty in data that you are not actually taking, based on your experience with similar experiments. Use that knowledge to compare experimental methods without implementing them.*
- *Identify the kind of uncertainty that can be minimized with experimental design or technique, and minimize it.*
- *Determine the uncertainty in a calculated result based on the uncertainty in experimental data.*

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