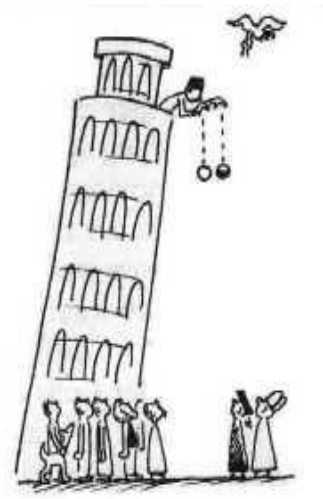
Background



The vector quantity 9.8 m/s^2 [down] occurs so frequently in the study of motion that it is given the symbol **g**. It was Galileo Galilei who first proved that, if we ignore the effects of air resistance, the acceleration of freely-falling objects is constant. He proved this experimentally by measuring the acceleration of metal balls rolling down a ramp. (Note: Galileo could not measure vertical acceleration because he had no way of measuring short periods of time accurately. So, his famous Leaning Tower of Pisa experiment probably never occurred.) Galileo found that, for a constant slope of the ramp, the acceleration was constant – it did not depend on the mass of the metal ball. Numerous methods have been developed since that have been used by scientists throughout the world to accurately determine a value for **g**. For example, at the International Bureau of Weights and Measures in France, experiments are performed in a vacuum chamber in which an object is launched upwards using an elastic. The object has a system of mirrors at its top and bottom that reflect laser beams used to measure the time of flight. The magnitude of **g** obtained using this technique is 9.809 260 m/s^2. Galileo would have been pleased!

Task

Your task is to measure the magnitude of **g** using a device of your own construction (i.e. Atwood machine, Fletcher's trolley, pendulum, ...).

Equipment & Materials

Many different materials can be used for this task. Keep it simple, cheap, and safe.

Procedure

1. Working in groups of 2-3 decide which device you will build.
2. Prepare a summary of your design for approval by your teacher. In your summary, describe in detail:
   (a) the physics principles/formulas that will be used, and
   (b) the variables that will be measured/calculated, including their units.
3. Construct the device, making note of any design changes or difficulties.
4. Use the device to determine the value of g. Multiple tests should be performed and an average calculated. If necessary, video analysis may be used to more accurately measure time.
5. Prepare a formal lab report that includes an introduction. Omit the hypothesis.

Submission

①	Working Device (1/group)	/10	
②	Lab Report (1/person)		
	• Introduction	/5	{explains the physics/formulas}
	• Question	/1	{What is the value of "g" in the County?}
	• Materials	/2	{list of materials/equipment}
	• Method	/3	{detailed, numbered steps, ...}
	• Observations	/3	{data charts, several trials & averages, % error}
	• Sample Calculations	/4	{g, % error, ...}
	• Conclusion	/1	{answer the question}
	• Analysis	/6	{discussion of two major sources of error, their impact, & ways to minimize/eliminate}
	• Spelling/Grammar/Form		{neat, organized, pen, ..., -½ for each mistake}
	TOTAL	/35	