

Off-the-Wall question #4: You would like to experimentally determine the acceleration of gravity. How many experimental procedures can you generate to do that? For each, state the physics principle you will be exploiting, the lab procedure, the equipment needed and the data to be taken (not necessarily in that order).

Note that any relationship you can think of that has a “g” in it can be turned a lab. For instance:

--Using an incline plane and Newton’s Second Law:

Use a meter stick and a stop watch to time how long it takes a cart to accelerate from rest a given distance down an incline. Measure the angle of the incline. Using kinematics, determine the cart’s acceleration. With the acceleration, use Newton’s Second Law to sum the forces along the line of motion. Assuming there is no frictional effects, the component of gravity along the line of motion will be the only force accelerating the cart down the incline. That expression will have a “g” in it, which means this approach will allow you to experimentally calculate “g.”

--Using kinematics:

Use a meter stick and stop watch to measure the time required for an object to free fall from rest a given distant. Use kinematics to determine the object’s acceleration, which will be the acceleration of gravity.

--Using a pendulum:

Set up a pendulum. Measure it’s pendulum length and its period of oscillation. The square of the period will be related to the inverse of the acceleration of gravity.

--Using a spring;

Determine a spring’s spring constant. Position the spring in the vertical. With the spring compressed a measured distance, use it to shoot a ball into the air. Use a meter stick to measure the maximum height of flight. With the potential energy function of gravity including “g,” use the conservation of energy to determine the acceleration of gravity “g.”

