

**Mississippi State University**  
**Department of Physics and Astronomy**  
**PH 2223 Lab**  
Computer Assisted Measurement of 'g'

What are we measuring today?

What are its units?

So what physical quantity does this represent? (Force, energy, position, ..., what?)

Familiarize yourself with *Equations 12.3, 12.4* (P.388; Sears and Zemansky's University Physics, Ed.12) and *Equations 2.12* (P.49; Sears and Zemansky's University Physics, Ed.12)

Now let us try to understand the theory.

Look at *Example. 12.2* (P.386; Sears and Zemansky's University Physics, Ed.12) and appreciate it.

Let us do a small activity. Pull out your calculators. Replace the ball of mass 0.5kg with a ball of mass  $5.9736 \times 10^{24}$ kg. Then calculate the acceleration that the smaller ball with mass 0.01kg has when it is at a distance of 6371000m from the ball of mass  $5.9736 \times 10^{24}$ kg. Repeat this activity by replacing the 0.01kg ball with a 1kg ball. Now, what is the acceleration of the 1kg ball at a distance of 6371000m from the ball of mass  $5.9736 \times 10^{24}$ kg? Does this value ring something in your head?! Remember even the huge ball of mass  $5.9736 \times 10^{24}$ kg will have some acceleration. Will the acceleration of the huge ball of mass  $5.9736 \times 10^{24}$ kg be larger or smaller than the acceleration of the 0.01kg/ 1kg ball? What do you think the numbers " $5.9736 \times 10^{24}$ kg" and "6371000m" represent?

Now let us do another activity to appreciate the procedure we will be followed in this experiment.

Imagine you are walking on a subway platform and you see people (who are standing stationary) passing next to you. Let us assume that the people are vertical lines (for simplicity, haven't you heard the spherical chicken joke?). There is a line of people standing on the platform and you approximate the spacing in between them to be 1m and the number of people standing in the line is 100. You have to get to the other end of the platform in 20 seconds otherwise you miss your train, so you begin running. How many people will you see go past you per second. Can you calculate your velocity? Are you able to link this to the experiment we will be doing?

Challenging:

Now suppose you start with some initial velocity and start accelerating towards the other end of the platform. You see 2<sup>nd</sup> person after 1s and the 10<sup>th</sup> person after 3s. (The spacing in between them is still 1m and there are 100 of them standing next to each other and you start accelerating from a meter behind person-1). What was your velocity and acceleration? Will you be able to catch the train which leaves in 10s? If not, then what should have been your acceleration with the same initial velocity?