SCIENCE9

Determining g and distance Name ____________________

We are now going to determine the value of ‘g’ (acceleration due to gravity) using experimentation.

Set-up your motion detector probe (using the clamp or other secure method) so that it is facing downward towards the floor from the lab bench. Get your dropping object (a basketball, non-valuable book or other object). In Logger Pro, click on New. In the Data Collection option, set the probe to collect data for 2 seconds, and set the number of samples per second to 30.

Place the dropping object about .5m from the probe. Once data collection has begun, let the dropping object free fall to the ground (if it is valuable, you may want to catch it before it hits the ground).

If you are satisfied with the results, calculate the acceleration due to gravity (using the velocity /time data) by entering the data into the following formula:

$$a = g = \frac{v_f - v_i}{t}$$

t = the total time of the drop. V_f = final velocity; V_i = should be zero (starts at rest).

Print out BOTH the Data Table and the Graph (print the Graph in Landscape mode). make sure your FULL NAME appears in the footer!

Do three different drops and calculate ‘g’ for each. Record your results in the data table (following page).

Determining g and distance Name ______________________________

DATA TABLE

V_i = initial velocity (from previous data point)
V_f = final velocity (from data table or graph)
Delta V = $V_f - V_i$

$$g = \frac{\Delta v}{t}$$

Run	**Time (s)**	$\mathbf{V_i}$	$\mathbf{V_f}$	Δv	**g (calculated)**
1		0 m/s			
2		0 m/s			
3		0 m/s			
Avg					

SCIENCE9

Determining g and distance

Name ________________________________

All falling objects on Earth are accelerated towards the center of the Earth at 9.8 m/sec^2. Using the following formulas, calculate the speed of the object when it hit the Earth (ignoring air resistance), and calculate the height at which the object was dropped from.

Formula to calculate speed of a falling object:

$$s = at,$$

where s = speed, a = acceleration (in m/s^2), and t = time (in seconds). For falling objects, you can substitute the a for g (the acceleration due to gravity, which is 9.8m/s^2).

To calculate the height, use the following formula:

$$d = \frac{1}{2}at^2,$$

where d = distance (in meters), a = acceleration (again, 9.8 m/s^2), and t = time (seconds). Below is a sample problem:

A ball is dropped from a building and takes 2.77 seconds to hit the Earth. How fast was the ball moving when it hit the Earth, and how high was it released from?

$s = at$ = (9.8m/s^2)(2.77s) = 27.146 = $\boxed{27\text{m/s}}$

$d = \frac{1}{2}at^2$ = (.5)(9.8m/s^2)(2.77s)^2 = 37.59721 = $\boxed{38\text{m}}$

Note that the answer has two significant figures. The .5 in the equation above does not limit the number of sig figs, because it is an exact value, and could be written as .500000000 if we wished to.

Record your data for falling objects below. Then calculate the speed of the object and the original height of each object. Step 3 involves throwing a baseball in the air (please do this step in the middle of field #1).

Location	Time (s)	Calculated Speed on impact	Calculated height (m)	Calculated height (ft) (Extra credit)
Hampton Hall (From 2nd floor to Great Room)				
Clubroom (top of railing to ground).				
Thrown Baseball				