**LAB: Breaking Down Free Fall**

**Materials (for each group)**

3 feet of molding (for a ceiling or floor, with a groove to roll a ball down) Books to stack  
Meter stick or ruler  
Protractor   
Golf ball  
Stopwatch  
Notebook and pen/pencil  
Computer with Excel (or graph by hand)

**Procedure**

1. Stack some books and set one side of the molding on the books to create a ramp.
2. Use the protractor to measure the angle between the ramp and the floor. Adjust the stack of books until you can get the ramp as close to 30° as possible. Record the final angle in your notebook.
3. Use the ruler or meter stick to mark 10 cm intervals along the ramp, starting at the floor and going upward.
4. Set the golf ball at a measured distance along the ramp. Time how long it takes for the golf ball to hit the floor after your let the ball go. Record both the distance you let the ball go and the time it takes for the ball to travel the length of the ramp.
5. Repeat step for at different lengths along the ramp.
6. Graph your results. Put time on the x-axis, and distance traveled on the y-axis. Do you notice any patterns? Can you possibly create an equation to represent your findings? If you come up with an equation, what do your variables mean? Have you seen an equation that resembles this before?
7. Try the experiment with different ramp angles (time permitting)

**Anticipated Results (for teacher, not students while working on lab):**

The graph the students create will show that the longer the ball is on the ramp, the faster it will move. With constant acceleration, the velocity of an object will get increasingly faster. The constant acceleration in the experiment is due to gravity. Acceleration due to gravity is measured as 9.81 m/su will not measure this acceleration because of the inclined plane, but if you were to conduct an experiment by dropping balls from different heights, this is what you would expect.

If you change the angle of the ramp to be steeper, the acceleration you record will be closer to that of gravity.

Teachers are encouraged to facilitate student discovery in Step #6. Some will need more guidance than others.

SOURCE:

Modified from: http://www.education.com/pdf/rolling-downhill-measuring-acceleration/