Physics Name:

Activity - How High

Purpose: To see how high you can throw a ball in the Earth's gravitational field. To determine the maximum speed that you can throw a ball with.

Materials: a ball
a stopwatch

Procedure: Throw a ball into the air (as straight as possible). Time how long it takes to reach the ground. Repeat several times and take an average. Use the *equations of kinematics* to determine the maximum height. Remember, the time to the top is one half of the total time (if you measure from where the ball starts to the same height on the way down)!

Data:

trial	time (s)	height (ft)
1		
2		
3		
AVERAGE:		

Analysis: • Use your time data and the four equations of kinematicsto determine the *maximum height* that the ball reached.

Questions: 1.) Recall equation #3 of Kinematics. Another way to write that equation looks like this: In the formula:

$$\mathbf{y(t) = y_0 + v_0t + 1/2at^2}$$

This equation is used to determine the height, *y(t)*, of any projectile at a given time, *t*.

a.) What does the y_0 represent?

b.) Approximately what is y(t) for your average throw?

c.) What do the "v_0" and the "a" represent?

2.) Why was a ball used? Could you use an open umbrella? Why or why not?

3.) Explain how you could determine the speed that you *released* the ball with. Calculate it. What assumptions are you making?

4.) What is the *impact velocity* of the ball (Hint: remember the symmetry of a projectile's path)? Calculate it.

5.) If you did this activity on a flat bed of a moving train would your results be different? Explain.

6.) How might your results differ if you took air resistance into account?

Error Analysis: Discuss the error introduced by reaction time? By ignoring air resistance, by assuming initial height to be zero. How could you improve this activity?

Conclusions: What did you learn? What did you find?