

Activity – How High?

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

Materials: ball
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!

Data:

Trial	Measured time (s)	Half time (s)	Height (m)	Height (ft)
1				
2				
3				
4				
5				
6				
				Average:

Analysis: Use your time data and the four equations of kinematics to determine the maximum height that the ball reached.

Questions:

1. Another "equation of kinematics" looks like this:

$$y = y_0 + v_0t + \frac{1}{2}at^2$$

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

- What does y_0 represent?
 - Approximately what is y for your average throw (use half of your average time in the equation above)?
 - What do v_0 and a represent?
2. How might your results differ if you took air resistance into account?

Physics

Name: _____

Date: _____

3. Why was a ball used? Could you use an open umbrella? Why or why not?
4. Explain how you could determine the speed that you released the ball with. What is it? What assumptions are you making?
5. What is the impact velocity of the ball? (Hint: remember the symmetry of a projectile's path.)
6. If you did this activity on a flat bed of a moving train would your results be different? Explain.

Error

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

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