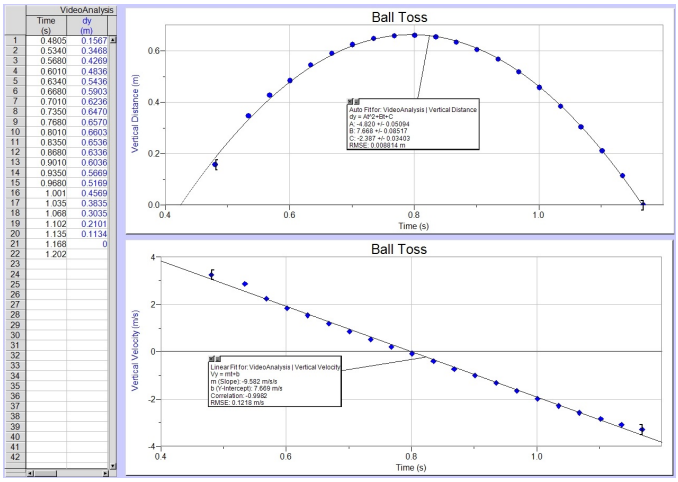
Problem

To determine the acceleration due to gravity by analyzing the vertical motion of a ball that has been thrown up into the air.



Instructions

1. This is an individual assignment. Because of the nature of this analysis everyone will have slightly different results.

   NOTE: We have already analyzed the motion of a basketball that has been dropped from rest using video analysis. <u>If you have not completed this learning activity you will need to see Mr. Young</u>.

2. Get the movie to analyze.
   - Insert > Movie > Ball Toss ☞ G:\Science\Young\SPH3U Material

3. Analyze the up and down motion of the ball <u>once it has left the girl's hands</u>.
   - the height of the calendar on the wall is 0.45 m
   - set the origin at the first data point (this data point should be the lowest)

4. Data Table
   - right-click on data table > Table Options ☞ keep "time", "y", "y velocity"
   - double-click on "y" heading ☞ label "Vertical Position", "dy", "m"
   - double-click on "y velocity" heading ☞ label "Vertical Velocity", "vy", "m/s"

5. Graphs
   - left-click on "x(m)" and select "Vertical Position" ☞ don't need the "x" or horizontal information
   - Insert > Graph ☞ should come up "Vertical Velocity"
   - reorient graphs so "d-t" graph above "v-t" graph
   - right-click on graphs > Graph Options ☞ "Point Protectors" on & "Connect Points" off
   - apply lines of best fit for each graph
   - assign an appropriate title for each graph

{10} 6. When you are finished you should end up with a set of graphs and data similar to those above. Be sure to submit a copy of your graphs. (Delete the video once you are finished with it otherwise it shows up on your print!)
   - File > Page Setup ☞ set the page orientation to "Landscape"
   - File > print ☞ be sure to include your name in the footer

Questions (Be sure to show your work and to use complete sentences.)

{3} 1. What type of motion is the ball experiencing? How could you tell simply by looking at the d-t graph.

{8} 2. (a) What is the acceleration due to gravity (a_g) according to the experiment (2 sig.dig.).
   (b) What is the % error between your value and the accepted value for a_g (2 sig.dig.).
   (c) Another person gets 7.0 m/s^2. What is the % difference between this value and yours (2 sig.dig.).

{6} 3. (a) Aristotle was an ancient philosopher. What was his theory about falling objects?
   (b) Who disproved this theory? How?
   (c) Why was it dangerous for scientists at that time to question the 2000-year-old teachings of Aristotle?

{2} 4. What is an anti-gravity suit? How does it work?

{6} 5. In our day-to-day lives, we are more concerned with braking (and accidents) in cars and other vehicles than with blasting off in rockets.
   (a) Explain the main problem associated with braking (and accidents)?
   (b) List 3 devices that have been invented to help with these braking problems
   (c) Explain how one of the devices listed in (b) works? Be sure to include details.