



CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY

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| <b>Name(s)</b><br>Sarah C. Schmidtler  | <b>Project Number</b><br><br>35607 |
| <b>Project Title</b><br>Measuring the Earth's Acceleration Constant and Mass   |                                    |
| <b>Abstract</b><br><b>Objectives/Goals</b><br>My objective was to measure the acceleration constant and mass of the earth to within 10% accuracy using a non-automated system.<br><b>Methods/Materials</b><br>I manually timed how long it took for an object to drop, and I manually timed the oscillation of a pendulum. I repeated the drop time experiment 60 times, and then pendulum period experiment 60 times. Then I timing 600 oscillations of the pendulum and divided my results by ten. I estimated the error of my combined results by randomly sampling g-values according to the mean of the individual experiments.<br><b>Results</b><br>The results I measured were within 3.4% accuracy.<br><b>Conclusions/Discussion</b><br>I have concluded that it is possible to measure the earth's acceleration constant and mass within 10%. The data also showed that without an automated system it is much more accurate to measure the acceleration constant of the earth by timing the oscillation of a pendulum rather than by timing the drop of a ball. This was because I was able to reduce the systematic error by counting 10 oscillations in one measurement and dividing the total time of those oscillations by 10. This reduced the systematic error that corresponded with my human reaction time. In the Pendulum Experiment, I only had to react to visual stimuli. Research shows that humans react faster to visual stimuli and this played a factor in my experiment every time I started and stopped the stopwatch. |                                    |
| <b>Summary Statement</b><br>This project measured the earth's acceleration and mass to within 3.4% accuracy with a non-automated system.   |                                    |
| <b>Help Received</b><br>Dad- helped me understand the math and show me how to program my results; Mom-invited the neighbors over to listen to my presentation and ask me questions; Eva- helped me retrieve the ball   |                                    |