



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Alice Romano	Project Number J1816
Project Title Measuring Earth's Properties	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of my science fair experiment is to measure some of the physical properties of our planet. In particular, I focused on measuring the Earth's gravitational acceleration.</p> <p>Methods/Materials I constructed a pendulum to help me measuring the gravity acceleration. With the pendulum I tested my hypothesis which was, If I used a longer string then the pendulum would swing back and forth for a longer amount of time. I tested multiple string lengths with some weights. When I was done, using my experiment results, I used the equation modeling the pendulum dynamics to calculate the gravity acceleration. Thirteen experiment sets were executed with two different values of weights (91.05 g & 128.45 g), two different lengths of the string (153 cm & 42.53 cm) and 4 displacements from the equilibrium (2,5 cm; 5 cm; 10 cm; 15 cm). The weight consisted of one small orange(I originally wanted to use an apple in honor of Sir Isaac Newton but the apple was over the maximum weight that could be measured by the precision digital scale I used).</p> <p>Results During each experiment sets, I executed three experiments. During each experiment I measured with a stop-watch the time of ten oscillations. Finally I took the average of the three experiments and divided by ten in order to obtain the average time of oscillation during each experiment set. I made seven qualitative observations and one quantitative observations (computation of an estimated value of the gravity acceleration).</p> <p>Conclusions/Discussion For this experiment, my hypothesis was that a longer string will cause the pendulum to go back and forth in a longer amount of time, with respect to using a shorter string. After doing the experiment and looking through my observations, I found that my hypothesis is correct. It is true that if I use a longer string it takes the pendulum a longer amount of time to go back and forth. By using the experimental observations I computed an estimated value of the local gravity acceleration. In particular, I obtained the following estimated value of the local gravitational acceleration $g=9.82 \text{ m/s}^2$ (notably this value is very close to the most accurate one reported in physics books which is 9.80665) What i got from the equations was reasonably close to the actual one. Also my hypothesis is correct.</p>	
Summary Statement Measuring by a custom-made pendulum the gravitational acceleration at Earth's surface	
Help Received Dr. Marcello Romano, my father, University Professor in Mechanical and Aerospace Engineering	