



CALIFORNIA STATE SCIENCE FAIR 2003 PROJECT SUMMARY

Name(s) Rosemary C. Jones	Project Number J1517
Project Title How Large Is the Earth?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to duplicate Eratosthenes' experiment in which he measured shadows at different latitudes in order to calculate the circumference of the earth.</p> <p>Methods/Materials On March 1, 2003, the shadow of a 36 inch yardstick was measured in three locations at the same longitude: Santa Barbara (measured by me), Fresno (measured by my cousin), and Yakima (measured by students at Wilson Middle School) at 9 am, noon and 3pm. I calculated the distance between the cities using a map, the mileage key and a ruler. To make sure that the yardstick was exactly perpendicular to the ground, all sites used a T-square. A level was used to make sure the surface where the shadow was measured was level. Each circumference was calculated using trigonometry to find the measurement of the angle of the yardstick and the sun's rays and then using a proportion.</p> <p>Results Using the nine different measurements at different times of day and different locations, I calculated nine different circumferences for the earth, the most accurate being 35,585 km. at noon and the least accurate being 66,927 km.</p> <p>Conclusions/Discussion My results supported my hypothesis for the noon measurements. The fact that less accurate for the 9 and 3 o'clock calculations than the noon calculations is because the equation I used only works at astronomic noon, which is not in fact when our clocks say 12:00, because of the time zones. I did some more research and found that the astronomic noon on March 1st was actually only a few minutes before or after noon in all three cities. The physicist I interviewed said it would take a more complex equation to find the circumference using the 9am and 3pm times and this is why Eratosthenes did his measurements at astronomic noon. Also, the results would be better if the measurements were done on June 21st (summer solstice) when the sun was directly overhead. I was surprised to discover that my circumference calculations were equally accurate regardless of the distance between the measurements done at noon. I would have predicted that the Santa Barbara to Yakima measurements would have been more accurate than the Fresno to Santa Barbara measurement.</p>	
Summary Statement My project is about how to estimate to circumference of the earth using Eratosthenes method using simple materials	
Help Received My science teacher suggested the project idea. Relatives in Fresno and students in Yakima did the measurements. My uncle, a physicist, explained the equation I used to calculate the circumference from the measurements. and checked my final results. My mom helped contact the school in Yakima.	