



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Julie Baker; Karen Nichols	Project Number S1601
Project Title Twinkle, Twinkle, Little Star, How We Wonder Where We Are?	
Abstract Objectives/Goals This project was designed to determine how accurate, and operator friendly the navigational tools were (compared to each other) when determining latitude, and using GMT to determine longitude (part two). Methods/Materials Both the Sextant and Quadrant were hand constructed. The North Star was sited on the head of the quadrant and the weight was pulled by gravity, intersecting a point of an angle. When determining latitude, the sextant was set on the base of a leveled tripod. One would look through the PVC pipe to sight the North Star and the other would see the angle detected by the Carpenter's angle. Both angle and weather were recorded. For determining longitude, the sunrise and sunset were recorded. A sunrise/sunset table was used to determine the sunrise or sunset at zero degrees longitude. The time of sunrise/sunset at zero degrees longitude was then subtracted from the observed sunrise or sunset. Each hour was multiplied by 15 degrees and each minute by .25 degrees. Finally these calculations were added together to determine longitude. In part two five locations were selected containing the same longitude as Edwards, CA. The sunrises and sunsets were recorded for multiple days to demonstrate the use of GMT in determining longitude. Results After taking readings of the North Star, with the quadrant and sextant, the quadrant's readings (AVG=35.06 Degrees N) were closer to the actual latitude (35.05 Degrees N). The Sextant's readings were accurate as well (34.74 Degrees N), but clearly not as close to the actual latitude. In Part Two of the experiment the longitudes were not as close to the actual longitude of the various locations (when demonstrating GMT). Conclusions/Discussion Considering the data, the quadrant is easier to operate resulting in more accurate readings. The sextant worked well, though considering the conditions of early mariners and the precision of the procedures needed, the readings were less accurate. Both navigational tools are similar, but the results show that the quadrant was easier to operate, quicker, and produced more accurate readings. After determining longitude we were within about sixty miles (or 1 degree) of Edwards, CA. For part two the results were less accurate than part one. Overall, these methods used by early Mariners could be used to find a large area, like a big city, rather than a specific house.	
Summary Statement A Navigational Study of the North Star using early Mariner Navigational Tools, and demonstrating the use of GMT (Greenwich Mean Time).	
Help Received Col. Joseph Nichols	