

Statistics Project—Accuracy of Sextant Measurements

Background: How accurately do people measure angles of moving objects? Celestial navigation is a technique for determining position on the earth by accurately measuring the apparent positions of celestial objects and then deducing the observer's position. The accuracy of the deduced position is affected by the accuracy of the measurements. Since the apparent positions of celestial objects are changing, the time of the observation is important also. This project looks at the accuracy of sextant measurements.

Time Accuracy Question: A very popular book on celestial navigation¹ contains the following statement:
“It is quite amazing how many people there are who, when you say ‘now,’ do not write down the correct time.”²
How many people like that are there?

Multiple Measurements Question: The same celestial navigation book offers this advice:
“The object of averaging five sights is to compensate for these little mistakes. If you can take only three sights, average them, but do not rely on the position line from a single observation.”³
So this leads to the question--What is the distribution of observation errors when using a sextant?

Time Accuracy Test Plan: Design a test to measure the ability of people to write down the current time on demand. Determine your sampling design and procedures for testing. Specify your response variable and what characteristics of that variable you will compute. Predict in advance the outcome of this study.

Multiple Measurements Test Plan: Get together with your instructor and she/he will demonstrate how to use a sextant with an artificial horizon. Use this experience to design a basic test for making sextant measurements. Determine your sampling design and procedures for testing. Specify your response variable and what characteristics of that variable you will compute. Predict in advance the outcome of this study

Getting Started: Run both basic tests on people in your group to see if there are any likely problems.

First Meeting: Prior to the meeting do the planning and “Getting Started” exercises above. Discuss your study proposal and any questions you have with your instructor. Your instructor will provide you with clarifying directions. Write a summary of this meeting and turn it in to the instructor.

¹ Celestial Navigation for Yachtsmen by Mary Blewitt.

² Ibid. pg 25

³ Ibid. pg 27

Formal Procedures Statement: Write down the procedures for your study and have your instructor critique these procedures. Your procedures statement should include: population, sampling technique, basic test instructions, data recording forms, etc.

Collect Data and Compute Statistics: Do both tests on your subjects. You should end up with a table of test results and a table of statistics based on the test results.

Penultimate Meeting: Present your results. If there are problems with the testing procedures resolve them and run the tests again. Discuss what conclusions are justified. Discuss every section of the project report and what your report should have for each section.

Write Project Report Draft: Write your report based on the discussions with your instructor.

Final Meeting: Present your draft report to the instructor. Use your instructor's critique to write the final report.

Write the Project Report.

Additional Project Guidelines:

Due Dates

[Report Format](#)

[Report Writing Cautions.](#)