

Teacher Guide for Library Statistics

Special notes and timing

In a test run, lesson 1 took students 20-30 minutes, lesson 2 took 10-15 minutes, and lesson 3 took about 30 minutes.

Learning Objectives

Students will:

- Describe their sampling method
- Collect data and make inferences about the library's collection from that data
- Analyze their sampling techniques and make suggestions for improvement

Materials

- Math journal or notebook
- Access to the school library

Helping Questions

How might you begin?

Why do you think you were asked to ____?

What information do you have? What else do you know? How can you use that information to get to an answer?

What do you notice? What else do you notice?

Why do you think that happens? (*Students may not know the answer to this question, but it helps them to think about it and try to explain it.*)

What did you try that didn't work? Can you learn something from that?

Can you explain it in a different way?

Do you think your answer makes sense?

Mathematical Notes

Depending upon your curriculum, it is possible that the students have never collected data from a sample before instead of the whole population (such as the favorite color of students in a class).

It is likely that the librarian does not know the number of books in the library with one-word titles. This gives the students a taste of how to figure out something that is just not known about a large quantity of data without having to look at every item.

In lesson 4, question 4, notice that the question asks about "your sample"—that is, just the shelves the students counted.

Students may not get the same answers as the librarian provides for number of books and percentage of books that are nonfiction. Help the students recognize that they probably followed a correct process. This is why statistics is more messy and complicated than collecting data from the entire population—you sometimes don't get the right answer! The students whose answers are quite different from the actual data will probably learn the most about the difficulties of reaching conclusions about an entire population from a sample.

The randomization process with 3 dice was based upon a library for a school of 430 students having 136 shelves in the library. If you have a library with more than 216 shelves, but fewer than 432 shelves, you can have the students add flipping a coin to rolling 3 dice. If they get heads, they choose the number shown in the table for the 3 dice rolls. If they get tails, they take the number in the table for the 3 dice rolls and add 216 to get the shelf location (for example, if the dice rolled are 2, then 5, then 3, and the coin flip is tails, the students go to shelf $63+216 = 279$).

Assessment Options

- Look at the students' math journals. Ensure that they write down enough details so that they could look back and understand their work without having the lesson cards available.
- Have students demonstrate the computations they used to figure out the answers to the questions.
- Check the students' sampling method. Ensure they are using the method prescribed in Lesson 2 instead of just picking shelves in the library to sample.

Extensions

- If you have more than one group of students working on this project, have the groups compare their answers. They used a different sample, so they should have slightly different answers. Have students discuss the differences and develop a plan to make their data collection less prone to error.
- Students should see that if they sampled more shelves, they might get a different answer. If time permits, have students do a sample with 10 shelves (they could just add three to the 7 shelves they already sampled).
- If students would prefer to ask a different question, they could find the percentage of books in the library with more than one author. It is possible that there is a difference between fiction and nonfiction, so you could have them sample in both categories and compare.
- Another project that students could study is the age of books in the library. In their sample, they would have to find the copyright date of the books in the library. The students could use a spreadsheet to track their data and compute averages. (To get a good sample from the library the students really should do around 350-400 books, but if time is an issue have them take a smaller sample but recognize that their answer is more likely to be incorrect.)
- Have students find an online poll. Can the students figure out if the sampling method is random or not? (If the poll was one where people were selected to participate, it is possibly random. If it is one where people volunteered to go to a website to answer questions, it is probably not random—the people who chose to answer questions may not represent the population.)

Teacher Reflection

- Did the students work effectively in pairs? What can you do to help the students work better together?
- Did some students struggle with how to figure out information about the population given data about the sample? Was that struggle because of difficulty with fundamental skills or some other reason?
- How did the students react to not knowing the "right" answer for the number of 1-word titles?
- How did the students react if their answers were different from the "right" answer?
- What were the greatest challenges for the students?

Standards Addressed

Common Core State Standards (and Colorado Academic Standards in Mathematics)

1. Number Sense, Properties, and Operations
3. Data Analysis, Statistics, and Probability

NCTM (National Council of Teachers of Mathematics) Content Standards

Number and Operations
Data Analysis and Probability

NCTM Process Standards

Problem Solving
Communication
Connections
Representation

References Used

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