TOPIC 12

Drawing Inferences

Objective Collecting Random Samples

Warm-Up

Light It Up Light Bulb Company tests 24 of the bulbs they just produced and found that 3 of them were defective. Use proportions to predict how many light bulbs would be defective in shipments of each size.

1. 100 light bulbs

2. 400 light bulbs

3. 750 light bulbs

Reviewing the Statistical Process

There are four components of the statistical process:
• Formulating a statistical question.
• Collecting appropriate data.
• Analyzing the data graphically and numerically.
• Interpreting the results of the analysis.

1. Summarize each of the four components. You may want to use examples to support your answers.

How could you describe the students in your classroom? How do the students in your classroom compare to other groups of students in your school, or to other seventh graders in the United States?

2. Formulate a statistical question about your classmates. How might you collect the information to answer your question?

One data collection strategy you can use is a survey. A survey is a method of collecting information about a certain group of people. It involves asking a question or a set of questions to those people. When information is collected, the facts or numbers gathered are called data.

3. Answer each question in the survey shown. You will use the results in the next activity.

a. What is your approximate height?   _____

b. Do you have a cell phone?   Yes_____ No _____

c. About how many text messages do you send each day? _____

The population is the entire set of items from which data can be selected. When you decide what you want to study, the population is the set of all elements in which you are interested. The elements of that population can be people or objects.

A census is the data collected from every member of a population.

1. Use your survey to answer each question.

a. Besides you, who else took the math class survey?

b. What is the population in your class survey?

c. Are the data collected in the class survey a census?
Explain your reasoning.

Ever since 1790, the United States has taken a census every 10 years to collect data about population and state resources. The original purposes of the census were to decide the number of representatives a state could send to the U.S. House of Representatives and to determine the federal tax burden.

2. Describe the population for the United States census.

3. Why do you think this collection of data is called "the census"?

In most cases, it is not possible or logical to collect data from every member of the population. When data are collected from a part of the population, the data are called a sample. A sample should be representative of the population. In other words, it should have characteristics that are similar to the entire population.

When data are gathered from a population, the characteristic used to describe the population is called a parameter.

When data are gathered from a sample, the characteristic used to describe the sample is called a statistic. A statistic is used to make an estimate about the parameter.

4. After the 2000 census, the United States Census Bureau reported that 7.4% of Georgia residents were between the ages of 10 and 14. Was a parameter or a statistic reported?
Explain your reasoning.

5. A recent survey of 1000 teenagers from across the United States shows that 4 out of 5 carry a cell phone with them.
a. What is the population in the survey?

b. Were the data collected in the survey a census? Why or why not?

c. Does the given statement represent a parameter or a statistic? Explain how you determined your answer.

d. Of those 1000 teenagers surveyed, how many carry a cell phone? How many do not carry a cell phone?

6. Use your math class survey, or the data from a sample class survey provided at the end of this lesson, to answer each question. Use a complete sentence to justify each answer.

a. How many students in the class have a cell phone?

b. What percent of the students in the class have a cell phone?

c. Does the percent of students in the class that have a cell phone represent a parameter or a statistic? Explain how you determined your answer.

7. Suppose you only want to survey a sample of the class about whether they have a cell phone. Discuss whether or not these samples would provide an accurate representation of all students in a class. Use complete sentences to justify your answers.

a. the selection of all of the girls for the sample

b. the selection of the students in the first seat of every row

c. the selection of every fourth student alphabetically

d. the selection of the first 10 students to enter the classroom

8. Suppose you wanted to determine the number of students who have a cell phone across the entire seventh grade.

a. What is the population?

b. Suggest and justify a method of surveying students in the seventh grade to obtain a representative sample.

When information is collected from a sample in order to describe a characteristic about the population, it is important that such a sample be as representative of the population as possible. A random sample is a sample that is selected from the population in such a way that every member of the population has the same chance of being selected.

Ms. Levi is purchasing standing desks for her classroom. She wants to set up the desks to minimize the amount of desk height adjusting by the students and decides to use the mean height of students in her math class as a guide. Rather than using the heights of all students in her class, she decides to collect a random sample of students in her class.

1. What is the population for this problem?

2. Ms. Levi received two suggestions to randomly sample her class. Decide if each strategy represents a random sample. If not, explain why not.

a. Ms. Levi chooses the girls in the class.

b. Ms. Levi chooses all of the students wearing white sneakers.

3. Ms. Levi decides to select a random sample of five students in her class, and then calculate the mean height. She assigns each student in her class a different number. Then, she randomly selects 5 numbers.

a. Explain why Ms. Levi's method of taking a sample is a random sample.

b. Do you think randomly selecting 5 students will accurately represent the population of her class? If not, do you think she should pick more or fewer students?

c. Damien hopes Ms. Levi will assign him the number 7 because it will have a better chance of being selected for the sample. Do you agree or disagree with Damien?
Explain your reasoning.

d. Julie claims Ms. Levi must begin with the number 1 when assigning numbers to students. Jorge says she can start with any number as long as she assigns every student a different number. Who is correct? Explain your reasoning.

One way to select the students is to write the numbers (or student names) on equal-sized pieces of paper, put the papers in a bag, draw out a piece of paper, and record the result. To create a true random sample, the papers should be returned to the bag after each draw.

Help Ms. Levi randomly select five students from her class.

4. With your partner, create a bag with 30 numbers from which to select your sample.

a. Draw 5 numbers and record your results.

b. Compare your sample with the samples of your classmates. What do you notice?

5. Suppose Ms. Levi starts with the number 15 when she assigns each of the 30 students in her class a number. How can you change your selection process to accommodate the list beginning at 15?

6. Suppose that the 5 numbers selected from your bag resulted in 5 girls.

a. Is the sample still a random sample? Explain your reasoning.

b. How is this outcome different from choosing all girls to represent the sample in Question 2?

LESSON 12.1a
We Want to Hear from You!

Objective   Collecting Random Samples

Review

1. A soccer player makes 4 out of every 5 penalty shots she attempts.
a. What might be a good model for simulating the number of shots the soccer player makes in when
attempting 4 penalty shots?

b. Describe how you would assign outcomes and then describe one trial of the simulation.

c. Conduct 20 trials of the simulation and record your results in a table.

d. According to your simulation, what is the probability that the soccer player makes exactly 3 out of the next 4 penalty shots?

2. Mike spins two spinners. The first spinner is divided into 4 equal sections and each is labeled with a perfect square (4, 9, 16, 25). The second spinner is divided into 5 equal sections and each is labeled with an even number (2, 4, 6, 8, 10).
a. Create an array to illustrate the possible products of the result of spinning both spinners.

b. What is the probability that the product is a perfect square?

c. What is the probability that the product is a perfect cube?

d. What is the probability that the product is a multiple of 10?