9.5 Would You Like to Try a Sample?

A Develop Understanding Task

In the task *Wow! That's Weird!*, you saw a number of statistics for things like the average weight of a house cat. You know it would be impossible to measure all the house cats to find their average weights, but scientists still claim to know it.

You've probably heard it many times before: "Survey results show that 54% of Americans believe that. . ." You're sure that you didn't participate in the survey and neither did anyone you know, and yet, the researchers claim that the survey represents the beliefs of all Americans.

How can this be possible? In the next few tasks, we'll explore how statistics allow us to draw conclusions about an entire group without actually working with the entire group. Sometimes the results make sense and other times you might think that they just can't be right. We will learn how to make judgments about statistical studies, based on the methods that have been used.

First, we need to get our terms straight. When we talk about the entire group that we are interested in, that is called the **population.** When some members of the group are selected to represent the entire group, that is called a **sample**. The thing we are interested in knowing about the population is the **parameter of interest**.

For each of the scenarios below, identify the population, the sample and the population parameter of interest.

1. A grocery store wants to know the average number of items that shoppers purchase in each visit to the store. They decide to count the items in the cart of every twentieth person through the check stand.

Population _____

Sample _____

Parameter of interest _____

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2. A team of biologists wants to know the average weight of fish in a lake. They decide to drop a net and measure all the fish caught in three different locations in the lake.

Population _____

Sample _____

Parameter of interest _____

3. There are lots of different ways that a sample can be chosen from a population. Group the following examples of ways to select a sample into six categories.

A.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You decide to put the name of each student in the school into a big bowl. You draw 100 names and ask those students to respond to a survey about the activities they prefer.

B.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You assign each student in the school a number. You randomly select a starting number among the first 10 numbers and then select every tenth student in the list from that point forward.

C.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You use the rolls from each homeroom class. You go through each homeroom class, drawing 2 names from each class. You ask those students to respond to a survey about the activities they prefer.

D.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You get the list of all the homeroom classes and randomly select 5 classes. You go to each of the classes selected and survey all the students in that class.

E.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You stand in the cafeteria during your lunch break and ask students in they would be willing to participate in your survey as they walk by.

F.   You are in charge of school activities. You want to know what activities students would prefer to participate in during the school year. You make a lot of copies of the survey about the

activities that students prefer and you put them on a table outside the cafeteria. Students can choose to take the survey and drop their responses into a big box on the table.

G.   You are interested in finding out the percent of residents in the city that have experienced a robbery in the past year. Using the city property records, you assign each residence a number. You use a random number generator to give you a list of numbers. You look up the police reports for each residence selected.
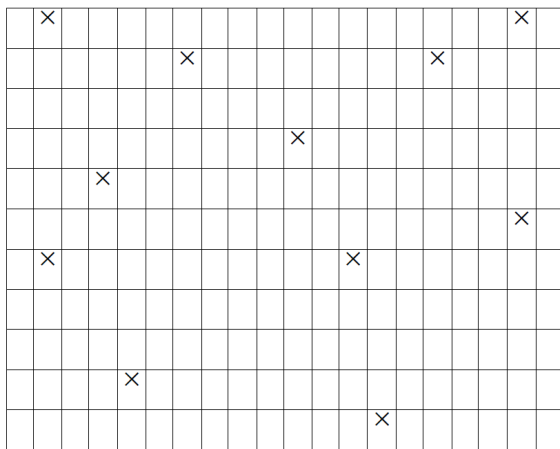
H.   You want to know the average number of hours that high school seniors spend playing video games in your state. You randomly select 20 high schools in the state and then ask all the seniors at each of the 20 high schools about their video game habits.

I.   An auto analyst is conducting a satisfaction survey, sampling from a list of 10,000 new car buyers. The list includes 2,500 Ford buyers, 2,500 GM buyers, 2,500 Honda buyers, and 2,500 Toyota buyers. The analyst selects a sample of 400 car buyers, by randomly sampling 100 buyers of each brand.
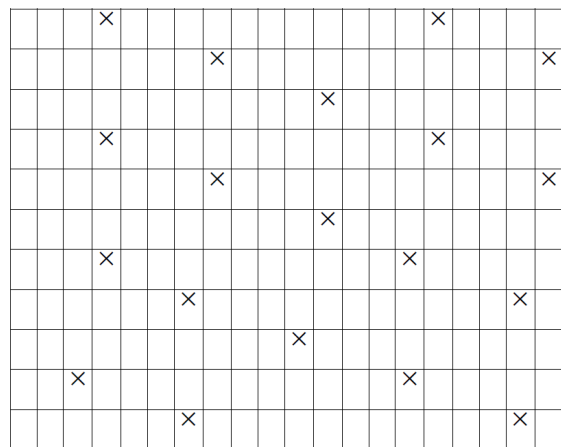
J.   A shopping mall management company would like to know the average amount that shoppers in the mall spend during their visit. They post two survey takers near one of the exits who ask shoppers to tell them what they spent as they leave the mall.
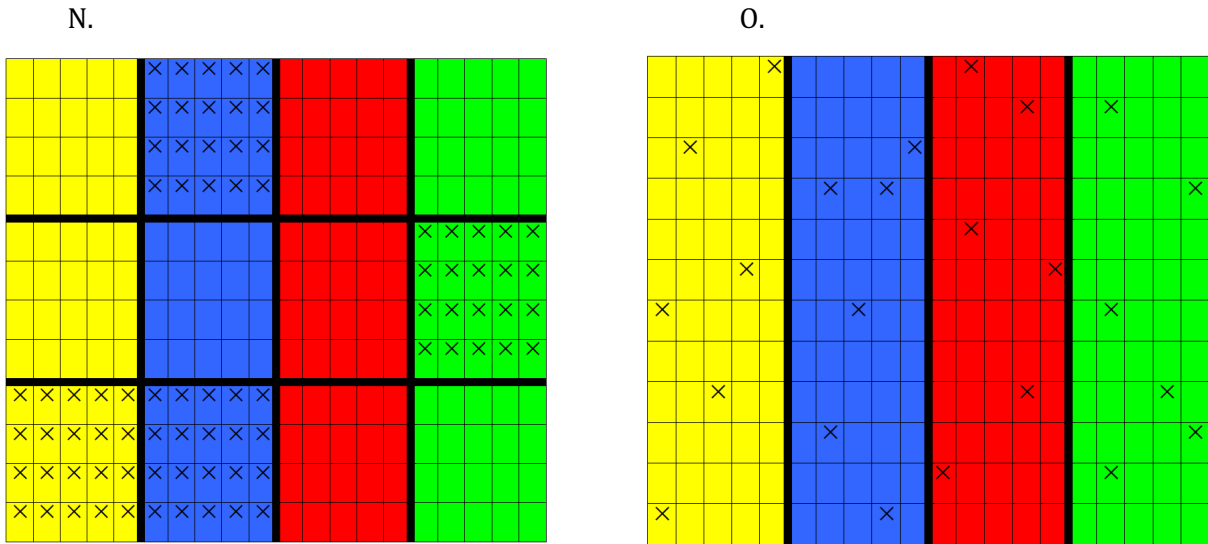
K.   A restaurant owner wants to find out the average number of dishes ordered at each table served on Friday evenings, their busiest time. She decides to collect and analyze every fifth receipt of the night, starting at 6:00 p.m.

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4. What might be some of the advantages and disadvantages of each type?

5. A person you know owns a small theater that shows local dramatic productions. She wants to know the average age of the people that buy tickets to the see the shows so that she can better select which plays to stage. Explain to the owner why selecting the first 20 people that arrive for the show may not be a representative sample.

6. Describe a process for selecting a representative sample of the theater patrons.

READY

Topic: Contrasting association and causation

When collecting data, statisticians are often interested in making predictions. Sometimes they simply want to know if one variable is related or is **associated** with another variable. (Can you predict one variable given information on the other one). Other times, they want to determine if one variable actually **causes** a change in another variable. For each example below, decide whether the variables simply explain each other, or if you think one variable would cause the other to change.

1. As the amount of food Ollie the elephant eats increases her weight also increases. (Associated/Causes)

2. As Popsicle sales go up in the summer, the number of people drowning also increases. (Associated/Causes)

3. As Erika's feet grow longer, she grows taller. (Associated/Causes)

4. As Tabatha gets older, her reading score improves in school. (Associated/Causes)

SET

Topic: Identifying population, sample, and parameter

For each scenario below, identify the *population*, *sample* and *parameter* of interest.

5.   The local school board wants to get parents to evaluate teachers. They select 100 parents and find that 89% approve of their child's teacher.

Population:　　　　　　　　　　Sample:　　　　　　　　　Parameter:

6. Jarret wants to know the average height of the students in his school. There are 753 students in his high school; he finds the heights of 52 of them.

Population:　　　　　　　　　　Sample:　　　　　　　　　Parameter:

7. A government official is interested in the percent of people at JFK airport that are searched by security.   He watches 300 people go through security and observes 42 that are searched.

Population:　　　　　　　　　　Sample:　　　　　　　　　Parameter:

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For each scenario, identify what type of sampling was used to obtain the sample. Explain whether or not you think the sample will be representative of the population it was sampled from:

8. Elvira surveys the first 60 students in the lunch line to determine if students at the school are satisfied with school lunch.

Type of sample:

Representative? Explain.

9. Elvira selects every 5th student in the lunch line to determine if students at the school are satisfied with school lunch.

Type of sample:

Representative? Explain.

10. Elvira randomly selects 7 different tables in the lunchroom and surveys every student on the table to determine if students at the school are satisfied with school lunch.

Type of sample:

Representative? Explain.

11. Elvira assigns every student in the school a number and randomly selects 60 students to survey to determine if student at the school are satisfied with school lunch.

Type of sample:

Representative? Explain.

12. Elvira wants to determine if students are satisfied with school lunch. She leaves surveys on a table for students to answer as the walk by.

Type of sample:

Representative? Explain.

13. Elvira wants to determine if students are satisfied with school lunch. She wants to include input from each grade level at the high school. She randomly surveys 25 freshman, 25 sophomores, 25 juniors, and 25 seniors.

Type of sample:

Representative? Explain.

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