LESSON
20 Sampling Techniques

Key Concept

As an introduction to sampling and surveys, this lesson presents some of the essential vocabulary for identifying different types of samples. Students also examine the benefits of random samples and analyze survey results for possible sources of bias.

Key Question: Example 1

What would the researchers have to do to conduct a census in this case?

They would have to measure the loudness of the music played during the aerobics classes at all 150 health clubs.

Key Question: Example 2

How could the NFL officials choose a cluster sample of the players?

Randomly choose 3 of the 32 teams. Then survey all the players on those teams.

Differentiated Instruction

Example 2 This lesson may be especially challenging for English language learners due to the large amount of vocabulary that is presented. Encourage these students to write in a notebook or journal their own definitions for the different types of samples. You may want to provide "sentence frames" to help students get started. For example, have students complete the following sentence frame in as many ways as possible: "A _____ sample is a sample where the members are chosen by _____." Remind students that the sentence frame is just a tool to help them get started. Students should feel free to modify the wording of the sentence as needed.

Key Question: Example 3

What is another way the school administrators could choose a sample that is not likely to be biased?

Survey every 25th student on a list of names of all students at the school.

Vocabulary

Example 3 Help students understand what is meant by a *biased sample* by asking them to consider how the word *bias* is used in everyday speech. For example, ask students to explain the meaning of the following sentence: "Parents of softball players are not allowed to be umpires because they might be biased."

Avoiding Common Errors

Example 3 Because every 10th student waiting in line to purchase lunch is surveyed in part a, students may identify this as a systematic sample and therefore conclude that the sample is not likely to be biased. Be sure students understand that the population is *all* students at the school and that this sample only takes into account students who are already in line to make a lunch purchase. Students who do not buy their lunch because they are unhappy with the choices are not part of the sample. Thus, the sample is not likely to be representative of the population.

Key Question: Example 4

How do you think the survey results might be different if a random sample of city residents were surveyed? Why?

It is likely that a greater percentage of the respondents would favor the ban on using cell phones while driving. This is because a random sample would most likely include people who are not cell phone users and these residents might be more likely to support the ban.

Closing the Lesson

Have students answer the following question: What are four different ways to choose a sample that is likely to be representative of a population?

Choose a simple random sample, a systematic sample, a stratified sample, or a cluster sample.

Vocabulary

Exercise 24 This exercise introduces the terms *population parameter* and *sample statistic*. In particular, students are given population parameters for trees in an apple orchard. Students discover that as the size of the sample grows, sample statistics approach population parameters. Note that students will learn more about population parameters and sample statistics in Lesson 21.

Homework Help

Example 1: Exs. 1–4

Example 2: Exs. 5–12

Example 3: Exs. 13–16, 19–22

Example 4: Exs. 17, 18

Enrichment: Exs. 23, 24

Homework Check

To quickly check student understanding of key concepts, go over the following exercises: 3, 5, 12, 15, 17.

ANSWERS

Check Answers

1. the readers of the magazine
2. the 238 readers who returned the survey
3. self-selected sample
4. Yes; a self-selected sample is not likely to be representative of the population.
5. The sample contains only residents of Groton Road, so other residents are underrepresented.
6. *Sample answer:* Conduct a telephone survey of randomly chosen residents.

Exercise Answers

1. 250 computers; 25 randomly chosen computers
2. 281 employees; 70 randomly chosen employees
3. customers during the one-day sale; 50 randomly chosen customers
4. all of the junk mail that the family receives; the junk mail received during one week
5. convenience sample
6. stratified sample
7. systematic sample
8. self-selected sample
9. systematic sample
10. simple random sample
11. convenience sample
12. Answers will vary.
13. Yes; a convenience sample is not likely to be representative of the population.
14. No; a simple random sample is likely to be representative of the population.
15. Yes; the friends of the members of the drama club are more likely to pay more for a ticket because they know someone involved in the production.
16. Yes; a self-selected sample is not likely to be representative of the population.
17. The sample contains only dog owners, who are more likely to favor an off-leash area.
18. *Sample answer:* Ask every 25th person who enters the park each evening for a week.
19. The fruit is chosen using a convenience sample. This method underrepresents the rest of the fruit, which could be inferior in quality to the fruit on the top.
20. By choosing 25 students from each class, the freshmen are overrepresented and the sophomores and the juniors are underrepresented.
21. *Sample answer:* Choose 19 freshmen, 27 sophomores, 29 juniors, and 25 seniors for the sample.
22. 100 students chosen from 504 students; in this sample, about 1 in every 5 students is surveyed, where the other method results in about 1 in every 7 students surveyed. The greater fraction of students surveyed, the more accurate the results will be.
23. **a.** A simple random sample may not include any of the dermatologists.
    b. 2
24. **a.** Answers will vary.
    b. Answers will vary.
    c. A sample of 80 trees would be likely to have a mean very close to 68.9 and a standard deviation very close to 25.5. As the sample size increases, sample statistics approach population parameters.