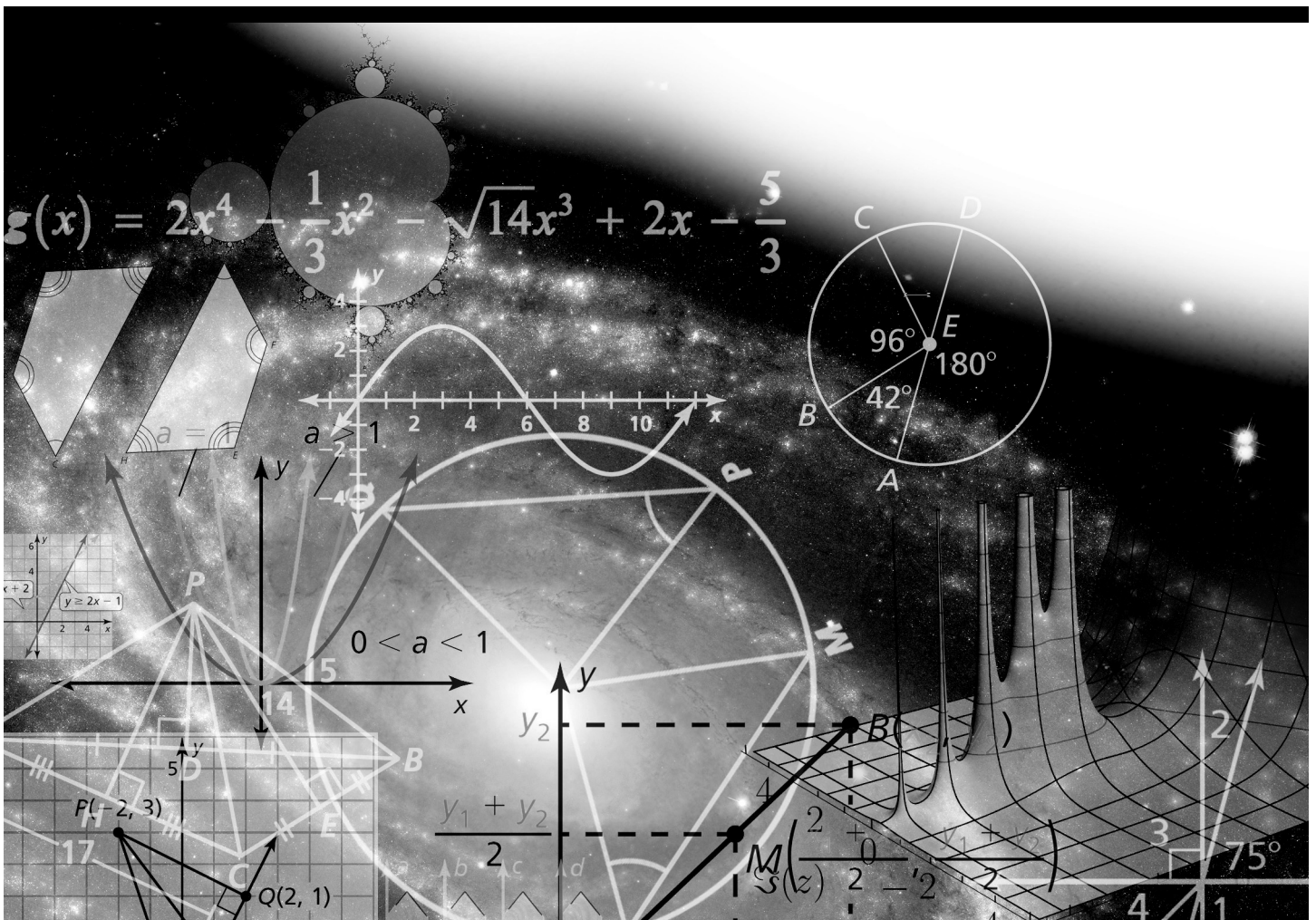


CHAPTER 10

Data Analysis and Statistics

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**Chapter
10**

Maintaining Mathematical Proficiency

Find the mean, median, and mode of the data set. Then determine which measure of center best represents the data. Explain.

1. 26, 24, 55, 21, 32, 26

2. 63, 66, 61, 70, 69, 67, 63, 65

3. 40, 37, 21, 43, 37, 41, 43, 25, 37

Find and interpret the standard deviation of the data set.

4. 18, 11, 15, 20, 16

5. 78, 71, 68, 75, 46, 66

10.1**Collecting Data**

For use with Exploration 10.1

Essential Question What are some considerations when undertaking a statistical study?

1 EXPLORATION: Analyzing Sampling Techniques

Work with a partner. Determine whether each sample is representative of the population. Explain your reasoning.

- a. To determine the number of hours people exercise during a week, researchers use random-digit dialing and call 1500 people.

- b. To determine how many text messages high school students send in a week, researchers post a survey on a website and receive 750 responses.

- c. To determine how much money college students spend on clothes each semester, a researcher surveys 450 college students as they leave the university library.

- d. To determine the quality of service customers receive, an airline sends an e-mail survey to each customer after the completion of a flight.

2 EXPLORATION: Analyzing Survey Questions

Work with a partner. Determine whether each survey question is biased. Explain your reasoning. If so, suggest an unbiased rewording of the question.

- a. Does eating nutritious, whole-grain foods improve your health?

10.1 Collecting Data (continued)

2 EXPLORATION: Analyzing Survey Questions (continued)

- b. Do you ever attempt the dangerous activity of texting while driving?

- c. How many hours do you sleep each night?

- d. How can the mayor of your city improve his or her public image?

3 EXPLORATION: Analyzing Survey Randomness and Truthfulness

Work with a partner. Discuss each potential problem in obtaining a random survey of a population. Include suggestions for overcoming the problem.

- a. The people selected might not be a random sample of the population.

- b. The people selected might not be willing to participate in the survey.

- c. The people selected might not be truthful when answering the question.

- d. The people selected might not understand the survey question.

Communicate Your Answer

- 4. What are some considerations when undertaking a statistical study?

- 5. Find a real-life example of a biased survey question. Then suggest an unbiased rewording of the question.

10.1**Practice**

For use after Lesson 10.1

Core Concepts**Types of Samples**

For a **self-selected sample**, members of a population can volunteer to be in the sample.



For a **systematic sample**, a rule is used to select members of a population. For instance, selecting every other person.



For a **stratified sample**, a population is divided into smaller groups that share a similar characteristic. A sample is then randomly selected from each group.



For a **cluster sample**, a population is divided into groups, called *clusters*. All of the members in one or more of the clusters are selected.



For a **convenience sample**, only members of a population who are easy to reach are selected.

Methods of Collecting Data

An **experiment** imposes a treatment on individuals in order to collect data on their response to the treatment. The treatment may be a medical treatment, or it can be any action that might affect a variable in the experiment, such as adding methanol to gasoline and then measuring its effect on fuel efficiency.

10.1 Practice (continued)

An **observational study** observes individuals and measures variables without controlling the individuals or their environment. This type of study is used when it is difficult to control or isolate the variable being studied, or when it may be unethical to subject people to a certain treatment or to withhold it from them.

A **survey** is an investigation of one or more characteristics of a population. In a survey, every member of a sample is asked one or more questions.

A **simulation** uses a model to reproduce the conditions of a situation or process so that the simulated outcomes closely match the real-world outcomes. Simulations allow you to study situations that are impractical or dangerous to create in real life.

Notes:**Worked-Out Examples****Example #1**

Identify the type of sample and explain why the sample is biased.

A sportswriter wants to determine whether baseball coaches think wooden bats should be mandatory in collegiate baseball. The sportswriter mails surveys to all collegiate coaches and uses the surveys that are returned.

The coaches choose to participate in the survey. So, the sample is a self-selected sample. The sample is biased because only those coaches with a strong opinion about wooden bats will respond.

Example #2

Determine whether the sample is biased. Explain your reasoning.

Every third person who enters an athletic event is asked whether he or she supports the use of instant replay in officiating the event.

The sample is not biased because the sample represents the population.

10.1 Practice (continued)**Practice A**

In Exercises 1–3, identify the type of sample described.

1. A restaurant owner wants to know whether the customers are satisfied with the service. Every fifth customer who exits the restaurant is surveyed.
2. An electronic manufacturer wants to know the customers' responses towards a newly released media player. Emails are sent to customers who recently purchased the device to participate in an online survey at their convenience.
3. A survey is conducted in a state to find out how many households own more than one vehicle. Households are divided into north, east, south, and west regions of the state, and a sample is randomly surveyed from each region.

In Exercises 4 and 5, identify the type of sample and explain why the sample is biased.

4. A manager of a company wants to determine whether the employees are satisfied with the lounge room. The manager surveys the employees who are in the lounge room during lunch break.
5. A news station asks its viewers to participate in an online poll about the presidential candidates.

In Exercises 6 and 7, identify the method of data collection the situation describes.

6. A researcher records whether shoppers at a grocery store buy magazines at the checkout aisles while waiting in line to check out.
7. A meteorologist uses a computer model to track the trajectory of a hurricane.

Practice B

In Exercises 1 and 2, identify the type of sample described.

1. An amphitheater wants to know if Saturday morning concerts would be attended. The amphitheater is divided into 30 different seating areas. It surveys all the members in five randomly selected seating areas.
2. The manager of an orange juice plant wants to test the quality of the plant's new extra-pulp orange juice. She does a taste test of every twentieth container of extra-pulp orange juice.

In Exercises 3 and 4, identify the type of sample and explain why the sample is biased.

3. A town council wants to know whether residents support lower taxes for those who own waterfront property. Thirty-four owners of waterfront property are surveyed.
4. A local radio station is considering switching from country music to classical music. Randomly throughout the day it announces the phone number and website where listeners can go to place their vote for either country music or classical music.

In Exercises 5 and 6, determine whether the sample is biased. Explain your reasoning.

5. A local senator is proposing a bill to lower the limit on the number of lobster that can be caught each day. Participants in a local fishing tournament are asked to complete a survey.
6. A triathlon organizer wants to know if a Saturday morning triathlon is preferred over a Sunday morning triathlon. The organizer randomly surveys five triathletes in one of the age groups.

In Exercises 7 and 8, explain why the survey question may be biased or otherwise introduce bias into the survey. Then describe a way to correct the flaw.

7. "Our plant has not been making a profit. Do you agree that the company should close this plant?"
8. "Do you agree that the mayor is receiving a salary that is far beyond what is reasonable?"