10.3 Collecting Data

Objective: Today we will identify types of sampling methods in statistical studies, recognize bias in sampling, analyze methods of collecting data, & we will learn to recognize bias in survey questions.

Warm-Up: None. Copy the Notes.

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- In a **RANDOM SAMPLE**, each member of a population has an equal chance of being selected.

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. (ex. selecting every other person)
- For a **CONVENIENCE Sample**, ONLY members of a population who are easy to reach are selected.
- For a **STRATIFIED Sample**, a population is divided into smaller groups that share a similar characteristic, & then randomly selected.
- For a **CLUSTER Sample**, a population is divided into groups, called *clusters*, & **ALL** members of one (or more) cluster(s) are selected.

- A **BIAS** is an error that results in a misrepresentation of a population.

Bias in Sampling

- An **UNBIASED SAMPLE** is representative of the population that you want information about.
- A **BIASED SAMPLE** is a sample that OVERrepresents or UNDER-represents part of the population.

biased sample = invalid data

Methods of Collecting Data

1. An **EXPERIMENT** imposes a treatment on individuals in order to collect data on their response to the treatment.
2. An **OBSERVATIONAL STUDY** observes individuals & measures variables without controlling the individuals or their environment.
3. A **SURVEY** is an investigation of one or more characteristics of a population.
4. A **SIMULATION** uses a model to reproduce the conditions of a situation or process so that the outcomes closely match the real-world outcomes.

In Exercises 5–8, identify the type of sample described.
(See Example 1.)

6. Each employee in a company writes their name on a card and places it in a hat. The employees whose names are on the first two cards drawn each win a gift card.

7. A taxicab company wants to know whether its customers are satisfied with the service. Drivers survey every tenth customer during the day.

In Exercises 9–12, identify the type of sample and explain why the sample is biased. *(See Example 2.)*

9. A town council wants to know whether residents support having an off-leash area for dogs in the town park. Eighty dog owners are surveyed at the park.

10. 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.

In Exercises 15–18, determine whether the sample is biased. Explain your reasoning.

16. A governor wants to know whether voters in the state support building a highway that will pass through a state forest. Business owners in a town near the proposed highway are randomly surveyed.

18. Your school principal randomly selects five students from each grade to complete a survey about classroom participation.

In Exercises 21–24, identify the method of data collection the situation describes. *(See Example 4.)*

22. The owner of a restaurant asks 20 customers whether they are satisfied with the quality of their meals.

23. A researcher compares incomes of people who live in rural areas with those who live in large urban areas.

In Exercises 25–28, explain why the survey question may be biased or otherwise introduce bias into the survey. Then describe a way to correct the flaw.
(See Example 5.)

26. "Would you rather watch the latest award-winning movie or just read some book?"

28. A child asks, "Do you support the construction of a new children's hospital?"

In Exercises 29–32, determine whether the survey question may be biased or otherwise introduce bias into the survey. Explain your reasoning.

30. "Do you think that renovating the old town hall would be a mistake?"

31. A police officer asks mall visitors, "Do you wear your seat belt regularly?"