

1.4.1: Exercises

1. Describe the main difference between an observational study and an experiment.

2. Imagine that you want to learn about the average number of hours, per day, that students at your college spend on their mobile devices. You want to select a simple random sample of 75 students from the full-time students at your college. You have a list of all full-time students, whose names are arranged in alphabetical order. How would you select a simple random sample of 75 students from this population? Describe your process.

3. Imagine you want to know how many hours per week students at your school spend studying, on average. Determine if the following sampling methods will reasonably produce representative samples. Justify your answers.
 - a. Select 40 students randomly using a list of all student IDs and a random number generator.

 - b. Select 80 students as they enter the library.

 - c. Select 150 students randomly using a list of all student IDs and a random number generator.

 - d. Select the 200 students enrolled in calculus III at the college this semester.

 - e. Which of the methods above would produce the most representative sample and the best estimate? Explain.

4. Examining the benefit of random sampling:

- a. Take 10 samples of size 5 using [this simulation \(by clicking on 5 circles, clicking reset after recording the average diameter, and repeating 10 times\)](#) and record the provided average diameters below:

You can use the QR code below to access the applet.



- b. The average diameter for this population of 60 circles is 19.3. For the samples you selected, how many had an average diameter greater than 19.3? How many had an average diameter less than 19.3?

- c. Generate 10 random samples using [this simulation \(by clicking the “generate sample” button, recording the average diameter, and repeating 10 times\)](#) and record the provided average diameters below:

You can use the QR code below to access the applet.



d. The average diameter for this population of 60 circles is 19.3. For the random samples, how many had an average diameter greater than 19.3? How many had an average diameter less than 19.3?

e. Which gave better estimates of the true population mean: your samples or the randomly generated samples? Why do you think this?

5. Give an example of a voluntary response sample. Explain how the sample does not represent the population.

6. Determine the type of sampling used (simple random, stratified, systematic, or convenience)

a. A market researcher polls every tenth person who walks into a store.

b. The first 50 people who walk into a sporting event are polled on their television preferences.

c. A computer generates 100 random numbers, and 100 people whose names correspond with the numbers on the list are chosen.

d. Which of the above sampling techniques will prevent the sample from being representative of the population? Explain.

7. A professor is curious what motivates students to cheat. They want to know if cheating is more pervasive in STEM classes compared to other disciplines. They randomly select 50 students from various STEM classes and 50 students from various non-STEM classes. They ask participants if they have cheated in the class and compare the proportion of students who say yes in each group. What type of bias should the professor be concerned about? Explain.
8. A market research company wants to gauge interest in a bingo facility in a small city. The researchers send out a text containing a link to the survey to randomly selected phone numbers in the city. What type of bias should the researchers be concerned about? Explain.

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