

1.E: Introduction to Statistics (Exercises)

These are homework exercises to accompany the Textmap created for "Introductory Statistics" by Shafer and Zhang. Complementary General Chemistry question banks can be found for other Textmaps and can be accessed here. In addition to these publicly available questions, access to private problems bank for use in exams and homework is available to faculty only on an individual basis; please contact Delmar Larsen for an account with access permission.

1.1: Basic Definitions and Concepts

Questions

1. Explain what is meant by the term *population*.
2. Explain what is meant by the term *sample*.
3. Explain how a sample differs from a population.
4. Explain what is meant by the term *sample data*.
5. Explain what a *parameter* is.
6. Explain what a *statistic* is.
7. Give an example of a population and two different characteristics that may be of interest.
8. Describe the difference between *descriptive statistics* and *inferential statistics*. Illustrate with an example.
9. Identify each of the following data sets as either a population or a sample:
 - a. The grade point averages (GPAs) of all students at a college.
 - b. The GPAs of a randomly selected group of students on a college campus.
 - c. The ages of the nine Supreme Court Justices of the United States on January 1, 1842
 - d. The gender of every second customer who enters a movie theater.
 - e. The lengths of Atlantic croakers caught on a fishing trip to the beach.
10. Identify the following measures as either quantitative or qualitative:
 - a. The 30 high-temperature readings of the last 30 days.
 - b. The scores of 40 students on an English test.
 - c. The blood types of 120 teachers in a middle school.
 - d. The last four digits of social security numbers of all students in a class.
 - e. The numbers on the jerseys of 53 football players on a team.
11. Identify the following measures as either quantitative or qualitative:
 - a. The genders of the first 40 newborns in a hospital one year.
 - b. The natural hair color of 20 randomly selected fashion models.
 - c. The ages of 20 randomly selected fashion models.
 - d. The fuel economy in miles per gallon of 20 new cars purchased last month.
 - e. The political affiliation of 500 randomly selected voters.
12. A researcher wishes to estimate the average amount spent per person by visitors to a theme park. He takes a random sample of forty visitors and obtains an average of \$28 per person.
 - a. What is the population of interest?
 - b. What is the parameter of interest?
 - c. Based on this sample, do we know the average amount spent per person by visitors to the park? Explain fully.
13. A researcher wishes to estimate the average weight of newborns in South America in the last five years. He takes a random sample of 235 newborns and obtains an average of 3.27 kilograms.
 - a. What is the population of interest?
 - b. What is the parameter of interest?
 - c. Based on this sample, do we know the average weight of newborns in South America? Explain fully.
14. A researcher wishes to estimate the proportion of all adults who own a cell phone. He takes a random sample of 1,572 adults; 1,298 of them own a cell phone, hence $1298 / 1572 \approx .83$ or about 83% own a cell phone.
 - a. What is the population of interest?
 - b. What is the parameter of interest?
 - c. What is the statistic involved?

- d. Based on this sample, do we know the proportion of all adults who own a cell phone? Explain fully.
15. A sociologist wishes to estimate the proportion of all adults in a certain region who have never married. In a random sample of 1,320 adults, 145 have never married, hence $145 / 1320 \approx .11$ or about 11% have never married.
- What is the population of interest?
 - What is the parameter of interest?
 - What is the statistic involved?
 - Based on this sample, do we know the proportion of all adults who have never married? Explain fully.
16. a. What must be true of a sample if it is to give a reliable estimate of the value of a particular population parameter?
b. What must be true of a sample if it is to give *certain* knowledge of the value of a particular population parameter?

Answers

- A population is the total collection of objects that are of interest in a statistical study.
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- A sample, being a subset, is typically smaller than the population. In a statistical study, all elements of a sample are available for observation, which is not typically the case for a population.
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- A parameter is a value describing a characteristic of a population. In a statistical study the value of a parameter is typically unknown.
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- All currently registered students at a particular college form a population. Two population characteristics of interest could be the average GPA and the proportion of students over 23 years.
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- Population.
 - Sample.
 - Population.
 - Sample.
 - Sample.
-
- Qualitative.
 - Qualitative.
 - Quantitative.
 - Quantitative.
 - Qualitative.
-
- All newborn babies in South America in the last five years.
 - The average birth weight of all newborn babies in South America in the last five years.
 - No, not exactly, but we know the approximate value of the average.
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- All adults in the region.
 - The proportion of the adults in the region who have never married.
 - The proportion computed from the sample, 0.1.
 - No, not exactly, but we know the approximate value of the proportion.

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