1. Explain what is meant by the term population.

1. A population is the total collection of objects that are of interest in a statistical study.

2. Explain what is meant by the term sample.

1. A subset of a population

3. Explain how a sample differs from a population.

1. 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.

4. Explain what is meant by the term sample data.

1. **Sample data** is the set of measurements, responses, or characteristics recorded from that group.

5. Explain what a parameter is.

1. A parameter is a value describing a characteristic of a population. In a statistical study the value of a parameter is typically unknown.

6. Explain what a statistic is.

1. A **statistic** is a numerical value that describes or summarizes a characteristic of a **sample**.

7. Give an example of a population and two different characteristics that may be of interest.

1. 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 years

8. Describe the difference between descriptive statistics and inferential statistics. Illustrate with an example

1. **Descriptive statistics** and **inferential statistics** are two foundational branches of statistical analysis, each serving a distinct purpose:

**Descriptive statistics :To summarize, organize, and present data in a meaningful way.**

**inferential statistics :To make predictions or draw conclusions about a population based on sample data.**

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.

1. Population.

b. The GPAs of a randomly selected group of students on a college campus.

1. Sample.

c. The ages of the nine Supreme Court Justices of the United States on.

1. Population.

d. The gender of every second customer who enters a movie theater.

1. Sample.

e. The lengths of Atlantic croakers caught on a fishing trip to the beach.

1. Sample.

10. Identify the following measures as either quantitative or qualitative:

a. The high-temperature readings of the last days.

1. Quantitative

b. The scores of students on an English test.

1. Quantitative

c. The blood types of teachers in a middle school.

1. Qualitative

d. The last four digits of social security numbers of all students in a class.

1. Qualitative

e. The numbers on the jerseys of football players on a team.

1. Qualitative

11. Identify the following measures as either quantitative or qualitative:

a. The genders of the first newborns in a hospital one year.

1. Qualitative.

b. The natural hair color of randomly selected fashion models.

1. Qualitative.

c. The ages of randomly selected fashion models.

1. Quantitative.

d. The fuel economy in miles per gallon of new cars purchased last month.

1. Quantitative.

e. The political affiliation of randomly selected voters.

1. Qualitative.

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 per person.

a. What is the population of interest?

1. The population of interest is **all visitors to the theme park**. That’s the full group the researcher ultimately wants to understand.

b. What is the parameter of interest?

1. The parameter of interest is the **true average amount spent per person** by all visitors to the theme park. This is a population-level value, which is typically unknown.

c. Based on this sample, do we know the average amount spent per person by visitors to the park?.

1. **No, not exactly.** We only know the average amount spent by the 40 sampled visitors. This sample average is a **statistic**, and while it gives us a good estimate, it doesn’t reveal the exact population average. However, if the sample is random and representative, it can provide a **reasonable approximation** of the true average.

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 newborns and obtains an average of kilograms.

a. What is the population of interest?

1. All newborn babies in South America in the last five years.

b. What is the parameter of interest?

1. The average birth weight of all newborn babies in South America in the last five years.

c. Based on this sample, do we know the average weight of newborns in South America?.

1. No, not exactly, but we know the approximate value of the average.

14. A researcher wishes to estimate the proportion of all adults who own a cell phone. He takes a random sample of adults; 1298 of them own a cell phone, hence or about own a cell phone.

a. What is the population of interest?

1. The population of interest is **all adults**—specifically, every adult the researcher wants to generalize the findings to.

b. What is the parameter of interest?

1. The parameter of interest is the **true proportion of all adults who own a cell phone**. This is a population-level value and is typically unknown.

c. What is the statistic involved?

1. The statistic is the **proportion of adults in the sample who own a cell phone**. From the document:

* Sample size = 1,572 adults
* Number who own a cell phone = 1,298
* Sample proportion = 12981572≈0.83\frac{1298}{1572} \approx 0.83 or **83%**

d. Based on this sample, do we know the proportion of all adults who own a cell phone?

1. **No, not exactly.** We only know the proportion from the sample. While this gives us a good estimate, it doesn’t reveal the exact proportion for the entire population. However, if the sample is random and representative, the statistic (83%) provides a **reasonable approximation** of the true population proportion.

15. A sociologist wishes to estimate the proportion of all adults in a certain region who have never married. In a random sample of adults, 1, 320 145 have never married, hence 145/1320 ≈0.11 or about 11% have never married.

a. What is the population of interest?

1. All adults in the region.

b. What is the parameter of interest?

1. The proportion of the adults in the region who have never married.

c. What is the statistic involved?

1. The proportion computed from the sample, 0.1.

d. Based on this sample, do we know the proportion of all adults who have never married?.

1. No, not exactly, but we know the approximate value of the proportion.

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?

1. A sample must be **random, representative, and well-sized** to provide a trustworthy approximation of the 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?

1. **The entire population itself**: Only by observing every member of the population can you know the exact value of a parameter.