

11.2: Populations & Samples

Populations and Samples

A **population** is the collection of all data, such as responses, measurements, or counts, that you want information about. A **sample** is a subset of a population.

A *census* consists of data from an entire population. But, unless a population is small, it is usually impractical to obtain all the population data. In most studies, information must be obtained from a *random sample*. (You will learn more about random sampling and data collection in the next section.)

It is important for a sample to be representative of a population so that sample data can be used to draw conclusions about the population. When the sample is not representative of the population, the conclusions may not be valid. Drawing conclusions about populations is an important use of *statistics*. Recall that statistics is the science of collecting, organizing, and interpreting data.

****CONCEPT 1: DISTINGUISHING BETWEEN POPULATIONS & SAMPLES****

1. Identify the population and the sample. Describe the sample.

a) In the United States, a survey of 2184 adults age 18 and over found that 1328 of them own at least one pet.

The population consists of the responses of all adults ages 18 and over in the United States, and the sample consists of the responses of the 2184 adults in the survey. Notice in the diagram that the sample is a subset of the responses of all adults in the United States. The sample consists of 1328 adults who said they own at least one pet and 856 adults who said they do not own any pets.

b) To estimate the gasoline mileage of new cars sold in the United States, a consumer advocacy group tests 845 new cars and finds they have an average of 25.1 miles per gallon.

The population consists of the gasoline mileages of all new cars sold in the United States, and the sample consists of the gasoline mileages of the 845 new cars tested by the group. Notice in the diagram that the sample is a subset of the gasoline mileages of all new cars in the United States. The sample consists of 845 new cars with an average of 25.1 miles per gallon.

2. Identify the population and the sample. Describe the sample.

a. The owner of a dance studio asks 32 dancers what their favorite type of dance is, and 25 of them say hip-hop.

The population consists of all the dancers at the studio, and the sample consists of the responses of the 32 in the survey. The sample consists of 25 dancers who answered hip-hop and 7 who did not say hip-hop.

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- b. A counselor at Easton Middle School pulled 225 student class schedules, and found 46 students have science first period.

The population consists of all students at Easton Middle School, and the sample consists of the 225 students whose schedules were pulled. The sample consists of 46 students who have science first period and 179 who do not have science first period.

A numerical description of a population characteristic is called a **parameter**. A numerical description of a sample characteristic is called a **statistic**. Because some populations are too large to measure, a statistic, such as the sample mean, is used to estimate the parameter, such as the population mean. It is important that you are able to distinguish between a parameter and a statistic.

****CONCEPT 2: DISTINGUISHING BETWEEN PARAMETERS & STATISTICS****

Determine if given data represents a parameter or a statistic and why.

3. a) For all students taking the SAT in a recent year, the mean mathematics score was 514. Is the mean score a parameter or statistic? Explain your reasoning.

Because the mean score of 514 is based on all students who took the SAT in a recent year, it is a parameter.

- b) A survey of 1060 women, ages 20-29 in the United States, found that the standard deviation of their heights is about 2.6 inches. Is the standard deviation of the heights a parameter or a statistic? Explain your reasoning.

Because there are more than 1060 women ages 20–29 in the United States, the survey is based on a subset of the population (all women ages 20–29 in the United States). So, the standard deviation of the heights is a statistic. Note that if the sample is representative of the population, then you can estimate that the standard deviation of the heights of all women ages 20–29 in the United States is about 2.6 inches

Determine if given data represents a parameter or a statistic and why.

4. a) For all the teenagers in a certain town working jobs last summer, the mean hourly wage was \$6.95. Is the mean wage a statistic or a parameter? Explain your reasoning.

Because the mean hourly wage of \$6.95 is based on all teenagers in a town who worked last summer, it is a parameter.

- b) A survey of 912 men, age 50-60 in Central America, found that the standard deviation of the length of their feet is about 4 centimeters. Is the standard deviation of the foot length a parameter or a statistic? Explain your reasoning.

Because there are more than 912 men ages 50–60 in Central America, the survey is based on a

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subset of the population (all men ages 50–60 in Central America). So, the standard deviation of the foot length is a statistic.