# Ch. 1 Introduction to Statistics

## 1.1 An Overview of Statistics

### 1 Distinguish Between a Population and a Sample

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Identify the population and the sample.**

1) A survey of 1353 American households found that 18% of the households own a computer.

2) When 1564 American households were surveyed, it was found that 57% of them owned two cars.

3) A survey of 2625 elementary school children found that 28% of the children could be classified as obese.

### 2 Distinguish Between a Parameter and a Statistic

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Determine whether the numerical value is a parameter or a statistic. Explain your reasoning.**

1) A recent survey by the alumni of a major university indicated that the average salary of 10,000 of its 300,000 graduates was $125,000.

2) The average salary of all assembly–line employees at a certain car manufacturer is $33,000..

3) A survey of 1103 students was taken from a university with 18,500 students.

### 3 Distinguish Between Descriptive Statistics and Inferential Statistics

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Identify whether the statement describes inferential statistics or descriptive statistics.**

1) The average age of the students in a statistics class is 22 years. Does this statement describe:

A) descriptive statistics B) inferential statistics

2) The chances of winning the California Lottery are one chance in twenty–two million. Does this statement describe:

A) inferential statistics B) descriptive statistics

3) There is a relationship between smoking cigarettes and getting emphysema. Does this statement describe:

A) inferential statistics B) descriptive statistics

4) From past figures, it is predicted that 39% of the registered voters in California will vote in the June primary. Does this statement describe:

A) inferential statistics B) descriptive statistics

5) Based on previous clients, a marriage counselor concludes that the majority of marriages that begin with cohabitation before marriage will result in divorce. Does this statement describe:

A) inferential statistics B) descriptive statistics

### 4 Concepts

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

1) Explain the difference between a sample and a population.

2) If you had to do a statistical study, would you use a sample or a population? Why?

## 1.2 Data Classification

### 1 Distinguish Between Qualitative and Quantitative Data

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Determine whether the data are qualitative or quantitative.**

1) the colors of automobiles on a used car lot

A) qualitative B) quantitative

2) the number of complaint letters received by the United States Postal Service in a given day

A) quantitative B) qualitative

3) the number of seats in a movie theater

A) quantitative B) qualitative

4) the numbers on the shirts of a girl's soccer team

A) qualitative B) quantitative

### 2 Classify Data with Respect to the Four Levels of Measurement

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Identify the data set's level of measurement.**

1) hair color of women on a high school tennis team

A) nominal B) ordinal C) interval D) ratio

2) numbers on the shirts of a girl's soccer team

A) nominal B) ordinal C) interval D) ratio

3) ages of students in a statistic class

A) ratio B) ordinal C) interval D) nominal

4) temperatures of 22 selected refrigerators

A) interval B) ordinal C) nominal D) ratio

5) number of milligrams of tar in 28 cigarettes

A) ratio B) ordinal C) interval D) nominal

6) number of pages in your statistics book

A) ratio B) ordinal C) interval D) nominal

7) marriage status (married, single, or divorced) of the faculty at the University of Colorado

A) nominal B) ordinal C) interval D) ratio

8) list of 1247 social security numbers

A) nominal B) ordinal C) interval D) ratio

9) the ratings of a movie ranging from "poor" to "good" to "excellent"

A) ordinal B) nominal C) interval D) ratio

10) the final grades (A, B, C, D, and F) for students in a statistics class

A) ordinal B) nominal C) interval D) ratio

11) the annual salaries for all teachers in California

A) ratio B) ordinal C) interval D) nominal

12) list of zip codes for Chicago

A) nominal B) ordinal C) interval D) ratio

13) the nationalities listed in a recent survey (for example, Asian, European, or Hispanic).

A) nominal B) ordinal C) interval D) ratio

14) the amounts of fat (in grams) in 44 cookies

A) ratio B) ordinal C) interval D) nominal

15) the years the summer Olympics were held in the United States

A) interval B) ordinal C) nominal D) ratio

16) numbers of touchdowns scored by a major university in five randomly selected games

1 2 5 1 2

A) ratio B) ordinal C) interval D) nominal

17) the average daily temperatures (in degrees Fahrenheit) on five randomly selected days

21 32 30 28 31

A) interval B) nominal C) ordinal D) ratio

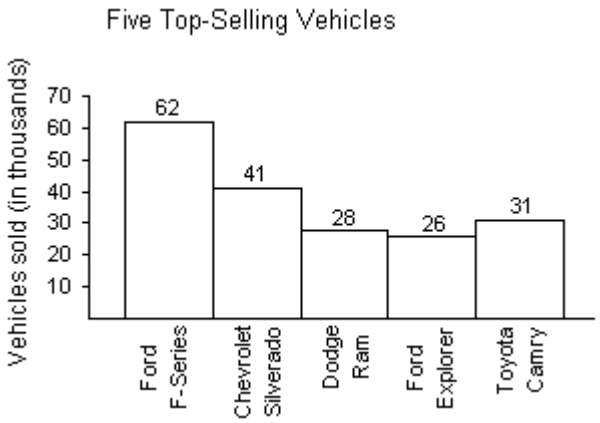
18) manuscripts rated "acceptable" or "unacceptable"

A) ordinal B) nominal C) ratio D) interval

19) the lengths (in minutes) of the top ten movies wth respect to ticket sales in 2007

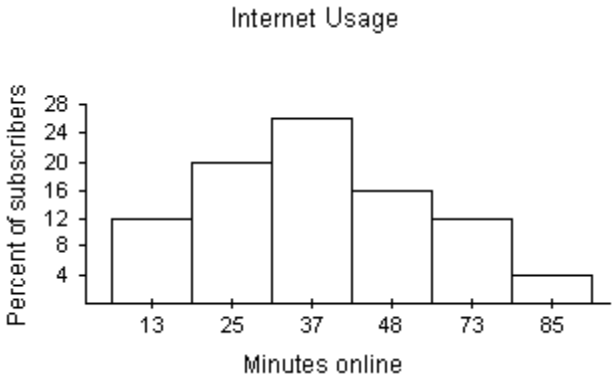
A) ratio B) nominal C) ordinal D) interval

20) the data listed on the horizontal axis in the graph




A) ratio B) interval C) ordinal D) nominal

21) the data listed on the horizontal axis in the graph




A) ratio B) nominal C) ordinal D) interval

## 3 Concepts

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

1) Explain the differences between the interval and ratio levels of measurement.

2) Explain why data expressed with the Celsius temperature scale is at the interval level of measurement rather than the ratio level.

## 1.3 Experimental Design

### 1 Decide on Methods of Data Collection

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Decide which method of data collection you would use to collect data for the study. Specify either observational study, experiment, simulation, or survey**

1) A study where a drug was given to 57 patients and a placebo to another group of 57 patients to determine if the drug has an effect on a patient's illness

A) experiment B) simulation

C) survey D) observational study

2) A study of the salaries of college professors in a particular state

A) survey B) simulation

C) experiment D) observational study

3) A study where a political pollster wishes to determine if his candidate is leading in the polls

A) observational study B) simulation

C) experiment D) survey

4) A study where you would like to determine the chance getting three girls in a family of three children

A) simulation B) survey

C) experiment D) observational study

### 2 Identify Sampling Techniques

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Identify the sampling technique used.**

1) Thirty–five sophomores, 35 juniors and 49 seniors are randomly selected from 230 sophomores, 280 juniors and 577 seniors at a certain high school.

A) stratified B) random C) cluster D) convenience E) systematic

2) Every fifth person boarding a plane is searched thoroughly.

A) systematic B) random C) cluster D) convenience E) stratified

3) At a local community college, five statistics classes are randomly selected out of 20 and all of the students from each class are interviewed.

A) cluster B) random C) convenience D) systematic E) stratified

4) A researcher randomly selects and interviews fifty male and fifty female teachers.

A) stratified B) random C) cluster D) convenience E) systematic

5) A researcher for an airline interviews all of the passengers on five randomly selected flights.

A) cluster B) random C) convenience D) systematic E) stratified

6) A community college student interviews everyone in a statistics class to determine the percentage of students that own a car.

A) convenience B) random C) cluster D) systematic E) stratified

7) Based on 12,500 responses from 42,000 questionnaires sent to its alumni, a major university estimated that the annual salary of its alumni was $96,500 per year.

A) random B) stratified C) cluster D) convenience E) systematic

8) In a recent television survey, participants were asked to answer "yes" or "no" to the question "Are you in favor of the death penalty?" Six thousand five hundred responded "yes" while 3700 responded "no". There was a fifty–cent charge for the call.

A) convenience B) random C) cluster D) stratified E) systematic

9) A lobbyist for a major airspace firm assigns a number to each legislator and then uses a computer to randomly generate ten numbers. The lobbyist contacts the legislators corresponding to these numbers.

A) random B) convenience C) cluster D) stratified E) systematic

10) To ensure customer satisfaction, every 35th phone call received by customer service will be monitored.

A) systematic B) random C) cluster D) stratified E) convenience

11) A market researcher randomly selects 200 drivers under 35 years of age and 100 drivers over 35 years of age.

A) stratified B) random C) cluster D) convenience E) systematic

12) To avoid working late, the quality control manager inspects the last 10 items produced that day.

A) convenience B) random C) cluster D) stratified E) systematic

13) The names of 70 contestants are written on 70 cards. The cards are placed in a bag, and three names are picked from the bag.

A) random B) stratified C) cluster D) convenience E) systematic

14) A researcher randomly selected 85 of the nation's middle schools and interviewed all of the teachers at each school.

A) cluster B) random C) stratified D) convenience E) systematic

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

15) After a hurricane, a disaster area is divided into 200 equal grids. Thirty of the grids are selected and every occupied household in the grid is interviewed to help focus relief efforts. Select the numbers of the first five grids that belong to the cluster sample.

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16) There are 750 incoming freshmen attending a university this fall. A researcher wishes to send questionnaires to a sample of 30 of them to complete regarding their drinking habits. Select the numbers of the first five freshmen who belong to the simple random sample.

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17) A college employs 85 faculty members. Without replacement, select the numbers of the five members who will serve on the tenure committee next year.

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18) Of the 5000 outpatients released from a local hospital in the past year, one hundred were contacted and asked their opinion on the care they received. Select the first five patients who belong to the simple random sample.

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## 3 Identify a Biased Sample

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

1) Explain what bias there is in a study done entirely online.

2) A report sponsored by the California Citrus Commission stated that cholesterol levels can be lowered by drinking at least one glass of a citrus product each day. Determine if the report is biased.

3) A local newspaper ran a survey by asking, "Do you support the deployment of a weapon that could kill millions of innocent people?" Determine whether the survey question is biased.

## 4 Concepts

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

**Provide an appropriate response.**

1) Explain the differences between cluster sampling and stratified sampling.

# Ch. 1 Introduction to Statistics
# Answer Key

## 1.1 An Overview of Statistics

### 1 Distinguish Between a Population and a Sample

1) population: collection of all American households; sample: collection of 1353 American households surveyed
2) population: collection of all American households; sample: collection of 1564 American households surveyed
3) population: elementary school children; sample: collection of 2625 elementary school children surveyed.

### 2 Distinguish Between a Parameter and a Statistic

1) It describes a statistic because the number $125,000 is based on a subset of the population.
2) It describes a parameter because the $33,000 is based on all the workers at the car manufacturer.
3) It descibes a statistic because the number 1103 is based on a subset of the population.

### 3 Distinguish Between Descriptive Statistics and Inferential Statistics

1) A
2) A
3) A
4) A
5) A

### 4 Concepts

1) A population is the collection of *all* outcomes, responses, measurements, or counts that are of interest.. A sample is a subset of a population.
2) A sample would be used. It is usually impractical to obtain all the population data.

## 1.2 Data Classification

### 1 Distinguish Between Qualitative and Quantitative Data

1) A
2) A
3) A
4) A

### 2 Classify Data with Respect to the Four Levels of Measurement

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) A
15) A
16) A
17) A
18) A
19) A
20) A
21) A

### 3 Concepts

1) Data at the ratio level are similar to data at the interval level, but with the added property that a zero entry is an inherent zero (implies "none"). Also, for data at the ratio level a ratio of two data values can be formed so that one data value can be expressed as a multiple of another.

2) Such data is at the interval level rather than the ratio level because the temperature of 0°C does not represent a condition where no heat is present, so it is not an inherent zero as required by the ratio level. Also, ratios of two temperatures cannot be formed so that one data value is expressed as a multiple of the other. The temperature 2°C is not twice as warm as 1°C.

## 1.3 Experimental Design

### 1 Decide on Methods of Data Collection

1) A
2) A
3) A
4) A

### 2 Identify Sampling Techniques

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) A
15) 163, 169, 15, 92, 97
16) 163, 487, 693, 169, 513
17) 16, 34, 69, 38, 13
18) 1634, 3890, 1695, 1392, 1509

### 3 Identify a Biased Sample

1) The study may be biased because it is limited to people with computers.
2) A report sponsored by the citrus industry is much more likely to reach conclusions favorable to the industry.
3) The wording of the question is biased, as it tends to encourage negative responses.

### 4 Concepts

1) For stratified sampling, each of the strata contains members with a certain characteristic. In contrast, clusters consist of geographic groupings, and each cluster should consist of members with all of the characteristics. With stratified samples, some of the members of each group are used. In a cluster sampling, all of the members of one or more groups are used.