1. The population consists of the responses of all ninth to twelfth graders in the United States. The sample consists of the responses of the 1501 ninth to twelfth graders in the survey. The sample data set consists of 1215 ninth to twelfth graders who said leaders today are more concerned with their own agenda than with achieving the overall goals of the organization they serve and 286 ninth to twelfth graders who did not say that.

2a. Population parameter, because the total spent on employees' salaries, $5,150,694, is based on the entire company.

 b. Sample statistic, because 43% is based on a subset of the population.

3a. The population consists of the responses of all U.S. adults, and the sample consists of the responses of the 1000 U.S. adults in the study.

 b. The part of this study that represents the descriptive branch of statistics involves the statement "three out of four adults will consult with their physician or pharmacist and only 8% visit a medication-specific website [when they have a question about their medication]."

 c. A possible inference drawn from the study is that most adults consult with their physician or pharmacist when they have a question about their medication.

1. A sample is a subset of a population.

2. It is usually impractical (too expensive and/or time consuming) to obtain all the population data.

3. A parameter is a numerical description of a population characteristic. A statistic is a numerical description of a sample characteristic.

4. The two main branches of statistics are descriptive statistics and inferential statistics.

5. False. A statistic is a numerical measure that describes a sample characteristic.

6. True

7. True

8. False. Inferential statistics involves using a sample to draw conclusions about a population.

9. False. A population is the collection of *all* outcomes, responses, measurements, or counts that are of interest.

10. False. A sample statistic can differ from sample to sample.

11. Population, because it is a collection of the salaries of each member of a Major League Baseball team.

12. Population, because it is a collection of the energy collected from all the solar panels on a photo voltaic power plant.

13. Sample, because the collection of the 300 people is a subset of the population of 13,000 people in the auditorium.

14. Population, because it is a collection of the revenue of all the stores at the shopping mall.

15. Sample, because the collection of the 10 patients is a subset of the population of 50 patients at the clinic.

16. Population, because it is a collection of the number of wireless devices in all U.S. households.

17. Population, because it is a collection of all the gamers' scores in the tournament.

18. Sample, because only the age of every fourth person entering the grocery store is recorded.

19. Population, because it is a collection of all the U.S. senators' political parties.

20. Sample, because the collection of the 20 air contamination levels is a subset of the population.

21. Population: Parties of registered voters
Sample: Parties of registered voters who respond to a survey

22. Population: Student donations at a food drive
Sample: Student donations of canned goods

23. Population: Ages of adults in the United States who own automobiles
Sample: Ages of adults in the United States who own Honda automobiles

24. Population: Incomes of home owners in Massachusetts
Sample: Incomes of home owners in Massachusetts with mortgages

25. Population: Collections of the responses of all U.S. adults
Sample: Collection of the responses of the 1020 U.S. adults surveyed
Sample data set: 42% of adults who said they trust their political leaders and 58% who said they did not

26. Population: Collection of fetal tobacco exposure of all infants
Sample: Collection of the fetal tobacco exposure of 203 infants
Sample data set: Infants with fetal tobacco exposure and their focused attention levels

27. Population: Collection of the influenza immunization status of all adults in the United States
Sample: Collection of the influenza immunization status of the 3301 U.S. adults surveyed
Sample data set: 39% of U.S. adults who received an influenza vaccine and 61% who did not

28. Population: Collection of the responses of travelers with pets in the world
    Sample: Collection of the responses of the 1100 travelers surveyed with pets
    Sample data set: 53% of respondents with pets who said they travel with their pets and 47% who said they did not

29. Population: Collection of the average hourly billing rates of all U.S. law firms
    Sample: Collection of the average hourly billing rates for partners of the 159 U.S. law firms surveyed
    Sample data set: The average hourly billing rate for partners of 159 U.S. law firms is $604.

30. Population: Collection of plans after high school of all students at a high school
    Sample: Collection of plans after high school of 496 students surveyed at a high school
    Sample data set: 95% of those surveyed who are planning to go to college and 5% who are not

31. Population: Collection of all U.S. adults
    Sample: Collection of the responses of those suffering with chronic pain of the 1029 U.S. adults surveyed
    Sample data set: 23% of respondents suffering with chronic pain who were diagnosed with a sleeping disorder and 77% who were not

32. Population: Collection of the responses of all preowned automobile shoppers
    Sample: Collection of the responses of the 1254 preowned automobile shoppers surveyed
    Sample data set: 5% of respondents shopping for preowned automobiles who bought extended warranties and 95% who did not

33. Population: Collection of all companies listed in the Standard & Poor's 500
    Sample: Collection of the responses of the 54 Standard & Poor's 500 companies surveyed
    Sample data set: Starting salaries of the 54 companies surveyed

34. Population: Collection of parents of 13- to 17-year-olds
    Sample: Collection of responses of 1060 parents of 13- to 17-year-olds surveyed
    Sample data set: 636 parents who said they check their teen's social media profile and 424 parents who did not

35. Sample statistic. The value $72,000 is a numerical description of a sample of average salaries

36. Sample statistic. The value 56.3% is a numerical description of a sample of college board members

37. Population Parameter. The 62 surviving passengers out of 97 total passengers is a numerical description of all of the passengers of the Hindenburg that survived.

38. Population parameter. The value 62% is a numerical description of the total number of governors.

39. Sample statistic. The value 7% is a numerical description of a sample of computer users.

40. Population parameter. The value 87% is a numerical description of the total number of voters.

41. Sample statistic. The value 80% is a numerical description of a sample of U.S. adults.

42. Population parameter. The score 20.6 is a numerical description of the ACT scores for all graduates.

43. The statement "23% of those suffering with chronic pain had been diagnosed with a sleep disorder" is an example of descriptive statistics. Using inferential statistics, you may conclude that an association exists between chronic pain and sleep disorders.

44. The statement "5% bought extended warranties" is an example of descriptive statistics. Using inferential statistics, you may conclude that most pre-owned automobile shoppers do not buy extended warranties.

45. Answers will vary.

46. Answers will vary.

47. The inference may incorrectly imply that exercise increases a person's cognitive ability. The study shows a slower decline in cognitive ability, not an increase.

48. The inference may incorrectly imply that obesity trends will continue in future years. Even though the obesity rates have been increasing, that does not mean the rates will continue to increase for eternity.

49. (a) The sample is the results on the standardized test by the participants in the study.

   (b) The population is the collection of all the results of the standardized test.

   (c) The statement "the closer that participants were to an optimal sleep duration target, the better they performed on a standardized test" is an example of descriptive statistics.

   (d) Individuals who obtain optimal sleep will be more likely to perform better on a standardized test then they would without optimal sleep.

1. The city names are nonnumerical entries, so these are qualitative data. The city populations are numerical entries, so these are quantitative data.

2. (1) Ordinal, because the data can be put in order.

   (2) Nominal, because no mathematical computations can be made.

3. (1) Interval, because the data can be ordered and meaningful differences can be calculated, but it does not make sense to write a ratio using the temperatures.

   (2) Ratio, because the data can be ordered, meaningful differences can be calculated, the data can be written as a ratio, and the data set contains an inherent zero.

1. Nominal and ordinal

2. Ordinal, interval, and ratio

3. False. Data at the ordinal level can be qualitative or quantitative.

4. False. For data at the interval level, you can calculate meaningful differences between data entries. You cannot calculate meaningful differences at the nominal or ordinal levels.

5. False. More types of calculations can be performed with data at the interval level than with data at the nominal level.

6. False. Data at the ratio level can be placed in a meaningful order.

7. Quantitative, because dog weights are numerical measurements.

8. Quantitative, because carrying capacities are numerical measurements.

9. Qualitative, because hair colors are attributes.

10. Qualitative, because student ID numbers are labels.

11. Quantitative, because infant heights are numerical measurements.

12. Qualitative, because mammal species are labels.

13. Qualitative, because the poll responses are attributes.

14. Quantitative, because wait times are numerical measurements.

15. Interval. Data can be ordered and meaningful differences can be calculated, but it does not make sense to say one year is a multiple of another.

16. Ordinal. Data can be arranged in order, but differences between data entries are not meaningful.

17. Nominal. No mathematical computations can be made, and data are categorized using numbers.

18. Ratio. Data can be ordered and meaningful differences can be calculated. A length of 0 means it lasts for 0 seconds. A ratio of two data entries can be formed so that one data entry can be meaningfully expressed as a multiple of another.

19. Ordinal. Data can be arranged in order, but the differences between data entries are not meaningful.

20. Interval. Data can be ordered and meaningful differences can be calculated, but it does not make sense to say one time is a multiple of another.

21. Horizontal: Nominal; Vertical: Ratio

22. Horizontal: Ordinal; Vertical: Ratio

23. Horizontal: Nominal; Vertical: Ratio

24. Horizontal: Interval; Vertical: Ratio

25. (a) Interval   (b) Nominal   (c) Ratio   (d) Ordinal

26. (a) Interval   (b) Nominal   (c) Interval   (d) Ratio

27. Qualitative. Ordinal. Data can be arranged in order, but differences between data entries are not meaningful.

28. Qualitative. Nominal. No mathematical computations can be made, and data are categorized by political party.

29. Qualitative. Nominal. No mathematical computations can be made and data are categorized by region.

30. Quantitative. Interval. Data can be ordered and meaningful differences can be calculated, but it does not make sense to say that one score is a multiple of another.

31. Qualitative. Ordinal. Data can be arranged in order, but the differences between data entries are not meaningful.

32. Quantitative. Ratio. A ratio of two data entries can be formed, so one data entry can be expressed as a multiple of another.

33. An inherent zero is a zero that implies "none." Answers will vary.

34. Answers will vary.

1. This is an observational study.

2. There is no way to tell why the people quit smoking. They could have quit smoking as a result of either chewing the gum or watching the DVD. The gum and the DVD could be confounding variables. To improve the study, two experiments could be done, one using the gum and the other using the DVD. Or just conduct one experiment using either the gum or the DVD.

3. Sample answer: Assign numbers 1 to 79 to the employees of the company. Use the table of random numbers and obtain 63, 7, 40, 19, and 26. The employees assigned these numbers will make up the sample.

4. (1) The sample was selected by using the students in a randomly chosen class. This is cluster sampling.