Statistical Reasoning for Everyday Life

Chapter 1 (Speaking of Statistics) Exam, form A

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

For problems 1 and 2, determine whether the evaluated group is a population or a sample.

1) The average (mean) age of all 63 Associate Professors at Cliffton University is 47 years.
   A) Population B) Sample

2) A researcher examines the property tax records of 84 property owners in one city and finds that 17% are behind in their tax payments.
   A) Population B) Sample

For problems 3 and 4, determine whether the given value is a statistic or a parameter.

3) The average (mean) age of all 63 Associate Professors at Cliffton University is 47 years.
   A) Statistic B) Parameter

4) A researcher examines the property tax records of 84 property owners in one city and finds that 17% are behind in their tax payments.
   A) Statistic B) Parameter

5) Following the Republican National Convention, a poll of 600 voters in a central Illinois community showed that 57% expected the Republican ticket to win over the Democrat ticket no matter whom the Democrats chose for vice-president. The margin of error was 4 percentage points. There are 25,000 registered voters in the community. Which range of values is likely to contain the population parameter?
   A) 13,250 to 15,250 B) 24,400 to 25,600
   C) 318 to 366 D) 53% to 61%

6) A poll of 488 citizens of Normal, Illinois, showed that 65% favored strict enforcement of speed limits with a margin of error of 4%. A second poll of 495 citizens of the same town showed that 34% favored strict enforcement of speed limits. Assuming that proper sampling techniques were used in both polls, one may conclude that
   A) the percent of the population that favors strict enforcement of speed limits is 49.5% ± 8%.
   B) the percent of the population that favors strict enforcement of speed limits is 49.5% ± 4%.
   C) one or both of the samples may have been unlikely samples from the population.
   D) the percent of the population that favors strict enforcement of speed limits is 65% ± 8%.

7) A poll of 700 attendees of the Taste of Chicago showed that 445 attendees, 65% of the sample, believed that the food was overpriced. It is estimated that 1,250,000 people attend the Taste. Although 65% plus or minus 5% of attendees believe that the food is overpriced, the Taste is a popular event. The raw data of the study is (are)
   A) 65% of the sample.
   B) 700 attendees, 455 attendees.
   C) 1,250,000 attendees, 700 attendees, 455 attendees.
   D) (60%, 70%)

8) A student wanted to know the favorite lunch at a large high school with a closed campus. What is the first step in conducting a statistical study to answer the question?
   A) Select a random sample of students.
   B) Precisely state the goal of the study.
   C) Select a random sample of students and teachers.
   D) Select a random sample of teachers.

For problems 9 and 10, determine whether the statement is based on census data or sample data.

9) The average (mean) age of all 63 Associate Professors at Cliffton University is 47 years.

A) Census data B) Sample data

10) A researcher determines that 17% of 84 property owners in a large city are behind in their tax payments.

A) Census data B) Sample data

For problems 11 and 12, select the most representative sample of the population of interest.

11) A college student who does laundry infrequently wants to determine the effect of stain remover on what should be white clothes.

A) Reports of two friends, one of whom was given stain remover.

B) The reports of an internet chatroom on laundry techniques.

C) Two loads of personal wash, one with, one without stain remover.

D) Two loads of wash, one personal, one of a friend, the stain remover assigned by a coin flip.

12) The father of a junior high school student wants to determine the most popular book among junior high students. Select the sample with the least potential bias.

A) A randomly selected group of 10 book sellers

B) A randomly selected group of 30 junior high students

C) A randomly selected group of 30 junior high students leaving the public library

D) The group of 30 junior high students attending the birthday party of the researcher's child

For problems 13 and 14, identify the sampling technique that was used.

13) A sample consists of every 49th student from a group of 496 students.

A) Systematic

B) Cluster

C) Convenience

D) Random

E) Stratified

14) To avoid working late, a quality-control analyst simply inspects the first 100 items produced in a day.

A) Systematic

B) Cluster

C) Convenience

D) Random

E) Stratified

For problems 15 and 16, determine whether the study is experimental or observational?

15) A marketing firm does a survey to find out how many people use a product. Of the 100 people contacted, 15 said they use the product.

A) Observational B) Experimental

16) Two samples of fish are taken from a river upstream and downstream of a factory to measure the effect of pollution from the factory on the fish.

A) Observational B) Experimental

17) A nutritionist wants to conduct a study to validate the efficacy of an herb as an aid in weight loss. She randomly assigns half of a group of overweight people to a treatment group who are given the herb with instructions for its use and a planned diet for six weeks. The other half of the group is given parsley with the same instructions and same diet. A nurse at the nutrition center weighs each subject on Friday of each week. Select the potential source of confounding.

A) The placebo effect

B) Experimenter effect

C) Method of assignment to treatment and control groups

D) The study is essentially free of potential confounding.

18) Select the most appropriate type of study for the question: Which is the best fertilizer for Mr. Jimenez's backyard grass?

A) Experimental

B) Experimental blinded

C) Double-blind

D) Observational

19) Which data provide the answer to the question: "How many times a week do students at Eureka College study more than three hours a day?"

A) Of 100 students surveyed, 43 reported that they study at least three hours a day on Saturdays and Sundays.

B) Of 100 students surveyed, 43 reported that they have studied at least three hours a day.

C) Of 100 students surveyed, 43 reported that they studied at least three hours a day twice last week.

D) Of 100 students surveyed, 43 reported that they intend to study at least three hours a day next week.

20) Determine which evaluation guideline applies best in questioning the results of the described study:

A homeowner put a brand-name fertilizer/weed killer on half of his lawn and a generic fertilizer/weed killer on the other half. After three weeks, the generic side had 1 weed per square meter, the other side had 1.7 weeds per square meter. The generic side required two mowings in the 3 weeks, the brand-name side one. The homeowner concluded that the generic was superior to the brand name.

A) Consider possible confounding variables.

B) Consider the sample.

C) Consider the type of study.

D) Consider the source.

Statistical Reasoning for Everyday Life

Chapter 1 (Speaking of Statistics) Exam, form B

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

For problems 1 and 2, determine whether the evaluated group is a population or a sample.

1) A researcher determines that 42.7% of all downtown office buildings have ventilation problems.
   A) Population B) Sample

2) After taking the first exam, 15 students dropped the class.
   A) Population B) Sample

For problems 3 and 4, determine whether the given value is a statistic or a parameter.

3) A researcher determines that 42.7% of all downtown office buildings have ventilation problems.
   A) Statistic B) Parameter

4) After taking the first exam, 15 students dropped the class.
   A) Statistic B) Parameter

5) One month before a recall election, a poll of 500 Wisconsin voters showed that 46% planned to vote for the Democratic challenger Tom Barrett and 45% planned to vote for Republican Governor Scott Walker. Undecided voters constituted another 9%. The margin of error was 5 percentage points. What conclusion can you draw from this poll?
   A) Barrett will win the election B) Walker can't get over 50% of the votes
   C) The race is too close to call D) No one will win

6) In a survey of 80 high school football players who committed to play in the Division III CCIW conference, 64 said that they would work out in their high school weight rooms in the summer before college. The margin of error for the survey was 6%. A census of all CCIW football players (not just freshmen) showed that 59% worked out at their high schools. One can conclude that
   A) the subjects were less than forthcoming in their responses to the survey.
   B) the sample was not representative of the population.
   C) there must have been an error in the determination of the margin of error.
   D) the census results are consistent with the confidence interval of the study.

7) Data has been collected from a representative sample of a well-defined population to answer the question: "How much money does the average senior male at Normal Community High School have in his pockets at the end of the school day on Friday?" The next step in the study is to
   A) determine the margin of error.
   B) summarize the data with a sample statistic.
   C) use the collected data to make inferences about the population.
   D) summarize the data with a sample parameter.

8) A U.S. government report stated that, "With bank interest rates around 1.0%, 8% of wage earners believe it worthwhile to keep money in a savings account. However, at 3.0% interest, 36% of wage earners believe it worthwhile to keep money in a savings account. The margin of error for both studies is 4 percentage points." A proper conclusion from the studies is that

A) increasing the interest rate from 1% to 3% will increase the number of persons saving money in a savings account.

B) increasing the interest rate may well have no effect on the number of persons saving money in a savings account.

C) increasing the interest rate will increase the number of persons saving money in a savings account.

D) the interest rate difference between 1% and 3% may well have no effect on the number of persons saving money in a savings account.

For problems 9 and 10, determine whether the statement is based on census data or sample data.

9) Among 50 of the total of 302 patients admitted to an emergency room during one month, 28% had no health insurance.

A) Census data B) Sample data

10) A researcher surveyed every fifth male entering a florist's shop on the day before Mother's Day and found that 53% of them were married.

A) Census data B) Sample data

For problems 11 and 12, select the most representative sample of the population of interest.

11) An employer wanted to determine the importance of health insurance as a benefit to employees.

A) A group of thirty employees of the company

B) A group of 300 union members work at the company

C) A group of 30 employees from the company who had medical treatment in the past year

D) A group of thirty potential employees at the state office of employment

12) A researcher wants to determine the status of the electorate one month before the presidential election. Select the sample most likely to produce biased data.

A) A random group of 30 persons in the phone book

B) A group of 30 persons contacted by phone with the numbers randomly chosen

C) A group of 30 persons from the researcher's birding club who voted in the last election

D) A group of 30 persons on the voter registration list

For problems 13 and 14, identify the sampling techniques used.

13) A market researcher selects 300 female soccer players and 300 male soccer players.

A) Random

B) Cluster

C) Stratified

D) Convenience

E) Systematic

14) A researcher interviews the first 19 colleagues who work in his building as they left work.

A) Random

B) Cluster

C) Stratified

D) Convenience

E) Systematic

For problems 15 and 16, determine whether the study is observational or experimental.

15) A clinic gives a drug to a group of ten patients and a placebo to another group of ten patients to find out if the drug has an effect on the patients' illness.

A) Observational B) Experimental

16) A quality-control specialist compares the output from a machine with a new lubricant to the output of machines with the old lubricant.

A) Observational B) Experimental

17) A nutritionist wants to conduct a study to validate the efficacy of an herb as an aid in weight loss. She randomly assigns half of a group of overweight people to a treatment group who are given the herb with instructions for its use and a planned diet for six weeks. The other half of the group is given the same diet without the herb. A nurse at the nutrition center weighs each subject on Friday of each week. Select the potential source of confounding.

A) The placebo effect

B) Method of assignment to treatment and control groups

C) Experimenter effect

D) The study is essentially free of confounding sources.

18) Select the most appropriate type of study for the question: Is Drug B superior to the currently used Drug A in treating pancreatitis?

A) Observational B) Case-controlled observational

C) Double-blind experiment D) Single-blind experiment

19) A survey of 100 dog owners showed that the average dog 'checked the mail' eleven times during an evening walk. Which question most probably represents the purpose of the study?

A) How many 'mail check stops' can a dog be expected to make on an evening walk?

B) How many dog owners take dogs for an evening walk?

C) How many dogs 'check the mail' on an evening walk?

D) How many pet owners have dogs?

20) Determine which evaluation guideline applies best in questioning the results of the described study:

A reading teacher wanted to know how many books her students read over the summer. She asked the local librarian to keep a record for her. The record showed that 7 students checked out a total of 60 books. At the first faculty meeting she reported that, on average, students in her class read 8.6 books over the summer.

A) Consider the sampling method.

B) Consider the measurement of the variable of interest.

C) Consider the source.

D) Consider possible confounding variables.

Statistical Reasoning for Everyday Life

Chapter 1 (Speaking of Statistics) Exam, form C

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

For problems 1 and 2, determine whether the evaluated group is a population or a sample.

1) Based on a randomly selected group of 500 patients with high cholesterol, it was found that 67% have heart disease.

   A) Population B) Sample

2) An investigation of 150 randomly selected local restaurants concluded that 42% of local restaurants have serious health code violations.

   A) Population B) Sample

For problems 3 and 4, determine whether the given value is a statistic or a parameter.

3) Based on a sample of 500 patients with high cholesterol, it was found that 67% have heart disease.

   A) Statistic B) Parameter

4) An investigation of 150 randomly selected local restaurants concluded that 42% of local restaurants have serious health code violations.

   A) Statistic B) Parameter

5) Based on a poll, a newspaper reported that between 54% and 62% of voters would be likely to vote for new county jail facility. What is the margin of error of the poll?

   A) 4% B) 8% C) 27% D) 31%

6) Of 540 college students interviewed, 360 said they were skeptical of statistical studies. The student conducting the study for the campus paper reported that between 15,000 and 17,000 of the 24,000 students on campus were skeptical of statistical studies. Which of the following is an acceptable alternative to the original report?

   A) "Between 63% and 71% of students at the university are skeptical of statistical studies."

   B) "Two of every three students on campus are skeptical of statistic studies."

   C) "A total of 16,000 students on this campus are skeptical of statistical studies."

   D) "If you are confident in the results of statistical studies, then the person on your left and the person on your right in every class are skeptical of the results of statistical studies."

7) Wisconsin had a recall vote for Governor in 2012 with Milwaukee Mayor Tom Barrett challenging the Republican Governor Scott Walker. A poll was conducted three weeks prior to the June election by surveying 520 randomly selected registered voters from the city of Milwaukee. Each voter was contacted and asked to declare a Barrett or Walker preference electronically. The results showed that 421 of those sampled preferred Barrett. The last step in the statistical study would be to

   A) determine the population parameter and the margin of error.

   B) examine the results for reasonableness or correctness.

   C) review the study and see if the design was correct to meet the goal of the study.

   D) publish the results of the study.

8) A U.S. government report stated that, "With bank interest rates at 3.0%, 21% of wage earners believe it worthwhile to keep money in a savings account. However, at 5.0% interest, 27% of wage earners believe it worthwhile to keep money in a savings account. The margin of error for both studies is 4 percentage points." The goal of the study

A) was to prove that higher interest rates encourage more people to save money.

B) is not clear from the report of the study.

C) was to determine the effect of an interest rate increase from 3% to 5% on the percentage of persons saving money.

D) was to determine the effect of interest rates on the percentage of persons saving money.

For problems 9 and 10, determine whether the statement is based on sample data or census data.

9) Based on a randomly selected group of 500 patients with diabetes, it was found that 67% are overweight.

A) Sample data B) Census data

10) A researcher examines the records of all the registered voters in one city and finds that 43% are registered Democrats.

A) Sample data B) Census data

For problems 11 and 12, select the most representative sample of the population of interest.

11) A concerned parent wants to determine the amount of time spent on the phone by her child's friends.

A) The results of a national poll of 1800 students in the same age group as the child

B) The answers to the question by the parent(s) of 10 of the friends

C) The answers to the question by 10 of the friends

D) The phone records of 10 of the group of friends

12) An employer wanted to determine the importance of health insurance as a benefit to employees. Which sample is likely to be unbiased by personal interest?

A) A group of 30 employees from the company who had medical treatment in the past year

B) A survey of 300 union members conducted by the union that represents workers at the company.

C) A group of thirty potential employees at the state office of employment

D) All of the groups in A, B, and C have potential bias.

For problems 13 and 14, identify the type of sampling used.

13) A tax auditor randomly selects 500 income tax returns from each of four income tax brackets.

A) Stratified

B) Systematic

C) Convenience

D) Random

E) Cluster

14) The name of each contestant is written on a separate card, the cards are placed in a bag and three names are picked from the bag.

A) Stratified

B) Systematic

C) Convenience

D) Random

E) Cluster

For problems 15 and 16, determine whether the study is experimental or observational.

15) A political pollster reports that his candidate has a 10% lead in the polls with 10% undecided.

A) Experimental B) Observational

16) A stock analyst selects a stock from a group of 20 for investment by choosing the stock with the greatest earnings per share reported for the last quarter.

A) Experimental B) Observational

17) A biologist wants to determine the effect of a diet supplement by using white rats. A shipment of 20 rats is obtained from a biological supply firm. They arrive in a single box. The biologist reaches into the box and the first ten rats caught are assigned to the control group and the remaining rats are assigned to the experimental group receiving the supplement. Select the potential source of confounding.

A) Method of formation of the control and treatment groups

B) Experimenter effect

C) Placebo effect

D) The study is essentially free from potential sources of confounding.

18) Select the most appropriate type of study for the question: Is the aspirin produced by a particular pharmaceutical company better than that of a competitor at relieving headaches?

A) Case-controlled observational B) Observational

C) Double-blind experimental D) Experimental

19) Sixty-seven of the 156 students taking Introductory Statistics are business majors. Which question most probably represents the purpose of the study?

A) What percent of students take Introductory Statistics?

B) What percent of Introductory Statistics students are business majors?

C) What percent of business majors take Introductory Statistics?

D) What percent of students are business majors?

20) Determine which evaluation guideline applies best in questioning the results of the described study:

A teacher wanted to know the attitudes of faculty on early dismissal for Homecoming. She randomly selected 20 of the 114 faculty and asked them to circle "agree" or "disagree" on the form: "Agree/Disagree: Valuable learning time should not be sacrificed for extracurricular social activities."

A) Consider the wording of any survey.

B) Consider the type of study.

C) Consider the form of response.

D) Consider the sampling method.

Statistical Reasoning for Everyday Life

Chapter 1 (Speaking of Statistics) Exam, form D

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

For problems 1 and 2, determine whether the evaluated group is a population or a sample.

1) A bird bander captured seven ovenbirds in her mist net and found that the average (mean) length (from the tip of the bill to the end of the tail) was 5.86 inches.

   A) Sample B) Population

2) A county planner studying health insurance costs determined that the average (mean) age of 10 of the 37 sheriff's deputies was 48.6 years.

   A) Sample B) Population

For problems 3 and 4, determine whether the given value is a statistic or parameter.

3) As shown in the *Crime Watch* article of the local newspaper, 37% of the crimes in the county in the month of September were crimes against property.

   A) Statistic B) Parameter

4) A researcher interviewed a random sample of 100 library patrons as they were leaving the library and found that 54% of them had checked out books.

   A) Statistic B) Parameter

5) An internet supplier of refilled ink jet printer cartridges sold cartridges to 30,000 customers over the past two months. A random sample of 1000 of those customers revealed that 180 were not happy with their purchase. The margin of error was 2%. Which range of values is likely to contain the population parameter?

   A) 29,000 to 31,000

   B) 16% to 20%

   C) 160 to 200

   D) 4800 to 6000

6) A poll taken of 500 voters three months before the election showed that 55% favored the Republican candidate with a margin of error of 4%. A second poll of 500 voters taken two weeks later showed that 45% favored the Republican candidate, again with a margin of error of 4%. Consider the following possible explanations for these results.

   1. At least one of the polls is wrong since the ranges of possible values of the population parameter do not overlap.
   2. Both polls are right, but voters changed their minds between the two polls.
   3. One of the polls selected a sample that was not representative of the population.

   Which statements are possible explanations of the results?

   A) Statements 1, 2, and 3

   B) Statements 1 and 2

   C) Statements 1 and 3

   D) Statements 2 and 3

7) A political campaign worker wishes to conduct a poll to determine how her candidate is likely to fare in the upcoming state Senate election. What is the population from which she should choose her sample?

   A) All citizens in her candidate's district

   B) All citizens in her candidate's district who are 18 or older

   C) All citizens in her candidate's district who voted in the previous election.

   D) All citizens in her candidate's district who are likely to vote in the election.

8) A researcher wanted to study the relationship between coffee drinking and heart problems. She interviewed all patients at several area hospitals and found that patients in the hospital for treatment of heart problems drank an average of 2.7 cups of coffee per day (Margin of error is 1.4 cups) while those patients being treated for other problems averaged only 1.4 cups of coffee per day (Margin of error is 0.8 cups). What conclusion can you draw about coffee as a cause of heart problems from this information?

A) Coffee is bad for you.

B) Coffee is good for you.

C) Heart patients drink more coffee than other patients.

D) None, because only patients in hospitals were interviewed.

For problems 9 and 10, determine whether the statement is based on sample data or census data.

9) The Centers for Disease Control and Prevention (CDC) reports that for the year 2013, 230,815 women and 2,109 men were diagnosed with breast cancer in the U.S.

A) Sample data B) Census data

10) In September 2016, a Gallup poll asked the following question of 1020 adults. *In general, how much trust and confidence do you have in mass media?* 32% responded that they have "a great deal" or "a fair amount" of trust.

A) Sample data B) Census data

For problems 11 and 12, select the most representative sample of the population of interest.

11) A researcher wishes to determine the average number of text messages per month sent by high school students who have cell phones.

A) Ask a random sample of 100 students how many text messages they send.

B) Ask a random sample of 100 students with cell phones how many text messages they send.

C) Interview 100 students in the mall who are seen talking on their cell phones.

D) Randomly select the cell phone records of 100 high school students.

12) The state Department of Natural Resources is considering lowering the bag limit on Walleyed Pike on Mud Lake and wants to know how such a decrease will affect the number of people fishing on Mud Lake. Which of the following samples is most likely to provide the necessary information?

A) A random sample of all fishermen in the state

B) A random sample of people currently living in the county containing Mud Lake

C) Interviewing all the fisherman on the lake each Saturday in July

D) Interviewing all the resort owners on Mud Lake

For problems 13 and 14, identify the type of sampling used.

13) A quality-improvement technician samples every 500^{th} bag of potato chips coming off the assembly line to test the chips for fat content.

A) Systematic

B) Cluster

C) Convenience

D) Random

E) Stratified

14) A political science student randomly selects 100 names from the voter list of registered Democrats and 100 from the list of registered Republicans.
   A) Systematic
   B) Cluster
   C) Convenience
   D) Random
   E) Stratified

For problems 15 and 16, determine whether the study is experimental or observational.

15) Researchers at a medical school want to compare two methods of treating blocked arteries. Fifty patients in similar condition are randomly assigned to two groups. One group is treated surgically and the other group is treated with drugs.
   A) Observational B) Experimental

16) Researchers at a medical school want to compare the rates of birth defects in babies born to mothers with low-fat diets with those born to mothers with high-fat diets. For one year, they collected data on all babies and their mothers in area hospitals, using information obtained from the mothers to determine whether they fall in the low fat or high fat diet category.
   A) Observational B) Experimental

17) A nutritionist wants to conduct a study to determine the efficacy of eating beans as an aid in weight loss. She randomly assigns half of a group of overweight people to a treatment group who are given a planned diet which includes a variety of beans at two meals each day for six weeks. The other half of the group is given the same diet without the beans. Both diets are designed to have the same caloric content. A nurse at the nutrition center weighs each subject on Friday of each week. Select the potential source of confounding (if any).
   A) Experimenter effect
   B) Placebo effect
   C) Method of assignment to treatment and control groups
   D) The study is essentially free of confounding sources.

18) Select the type of study most appropriate to the question: Researchers wish to study the effects on weight of feeding by formula versus breast milk. One of the factors to be studied is the body weight of the children at two years of age. What kind of study would be most appropriate?
   A) Observational B) Experimental
   C) Double-blind study D) Blinded experimental

19) In a study of teen cell phone use, 117 high school students were observed as they drove out of their high school parking lot after school. Of these drivers, 46 were already talking on their cell phones as they drove out. What is the most probable purpose of this study?
   A) To find out what percent of high school students have cell phones.
   B) To find out what percent of cell phone users are high school students.
   C) To find out what percent of high school students use cell phones while driving.
   D) To find out what percent of high school students with cell phones drive cars to school.

20) Determine which evaluation guideline(s) apply in questioning the results of the described study.
   A mathematics teacher wanted to determine whether assigning homework had a beneficial effect on student learning in first year algebra. His class met at 8:00 in the morning and he obtained the cooperation of another teacher of the same class that met at 2:00 in the afternoon. He gave his class no homework while the other teacher continued to assign homework as he usually did. Both teachers gave the same tests so that they could compare the results.
   A) Consider possible confounding variables
   B) Consider the sample
   C) Consider the measurement of the variable of interest
   D) All of the above