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.

Determine whether the evaluated group is a population or a sample in #1 and #2.

1) The average age of 45 employees of a large company is found to be 32 years.

A) Population B) Sample

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

A) Population B) Sample

Determine whether the given value is a statistic or a parameter in #3 and #4.

3) A sample of 120 employees of a company is selected and the average age is found to be 37 years.

A) Statistic B) Parameter

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

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. What is the range 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) there are definitely errors in one of the polls.

7) 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) State the goal of the study precisely.

C) Select a random sample of students and teachers.

D) Select a random sample of teachers.

8) A poll of 700 persons attending the Taste of Chicago showed that 455 persons, 65% of the sample, believed that the food was overpriced. It is estimated that 1,250,000 persons attend the Taste.

Statistics suggest that, 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 persons, 455 persons.

C) 1,250,000 persons, 700 persons, 455 persons.

D) (60%, 70%).

Determine whether the statement is based on census data or sample data in #9 and #10.

9) The average age of 45 employees of a large company is found to be 32 years.

A) Census data B) Sample data

10) A researcher determines that 42.7% of all downtown office buildings have ventilation problems.

A) Census data B) Sample data

Select the sample most representative of the population of interest in #11 and #12.

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

A) Reports of two friends, one of whom was given bluing

B) The reports of an internet chatroom on laundry techniques

C) Two loads of personal wash, one with, one without bluing

D) Two loads of wash, one personal, one of a friend, the bluing 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

Identify the type of sampling used in #13 and #14.

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

Is the study experimental or observational in #15 and #16?

15) A marketing firm does a survey to find out how many people use a product. Of the one hundred people contacted, fifteen 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 persons 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) Placebo effect

B) Experimenter effect

C) Method of assignment to treatment and control groups

D) The study is essentially free of potential confounding.

Select the type of study most appropriate to the question in #18.

18) Which is the best fertilizer for Mr. Jimenez' backyard grass?

A) Experimental B) Experimental blinded

C) Case-controlled observational D) Observational

19) Which data provide the answer to the question: "How frequently can a student at Eureka College be expected to study more than three hours a day?".

A) Of 100 students surveyed, 43 reported that they study at least three hours a day twice a week.

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.

Determine which evaluation guideline applies best in questioning the results of the described study in #20.

20) 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 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 in #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 of the students dropped the class.

A) Population B) Sample

Determine whether the given value is a statistic or a parameter in #3 and #4.

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 of the students dropped the class.

A) Statistic B) Parameter

5) Following the Republican National Convention, a poll of 500 voters in a Central Illinois community showed that 63% expected the Republican ticket to win over the Democrat ticket no matter whom the Democrats chose for vice-president. The margin of error was 5 percentage points. There are 27,000 registered voters in the community. What is the range likely to contain the number of voters who expected the Republican ticket to win?

A) 58% to 68% B) 15,660 to 18,360

C) 26,685 to 27,315 D) 290 to 340

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 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.". A proper conclusion from the studies is that

A) increasing the interest rate by 2 percentage points 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 3% and 5% may well have no effect on the number of persons saving money in a savings account.

Determine whether the statement is based on census data or sample data in #9 and #10.

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 determines that of all 25 year old women in her city, 37% are married.

A) Census data B) Sample data

Select the sample most representative of the population of interest in #11 and #12.

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 survey of 300 union members conducted by the union that represents workers 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 numbers

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

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

Identify the type of sampling used in #13 and #14.

13) A market researcher selects 500 drivers less than 30 years of age and 500 drivers over 30 years of age.

A) Random B) Cluster C) Stratified

D) Convenience E) Systematic

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

A) Random B) Cluster C) Stratified

D) Convenience E) Systematic

Is the study observational or experimental in #15 and #16?

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 persons 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.

Select the type of study most appropriate to the question in #18.

18) Is Drug B superior to the currently used Drug A in treating pancreatitus?

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?

Determine which evaluation guideline applies best in questioning the results of the described study in #20.

20) 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.

Determine whether the evaluated group is a population or a sample in #1 and #2.

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

Determine whether the given value is a statistic or a parameter in #3 and #4.

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 58% and 62% of voters would be likely to vote for a school bond issue. What is the margin of error of the poll?

A) 31% B) 29% C) 10% D) 2%

6) Of 54 college students interviewed, 36 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) Central Illinois has given a majority of its vote to every Republican presidential candidate since John F. Kennedy. A study was conducted three weeks after the Democratic convention to determine the preference of Central Illinois voters. A random sample of 1100 Central Illinoisians was selected from the rolls of registered voters. Each was contacted and asked to declare a Bush or Gore preference electronically. The results showed that 996 of those in the sample showed a preference for Gore. 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.

Determine whether the statement is based on sample data or census data in #9 and #10.

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

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

Select the sample most representative of the population of interest in #11 and #12.

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.

Identify the type of sampling used in #13 and #14.

13) A tax auditor selects every 1000th income tax return that is received.

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

Is the study experimental or observational in #15 and #16?

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 twenty for investment by choosing the stock with the greatest earnings per share reported for the last quarter.

A) Experimental B) Observational

17) A nutritionist wants to conduct a study to validate the efficacy of an herb as an aid in weight loss. One hundred members of a weight loss group who are patrons of the nutrition center sign up for the treatment or the control group. After 50 have signed up for the control group, the rest are assigned to the treatment group. The members of the treatment group are given the herb with instructions for its use and a planned diet for six weeks. The control 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) 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.

Select the type of study most appropriate to the question in #18.

18) 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?

Determine which evaluation guideline applies best in questioning the results of the described study in #20.

20) 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.

Determine whether the evaluated group is a population or a sample in #1 and #2.

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

   A) Sample B) Population

2) A city planner studying pension costs determined that the average age of the 42 city library employees was 54.2 years.

   A) Sample B) Population

Determine whether the given value is a statistic or parameter in #3 and #4.

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 cartridges for ink jet printers sold cartridges to 30,000 customers over the past two months. A random sample of 1000 of those customers revealed that 18% were not happy with their purchase. The margin of error was 2%. What range 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 or 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.

Determine whether the statement is based on sample data or census data in #9 and #10.

9) The Centers for Disease Control and Prevention (CDC) reports that for the year 2003, 181,646 women and 1,826 men were diagnosed with breast cancer in the U.S.

   A) Sample data B) Census data

10) In May of 2007, a Gallup poll asked the following question of 1007 people surveyed. *Now thinking about how human beings came to exist on Earth, do you, personally, believe in evolution, or not?* 68% of Republicans, 37% of Independents, and 40% of Democrats responded that they do not believe in evolution.

   A) Sample data B) Census data

Select the sample most representative of the population of interest in #11 and #12.

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 raising deer hunting and fishing license fees (required for anyone 12 years old or older) and wants to know how such an increase will affect the number of people purchasing such licenses. Which of the following samples is most likely to provide the necessary information?

   A) A random sample of people in the state who are 12 or older

   B) A random sample of people currently holding a hunting or fishing license

   C) Interviewing a sample of fisherman at a boat landing

   D) Interviewing a sample of hunters who were successful during the past deer season

Identify the type of sampling used in #13 and #14

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

Is the study experimental or observational in #15 and #16?

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 whose diets are classified as low fat with those born to mothers whose diets are high in fat. For one year, they collect 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 an herb as an aid in weight loss. She randomly assigns half of a group of overweight persons 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 (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) Researchers at the University of Melbourne (Australia) wish to study the long-term effects of using repeated doses (instead of one dose) of antenatal corticosteroids to reduce the risk of respiratory distress syndrome in newborns. One of the factors to be studied is the body weight of the children at two years of age. What kind of study will best suit their purposes?

A) Observational B) Experimental

C) Case-controlled observational 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.

Determine which evaluation guideline(s) apply in questioning the results of the described study in #20.

20) 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