Essentials of Statistics 7th edition Triola Test Bank

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

1) Determine whether the given description corresponds to an experiment or an observational study. 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) Experiment B) Observational study

   Answer: B

2) Identify which type of sampling is used. 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) Cluster
   B) Simple Random
   C) Convenience
   D) Systematic
   E) Stratified

   Answer: B

3) Identify which type of sampling is used. To avoid working late, a quality control analyst simply inspects the first 100 items produced in a day.
   A) Cluster
   B) Systematic
   C) Simple Random
   D) Stratified
   E) Convenience

   Answer: E

4) An education expert is researching teaching methods and wishes to interview teachers from a particular school district. She randomly selects ten schools from the district and interviews all of the teachers at the selected schools. Does this sampling plan result in a random sample? Simple random sample? Explain.
   A) No; no. The sample is not random because teachers in small schools are more likely to be selected than teachers in larger schools. It is not a simple random sample because some samples are not possible, such as a sample that includes teachers from schools that were not selected.
   B) Yes; yes. The sample is random because all teachers have the same chance of being selected. It is a simple random sample because all samples have the same chance of being selected.
   C) No; yes. The sample is not random because teachers in small schools are more likely to be selected than teachers in larger schools. It is a simple random sample because all samples have the same chance of being selected.
   D) Yes; no. The sample is random because all teachers have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample that includes teachers from schools that were not selected.

   Answer: D

5) Identify the type of observational study used. A town obtains current employment data by polling 10,000 of its citizens this month.
   A) Prospective B) Cross–sectional C) Retrospective D) None of these

   Answer: B

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6) Determine whether the given value is a discrete or continuous variable. People are asked to state how many times in the last month they visited their family doctor.

A) Discrete B) Continuous

Answer: A

7) Determine which of the four levels of measurement is most appropriate. Students' grades, A, B, or C, on a test.

A) Interval B) Ratio C) Ordinal D) Nominal

Answer: C

8) A tax auditor selects every 1000th income tax return that is received. Identify which of these types of sampling is used.

A) Systematic
B) Simple Random
C) Convenience
D) Stratified
E) Cluster

Answer: A

9) Determine whether the given value is a statistic or a parameter. Thirty percent of all dog owners poop scoop after their dog.

A) Statistic B) Parameter

Answer: B

10) Determine whether the given value is from a discrete or continuous data set. The time it takes a computer to complete a task.

A) Discrete B) Continuous

Answer: B

11) On a test, 74% of the questions are answered correctly. If 111 questions are correct, how many questions are on the test?

A) 37 questions B) 67 questions C) 82 questions D) 150 questions

Answer: D

12) Researchers collect data by interviewing athletes who have won Olympic gold medals from 1992 to 2016. Identify the type of study.

A) Cross–sectional B) Retrospective C) Prospective D) None of these

Answer: B

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13) A psychology student wishes to investigate differences in political opinions between business majors and political science majors at her college. She randomly selects 100 students from the 260 business majors and 100 students from the 180 political science majors. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) Yes; no. The sample is random because all students have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample consisting of 50 business majors and 150 political science majors.

B) No; yes. The sample is not random because political science majors have a greater chance of being selected than business majors. It is a simple random sample because all samples of size 200 have the same chance of being selected.

C) No; no. The sample is not random because political science majors have a greater chance of being selected than business majors. It is not a simple random sample because some samples are not possible, such as a sample consisting of 50 business majors and 150 political science majors.

D) Yes; yes. The sample is random because all students have the same chance of being selected. It is a simple random sample because all samples of size 200 have the same chance of being selected.

Answer: C

14) Correlation does not imply _____.

A) linearity B) causation C) bias D) significance

Answer: B

15) There are many potential pitfalls that can cause problems when analyzing data. Which of these choices are not classified as a potential pitfall?

A) Nonresponse B) Self-reported data

C) Order of survey questions D) Measured data

Answer: D

16) A management survey for a company surveyed 235 employees. 44.7% of the employees surveyed were females. The number of males would be _____.

A) 13 B) 105

C) 130 D) Unable to determine

Answer: C

17) What type of data values are quantitative and the number of values is finite or countable?

A) Discrete B) Categorical C) Interval D) Continuous

Answer: A

18) A _____ is the collection of data from every member of the population.

A) placebo B) statistic C) sample D) census

Answer: D

19) A _____ is the complete collection of all measurements or data collected, whereas, a _____ is a subcollection of members selected from the complete collection.

A) sample; population B) population; parameter

C) sample; census D) population; sample

Answer: D

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20) The four levels of measurement that are commonly used for classifying data are ratio, _____, _____, and _____.

A) normal; ordinal; interval
B) interval; normal; ordinary
C) nominal; ordinal; interval
D) nominal; ordinal; categorical

Answer: C

21) Identify which type of sampling is used. A pollster uses a computer to generate 500 random numbers, then interviews the voters corresponding to those numbers.

A) Random B) Systematic C) Stratified D) Convenience E) Cluster

Answer: A

22) Determine whether the given value is a statistic or a parameter. After taking the first exam, 15 of the students dropped the class.

A) Statistic
B) Parameter

Answer: B

23) Determine which of the four levels of measurement is most appropriate. Students' grades of A, B, or C, on a test.

A) Ordinal B) Interval C) Ratio D) Nominal

Answer: A

24) Determine which of the four levels of measurement is most appropriate. Level of satisfaction of survey respondents.

A) Interval B) Ratio C) Ordinal D) Nominal

Answer: C

25) Identify which type of sampling is used. A tax auditor selects every 1000th income tax return that is received.

A) Random B) Cluster C) Stratified D) Systematic E) Convenience

Answer: D

26) Determine whether the given description corresponds to an observational study or an experiment. A political pollster reports that his candidate has a 10% lead in the polls with 10% undecided.

A) Experiment
B) Observational study

Answer: B

27) Identify the type of study used. A town obtains current employment data by polling 10,000 of its citizens this month.

A) Prospective B) Cross–sectional C) Retrospective D) None of these

Answer: B

28) Determine whether the given description corresponds to an observational study or an experiment. A doctor gives a new medication to half of his patients with the flu and a placebo to the other half of his patients with the flu.

A) Experiment
B) Observational study

Answer: A

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29) Identify which type of sampling is used. A research team wants to study the demographics of college students in the United States using proportionate samples of students in majors reflecting actual U.S. percentages.
A) Convenience
B) Cluster
C) Systematic
D) Simple random
E) Stratified

Answer: E

30) A marijuana survey included 1610 responses from a list of approximately 241,500,000 adults in the United States from which every $150{,}000^{th}$ name was surveyed. Identify which of these types of sampling is used:
A) Simple random
B) Convenience
C) Stratified
D) Systematic
E) Cluster

Answer: D

31) A gardener has 75 clients, 45% of whom are businesses. Find the number of business clients.
A) 73 clients B) 36 clients C) 34 clients D) 41 clients

Answer: C

32) 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. Identify the type of study used.
A) Observational study B) Experiment

Answer: A

33) The similarity between an ordinal level of measurement and an interval level of measurement is that _____.
A) both can be arranged in some order
B) neither can be arranged in some order
C) differences between data values cannot be determined or are meaningless
D) differences between data values can be determined and are meaningful

Answer: A

34) Which of the following does not apply to the ratio level of measurement?
A) Differences between data values can be found and are meaningful
B) Cannot be arranged in order
C) Can be arranged in order
D) There is a natural zero starting point

Answer: B

35) Determine which level of measurement is appropriate. A sample of children's balls are classified from softest to hardest.
A) Ordinal B) Interval C) Nominal D) Ratio

Answer: A

36) Determine which level of measurement is appropriate. Salaries of college professors.
A) Ratio B) Nominal C) Ordinal D) Interval

Answer: A

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37) Which of the following is an inappropriate way to deal with missing data?
A) Substitute missing values
B) Determine if missing values are random
C) Ignore missing data
D) Delete cases with missing data

Answer: C

38) In a cross–sectional study, data are _____.
A) collected from a past time period
B) observed, measured, and collected at one point of time
C) collected in the future from groups that share common factors
D) observed, measure, and collected over a period of time

Answer: B

39) Which type of experiment separates subjects into groups that are similar but differ in ways that might affect the outcome of the experiment?
A) Randomized block design
B) Rigorously controlled design
C) Matched pairs design
D) Completely randomized design

Answer: A

40) The good design of experiments includes blinding, _____, and _____.
A) internalization; randomization
B) replication; randomization
C) replication; voluntary response samples
D) replication; experimentation

Answer: B

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

41) Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.
Last year, the average math SAT score for students at one school was 475. The headmaster introduced new teaching methods hoping to improve scores. This year, the mean math SAT score for a sample of students was 481. Is there statistically significant evidence that the new teaching method is effective? If the teaching method had no effect, there would be roughly a 3 in 10 chance of seeing such an increase. Does the result have statistical significance? Why or why not? Does the result have practical significance?

Answer: No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.

42) Why do you think that cluster sampling is frequently used in practice?

Answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. If a study wants to solicit opinions from the homeless population, it is more effective to choose a few selected towns and interview a significant number of homeless people in each town rather than study a few homeless people in all towns. A significant and similar sample are identified in each cluster. In this case, a study accessing the entire population through simple random sample would be too big and expensive.
In stratified sampling, the population is divided into strata according to some variables that are thought to be related to the variables of interest. A sample is taken from every stratum. There is not an identified variable of interest in the homeless study.

43) "38% of adults in the United States regularly visit a doctor". This conclusion was reached by a college student after she had questioned 520 randomly selected members of her college. What is wrong with her conclusion?

Answer: The sample is biased. College students are not representative of the U.S. population as a whole.

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44) Subscribers of the women's magazine Cosmopolitan are asked to participate in a survey about preferred cereals for breakfast. Are the results likely to be representative of all women? Of all subscribers of Cosmopolitan? Why or why not?

Answer: No. Cosmopolitan attracts women with specific demographics and subscribers will not be representative of all women, however, a sample well selected, will not be representative. No, this sample will not even be representative of all Cosmopolitan subscribers because it is a voluntary response sample – subscribers themselves choose whether to respond. Those with stronger opinions are more likely to respond so the sample is unlikely to be representative of all subscribers to the magazine.

45) Given the data in the table, what issue can be addressed by conducting a statistical analysis of the values?

Amounts of Saturated Fat (in grams) in Two–Once Regular and Low–Fat Muffins

Regular	4.5	3.5	3.7	5.2	4.9	3.9
Low–Fat	1.2	2.1	2.2	1.8	1.6	2.2

Answer: Given the context of the data, we could address the issue of whether the two types of muffins provide the same amounts of saturated fat, or whether there is a difference between the two types of muffin.

46) At a school there are two different math classes for children of the same age. The two classes have different teachers. The school principal is interested in gauging the effectiveness of two different teaching methods and asks each teacher to try one of the methods. At the end of the semester both classes are given the same test and the results are compared. In this experiment, what is the variable of interest? Give some examples of variables which could be confounding variables.

Answer: The variable of interest is the teaching method. Possible confounding variables are "skill of teacher" (is one teacher better than the other?), "aptitude of students" (do the two classes have students of the same ability?), "amount of study time" (does one class have students who are more conscientious?).

47) A lawyer surveyed a simple random sample of his colleagues and asked them whether they were left–handed or right–handed. Is this convenience sample likely to provide results typical of all adults in the United States? Do convenience samples in general provide good results?

Answer: Yes. There is nothing about left–handedness or right–handedness that would affect being one of the lawyer's colleagues. In terms of left– or right–handedness, a simple random sample of the lawyer's colleagues is likely to be representative of all adults in the United States. Convenience samples in general do not tend to provide good results as the sample is often not representative of a broader population.

48) Identify the sample and population. Also, determine whether the sample is likely to be representative of the population. A study is interested in whether men and women are equally likely to vote Democratic, Republican or Independent or not vote in a presidential election. Results were polled through a popular news website.

Answer: Sample: the individuals who responded to the website poll; population: all voting age adults; not representative due to being a convenience sample.

49) Distinguish between categorical and quantitative data. Give an example of each.

Answer: Qualitative data can be separated into categories that are distinguished by nonnumeric characteristics. Quantitative data consist of numbers representing counts or measurements. Examples will vary.

50) Explain why using self–reported data instead of measured data is a potential pitfall in data collection. Be sure to include an example.

Answer: Answers will vary. Using self–reported data may be inaccurate since people may want to represent themselves in a certain way. For example, people often report that they weigh less than they actually do.

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51) Explain the difference between stratified and cluster sampling.

Answer: In both cluster sampling and stratified sampling, sub–groups (clusters or strata) are formed. However, in stratified sampling, all strata are used and a sample is selected from each strata. In cluster sampling, a sample of the clusters is first selected, then all members of those clusters are selected.

52) The table shows the weights (in pounds) and monthly incomes (in dollars) of nine randomly selected women between the ages of 18 and 65.

Weight (lb)	113	132	155	122	166	140	118	129	185
Monthly Income (dollars)	1420	3650	5475	2310	4710	2910	1720	2460	4115

If we use statistical methods to conclude that there is a correlation (or relationship or association) between the weights of women and their monthly incomes, can we conclude that by increasing her weight a woman can increase her monthly income?

Answer: No. If a correlation (or relationship or association) is found, this doesn't mean that one variable is the cause of another. Larger weights do not cause higher incomes, but tend to be associated with higher incomes because both weight and income are associated with a third variable, age. Older women tend to be heavier and to have higher incomes than younger women.

53) A teacher was interested in knowing how much tax people pay in the United States. She selected a simple random sample of her friends and asked them about their taxes. Is this sample likely to be representative of all adults in the United States?

Answer: An observational study would be more appropriate. An experiment would not be appropriate because it would be unethical to administer as a treatment a substance known to be toxic. However a retrospective observational study, for example, could be carried out by examining records from the past and observing the effects where the substance had been accidentally ingested.

54) Would an observational study or an experiment be more appropriate to investigate the effects on humans of a substance known to be toxic? Explain.

Answer: No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.

55) A coach uses a new technique in training middle distance runners. The times, in seconds, for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Before	115.2	114	116.4	119.8	110.9	112.4	111.5	117.3
After	112.9	112.7	114	120.6	109.1	109.1	107.9	113.4

Does the conclusion that the technique is effective appear to be supported with statistical significance? Does the conclusion that the technique is effective appear to have practical significance?

Answer: Yes. Almost all runners have considerably faster times after the training. Yes. The differences appear to be substantial.

56) Why is cluster sampling frequently used in practice?

Answer: Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.

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57) Identify the sample and population. Also, determine whether the sample is likely to be representative of the population. An employee at the local ice cream parlor asks three customers if they like chocolate ice cream.

Answer: Sample: the 3 selected customers; population: all customers; not representative.

58) Use critical thinking to develop an alternative conclusion. A study shows that the number of reported sexually transmitted diseases was significantly higher for high schools that offered courses in sex education than for high schools that did not. Conclusion: The introduction of sex education courses at the high school level has resulted in increased promiscuity among teens.

Answer: Sex education gives students information about sexual activities including the results of engaging in those activities, such as pregnancy and disease. Promiscuous behavior is more about a lack of information. This fallacy explanation is saying that since sex education is being taught in high schools, the teachings increase the promiscuity of teenagers. This is completely false because yes the teenagers are learning how to have safe and protective sex, but it's up to them and how they choose to use that information about sex to alter the cause of their promiscuity.

59) Would an observational study or an experiment be more appropriate to investigate the effects on fertilizer on plant growth? Explain.

Answer: An experiment would be more appropriate.

60) Explain what is meant by the term "confounding," and give an example of an experiment in which confounding is likely to be a problem.

Answer: Confounding occurs in an experiment when the effects of two or more variables cannot be distinguished from each other. Examples will vary. One example is that of a school district that conducts a study regarding whether the science laboratory approach or the computer simulation approach is better for learning chemistry among seniors. A standardized achievement test is used to measure learning, and the results of the two schools are compared. Unless controlled in the study, two confounding variables are teaching expertise and student motivation.

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

Use critical thinking to determine whether the sampling method appears to be sound or is flawed.

61) You plan to make a survey of 200 people. The plan is to talk to every 10th person coming out of the school library. Is there a problem with your plan?

Answer: People who don't go to the library are excluded.

62) A questionnaire is sent to 10,000 persons. 5,000 responded to the questionnaire. 3,000 of the respondents say that they "love chocolate ice cream". We conclude that 60% of people love chocolate ice cream. What is wrong with this survey?

Answer: This is a voluntary response sample. The survey is based on voluntary, self–selected responses and therefore has serious potential for bias.

63) An airline company advertises that 100% of their flights are on time after checking 5 randomly selected flights and finding that these 5 were on time. What is wrong with their claim?

Answer: The sample was too small.

64) "7 out of 10 dentists recommend Brand X toothpaste". This finding is based on the results of a survey of 10 randomly selected dentists. What is wrong with this survey?

Answer: The sample was too small.

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65) A researcher published this survey result: "74% of people would be willing to spend 10 percent more for energy from a non–polluting source". The survey question was announced on a national radio show and 1,200 listeners responded by calling in. What is wrong with this survey?

Answer: This is a voluntary response sample. The survey is based on voluntary, self–selected responses and therefore has serious potential for bias.

66) "38% of adults in the United States regularly visit a doctor". This conclusion was reached by a college student after she had questioned 520 randomly selected members of her college. What is wrong with her survey?

Answer: The sample is biased. College students are not representative of the U.S. population as a whole.

Form a conclusion about statistical significance. Do not make any formal calculations. Either use the results provided or make subjective judgments about the results.

67) A manufacturer of laptop computers claims that only 1% of their computers are defective. In a sample of 600 computers, it was found that 3% were defective. If the proportion of defectives were really only 1%, there would be less than 1 chance in 1000 of getting such a large proportion of defective laptops in the sample. Is there statistically significant evidence against the manufacturer's claim? Why or why not?

Answer: Yes. If the claimed proportion of defectives of 1% were correct, there would be a very small likelihood of getting 3% defectives in the sample. The sample rate of 3% is significantly greater than the claimed rate of 1%.

68) A researcher investigated whether following a vegetarian diet could help to reduce blood pressure. For a sample of 85 people who followed a vegetarian diet for 4 months, the mean systolic blood pressure was 124 mmHg and for a sample of 75 people who followed a nonvegetarian diet for 4 months, the mean systolic blood pressure was 138 mmHg. Methods of statistics show that if a vegetarian diet had no effect on blood pressure, there would be less than 1 chance in a 100 of getting these results. Does the result have statistical significance? Why or why not? Does the result have practical significance?

Answer: Yes. The group following a vegetarian diet had a substantially lower mean blood pressure. If a vegetarian diet did not help to reduce blood pressure, there would be a very small chance of getting these results. Yes; the difference in blood pressure appears substantial and enough to be an important factor in health.

69) Last year, the average math SAT score for students at one school was 475. The headmaster introduced new teaching methods hoping to improve scores. This year, the mean math SAT score for a sample of students was 481. Is there statistically significant evidence that the new teaching method is effective? If the teaching method had no effect, there would be roughly a 3 in 10 chance of seeing such an increase. Does the result have statistical significance? Why or why not? Does the result have practical significance?

Answer: No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.

70) Charlie's teacher claims that he does not study and just guesses on exams. On an exam with 201 true–false questions, Charlie answered 53.7% of the questions correctly. Calculations using these results show that if he were really just guessing, there would be roughly 1 chance in 7 that he would do this well. Is there statistically significant evidence against the teacher's claim that Charlie is just guessing? Why or why not?

Answer: No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.

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71) In a random sample of 160 women, 78% favored stricter gun control laws. In a random sample of 220 men, 61% favored stricter gun control laws. Is there statistically significant evidence that a larger proportion of women than men favor stricter gun control laws?

Answer: Yes. In these samples, the proportion of women favoring stricter gun control is substantially higher than the proportion of men favoring stricter gun control. If the true proportions were actually equal, there would be a very small likelihood of seeing such a large difference in the samples..

Provide an appropriate response.

72) Use the data in the table to answer the question. The x–values are amounts of saturated fat (in grams) in various regular two–ounce muffins. The y–values are amounts of saturated fat (in grams) in various "low fat" two–ounce muffins.

Amounts of Saturated Fat in Regular and Low–Fat Muffins

x	5.2	5.8	4.8	5.8	5.4	4.5
y	1.2	2.1	1.3	2.4	1.5	1.1

Is each x–value matched with a corresponding y–value? That is, is each x–value associated with the corresponding y–value in some meaningful way? If the x– and y–values are not matched, does it make sense to use the difference between each x–value and the y–value that is in the same column?

Answer: The x–values are not matched with the y–values, so it does not make sense to use the differences between each x–value and the y–value that is in the same column.

73) Use the data in the table to answer the question. The x–values are amounts of saturated fat (in grams) in various regular two–ounce muffins. The y–values are amounts of saturated fat (in grams) in various "low fat" two–ounce muffins.

Amounts of Saturated Fat in Regular and Low–Fat Muffins

x	5.3	5.7	5.8	3.8	4.2	6.1
y	1.2	2.1	1.7	1.9	0.7	2.3

Note that the table lists measured amounts of saturated fat in two different types of muffin. Given these data, what issue can be addressed by conducting a statistical analysis of the values?

Answer: Given the context of the data, we could address the issue of whether the two types of muffin provide the same amounts of saturated fat, or whether there is a difference between the two types of muffin.

74) Use the data in the table to answer the question. The x–values are amounts of saturated fat (in grams) in various regular two–ounce muffins. The y–values are amounts of saturated fat (in grams) in various "low fat" two–ounce muffins.

Amounts of Saturated Fat in Regular and Low–Fat Muffins

x	4.7	6.1	3.5	5.2	3.8	4.3
y	1.2	2.1	0.8	1.5	1.8	2.4

The measured amounts of saturated fat were supplied by the producers of the muffins. Is there an incentive for producers to report values that are not accurate?

Answer: For health reasons, consumers often prefer to buy muffins which are low in saturated fat. There is an incentive for producers to make the amount of saturated fat appear as low as possible. For this reason, the source of the data could be suspect with a potential for bias.

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75) The table shows the weights, in pounds, of seven subjects before and after following a particular diet for two months. Assume that the x–values are the weights before the diet and the y–values are the weights after the diet.

Subject	A	B	C	D	E	F	G
Before	159	173	199	181	200	160	188
After	152	164	197	186	186	162	176

Are the x–values matched with the corresponding y–values? That is, is each x–value associated with the corresponding y–value in some meaningful way? If the x– and y–values are matched, does it make sense to use the difference between each x–value and the y–value that is in the same column? Why or why not?

Answer: The x–values are matched with the corresponding y–values. It makes sense to use the difference between each x–value and the y–value that is in the same column. Both represent weights measured in pounds and both are associated with the same person. The x–value is the weight of a person before the diet and the y–value in the same column is the weight of the same person after the diet. The difference represents the amount of weight lost (or gained) by that person.

76) The table shows the weights (in pounds) and monthly incomes (in dollars) of nine randomly selected women between the ages of 18 and 65. Assume that the x–values are the weights and the y–values are the monthly incomes.

Weight (lb)	113	132	155	122	166	140	118	129	185
Monthly Income (dollars)	1420	3650	5475	2310	4710	2910	1720	2460	4115

Are the x–values matched with the corresponding y–values? That is, is each x–value associated with the corresponding y–value in some meaningful way? If the x– and y–values are matched, does it make sense to use the difference between each x–value and the y–value that is in the same column? Why or why not?

Answer: The x–values are matched with the y–values. It does not make sense to use the difference between each x–value and the y–value that is in the same column. The x–values are weights (in pounds) and the y–values are monthly incomes (in dollars), so the differences are meaningless.

77) The table shows the weights (in pounds) and monthly incomes (in dollars) of nine randomly selected women between the ages of 18 and 65. Assume that the x–values are the weights and the y–values are the monthly incomes.

Weight (lb)	113	132	155	122	166	140	118	129	185
Monthly Income (dollars)	1420	3650	5475	2310	4710	2910	1720	2460	4115

What issue can be addressed by conducting a statistical analysis of the values?

Answer: Is there a relationship or an association between a woman's weight and her monthly income?

78) The table shows the weights (in pounds) and monthly incomes (in dollars) of nine randomly selected women between the ages of 18 and 65. Assume that the x–values are the weights and the y–values are the monthly incomes.

Weight (lb)	113	132	155	122	166	140	118	129	185
Monthly Income (dollars)	1420	3650	5475	2310	4710	2910	1720	2460	4115

If we use statistical methods to conclude that there is a correlation (or relationship or association) between the weights of women and their monthly incomes, can we conclude that by increasing her weight a woman can increase her monthly income?

Answer: No. If a correlation (or relationship or association) is found, this doesn't mean that one variable is the cause of another. Larger weights do not cause higher incomes, but tend to be associated with higher incomes because both weight and income are associated with a third variable, age. Older women tend to be heavier and to have higher incomes than younger women.

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Use critical thinking to develop an alternative conclusion.

79) A study shows that adults who work at their desk all day weigh more than those who do not. Conclusion: Desk jobs cause people to gain weight.

Answer: Desk job workers are confined to their chairs for most of their work day. Other jobs require standing or walking around which burns calories. It is probably the lack of exercise that causes higher weights, not the desk job itself. Avoid causality altogether by saying lack of walking and exercise is associated with higher weights.

80) In a study of headache patients, every one of the study subjects with a headache was found to be improved after taking a week off of work. Conclusion: Taking time off work cures headaches.

Answer: Headaches generally last for only a few hours, so anything would seem like a cure. There is no evidence to suggest that taking time off work will cure a headache.

81) A study of achievement scores by sixth–grade students on a standardized math test showed the three top scorers were all gifted piano players. Conclusion: Playing the piano leads to mathematical achievement.

Answer: A sample of 3 among many students is not sufficient to conclude that playing the piano is conducive to math achievement. Student motivation and interest in math should be considered as factors.

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

Solve the problem.

82) A gardener has 87 clients, 45% of whom are businesses. Find the number of business clients.

A) 85 clients B) 48 clients C) 41 clients D) 39 clients

Answer: D

83) Alex and Juana went on a 80–mile canoe trip with their class. On the first day they traveled 16 miles. What percent of the total distance did they canoe?

A) 500% B) 0.2% C) 20% D) 5%

Answer: C

84) On a test, if 130 questions are answered and 42% of them are correct, what is the number of correct answers?

A) 83 B) –29 C) 60 D) 55

Answer: D

85) On a test, 74% of the questions are answered correctly. If 111 questions are correct, how many questions are on the test?

A) 37 B) 150 C) 67 D) 74

Answer: B

86) On a test, if 80 questions are answered and 46 of them are correct, what is the percent of correct answers? Round to the nearest percent.

A) 42% B) 58% C) 0.58% D) 174%

Answer: B

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

Provide an appropriate response.

87) A bus company claims that in the past year it has reduced the number of late departures of buses by 100%. What is wrong with this statement?

Answer: A reduction of 100% would mean that the company had reduced the number of late departures to zero which is not plausible.

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88) An advertisement for a heating pad says that it can reduce back pain by 200%. What is wrong with this statement?

Answer: If a person's back pain was reduced by 100%, it would be completely eliminated, so it is not possible for a person's back pain to be reduced by more than 100%.

89) Jon consulted with an accountant to prepare his tax return. He recommended the accountant to his friend saying that this year the amount he paid in taxes was 150% less than last year. What is wrong with this statement?

Answer: If Jon's taxes were reduced by 100% he would be paying no taxes at all, so it is not possible for his taxes to be reduced by more than 100%.

90) An article stated that last year 807 people taking a certain medication suffered from serious side effects while this year, after the medication had been modified, only 391 suffered serious side effects. What information is missing? Why would it be important to include this information?

Answer: There is no context to the data. The article should include the number of people taking the medication last year and this. More important than the number suffering serious side effects is the percentage of those taking the medication that suffer side effects. Although fewer people suffered side effects this year, it is possible (if fewer people are taking the medication this year) that the percentage suffering side effects has actually increased.

91) A coach uses a new technique in training middle distance runners. The times, in seconds, for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	A	B	C	D	E	F	G	H
Before	115.2	115.2	117.9	110.3	115.5	112.4	119.4	113.8
After	112.9	113.9	115.5	111.1	113.7	109.1	115.8	109.9

Does the conclusion that the technique is effective appear to be supported with statistical significance? Does the conclusion that the technique is effective appear to have practical significance?

Answer: Yes. Almost all runners have considerably faster times after the training.
Yes. The differences appear to be substantial.

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

Determine whether the given value is a statistic or a parameter.

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

A) Parameter B) Statistic

Answer: B

93) After taking the first exam, 15 of the students dropped the class.

A) Statistic B) Parameter

Answer: B

94) After inspecting all of 55,000 kg of meat stored at the Wurst Sausage Company, it was found that 45,000 kg of the meat was spoiled.

A) Parameter B) Statistic

Answer: A

95) A health and fitness club surveys 40 randomly selected members and found that the average weight of those questioned is 157 lb.

A) Statistic B) Parameter

Answer: A

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Determine whether the given value is from a discrete or continuous data set.

96) The number of freshmen entering college in a certain year is 621.
A) Continuous B) Discrete
Answer: B

97) The temperature of a cup of coffee is 67.3°F.
A) Discrete B) Continuous
Answer: B

98) The weight of Bill's pack as he sets off on a backpacking trip is 48.3 lb.
A) Continuous B) Discrete
Answer: A

99) The number of limbs on a 2–year–old oak tree is 21.
A) Discrete B) Continuous
Answer: A

100) The height of 2–year–old maple tree is 28.3 ft.
A) Discrete B) Continuous
Answer: B

101) The number of stories in a Manhattan building is 22.
A) Continuous B) Discrete
Answer: B

102) The total number of phone calls a sales representative makes in a month is 425.
A) Discrete B) Continuous
Answer: A

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

103) The temperatures of eight different plastic spheres.
A) Ratio B) Ordinal C) Nominal D) Interval
Answer: D

104) The sample of spheres categorized from softest to hardest.
A) Ratio B) Ordinal C) Nominal D) Interval
Answer: B

105) Salaries of college professors.
A) Nominal B) Interval C) Ratio D) Ordinal
Answer: C

106) Survey responses of "good, better, best".
A) Interval B) Nominal C) Ratio D) Ordinal
Answer: D

107) Temperatures of the ocean at various depths.
A) Ratio B) Interval C) Ordinal D) Nominal
Answer: B

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108) Nationalities of survey respondents.
A) Nominal B) Interval C) Ordinal D) Ratio
Answer: A

109) Ages of survey respondents.
A) Nominal B) Ratio C) Ordinal D) Interval
Answer: B

110) The subjects in which college students major.
A) Ordinal B) Ratio C) Nominal D) Interval
Answer: C

111) Student's grades, A, B, or C, on a test.
A) Ratio B) Ordinal C) Nominal D) Interval
Answer: B

112) Amount of fat (in grams) in cookies.
A) Ratio B) Nominal C) Interval D) Ordinal
Answer: A

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

Identify the sample and population. Also, determine whether the sample is likely to be representative of the population.

113) An employee at the local ice cream parlor asks three customers if they like chocolate ice cream.
Answer: Sample: the 3 selected customers; population: all customers; not representative

114) 100,000 randomly selected adults were asked whether they drink at least 48 oz of water each day and only 45% said yes.
Answer: Sample: the 100,000 selected adults; population: all adults; representative

115) In a poll of 50,000 randomly selected college students, 74% answered "yes" when asked "Do you have a television in your dorm room?".
Answer: Sample: the 50,000 selected college students; population: all college students; representative

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

Determine whether the given description corresponds to an observational study or an experiment.

116) 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) Experiment B) Observational study
Answer: B

117) 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 study B) Experiment
Answer: B

118) A sample of fish is taken from a lake to measure the effect of pollution from a nearby factory on the fish.
A) Observational study B) Experiment
Answer: A

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119) A political pollster reports that his candidate has a 10% lead in the polls with 10% undecided.
A) Experiment B) Observational study
Answer: B

120) 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 study B) Experiment
Answer: B

121) 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) Experiment B) Observational study
Answer: B

122) A stock analyst compares the relationship between stock prices and earnings per share to help him select a stock for investment.
A) Experiment B) Observational study
Answer: B

123) A T.V. show's executives raised the fee for commercials following a report that the show received a "No. 1" rating in a survey of viewers.
A) Observational study B) Experiment
Answer: A

124) A T.V. show's executives commissioned a study to gauge the impact of the show's ratings on the sales of its advertisers.
A) Observational study B) Experiment
Answer: A

125) A doctor induces a cardiac stress test to determine the reason for a patient's illness.
A) Observational study B) Experiment
Answer: B

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

126) 49, 34, and 48 students are selected from the Sophomore, Junior, and Senior classes with 496, 348, and 481 students respectively.
A) Systematic B) Convenience C) Random D) Stratified E) Cluster
Answer: D

127) A sample consists of every 49th student from a group of 496 students.
A) Systematic B) Stratified C) Random D) Convenience E) Cluster
Answer: A

128) A market researcher selects 500 drivers under 30 years of age and 500 drivers over 30 years of age.
A) Systematic B) Cluster C) Stratified D) Convenience E) Random
Answer: C

129) A market researcher selects 500 people from each of 10 cities.
A) Systematic B) Random C) Stratified D) Cluster E) Convenience
Answer: C

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130) A tax auditor selects every 1000th income tax return that is received.
A) Systematic B) Random C) Convenience D) Cluster E) Stratified
Answer: A

131) A pollster uses a computer to generate 500 random numbers, then interviews the voters corresponding to those numbers.
A) Convenience B) Random C) Systematic D) Stratified E) Cluster
Answer: B

132) To avoid working late, a quality control analyst simply inspects the first 100 items produced in a day.
A) Cluster B) Convenience C) Systematic D) Random E) Stratified
Answer: B

133) An education researcher randomly selects 48 middle schools and interviews all the teachers at each school.
A) Systematic B) Cluster C) Stratified D) Convenience E) Random
Answer: B

134) A researcher interviews 19 work colleagues who work in his building.
A) Random B) Cluster C) Convenience D) Stratified E) Systematic
Answer: C

135) 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) Systematic B) Cluster C) Stratified D) Random E) Convenience
Answer: D

Provide an appropriate response.

136) An education expert is researching teaching methods and wishes to interview teachers from a particular school district. She randomly selects ten schools from the district and interviews all of the teachers at the selected schools. Does this sampling plan result in a random sample? Simple random sample? Explain.
A) Yes; yes. The sample is random because all teachers have the same chance of being selected. It is a simple random sample because all samples have the same chance of being selected.
B) No; yes. The sample is not random because teachers in small schools are more likely to be selected than teachers in larger schools. It is a simple random sample because all samples have the same chance of being selected.
C) Yes; no. The sample is random because all teachers have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample that includes teachers from schools that were not selected.
D) No; no. The sample is not random because teachers in small schools are more likely to be selected than teachers in larger schools. It is not a simple random sample because some samples are not possible, such as a sample that includes teachers from schools that were not selected.
Answer: C

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137) A psychology student wishes to investigate differences in political opinions between business majors and political science majors at her college. She randomly selects 100 students from the 260 business majors and 100 students from the 180 political science majors. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) No; yes. The sample is not random because political science majors have a greater chance of being selected than business majors. It is a simple random sample because all samples of size 200 have the same chance of being selected.

B) No; no. The sample is not random because political science majors have a greater chance of being selected than business majors. It is not a simple random sample because some samples are not possible, such as a sample consisting of 50 business majors and 150 political science majors.

C) Yes; no. The sample is random because all students have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample consisting of 50 business majors and 150 political science majors.

D) Yes; yes. The sample is random because all students have the same chance of being selected. It is a simple random sample because all samples of size 200 have the same chance of being selected.

Answer: B

138) A computer company employs 100 software engineers and 100 hardware engineers. The personnel manager randomly selects 20 of the software engineers and 20 of the hardware engineers and questions them about career opportunities within the company. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) Yes; no. The sample is random because all employees have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample consisting of 30 software engineers and 10 hardware engineers.

B) No; no. The sample is not random because not all employees have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample consisting of 30 software engineers and 10 hardware engineers.

C) Yes; yes. The sample is random because all employees have the same chance of being selected. It is a simple random sample because all samples of size 40 have the same chance of being selected.

D) No; yes. The sample is not random because not all employees have the same chance of being selected. It is a simple random sample because all samples of size 40 have the same chance of being selected.

Answer: A

139) The personnel manager at a company wants to investigate job satisfaction among the female employees. One evening after a meeting she talks to all 30 female employees who attended the meeting. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) No; yes. The sample is not random because not all female employees have the same chance of being selected. Those that didn't attend the meeting have no chance of being selected. It is a simple random sample because all samples of 30 female employees have the same chance of being selected.

B) Yes; yes. The sample is random because all female employees have the same chance of being selected. It is a simple random sample because all samples of size 30 have the same chance of being selected.

C) Yes; no. The sample is random because all female employees have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing female employees who did not attend the meeting.

D) No; no. The sample is not random because not all female employees have the same chance of being selected. Those that didn't attend the meeting have no chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing female employees who did not attend the meeting.

Answer: D

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140) A polling company obtains an alphabetical list of names of voters in a precinct. They select every 20th person from the list until a sample of 100 is obtained. They then call these 100 people. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) No; yes. The sample is not random because not all voters have the same chance of being selected. The second person on the list has no chance of being selected. It is a simple random sample because all samples of 100 voters have the same chance of being selected.

B) Yes; yes. The sample is random because all voters have the same chance of being selected. It is a simple random sample because all samples of 100 voters have the same chance of being selected.

C) No; no. The sample is not random because not all voters have the same chance of being selected. The second person on the list has no chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing the second person on the list.

D) Yes; no. The sample is random because all voters have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing the second person on the list.

Answer: C

141) A researcher obtains an alphabetical list of the 2560 students at a college. She uses a random number generator to obtain 50 numbers between 1 and 2560. She chooses the 50 students corresponding to those numbers. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) Yes; no. The sample is random because all students have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing the first 50 students on the list.

B) Yes; yes. The sample is random because all students have the same chance of being selected. It is a simple random sample because all samples of 50 students have the same chance of being selected.

C) No; no. The sample is not random because not all students have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing the the first 50 students on the list.

D) No; yes. The sample is not random because not all students have the same chance of being selected. It is a simple random sample because all samples of 50 students have the same chance of being selected.

Answer: B

142) An electronics store receives a shipment of eight boxes of calculators. Each box contains ten calculators. A quality control inspector chooses a box by putting eight identical slips of paper numbered 1 to 8 into a hat, mixing thoroughly and then picking a slip at random. He then chooses a calculator at random from the box selected using a similar method with ten slips of paper in a hat. He repeats the process until he obtains a sample of 5 calculators for quality control testing. Does this sampling plan result in a random sample? Simple random sample? Explain.

A) Yes; yes. The sample is random because all calculators have the same chance of being selected. It is a simple random sample because all samples of 5 calculators have the same chance of being selected.

B) No; no. The sample is not random because not all calculators have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing 5 calculators from the same box.

C) No; yes. The sample is not random because not all calculators have the same chance of being selected. It is a simple random sample because all samples of 5 calculators have the same chance of being selected.

D) Yes; no. The sample is random because all calculators have the same chance of being selected. It is not a simple random sample because some samples are not possible, such as a sample containing 5 calculators from the same box.

Answer: A

Identify the type of observational study (cross–sectional, retrospective, prospective).

143) A statistical analyst obtains data about ankle injuries by examining a hospital's records from the past 3 years.

A) Retrospective B) Cross–sectional C) Prospective D) None of these

Answer: A

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144) Researchers collect data by interviewing athletes who have won olympic gold medals from 1992 to 2008.
A) Cross–sectional B) Retrospective C) Prospective D) None of these

Answer: B

145) A researcher plans to obtain data by following those in cancer remission since January of 2005.
A) Cross–sectional B) Retrospective C) Prospective D) None of these

Answer: C

146) A town obtains current employment data by polling 10,000 of its citizens this month.
A) Prospective B) Cross–sectional C) Retrospective D) None of these

Answer: B

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

Provide an appropriate response.

147) A market researcher obtains a sample of 50 people by standing outside a store and asking every 20th person who enters the store to fill out a survey until she has 50 people. What sampling method is being used here? Will the resulting sample be a random sample? Will it be a simple random sample? Explain your thinking.

Answer: This is systematic sampling. The sample obtained will be a random sample because everyone has the same chance of being chosen but will not be a simple random sample as different samples of 50 people have difference chances of being chosen. Note that the sample is random depends on the market researcher randomly selecting 20 as the starting point prior to research.

148) A teacher at a school obtains a sample of students by selecting a random sample of 20 students from each grade. What kind of sampling is being used here? Will the resulting sample be a simple random sample of the population of students at the school? Explain your thinking.

Answer: This is stratified sampling. The sample obtained will not be a simple random sample because different samples of students have different chances of being selected.

149) A researcher obtains a sample of high school teachers in his school district by randomly selecting 10 high schools and interviewing all the teachers at each of these 10 schools. What kind of sampling is being used here? Will the resulting sample be a simple random sample of the population of teachers in the school district? Explain your thinking.

Answer: This is cluster sampling. The sample obtained will not be a simple random sample of all high school teachers in the district because different samples have different chances of being selected.

150) Explain what is meant by the term "confounding" and give an example of an experiment in which confounding is likely to be a problem.

Answer: Confounding occurs in an experiment when the effects of two or more variables cannot be distinguished from each other. Examples will vary. One example is that of a school district that conducts a study regarding whether the science laboratory approach or the computer simulation approach is better for learning chemistry among seniors. A standardized achievement test is used to measure learning, and the results of the two schools are compared. Unless controlled in the study, two confounding variables are teaching expertise and student motivation.

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151) At a school there are two different math classes of the same age. The two classes have different teachers. The school principal is interested in gauging the effectiveness of two different teaching methods and asks each teacher to try one of the methods. At the end of the semester both classes are given the same test and the results are compared. In this experiment, what is the variable of interest? Give some examples of variables which could be confounding variables.

Answer: The variable of interest is the teaching method. Possible confounding variables are "skill of teacher" (is one teacher better than the other?), "aptitude of students" (do the two classes have students of the same ability?), "amount of study time" (does one class have students who are more conscientious?).

152) Explain the difference between stratified and cluster sampling.

Answer: In both cluster sampling and stratified sampling, sub–groups (clusters or strata) are formed. However, in stratified sampling, all strata are used and a sample is selected from each strata. In cluster sampling, a sample of the clusters is first selected, then all members of those clusters are selected.

153) Why do you think that cluster sampling is frequently used in practice.

Answer: Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.

154) A researcher wants to obtain a sample of 100 school teachers from the 800 school teachers in a school district. Describe procedures for obtaining a sample of each type: random, systematic, convenience, stratified, cluster.

Answer: Answers will vary. One answer is as follows. (1) Random: List the names of the teachers in alphabetical order from 1 through 800. Select 100 teachers by a random number computer program. (2) Systematic: Blindly select from a box one of eight index cards, each of which has a number from 1 to 8 written on it. Sample from the alphabetized list, beginning with that number followed by all its integral multiples until 100 teachers are selected. (3) Convenience: Offer an incentive to the teachers, and select the first 100 volunteers. (4) Stratified: Prepare an alphabetized list of teachers by school (i.e., strata) and randomly select teachers in proportion to school size until 100 teachers are selected. (5) Cluster: Form 8 clusters from 8 consecutive blocks of 100 teachers in the alphabetized list. Blindly draw an index card from the box, and whichever card is drawn, all 100 teachers in that cluster will be the sample. Making clusters from the individual schools might not work, since the school or schools randomly selected might not have 100 teachers in total.

155) A researcher conducts an experiment to determine whether acupuncture can help people to recover from back injuries. Participants are randomly assigned to a treatment group or a control group. Over a period of three weeks, those assigned to the treatment group receive acupuncture treatments. At the end of the three weeks, the improvement reported by those in the treatment group is compared with the improvement reported by those in the control group. In this experiment there is no blinding. What does this mean and why could this cause a problem?

Answer: An experiment is blind if participants do not know whether they are receiving the treatment or a placebo. Blinding allows investigators to determine whether the treatment effect is significantly different from the placebo effect. This experiment is not blind because participants know whether they are receiving treatment. This may make it hard to determine to what extent improvements in the treatment group are due to the acupuncture and to what extent they are due to the placebo effect.

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156) In a clinical trial for a new headache medication, participants are randomly assigned to a treatment group or a placebo group. They do not know whether they are receiving the medication or a placebo. However the doctors administering the medication and evaluating the results do know which participants are receiving the medication. This experiment is blind but not double blind. Explain what this means and why the absence of double blinding could cause a problem.

Answer: This experiment is blind because participants do not know whether they are receiving the treatment or a placebo. This will allows investigators to determine whether the treatment effect is significantly different from the placebo effect. However, the experiment is not double blind because the doctors administering the medication and evaluating the results know which participants are receiving the medication. The doctors may not be impartial and their evaluation and analysis of results could be influenced by their knowledge of which participants are receiving the treatment.

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1) B
2) B
3) E
4) D
5) B
6) A
7) C
8) A
9) B
10) B
11) D
12) B
13) C
14) B
15) D
16) C
17) A
18) D
19) D
20) C
21) A
22) B
23) A
24) C
25) D
26) B
27) B
28) A
29) E
30) D
31) C
32) A
33) A
34) B
35) A
36) A
37) C
38) B
39) A
40) B
41) No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.
42) Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. If a study wants to solicit opinions from the homeless population, it is more effective to choose a few selected towns and interview a significant number of homeless people in each town rather than study a few homeless people in all towns. A significant and similar sample are identified in each cluster. In this case, a study accessing the entire population through simple random sample would be too big and expensive.
In stratified sampling, the population is divided into strata according to some variables that are thought to be related to the variables of interest. A sample is taken from every stratum. There is not an identified variable of interest in the homeless study.

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43) The sample is biased. College students are not representative of the U.S. population as a whole.
44) No. Cosmopolitan attracts women with specific demographics and subscribers will not be representative of all women, however, a sample well selected, will not be representative. No, this sample will not even be representative of all Cosmopolitan subscribers because it is a voluntary response sample – subscribers themselves choose whether to respond. Those with stronger opinions are more likely to respond so the sample is unlikely to be representative of all subscribers to the magazine.
45) Given the context of the data, we could address the issue of whether the two types of muffins provide the same amounts of saturated fat, or whether there is a difference between the two types of muffin.
46) The variable of interest is the teaching method. Possible confounding variables are "skill of teacher" (is one teacher better than the other?), "aptitude of students" (do the two classes have students of the same ability?), "amount of study time" (does one class have students who are more conscientious?).
47) Yes. There is nothing about left–handedness or right–handedness that would affect being one of the lawyer's colleagues. In terms of left– or right–handedness, a simple random sample of the lawyer's colleagues is likely to be representative of all adults in the United States. Convenience samples in general do not tend to provide good results as the sample is often not representative of a broader population.
48) Sample: the individuals who responded to the website poll; population: all voting age adults; not representative due to being a convenience sample.
49) Qualitative data can be separated into categories that are distinguished by nonnumeric characteristics. Quantitative data consist of numbers representing counts or measurements. Examples will vary.
50) Answers will vary. Using self–reported data may be inaccurate since people may want to represent themselves in a certain way. For example, people often report that they weigh less than they actually do.
51) In both cluster sampling and stratified sampling, sub–groups (clusters or strata) are formed. However, in stratified sampling, all strata are used and a sample is selected from each strata. In cluster sampling, a sample of the clusters is first selected, then all members of those clusters are selected.
52) No. If a correlation (or relationship or association) is found, this doesn't mean that one variable is the cause of another. Larger weights do not cause higher incomes, but tend to be associated with higher incomes because both weight and income are associated with a third variable, age. Older women tend to be heavier and to have higher incomes than younger women.
53) An observational study would be more appropriate. An experiment would not be appropriate because it would be unethical to administer as a treatment a substance known to be toxic. However a retrospective observational study, for example, could be carried out by examining records from the past and observing the effects where the substance had been accidentally ingested.
54) No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.
55) Yes. Almost all runners have considerably faster times after the training. Yes. The differences appear to be substantial.
56) Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.
57) Sample: the 3 selected customers; population: all customers; not representative.
58) Sex education gives students information about sexual activities including the results of engaging in those activities, such as pregnancy and disease. Promiscuous behavior is more about a lack of information. This fallacy explanation is saying that since sex education is being taught in high schools, the teachings increase the promiscuity of teenagers. This is completely false because yes the teenagers are learning how to have safe and protective sex, but it's up to them and how they choose to use that information about sex to alter the cause of their promiscuity.
59) An experiment would be more appropriate.

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60) Confounding occurs in an experiment when the effects of two or more variables cannot be distinguished from each other. Examples will vary. One example is that of a school district that conducts a study regarding whether the science laboratory approach or the computer simulation approach is better for learning chemistry among seniors. A standardized achievement test is used to measure learning, and the results of the two schools are compared. Unless controlled in the study, two confounding variables are teaching expertise and student motivation.
61) People who don't go to the library are excluded.
62) This is a voluntary response sample. The survey is based on voluntary, self-selected responses and therefore has serious potential for bias.
63) The sample was too small.
64) The sample was too small.
65) This is a voluntary response sample. The survey is based on voluntary, self-selected responses and therefore has serious potential for bias.
66) The sample is biased. College students are not representative of the U.S. population as a whole.
67) Yes. If the claimed proportion of defectives of 1% were correct, there would be a very small likelihood of getting 3% defectives in the sample. The sample rate of 3% is significantly greater than the claimed rate of 1%.
68) Yes. The group following a vegetarian diet had a substantially lower mean blood pressure. If a vegetarian diet did not help to reduce blood pressure, there would be a very small chance of getting these results. Yes; the difference in blood pressure appears substantial and enough to be an important factor in health.
69) No. The new mean SAT score is not substantially higher. Even if the new teaching method had no effect, a small increase such as this could easily be seen just by chance. No. The increase is not sufficient to be of practical significance.
70) No; The exam result of 53.7% is not substantially greater than 50%. Even if Charlie were just guessing, he could easily do this well just by chance.
71) Yes. In these samples, the proportion of women favoring stricter gun control is substantially higher than the proportion of men favoring stricter gun control. If the true proportions were actually equal, there would be a very small likelihood of seeing such a large difference in the samples..
72) The x-values are not matched with the y-values, so it does not make sense to use the differences between each x-value and the y-value that is in the same column.
73) Given the context of the data, we could address the issue of whether the two types of muffin provide the same amounts of saturated fat, or whether there is a difference between the two types of muffin.
74) For health reasons, consumers often prefer to buy muffins which are low in saturated fat. There is an incentive for producers to make the amount of saturated fat appear as low as possible. For this reason, the source of the data could be suspect with a potential for bias.
75) The x-values are matched with the corresponding y-values. It makes sense to use the difference between each x-value and the y-value that is in the same column. Both represent weights measured in pounds and both are associated with the same person. The x-value is the weight of a person before the diet and the y-value in the same column is the weight of the same person after the diet. The difference represents the amount of weight lost (or gained) by that person.
76) The x-values are matched with the y-values. It does not make sense to use the difference between each x-value and the y-value that is in the same column. The x-values are weights (in pounds) and the y-values are monthly incomes (in dollars), so the differences are meaningless.
77) Is there a relationship or an association between a woman's weight and her monthly income?
78) No. If a correlation (or relationship or association) is found, this doesn't mean that one variable is the cause of another. Larger weights do not cause higher incomes, but tend to be associated with higher incomes because both weight and income are associated with a third variable, age. Older women tend to be heavier and to have higher incomes than younger women.
79) Desk job workers are confined to their chairs for most of their work day. Other jobs require standing or walking around which burns calories. It is probably the lack of exercise that causes higher weights, not the desk job itself. Avoid causality altogether by saying lack of walking and exercise is associated with higher weights.
80) Headaches generally last for only a few hours, so anything would seem like a cure. There is no evidence to suggest that taking time off work will cure a headache.

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81) A sample of 3 among many students is not sufficient to conclude that playing the piano is conducive to math achievement. Student motivation and interest in math should be considered as factors.
82) D
83) C
84) D
85) B
86) B
87) A reduction of 100% would mean that the company had reduced the number of late departures to zero which is not plausible.
88) If a person's back pain was reduced by 100%, it would be completely eliminated, so it is not possible for a person's back pain to be reduced by more than 100%.
89) If Jon's taxes were reduced by 100% he would be paying no taxes at all, so it is not possible for his taxes to be reduced by more than 100%.
90) There is no context to the data. The article should include the number of people taking the medication last year and this. More important than the number suffering serious side effects is the percentage of those taking the medication that suffer side effects. Although fewer people suffered side effects this year, it is possible (if fewer people are taking the medication this year) that the percentage suffering side effects has actually increased.
91) Yes. Almost all runners have considerably faster times after the training.
Yes. The differences appear to be substantial.
92) B
93) B
94) A
95) A
96) B
97) B
98) A
99) A
100) B
101) B
102) A
103) D
104) B
105) C
106) D
107) B
108) A
109) B
110) C
111) B
112) A
113) Sample: the 3 selected customers; population: all customers; not representative
114) Sample: the 100,000 selected adults; population: all adults; representative
115) Sample: the 50,000 selected college students; population: all college students; representative
116) B
117) B
118) A
119) B
120) B
121) B
122) B

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123) A
124) A
125) B
126) D
127) A
128) C
129) C
130) A
131) B
132) B
133) B
134) C
135) D
136) C
137) B
138) A
139) D
140) C
141) B
142) A
143) A
144) B
145) C
146) B
147) This is systematic sampling. The sample obtained will be a random sample because everyone has the same chance of being chosen but will not be a simple random sample as different samples of 50 people have difference chances of being chosen. Note that the sample is random depends on the market researcher randomly selecting 20 as the starting point prior to research.
148) This is stratified sampling. The sample obtained will not be a simple random sample because different samples of students have different chances of being selected.
149) This is cluster sampling. The sample obtained will not be a simple random sample of all high school teachers in the district because different samples have different chances of being selected.
150) Confounding occurs in an experiment when the effects of two or more variables cannot be distinguished from each other. Examples will vary. One example is that of a school district that conducts a study regarding whether the science laboratory approach or the computer simulation approach is better for learning chemistry among seniors. A standardized achievement test is used to measure learning, and the results of the two schools are compared. Unless controlled in the study, two confounding variables are teaching expertise and student motivation.
151) The variable of interest is the teaching method. Possible confounding variables are "skill of teacher" (is one teacher better than the other?), "aptitude of students" (do the two classes have students of the same ability?), "amount of study time" (does one class have students who are more conscientious?).
152) In both cluster sampling and stratified sampling, sub–groups (clusters or strata) are formed. However, in stratified sampling, all strata are used and a sample is selected from each strata. In cluster sampling, a sample of the clusters is first selected, then all members of those clusters are selected.
153) Answers will vary. Possible answer: Cluster sampling can save time and money and be more efficient, especially when the clusters are geographically far apart from each other. For example, if a researcher wishes to interview a sample of high school teachers in a school district, it will be easier to interview all the teachers at a few schools than to interview a few teachers from many different schools.

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154) Answers will vary. One answer is as follows. (1) Random: List the names of the teachers in alphabetical order from 1 through 800. Select 100 teachers by a random number computer program. (2) Systematic: Blindly select from a box one of eight index cards, each of which has a number from 1 to 8 written on it. Sample from the alphabetized list, beginning with that number followed by all its integral multiples until 100 teachers are selected. (3) Convenience: Offer an incentive to the teachers, and select the first 100 volunteers. (4) Stratified: Prepare an alphabetized list of teachers by school (i.e., strata) and randomly select teachers in proportion to school size until 100 teachers are selected. (5) Cluster: Form 8 clusters from 8 consecutive blocks of 100 teachers in the alphabetized list. Blindly draw an index card from the box, and whichever card is drawn, all 100 teachers in that cluster will be the sample. Making clusters from the individual schools might not work, since the school or schools randomly selected might not have 100 teachers in total.

155) An experiment is blind if participants do not know whether they are receiving the treatment or a placebo. Blinding allows investigators to determine whether the treatment effect is significantly different from the placebo effect. This experiment is not blind because participants know whether they are receiving treatment. This may make it hard to determine to what extent improvements in the treatment group are due to the acupuncture and to what extent they are due to the placebo effect.

156) This experiment is blind because participants do not know whether they are receiving the treatment or a placebo. This will allows investigators to determine whether the treatment effect is significantly different from the placebo effect. However, the experiment is not double blind because the doctors administering the medication and evaluating the results know which participants are receiving the medication. The doctors may not be impartial and their evaluation and analysis of results could be influenced by their knowledge of which participants are receiving the treatment.

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