

Statistics - Unlocking the Power of Data, 3e (Lock)

Chapter 1 Collecting Data

1.1 The Structure of Data

Use the following to answer the questions below:

A high school senior is collecting data on the colleges in which she is interested. Identify the variables as either categorical or quantitative.

1) *Type of college*: Private or Public college

Answer: Categorical

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

2) *Tuition*: in thousands of dollars

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

3) *State*: the state in which the college is located

Answer: Categorical

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

4) *Zip Code*: the zip code of the part of the country in which the college is located

Answer: Categorical

Diff: 2 Type: SA Var: 1

L.O.: 1.1.2

5) *Enrollment*: the number of students enrolled at the college

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

6) *Student-Faculty Ratio*: the number of students divided by the number of faculty

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

7) *Graduation Rate*: as a percentage

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

Use the following to answer the questions below:

A high school senior is collecting data on the colleges in which she is interested, including the following variables: *Type of college, Tuition, State, Enrollment, Student-Faculty Ratio, Graduation Rate*

8) What are the cases in the high school senior's dataset?

- A) Colleges
- B) Tuition
- C) Graduation Rate
- D) State

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.1

9) Refer to the variables collected by the high school senior looking at colleges. Identify a question we might ask about any one of these individual variables.

Answer: Answers will vary. Some possible answers include:

Type of college: Is she considering more private schools than public schools?

Tuition: What is the average tuition of the colleges she is considering? What is the "cheapest" school she is considering? What is the most expensive school she is considering?

State: Is there a state that she seems to prefer?

Enrollment: What is the average size of the colleges she is considering? What is the largest college she is considering? What is the largest college she is considering?

Student-Faculty Ratio: What is the average SF ratio for the schools she is considering? What is the smallest SF ratio for the schools she is considering? What is the largest SF ratio for the schools she is considering?

Graduation Rate: What is the average graduation rate for the schools she is considering? What is the lowest graduation rate for the schools she is considering? What is the highest graduation rate for the schools she is considering?

Diff: 2 Type: ES Var: 1

L.O.: 1.1.4;1.1.5

10) Refer to the variables collected by the high school senior looking at colleges. Identify a question that we might ask about relationships between any two (or more) of these variables.

Answer: Answers will vary. Some possible answers include:

Which type of schools tend to cost more, the private or the public schools?

Which type of schools tend to have the higher graduation rate, the private or public schools?

Which type of schools tend to have the lower student-faculty ratio, the private or public schools?

Which state is the most expensive?

Can student-faculty ratio be used to predict tuition?

Can graduation rate be used to predict tuition?

Can enrollment be used to predict tuition?

Diff: 2 Type: ES Var: 1

L.O.: 1.1.4;1.1.5

Use the following to answer the questions below:

A realtor's website provides information on area homes that are for sale. Identify each of the variables as either categorical or quantitative.

11) *List Price*: amount, in thousands of dollars, for which the house is being sold

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

12) *School District*: the school district in which the home is located

Answer: Categorical

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

13) *Size*: in square feet

Answer: Quantitative

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

14) *Style*: the style of home (ranch, Cape Cod, Victorian, etc.)

Answer: Categorical

Diff: 1 Type: SA Var: 1

L.O.: 1.1.2

Use the following to answer the questions below:

A realtor's website provides information on area homes that are for sale, including the following variables: *List Price*, *School District*, *Size*, *Style*.

15) What are the cases in the realtor's dataset?

A) Individual houses

B) List Price

C) Size

D) Style

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.1

16) Refer to the variables provided by the realtor. Identify a question we might ask about any one of these individual variables.

Answer: Answers will vary. Some possible answers include:

List Price: What is the average list price of homes for sale in the area? What is the least expensive home for sale in the area? What is the most expensive home for sale in the area?

School District: In which school district are most of the homes located?

Size: What is the average size of homes for sales in the area? What is the largest home for sale in the area? What is the smallest home for sale in the area?

Style: What style of home is most popular (or for sale the most) in this area?

Diff: 2 Type: ES Var: 1

L.O.: 1.1.4;1.1.5

17) Refer to the variables provided by the realtor. Identify a question that we might ask about relationships between any two (or more) of these variables.

Answer: Answers will vary. Some possible answers include

Does the price of the home depend on the school district (i.e., does one tend to cost more than others?)?

Which style of home tends to cost the most?

Do larger homes tend to cost more than smaller homes?

Diff: 2 Type: ES Var: 1

L.O.: 1.1.4;1.1.5

Use the following to answer the questions below:

The USStates dataset, used throughout the textbook, contains information on the 50 U.S. states. A small segment from the dataset is displayed in the following table.

State	Percent of Residents with a College Degree
⋮	⋮
California	34.5
Colorado	39.6
Connecticut	42.7
⋮	⋮

18) What are the cases in this dataset?

A) States

B) Percent of residents with a college degree

C) Residents

D) USStates dataset

Answer: A

Diff: 1 Type: BI Var: 1

L.O.: 1.1.1

- 19) What variable from this dataset is displayed? Is it categorical or quantitative?
- A) Variable = Percent of state residents with a college degree. This is a quantitative variable.
 - B) Variable = Percent of state residents with a college degree. This is a categorical variable.
 - C) Variable = State. This is a quantitative variable.
 - D) Variable = State. This is a categorical variable.

Answer: A

Diff: 1 Type: BI Var: 1

L.O.: 1.1.1;1.1.2

- 20) Data from the state of Connecticut were used to determine that 42.7% of state residents had a college degree. What were the cases from Connecticut used to arrive at this figure?

- A) Residents of Connecticut
- B) The state of Connecticut
- C) 42.7 percent of the Connecticut residents with a college degree
- D) The residents of California, Colorado, and Connecticut

Answer: A

Diff: 3 Type: BI Var: 1

L.O.: 1.1.1

- 21) What variable was used to determine that 42.7% of Connecticut state residents have a college degree? Is it categorical or quantitative?

- A) Variable = whether or not they have a college degree. This is a categorical variable.
- B) Variable = whether or not they have a college degree. This is a quantitative variable.
- C) Variable = what state they are from. This is a categorical variable.
- D) Variable = what state they are from. This is a quantitative variable.

Answer: A

Diff: 3 Type: BI Var: 1

L.O.: 1.1.1;1.1.2

- 22) The _____ variable is used to understand or predict values of the _____ variable.

- A) Blank 1 = Explanatory, Blank 2 = Response
- B) Blank 1 = Response, Blank 2 = Explanatory
- C) Blank 1 = Categorical, Blank 2 = Quantitative
- D) Blank 1 = Quantitative, Blank 2 = Categorical

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.3

1.2 Sampling from a Population

- 1) A population includes all individuals or objects of interest.

Answer: TRUE

Diff: 1 Type: TF Var: 1

L.O.: 1.2.1

2) A population is a subset of the sample.

Answer: FALSE

Diff: 1 Type: TF Var: 1

L.O.: 1.2.1

3) A biased sample is one that does not accurately reflect or represent the population.

Answer: TRUE

Diff: 1 Type: TF Var: 1

L.O.: 1.2.0

Use the following to answer the questions below:

State whether the data are best described as a population or a sample.

4) The makers of M&M's state that when they package their candies they thoroughly mix the colored candies together and randomly put them into packages. A student purchases a bag of Milk Chocolate M&M's from the vending machine.

A) Sample

B) Population

Answer: A

Diff: 1 Type: BI Var: 1

L.O.: 1.2.1

5) A professor wants to schedule a review session for an exam. He asks all students enrolled in the course their preferred time, and they all respond.

A) Population

B) Sample

Answer: A

Explanation: Population - he collects data from everyone enrolled in the course

Diff: 2 Type: BI Var: 1

L.O.: 1.2.1

6) A researcher has identified a beach with a substantial number of driftwood logs. She randomly chooses 30 logs and takes core samples from those logs.

A) Sample

B) Population

Answer: A

Explanation: Sample. She has only measured a subset of all of the logs on the beach.

Diff: 2 Type: BI Var: 1

L.O.: 1.2.1

7) A football fan recorded the number of rushing yards for all NFL running backs who played last season.

A) Population

B) Sample

Answer: A

Explanation: Population. The data were collected on all of the running backs.

Diff: 2 Type: BI Var: 1

L.O.: 1.2.1

Use the following to answer the questions below:

A tree enthusiast is interested in estimating the typical length of oak tree leaves. He chooses 30 leaves from the oak tree in his backyard.

8) What is the sample in this situation?

Answer: 30 leaves selected from this oak tree

Diff: 2 Type: ES Var: 1

L.O.: 1.2.1

9) What is the population in which the tree enthusiast is interested?

Answer: All oak tree leaves

Diff: 2 Type: ES Var: 1

L.O.: 1.2.1

10) Is this a biased sampling strategy?

A) Yes

B) No

Answer: A

Explanation: This is a biased sampling strategy as he is only taking the leaves from one tree; there could be something unusual about that tree. At best we can generalize to the leaves on the tree in his backyard.

Diff: 2 Type: MC Var: 1

L.O.: 1.2.2;1.2.3

In each situation, indicate whether the method of data collection is biased.

11) Ask the students at the gym on a Tuesday afternoon how many hours a week they work out to estimate the average amount of time students at the university work out.

A) Biased

B) Not biased

Answer: A

Explanation: Biased, because only students at the gym (who are likely working out) were sampled. Students who don't go to the gym (and thus possibly don't work out) were not included in the sample. Another potential source of bias is that, for various reasons, the students asked the question may exaggerate about the amount of time they work out each week.

Diff: 1 Type: BI Var: 1

L.O.: 1.2.2;1.2.3;1.2.4;1.2.5

12) A professor asks her class of first year students if any of them consumed alcohol over the weekend.

A) Biased

B) Not biased

Answer: A

Explanation: This sample is likely biased. First year students would tend to be under the age of 21, and thus it would be illegal for them to be consuming alcohol. They might not want to truthfully tell their professor about engaging in an illegal behavior.

Diff: 1 Type: BI Var: 1

L.O.: 1.2.2;1.2.3;1.2.4;1.2.5

13) A campus bookstore is holding a drawing to give away five free textbooks (one per student). Students enter the contest by writing their name and contact information on an index card. The index cards were placed in a bowl, thoroughly mixed around, and five cards were selected. Those five students were contacted and received their free textbook.

A) Not biased

B) Biased

Answer: A

Explanation: This is a non-biased sample of the students who entered the contest (the population in this situation is the student who entered the contest).

Diff: 3 Type: BI Var: 1

L.O.: 1.2.2;1.2.3;1.2.4

14) A professor is considering a new textbook for her introductory statistics class. She wants to choose a book that emphasizes graphing data. A book that she is considering has 530 pages. To estimate the proportion of pages in the book that have displays of data, she randomly generates 20 numbers between 1 and 530. She then records whether or not each selected page contains displays of data.

A) Not biased

B) Biased

Answer: A

Explanation: Her pages were selected by generating random numbers. This is an unbiased sampling method.

Diff: 1 Type: BI Var: 1

L.O.: 1.2.2;1.2.3;1.2.4

15) A reporter from the campus newspaper is writing an article about student opinions on Greek organizations (sororities and fraternities). For his article, he visits all of the Greek houses on campus and interviews a random sample of residents of each house.

A) Biased

B) Not biased

Answer: A

Explanation: His sample only contains individuals who have chosen to participate in Greek life, and thus the opinions will be biased towards the individuals who choose to belong to a Greek organization.

Diff: 1 Type: BI Var: 1

L.O.: 1.2.2;1.2.3;1.2.4

1.3 Experiments and Observational Studies

Use the following to answer the questions below:

A group of researchers investigated the effect of media usage (whether or not subjects watch television or use the Internet) in the bedroom on "Tiredness" during the day (measured on a 50 point scale).

1) Identify the variables described and whether they are categorical or quantitative.

- A) Media usage in the bedroom = Categorical; "Tiredness" = Quantitative
- B) Media usage in the bedroom = Quantitative; "Tiredness" = Categorical
- C) Media usage in the bedroom = Categorical; "Tiredness" = Categorical
- D) Media usage in the bedroom = Quantitative; "Tiredness" = Quantitative

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.2

2) Identify the variables as either explanatory or response variables.

- A) Media usage in the bedroom = Explanatory; "Tiredness" = Response variable
- B) Media usage in the bedroom = Response variable; "Tiredness" = Explanatory
- C) Media usage in the bedroom = Explanatory; "Tiredness" = Explanatory
- D) Media usage in the bedroom = Response variable; "Tiredness" = Response variable

Answer: A

Diff: 1 Type: BI Var: 1

L.O.: 1.1.3

3) To collect these data, the researchers randomly selected homes to visit and interviewed the adult member of the household whose birthday was nearest. Is this an experiment or an observational study?

- A) Observational study
- B) Experiment

Answer: A

Explanation: This is an observational study because treatments are not being applied to the study participants; they are being asked about their normal behaviors.

Diff: 1 Type: BI Var: 1

L.O.: 1.3.3

4) Suppose that the researchers found that the individuals who use media in the bedroom tended to be more tired during the day than those who do not. Would it be appropriate for the researchers to conclude that using media in the bedroom causes tiredness during the day?

A) Yes

B) No

Answer: B

Explanation: No, it would not be appropriate to make a claim about a causal relationship between media usage in the bedroom and tiredness because this is an observational study. It could be the case that the individuals used media in the bedroom because they couldn't sleep, and they were tired because of their inability to sleep. An experiment needs to be conducted to show a cause-and-effect relationship between two variables.

Diff: 2 Type: BI Var: 1

L.O.: 1.3.1;1.3.2;1.3.4

5) Association implies causation.

Answer: FALSE

Diff: 1 Type: TF Var: 1

L.O.: 1.3.1

6) In elementary school (Grades 1 through 6) there is a strong association between a child's height and reading ability. What is a possible confounding variable that would help explain this relationship? Explain briefly.

Answer: Age/grade is a possible confounding variable. Older students (who tend to be in the higher grades) tend to be taller than the younger students (in the lower grades). The older students should also be better readers than the younger students.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.2

7) A sample of college age students shows an interesting association between hair length (in inches) and height (also in inches). On average, shorter students tend to have longer hair. What is a possible confounding variable that would help explain this relationship?

A) Gender

B) Age

C) Grade point average

D) Local fashion preferences

Answer: A

Explanation: Gender is a possible confounding variable. We are looking at students in general, which can be either male or female. Females tend to be shorter than males, and females tend to have longer hair than males.

Diff: 2 Type: BI Var: 1

L.O.: 1.3.2

Use the following to answer the questions below:

A recent study investigated the impact of psychological stress on men's judgments of female body size. The men were randomly assigned to one of two groups; one group was assigned to participate in a stressful task while the other group did not take part in the task. Then the men were asked to rate the attractiveness of female bodies varying in size from emaciated to obese.

8) What are the cases in this study?

Answer: Men

Diff: 2 Type: SA Var: 1

L.O.: 1.1.1

9) Is this an experiment or an observational study?

A) Experiment

B) Observational study

Answer: A

Explanation: This is an experiment because the men were assigned, at random, to one of two treatments (stressful task or not). Because their normal behavior was modified, this is not an observational study.

Diff: 1 Type: BI Var: 1

L.O.: 1.3.3

10) Identify the explanatory variable in this experiment.

A) Type of task (stressful or not)

B) Rating of the attractiveness of the female body sizes

Answer: A

Diff: 1 Type: BI Var: 1

L.O.: 1.1.3

11) Identify the response variable in this experiment.

A) Type of task (stressful or not)

B) Rating of the attractiveness of the female body sizes

Answer: B

Diff: 1 Type: BI Var: 1

L.O.: 1.1.3

12) Is a control group used in this experiment?

A) Yes

B) No

Answer: A

Explanation: Yes, a control group is used. The group that did not participate in the stressful task is the control group.

Diff: 1 Type: MC Var: 1

L.O.: 1.3.0

Use the following to answer the questions below:

Identify whether each of the following scenarios describe a randomized comparative experiment or a matched pairs experiment.

13) To study the impact of texting while driving, researchers have students drive around an obstacle course twice, once while texting and once without texting (the order of which was randomized). Their score for each turn is the number of obstacles they successfully maneuvered around.

Answer: Matched pairs

Diff: 1 Type: SA Var: 1

L.O.: 1.3.6

14) Studies have shown that multi-tasking typically results in lower productivity. However, some people believe that individuals who play video games are better at multi-tasking. To investigate this, 28 video game players were randomly assigned to one of two groups. One group was assigned to play a video game that involved driving a car around a track. The other group was assigned to play the same video game while simultaneously answering unrelated trivia questions over the phone.

Answer: Randomized Comparative Experiment

Diff: 1 Type: SA Var: 1

L.O.: 1.3.6

15) To study the effect of classical music on concentration, 26 math majors were assigned at random into two groups. Subjects in one group listened to classical music while trying to solve a hard Sudoku puzzle, while the subjects in the other group solved the same puzzle in a silent room. The time it took each student to finish was recorded.

Answer: Randomized Comparative Experiment

Diff: 1 Type: SA Var: 1

L.O.: 1.3.6

16) On their website, the makers of Cold-EEZE lozenges provide links to studies done to demonstrate the effectiveness of their product at shortening the duration of the common cold. One study, published in the *Annals of Internal Medicine*, is described as a "randomized, double-blind, placebo-controlled" study. Briefly explain what the phrase "randomized, double-blind, placebo-controlled" means.

Answer: "Randomized" means that the subjects in the experiment were randomly assigned to the different treatments. Since this was a "placebo-controlled" experiment, one of the treatments was the Cold-EEZE lozenge while the other was a lozenge not believed to have any effect on the duration of a cold. "Double-blind" means that neither the subjects nor the individuals evaluating them knew which treatment the subjects were receiving; to ensure that this could happen, both the Cold-EEZE lozenge and the placebo need to be administered in the same way and be otherwise indistinguishable.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.5

17) Is using meditation to relax and clear the mind a natural way to treat insomnia? Design an experiment to investigate this question. Assume that you have 20 individuals who suffer from insomnia available to participate in the study. At the end of two months, you will ask subjects to rate their sleep quality.

Answer: Randomly assign the 20 subjects to one of two groups. One group of 10 subjects will be taught how to meditate and asked to meditate once a day. The other group of 10 subjects will not change their normal behavior (this is the control group). After two months, compare sleep quality for the two groups.

Diff: 1 Type: ES Var: 1

L.O.: 1.3.7

Use the following to answer the questions below:

Can people text just as quickly with their off hand as they do their dominant hand?

Assume that you have 42 volunteers available to participate in your study, and that the response you will measure is the time it takes to type and send a text message.

18) Design a randomized comparative experiment to investigate this question. Be specific about how randomization will be used in your experiment.

Answer: Randomly assign the 42 subjects to one of two groups. One group will be assigned to send a text message with their dominant hand, while the other group will send the same text message with their off-hand. All participants will send the same message. The time it takes to type and send the message will be recorded and compared for the two groups.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.6;1.3.7

19) Design a matched pairs experiment to investigate this question. Be specific about how randomization will be used in your experiment.

Answer: Each subject will send the text message with both hands, but the order of "dominant" and "off hand" should be randomized for each subject. The time it takes for them to send each text message should be recorded.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.6;1.3.7

Use the following to answer the questions below:

The Admissions Office at a small university has developed a new 10-minute video about the university to send to prospective students. Before mass-producing the DVD, they would like to test whether it is more effective than the current video. Suppose that you have 12 high school student volunteers who have agreed to take part in an experiment. The explanatory variable to be studied is the type of video, with two levels OLD and NEW.

20) Design a study that could be used in this situation. Give explicit instructions on what the 12 students should do, and be sure to indicate how randomization is used in the study.

Answer: *Answers will vary.* Students could describe either a randomized comparative experiment or a matched pairs experiment.

An example of a randomized comparative experiment would be:

Randomly assign the 12 students to one of two groups. One group of 6 watch the OLD video (this is the control group). The other group of 6 students watch the new video.

An example of a matched pairs experiment would be:

In this type of study, the students would watch both videos. For each student, randomly decide which video they should watch first, labeled "1" (OLD) or "2" (NEW). The student should not know which is the OLD and which is the NEW. After watching the first video, have the student watch the second video.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.7

21) What specific question would you ask the students to measure as the response variable in this study?

Answer: *Answers will vary.*

For the randomized comparative study, you might ask something like "Based on the video alone, would you consider attending the university?" or "Based on the video alone, rate the likelihood of your attending the university on a scale from 1 to 10."

For a matched pairs experiment, you might ask something like "Which video makes you more likely to consider the university, 1 or 2?"

Diff: 2 Type: ES Var: 1

L.O.: 1.3.0

22) What are the cases in your study?

A) High school students

B) Type of video

C) OLD and NEW

D) Instructional materials

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.1

23) Would you describe your study as a randomized comparative experiment, a matched pair experiment, or an observational study? Briefly explain.

Answer: Answers will depend on their design.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.6

24) Explain what it means, in the context of this study, to want the subjects to be "blind."

Answer: It means that you do not want the student to know which video they are viewing (the old or the new).

Diff: 1 Type: ES Var: 1

L.O.: 1.3.5

25) When purchasing some foods, like Jello, at the grocery store, the color of the product typically "matches" the taste. For example, lemon-flavored Jello is yellow, cherry-flavored Jello is red, orange-flavored Jello is orange, and grape-flavored Jello is purple. But, does the color of our food impact the taste that we perceive? Suppose you want to design an experiment to address this question. Note that you can easily make your own "Jello" with simple ingredients that include unflavored gelatin, flavored extracts, and food coloring. Assume that the 30 college students are willing to participate in your study and the response variable is the number of flavors correctly identified.

How would you design a randomized comparative experiment with two groups, each getting a different treatment? Be sure to explain how randomization is used.

Answer: *Answers will vary.* A possible acceptable answer would be:

Make a few batches of "Jello" where the color does not "match" the flavor. For example, make some purple orange-flavored "Jello", some red lemon-flavored "Jello," some green cherry-flavored "Jello," and some yellow grape-flavored "Jello." Randomly assign the 30 students to one of two groups. One group will taste the "Jello" blindfolded, and the other group will taste the "Jello" while being able to see the color.* Provide all subjects in each group a sample of all flavors to taste, and ask them to identify the flavor of each. Record the number that each participant gets correct.

* Note that one group should see the misleading colors and the other should not. There could be several ways in which the latter occurs, including being blindfolded or being served Jello where the color and flavor "match."

Diff: 3 Type: ES Var: 1

L.O.: 1.3.6;1.3.7

26) A group of students were asked to count the number of scars on both of their hands. The number of scars on their dominant hand was compared to the number of scars on their "off" hand. Is this an observational study or a randomized experiment?

A) Observational study

B) Randomized experiment

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.3.3

Use the following to answer the questions below:

A university's Admissions staff sends one of four different representatives to work at college fairs. A study was conducted to evaluate the relative effectiveness of the four representatives. For each college fair over the course of the year, the number of inquiries from students, the type of fair (large or small), the representative who worked at that fair, and the percent of inquiries that resulted in applications were recorded. It was found that one of the representatives was far more effective at getting lots of inquiries.

27) What are the cases in this study?

- A) College fairs
- B) Representatives
- C) The percent of inquiries that resulted in applications
- D) The number of inquiries from students

Answer: A

Diff: 2 Type: BI Var: 1

L.O.: 1.1.1

28) What are the variables recorded in this study? List them and identify each as either categorical or quantitative.

Answer: Number of inquiries from students — quantitative

Type of fair — categorical (large or small)

Representative who attended — categorical (will be one of the four representatives)

Percent of inquiries that resulted in applications — quantitative

Diff: 2 Type: ES Var: 1

L.O.: 1.1.1;1.1.2

29) Is this an observational study or an experiment?

- A) Yes
- B) No

Answer: A

Explanation: This is an observational study because the representatives weren't randomly assigned to the fairs.

Diff: 2 Type: MC Var: 1

L.O.: 1.3.3

30) Can we conclude that sending the most effective representative to more college fairs will increase the number of inquiries from those college fairs?

- A) Yes
- B) No

Answer: B

Explanation: No, we cannot make that conclusion. This was not a randomized experiment (which is the only way to conclude causation), and thus there could be another lurking variable that could explain why one representative tended to be more effective.

Diff: 2 Type: MC Var: 1

L.O.: 1.3.4

31) Briefly explain the distinction between an observational study and a designed experiment.

Answer: In a designed experiment, some sort of treatment is applied to the cases in the study (i.e., their usual behavior/condition is modified). In an observational study, the cases are observed as they are, without any interference. Only a designed experiment can result in a cause-and-effect conclusion.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.3

32) A company is interested in redesigning its website, and two possible designs are being considered. The company wants to get input in the form of ratings of the two designs. Design a matched pairs experiment to decide which design gets higher ratings. Fifty volunteers are available to participate.

Answer: Call the designs A and B. Randomly assign half of the volunteers to examine design A first and the rest to examine design B first. They should rate the design (say, on a scale from 1 to 10). After they have seen one design, they should examine and rate the other. The difference in their ratings should be computed.

Diff: 2 Type: ES Var: 1

L.O.: 1.3.6;1.3.7

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