Test Bank for Statistics Informed Decisions Using Data 6th Sullivan

Access Complete Test Bank for Statistics Informed Decisions Using Data 6th Sullivan

Ch. 1 Data Collection

1.1 Introduction to the Practice of Statistics

1 Define statistics and statistical thinking.

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

Provide an appropriate response.

1) What is statistics?

Answer: Statistics is the science of collecting, summarizing, organizing, and analyzing information in order to answer questions or draw conclusions.

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

2) Which of the following is not true of statistics?
A) Statistics is used to answer questions with 100% certainty.
B) Statistics involves collecting and summarizing data.
C) Statistics can be used to organize and analyze information.
D) Statistics is about providing a measure of confidence in any conclusions

Answer: A

2 Explain the process of statistics.

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

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

1) In a survey conducted in the town of Atherton, 23% of adult respondents reported that they had been involved in at least one car accident in the past ten years.
A) statistic B) parameter

Answer: A

2) 23.2% of the mayors of cities in an entire certain state are from minority groups.
A) parameter B) statistic

Answer: A

3) A study of 2,700 college students in the city of Pemblington found that 9% had been victims of violent crimes.
A) statistic B) parameter

Answer: A

4) 51.6% of all the residents of Idlington Garden City are female.
A) parameter B) statistic

Answer: A

5) Telephone interviews of 316 employees of a large electronics company found that 45% were dissatisfied with their working conditions.
A) statistic B) parameter

Answer: A

6) The average age of the 65 students in Ms. Hope's political science class is 21 years 8 months.
A) parameter B) statistic

Answer: A

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7) Mark retired from competitive athletics last year. In his whole career as a sprinter he had competed in the 100-meters event a total of 328 times. His average time for these 328 races was 10.25 seconds.

A) parameter B) statistic

Answer: A

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

Provide an appropriate response.

8) A survey of 1,805 American households found that 71% of the households own a DVD recorder. Identify the population, the sample, and the individuals in the study.

Answer: population: collection of all American households; sample: collection of 1,805 American households surveyed; individuals: each household

9) A survey of 1,242 American households found that 32% of the households own at least two bicycles. Identify the population, the sample, and the individuals in the study.

Answer: population: collection of all American households; sample: collection of 1,242 American households surveyed; individuals: each household

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

10) Parking at a large university has become a very big problem. University administrators are interested in determining the average parking time (e.g. the time it takes a student to find a parking spot) of its students. An administrator inconspicuously followed 190 students and carefully recorded their parking times. Identify the population of interest to the university administration.

A) the parking times of the entire set of students that park at the university
B) the parking times of the 190 students from whom the data were collected
C) the entire set of faculty, staff, and students that park at the university
D) the students that park at the university between 9 and 10 AM on Wednesdays

Answer: A

11) A manufacturer of cellular phones has decided that an assembly line is operating satisfactorily if less than 0.0 1% of the phones produced per day are defective. To check the quality of a day's production, the company decides to randomly sample 60 phones from a day's production to test for defects. Define the population of interest to the manufacturer.

A) all the phones produced during the day in question
B) the 60 phones sampled and tested
C) the 60 responses: defective or not defective
D) the 0.01% of the phones that are defective

Answer: A

12) A recent study attempted to estimate the proportion of Florida residents who were willing to spend more tax dollars on protecting the Florida beaches from environmental disasters. Twenty-one hundred Florida residents were surveyed. Which of the following is the population used in the study?

A) all Florida residents
B) the 2,100 Florida residents surveyed
C) the Florida residents who were willing to spend more tax dollars on protecting the beaches from environmental disasters
D) all Florida residents who lived along the beaches

Answer: A

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13) Parking at a large university has become a very big problem. University administrators are interested in determining the average parking time (e.g. the time it takes a student to find a parking spot) of its students. An administrator inconspicuously followed 130 students and carefully recorded their parking times. Identify the sample of interest to the university administration.

A) parking times of the 130 students
B) parking time of a student
C) location of the parking spot
D) type of car (import or domestic)

Answer: A

14) The legal profession conducted a study to determine the percentage of cardiologists who had been sued for malpractice in the last five years. The sample was randomly chosen from a national directory of doctors. Identify the individuals in the study.

A) each cardiologist selected from the directory
B) the responses: have been sued/have not been sued for malpractice in the last five years
C) the doctor's area of expertise (i.e., cardiology, pediatrics, etc.)
D) all cardiologists in the directory

Answer: A

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

15) Administrators at a large university want to know the average debt incurred by their graduates. Surveys were mailed to 260 graduating seniors asking them to report their total student loan debt. Identify the population, sample, and individuals in the study.

Answer: The population of interest is the student loan debt incurred by all graduates of the university. The sample is student loan debt of the 260 graduating seniors that were collected by the university administrators. The individuals are each graduating senior whose student loan debt was recorded.

16) A study was conducted to determine if listening to heavy metal music affects critical thinking. To test the claim, 120 subjects were randomly assigned to two groups. Both groups were administered a basic math skills exam. The first group took the exam while heavy metal music was piped into the exam room, while the second group took the exam in a silent room. The mean exam score for the first group was 82, and the mean exam score for the second group was 90. The researchers concluded that heavy metal music negatively affects critical thinking. Identify (a) the research objective, (b) the sample, (c) the descriptive statistics, and (d) the conclusions made in the study.

Answer: (a) if listening to heavy metal music affects critical thinking
(b) the 120 subjects
(c) the mean exam score for the first group = 82, and the mean exam score for the second group was 90
(d) that heavy metal music negatively affects critical thinking

17) A telephone poll asked 1,122 registered voters "Would you vote for the current vice president if he ran for president?" Of these 1,122 respondents, 37% would vote for the current vice president if he ran for president. The administrators of the study concluded that 37% of all registered voters would vote for the current vice president if he ran for president. Identify (a) the research objective, (b) the sample, (c) the descriptive statistics, and (d) the conclusions made in the study.

Answer: (a) to determine the percentage of registered voters who would vote for the current vice president if he ra president
(b) the 1,122 registered voters surveyed
(c) 37% of the respondents supported reelection
(d) that 37% of all registered voters would vote for the current vice president if he ran for president

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

18) Which branch of statistics deals with the organization and summarization of collected information?
A) Descriptive statistics B) Inferential statistics
C) Survey design D) Computational statistics
Answer: A

3 Distinguish between qualitative and quantitative variables.

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

Classify the variable as qualitative or quantitative.

1) the colors of book covers on a bookshelf
A) qualitative B) quantitative
Answer: A

2) the number of calls received at a company's help desk
A) quantitative B) qualitative
Answer: A

3) the number of seats in a school auditorium
A) quantitative B) qualitative
Answer: A

4) the numbers on the shirts of a football team
A) qualitative B) quantitative
Answer: A

5) the bank account numbers of the students in a class
A) qualitative B) quantitative
Answer: A

6) the weights of cases loaded onto an airport conveyor belt
A) quantitative B) qualitative
Answer: A

7) the temperatures of cups of coffee served at a restaurant
A) quantitative B) qualitative
Answer: A

8) the native languages of students in an English class
A) qualitative B) quantitative
Answer: A

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Solve the problem.

9) A bicycle manufacturer produces four different bicycle models. Information is summarized in the table below:

Model	Series Number	Weight	Style
Ascension	A120	32	Mountain
Road Runner	B640	22	Road
All Terrain	C300	27	Hybrid
Class Above	D90	17	Racing

Identify the variables and determine whether each variable is quantitative or qualitative.

A) series number: qualitative; weight: quantitative; style: qualitative
B) series number: quantitative; weight: quantitative; style: qualitative
C) series number: quantitative; weight: qualitative; style: qualitative
D) series number: qualitative; weight: qualitative; style: qualitative

Answer: A

10) An international relations professor is supervising four master's students. Information about the students is summarized in the table.

Student Name	Student Number	Area of Interest	GPA
Anna	914589205	Africa	3.23
Pierre	981672635	Middle East	3.50
Juan	906539012	Latin America	3.80
Yoko	977530271	Asia	3.71

Identify the variables and determine whether each variable is quantitative or qualitative.

A) student number: qualitative; area of interest: qualitative; GPA: quantitative
B) student number: quantitative; area of interest: qualitative; GPA: quantitative
C) student number: quantitative; area of interest: qualitative; GPA: qualitative
D) student number: qualitative; area of interest: qualitative; GPA: qualitative

Answer: A

Provide an appropriate response.

11) Quantitative variables classify individuals in a sample according to

A) numerical measure.
B) physical attribute.
C) personality characteristic.
D) exhibited trait.

Answer: A

4 Distinguish between discrete and continuous variables.

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

Determine whether the quantitative variable is discrete or continuous.

1) the number of bottles of juice sold in a cafeteria during lunch

A) discrete
B) continuous

Answer: A

2) the weight of a player on the wrestling team

A) continuous
B) discrete

Answer: A

3) the cholesterol levels of a group of adults the day after Thanksgiving

A) continuous
B) discrete

Answer: A

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4) the low temperature in degrees Fahrenheit on January 1st in Cheyenne, Wyoming
A) continuous B) discrete

Answer: A

5) the number of goals scored in a hockey game
A) discrete B) continuous

Answer: A

6) the speed of a car on a Boston tollway during rush hour traffic
A) continuous B) discrete

Answer: A

7) the number of phone calls to the police department on any given day
A) discrete B) continuous

Answer: A

8) the age of the oldest employee in the data processing department
A) continuous B) discrete

Answer: A

9) the number of pills in an aspirin bottle
A) discrete B) continuous

Answer: A

Provide an appropriate response.

10) The peak shopping time at a pet store is between 8-11:00 am on Saturday mornings. Management at the pet store randomly selected 100 customers last Saturday morning and decided to observe their shopping habits. They recorded the number of items that a sample of the customers purchased as well as the total time the customers spent in the store. Identify the types of variables recorded by the pet store.
A) number of items - discrete; total time - continuous
B) number of items - continuous; total time - continuous
C) number of items - continuous; total time - discrete
D) number of items - discrete; total time - discrete

Answer: A

11) The number of violent crimes committed in a city on a given day in a random sample of 50 days is a _____ random variable.
A) discrete B) continuous

Answer: A

12) Classify the following random variable: telephone area codes
A) qualitative data B) experimental data
C) quantitative continuous data D) quantitative discrete data

Answer: A

13) A student is asked to rate a guest speaker's ability to communicate on a scale of poor-average-good-excellent. The student is to fill in a corresponding circle on a bubble form. This is an example of collecting what type of data?
A) qualitative B) continuous C) discrete D) insightful

Answer: A

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5 Determine the level of measurement of a variable.

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

Determine the level of measurement of the variable.

1) the musical instrument played by a music student
A) nominal B) ratio C) ordinal D) interval
Answer: A

2) the medal received (gold, silver, bronze) by an Olympic gymnast
A) ordinal B) ratio C) nominal D) interval
Answer: A

3) height of a tree
A) ratio B) interval C) nominal D) ordinal
Answer: A

4) the native language of a tourist
A) nominal B) ratio C) ordinal D) interval
Answer: A

5) the day of the month
A) interval B) ratio C) nominal D) ordinal
Answer: A

6) an officer's rank in the military
A) ordinal B) ratio C) nominal D) interval
Answer: A

7) weight of rice bought by a customer
A) ratio B) interval C) nominal D) ordinal
Answer: A

8) a student's favorite sport
A) nominal B) ratio C) ordinal D) interval
Answer: A

9) ranking (first place, second place, etc.) of contestants in a singing competition
A) ordinal B) ratio C) nominal D) interval
Answer: A

10) weight capacity of a backpack
A) ratio B) interval C) nominal D) ordinal
Answer: A

11) an evaluation received by a physics student (excellent, good, satisfactory, or poor).
A) ordinal B) ratio C) nominal D) interval
Answer: A

12) the year of manufacture of a car
A) interval B) ratio C) nominal D) ordinal
Answer: A

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13) time spent playing basketball
A) ratio B) interval C) nominal D) ordinal
Answer: A

14) category of storm (gale, hurricane, etc.)
A) ordinal B) ratio C) nominal D) interval
Answer: A

1.2 Observational Studies versus Designed Experiments

1 Distinguish between an observational study and an experiment.

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

Determine whether the study depicts an observational study or an experiment.

1) A medical researcher obtains a sample of adults suffering from diabetes. She randomly assigns 42 people to a treatment group and 42 to a placebo group. The treatment group receives a medication over a period of three months and the placebo group receives a placebo over the same time frame. At the end of three months the patients' symptoms are evaluated.
A) experiment B) observational study
Answer: A

2) A poll is conducted in which professional musicians are asked their ages.
A) observational study B) experiment
Answer: A

3) A pollster obtains a sample of students and asks them how they will vote on an upcoming referendum.
A) observational study B) experiment
Answer: A

4) The personnel director at a large company would like to determine whether the company cafeteria is widely used by employees. She calls each employee and asks them whether they usually bring their own lunch, eat at the company cafeteria, or go out for lunch.
A) observational study B) experiment
Answer: A

5) A scientist was studying the effects of a new fertilizer on crop yield. She randomly assigned half of the plots on a farm to group one and the remaining plots to group two. On the plots in group one, the new fertilizer was used for a year. On the plots in group two, the old fertilizer was used. At the end of the year the average crop yield for the plots in group one was compared with the average crop yield for the plots in group two.
A) experiment B) observational study
Answer: A

6) A researcher obtained a random sample of 100 smokers and a random sample of 100 nonsmokers. After interviewing all 200 participants in the study, the researcher compared the rate of depression among the smokers with the rate of depression among nonsmokers.
A) observational study B) experiment
Answer: A

Provide an appropriate response.

7) True or False: Observational studies allow the researcher to claim causation, not just association.
A) False B) True
Answer: A

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8) True or False: Experiments intentionally manipulate the value of an explanatory variable.
A) True B) False

Answer: A

2 Explain the various types of observational studies.

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

Determine what type of observational study is described. Explain.

1) Researchers wanted to determine whether there was an association between high blood pressure and the suppression of emotions. The researchers looked at 1800 adults enrolled in a Health Initiative Observational Study. Each person was interviewed and asked about their response to emotions. In particular they were asked whether their tendency was to express or to hold in anger and other emotions. The degree of suppression of emotions was rated on a scale of 1 to 10. Each person's blood pressure was also measured. The researchers analyzed the results to determine whether there was an association between high blood pressure and the suppression of emotions.
A) cross-sectional; Information is collected at a specific point in time.
B) cohort; Individuals are observed over a long period of time.
C) case-control; Individuals are asked to look back in time.

Answer: A

2) Researchers wanted to determine whether there was an association between city driving and stomach ulcers. They selected a sample of 900 young adults and followed them for a twenty-year period. At the start of the study none of the participants was suffering from a stomach ulcer. Each person kept track of the number of hours per week they spent driving in city traffic. At the end of the study each participant underwent tests to determine whether they were suffering from a stomach ulcer. The researchers analyzed the results to determine whether there was an association between city driving and stomach ulcers.
A) cohort; Individuals are observed over a long period of time.
B) cross-sectional; Information is collected at a specific point in time.
C) case-control; Individuals are asked to look back in time.

Answer: A

3) A researcher wanted to determine whether women with children are more likely to develop anxiety disorders than women without children. She selected a sample of 900 twenty-year old women and followed them for a twenty-year period. At the start of the study, none of the women had children. By the end of the study 53% of the women had at least one child. The level of anxiety of each participant was evaluated at the beginning and at the end of the study and the increase (or decrease) in anxiety was recorded. The researchers analyzed the results to determine whether there was an association between anxiety and having children.
A) cohort; Individuals are observed over a long period of time.
B) cross-sectional; Information is collected at a specific point in time.
C) case-control; Individuals are asked to look back in time.

Answer: A

4) Vitamin D is important for the metabolism of calcium and exposure to sunshine is an important source of vitamin D. A researcher wanted to determine whether osteoperosis was associated with a lack of exposure to sunshine. He selected a sample of 250 women with osteoperosis and an equal number of women without osteoperosis. The two groups were matched - in other words they were similar in terms of age, diet, occupation, and exercise levels. Histories on exposure to sunshine over the previous twenty years were obtained for all women. The total number of hours that each woman had been exposed to sunshine in the previous twenty years was estimated. The amount of exposure to sunshine was compared for the two groups.
A) case-control; Individuals are asked to look back in time
B) cross-sectional; Information is collected at a specific point in time.
C) cohort; Individuals are observed over a long period of time.

Answer: A

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5) Can money buy happiness? A researcher wanted to determine whether there was any association between economic status and happiness. She selected a sample of 1000 adults and interviewed them. Each person was asked about their financial situation and their level of happiness was evaluated. The researcher analyzed the results to determine whether there was an association between economic status and happiness.
   A) cross-sectional; Information is collected at a specific point in time.
   B) cohort; Individuals are observed over a long period of time.
   C) case-control; Individuals are asked to look back in time.

   Answer: A

6) A researcher wanted to determine whether colon cancer was associated with eating meat. He selected a sample of 500 men with colon cancer and an equal number of men without colon cancer. The two groups were matched - in other words they were similar in terms of age, occupation, income, and exercise levels. Histories on the amount of meat consumed over the previous twenty years were obtained for all men. The total amount of meat that each man eaten in the previous twenty years was estimated. The meat consumption was compared for the two groups.
   A) case-control; Individuals are asked to look back in time
   B) cross-sectional; Information is collected at a specific point in time.
   C) cohort; Individuals are observed over a long period of time.

   Answer: A

1.3 Simple Random Sampling

1 Obtain a simple random sample.

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

Provide an appropriate response.

1) The government of a town needs to determine if the city's residents will support the construction of a new town hall. The government decides to conduct a survey of a sample of the city's residents. Which one of the following procedures would be least appropriate for obtaining a sample of the town's residents?
   A) Survey the first 300 people listed in the town's telephone directory.
   B) Survey a random sample of persons within each geographic region of the city.
   C) Survey a random sample of employees at the old city hall.
   D) Survey every 8th person who walks into city hall on a given day.

   Answer: A

2) The city council of a small town needs to determine if the town's residents will support the building of a new library. The council decides to conduct a survey of a sample of the town's residents. Which one of the following procedures would be least appropriate for obtaining a sample of the town's residents?
   A) Survey a random sample of librarians who live in the town.
   B) Survey a random sample of persons within each neighborhood of the town.
   C) Survey 300 individuals who are randomly selected from a list of all people living in the state in which the town is located.
   D) Survey every 15th person who enters the old library on a given day.

   Answer: A

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3) The policy committee at State University has 6 members: Jose, John, Prof. Rise, Dr. Hernandez, LaToyna, and Ming. A subcommittee of two members must be formed to investigate the visitation policy in the dormitories. List all possible simple random samples of size 2.

A) Jose and John, Jose and Prof. Rise, Jose and Dr. Hernandez, Jose and LaToyna, Jose and Ming, John and Prof. Rise, John and Dr. Hernandez, John and LaToyna, John and Ming, Prof. Rise and Dr. Hernandez, Prof. Rise and LaToyna, Prof. Rise and Ming, Dr. Hernandez and LaToyna, Dr. Hernandez and Ming, LaToyna and Ming

B) Jose and John, Prof. Rise and Dr. Hernandez, LaToyna and Ming

C) Jose and John, John and Prof. Rise, Prof. Rise and Dr. Hernandez, Dr. Hernandez and LaToyna, LaToyna and Ming

D) Jose and John, Jose and Prof. Rise, Jose and Dr. Hernandez, Jose and LaToyna, Jose and Ming

Answer: A

4) Select a random sample of five state capitals from the list below using the two digit list of random numbers prov Begin with the uppermost left random number and proceed down each column. When a column is complete, u numbers at the top of the next right column and proceed down that column.

State Capitals

1	Albany, NY	11	Charleston, WV	21	Hartford, CT	31	Madison, WI	41	Richmond, VA
2	Annapolis, MD	12	Cheyenne, WY	22	Helena, MT	32	Montgomery, AL	42	Sacramento, CA
3	Atlanta, GA	13	Columbia, SC	23	Honolulu, HI	33	Montpelier, VT	43	Salem, OR
4	Augusta, ME	14	Columbus, OH	24	Indianapolis, IN	34	Nashville, TN	44	Salt Lake City, UT
5	Austin, TX	15	Concord, NH	25	Jackson, MS	35	Oklahoma City, OK	45	Santa Fe, NM
6	Baton Rouge, LA	16	Denver, CO	26	Jefferson City, MO	36	Olympia, WA	46	Springfield, IL
7	Bismarck, ND	17	Des Moines, IA	27	Juneau, AK	37	Phoenix, AZ	47	St. Paul, MN
8	Boise, ID	18	Dover, DE	28	Lansing, MI	38	Pierre, SD	48	Tallahassee, FL
9	Boston, MA	19	Frankfort, KY	29	Lincoln, NE	39	Providence, RI	49	Topeka KS
10	Carson City, NV	20	Harrisburg, PA	30	Little Rock, AR	40	Raleigh, NC	50	Trenton, NJ

Random Numbers

46	81	17	60	92	59	40	9
53	78	45	14	53	78	8	43
3	99	46	86	41	42	36	95
39	14	16	59	84	18	5	48
45	41	77	91	11	43	76	28

A) Springfield, IL; Atlanta,GA; Providence, RI; Santa Fe, NM; Columbus OH.

B) Springfield, IL; Des Moines, IA; Boston, MA; Santa Fe, NM; Columbus OH.

C) Carson City NV; Boise ID; Atlanta, GA; Cheyenne, WY; Boston, MA.

D) Boston, MA; Concord, NH; Dover DE; Santa Fe, NM; Richmond, VA.

Answer: A

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5) The top 38 cities in Wisconsin as determined by population are given below. Select a random sample of four cities from the list below using the two digit list of random numbers provided. Begin with the uppermost left random number and proceed down each column. When a column is complete, use the numbers at the top of the next right column and proceed down that column. Information was obtained from the web site http://www.citypopulation.de/USA-Wisconsin.html.

Wisconsin Cities by Population

1	Milwaukee	9	Eau Claire	17	New Berlin	25	West Bend	33	Watertown
2	Madison	10	Janesville	18	Wausau	26	Superior	34	Muskego
3	Green Bay	11	West Allis	19	Greenfield	27	Mount Pleasant	35	De Pere
4	Kenosha	12	La Crosse	20	Beloit	28	Neenah	36	Fitchburg
5	Racine	13	Sheboygan	21	Manitowoc	29	Stevens Point	37	South Milwaukee
6	Appleton	14	Wauwatosa	22	Menomonee Falls	30	Caledonia	38	Grand Chute
7	Waukesha	15	Fond du Lac	23	Franklin	31	Sun Prairie		
8	Oshkosh	16	Brookfield	24	Oak Creek	32	Mequon		

Random Numbers

21	49	6	6	19	15	11	17
12	43	4	31	7	18	1	43
23	30	2	24	21	18	6	48
44	12	20	32	2	28	12	38
8	30	38	43	41	29	3	13

A) Manitowoc, La Crosse, Franklin, Oshkosh.
B) Manitowoc, Appleton, Greenfield, Fond du Lac.
C) Milwaukee, Madison, Green Bay, Kenosha.
D) Milwaukee, Eau Claire, New Berlin, West Bend.

Answer: A

1.4 Other Effective Sampling Methods

1 Determine the appropriate sampling type

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

Identify the type of sampling used.

1) Thirty-five math majors, 34 music majors and 65 history majors are randomly selected from 244 math majors, 453 music majors and 550 history majors at the state university. What sampling technique is used?
A) stratified
B) simple random
C) cluster
D) convenience
E) systematic

Answer: A

2) Every fifth adult entering an airport is checked for extra security screening. What sampling technique is used?
A) systematic
B) simple random
C) cluster
D) convenience
E) stratified

Answer: A

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3) At a local technical school, five auto repair classes are randomly selected and all of the students from each class are interviewed. What sampling technique is used?
   A) cluster
   B) simple random
   C) convenience
   D) systematic
   E) stratified

   Answer: A

4) A writer for an art magazine randomly selects and interviews fifty male and fifty female artists. What sampling technique is used?
   A) stratified
   B) simple random
   C) cluster
   D) convenience
   E) systematic

   Answer: A

5) A travel industry researcher interviews all of the passengers on five randomly selected cruises. What sampling technique is used?
   A) cluster
   B) simple random
   C) convenience
   D) systematic
   E) stratified

   Answer: A

6) A statisticsstudent interviews everyone in his apartment building to determine what percent of people own a cell phone. What sampling technique is used?
   A) convenience
   B) simple random
   C) cluster
   D) systematic
   E) stratified

   Answer: A

7) A lobbyist for the oil industry assigns a number to each senator and then uses a computer to randomly generate ten numbers. The lobbyist contacts the senators corresponding to these numbers. What sampling technique was used?
   A) simple random
   B) convenience
   C) cluster
   D) stratified
   E) systematic

   Answer: A

8) Based on 9,000 responses from 44,500 questionnaires sent to all its members, a major medical association estimated that the annual salary of its members was $122,500 per year. What sampling technique was used?
   A) simple random
   B) stratified
   C) cluster
   D) convenience
   E) systematic

   Answer: A

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9) In a recent Twitter survey, participants were asked to answer "yes" or "no" to the question "Are you in favor of stricter gun control?" 6571 responded "yes" while 5237 responded "no". What sampling technique was used?
   A) convenience
   B) simple random
   C) cluster
   D) stratified
   E) systematic

   Answer: A

10) A sample consists of every 35th worker from a group of 5000 workers. What sampling technique was used?
   A) systematic
   B) simple random
   C) cluster
   D) stratified
   E) convenience

   Answer: A

11) A market researcher randomly selects 400 homeowners under 60 years of age and 200 homeowners over 60 years of age. What sampling technique was used?
   A) stratified
   B) simple random
   C) cluster
   D) convenience
   E) systematic

   Answer: A

12) To avoid working late, the plant foreman inspects the first 30 microwaves produced that day. What sampling technique was used?
   A) convenience
   B) simple random
   C) cluster
   D) stratified
   E) systematic

   Answer: A

13) The names of 80 employees are written on 80 cards. The cards are placed in a bag, and three names are picked from the bag. What sampling technique was used?
   A) simple random
   B) stratified
   C) cluster
   D) convenience
   E) systematic

   Answer: A

14) An education researcher randomly selects 90 of the nation's junior colleges and interviews all of the professors at each school. What sampling technique was used?
   A) cluster
   B) simple random
   C) stratified
   D) convenience
   E) systematic

   Answer: A

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Provide an appropriate response.

15) The United States can be divided into four geographical regions: Northeast, South, Midwest, and West. The Northeast region consists of 9 states; the South region consists of 16 states; the Midwest consists of 12 states; and the West consists of 13 states. If a survey is to be administered to the governors of 12 of the states and we want equal representation for the states in each of the four regions, how many states from the South should be selected? Round to the nearest whole state.

A) 3 B) 4 C) 2 D) 5

Answer: A

2 Design a sampling method.

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

Solve the problem.

1) For a poll of voters regarding a referendum calling for renewing the residential renewable energy tax credit, design a sampling method to obtain the individuals in the sample.

Answer: Answers will vary. One option would be stratified sampling. Since this is a national issue, different geographical locations are likely to have similar views.

2) A pharmaceutical company wants to conduct a survey of 50 individuals who have type 1 diabetes. The company has obtained a list from doctors throughout the country of 7400 individuals who are known to have type 1 diabetes. Design a sampling method to obtain the individuals in the sample.

Answer: Answers will vary. Simple random sampling will work fine here, especially because a list of 7400 individuals who meet the needs of our study already exists.

1.5 Bias in Sampling

1 Explain the sources of bias in sampling.

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

Provide an appropriate response.

1) An online newspaper conducted a survey by asking, "Do you support the lowering of air quality standards if it could cause the death of millions of innocent people from pollution related diseases?" Determine the type of bias.

Answer: Response bias; poorly worded question

2) A local hardware store wants to know if its customers are satisfied with the customer service they receive. The store posts an interviewer at the front of the store to ask the first 140 shoppers who leave the store, "How satisfied, on a scale of 1 to 10, were you with this store's customer service?" Determine the type of bias.

Answer: Sampling bias; the customers are not chosen through a random sample.

3) Before opening a new dealership, an auto manufacturer wants to gather information about car ownership and driving habits of the local residents. The marketing manager of the company randomly selects 1000 households from all households in the area and mails a questionnaire to them. Of the 1000 surveys mailed, she receives 145 back. Determine the type of bias.

Answer: Nonresponse bias

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

4) Which type of bias occurs because the individuals tend to favor one part of the population over another?

A) sampling bias B) response bias C) nonresponse bias D) no bias

Answer: A

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5) A researcher wants to study the effects of advertising of accessible online college upon high school boys and sampled small Midwestern towns. The results from this study were used to project a national campaign on accessible forms of online college. What type or error may have occurred?

A) Sampling error
B) Data-entry error
C) Question error
D) Nonsampling error

Answer: A

1.6 The Design of Experiments

1 Describe the characteristics of an experiment.

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

Provide an appropriate response.

1) What is a designed experiment?

Answer: A designed experiment is a controlled study in which treatments are applied to experimental units, and the effect of varying these treatments on a response variable is observed.

2) What is a factor?

Answer: A factor is the variable whose effect on the response variable is to be assessed by the experimenter.

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

3) Which of the following is not true about factors?

A) Factors whose effect on the response variable is not of interest can be set after the experiment.
B) Factors whose effect on the response variable interests us should be set at predetermined levels.
C) One way to control factors is to fix their level at one predetermined value throughout the experiment.
D) Any combination of the values of the factors is called a treatment.

Answer: A

4) The variable measured in the experiment is called _____ .

A) the response variable
B) a sampling unit
C) the treatment
D) the predictor variable

Answer: A

5) The object upon which the treatment is applied is called _____ .

A) an experimental unit
B) the factor
C) the predictor variable
D) a treatment

Answer: A

6) _____ is a combination of the values of factors in an experiment.

A) A treatment
B) The sampling design
C) The factor level
D) The design

Answer: A

7) An experiment in which the experimental unit (or subject) does not know which treatment he or she is receiving is called a _____ .

A) single-blind experiment
B) double-blind experiment
C) randomized block design
D) matched-pairs design

Answer: A

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8) An experiment in which neither the experimental unit nor the researcher in contact with the experimental unit knows which treatment the experimental unit is receiving is called a _____ .

A) double-blind experiment
B) single-blind experiment
C) randomized block design
D) matched-pairs design

Answer: A

9) A salesman boasts to a farmer that his new fertilizer will increase the yield of the farmer's crops by 15%. The farmer wishes to test the effects of the new fertilizer on her corn yield. She has four equal sized plots of land —one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal sized portions and randomly labels them A, B and C. The four A portions are treated with her old fertilizer. The four B portions are treated with the new fertilizer. The four C portions receive no fertilizer. At harvest time, the corn yield is recorded for each section of land. What is the claim she is testing?

A) The new fertilizer yielded at least a 15% improvement.
B) The total yield increased at least 15%.
C) The A sections had at least a 15% increase in yield.
D) The average soil field had at least a 15% increase in yield.

Answer: A

10) A drug company wanted to test a new indigestion medication. The researchers found 700 adults aged 25-35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose indigestion symptoms decreased was recorded and compared. What is the response variable in this experiment?

A) The percentage who had decreased indigestion symptoms.
B) The type of drug (medication or placebo).
C) The 700 adults aged 25-35.
D) The one month treatment time.

Answer: A

11) A drug company wanted to test a new indigestion medication. The researchers found 300 adults aged 25-35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose indigestion symptoms decreased was recorded and compared. What is the treatment in this experiment?

A) The drug.
B) The percentage who had decreased indigestion symptoms.
C) The 300 adults aged 25-35.
D) The one month treatment time.

Answer: A

12) A drug company wanted to test a new depression medication. The researchers found 200 adults aged 25-35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose depression symptoms decreased was recorded and compared. How many levels does the treatment in this experiment have?

A) 2 (medication or placebo)
B) 200 (number of respondents)
C) 1 (months of treatment)
D) 10 (age span of respondents)

Answer: A

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13) A drug company wanted to test a new depression medication. The researchers found 500 adults aged 25-35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose depression symptoms decreased was recorded and compared. Identify the experimental units.
A) The 500 adults aged 25-35.
B) The percentage who had decreased depression symptoms.
C) The drug (medication or placebo).
D) The one month treatment time

Answer: A

2 Explain the steps in designing an experiment, completely randomized design, matched -pairs design, or randomized block design.

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

Provide an appropriate response.

1) A drug company wanted to test a new depression medication. The researchers found 700 adults aged 25-35 and randomly assigned them to two groups. The first group received the new drug, while the second received a placebo. After one month of treatment, the percentage of each group whose depression symptoms decreased was recorded and compared. What type of experimental design is this?
A) completely randomized design
B) randomized block design
C) matched-pairs design
D) single-blind design

Answer: A

2) A medical journal published the results of an experiment on anxiety. The experiment investigated the effects of a controversial new therapy for anxiety. Researchers measured the anxiety levels of 96 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women's anxiety levels. The differences between the the pre- and post-therapy anxiety levels were reported. What is the response variable in this experiment?
A) The differences between the the pre- and post-therapy anxiety levels
B) The 96 adult women who suffer from anxiety.
C) The disorder (anxiety or no anxiety).
D) The therapy.

Answer: A

3) A medical journal published the results of an experiment on anorexia. The experiment investigated the effects of a controversial new therapy for anorexia. Researchers measured the anorexia levels of 39 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women's anorexia levels. The differences between the the pre- and post-therapy anorexia levels were reported. What is the treatment in this experiment?
A) the therapy
B) the 39 adult women who suffer from anorexia
C) the disorder (anorexia or no anorexia)
D) the differences between the the pre- and post-therapy anorexia levels

Answer: A

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4) A medical journal published the results of an experiment on depression. The experiment investigated the effects of a controversial new therapy for depression. Researchers measured the depression levels of 83 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women's depression levels. The differences between the the pre- and post-therapy depression levels were reported. How many levels does the treatment have in this experiment?
A) 2 (pre- and post-therapy)
B) 1 (therapy)
C) 83 (the adult women who suffer from depression)
D) 166 (the adult women who suffer from depression measured pre- and post-therapy)

Answer: A

5) A medical journal published the results of an experiment on depression. The experiment investigated the effects of a controversial new therapy for depression. Researchers measured the depression levels of 72 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women's depression levels. The differences between the the pre- and post-therapy depression levels were reported. What type of experimental design is this?
A) matched-pairs design
B) completely randomized design
C) randomized block design
D) single-blind design

Answer: A

6) A medical journal published the results of an experiment on anxiety. The experiment investigated the effects of a controversial new therapy for anxiety. Researchers measured the anxiety levels of 79 adult women who suffer moderate conditions of the disorder. After the therapy, the researchers again measured the women's anxiety levels. The differences between the the pre- and post-therapy anxiety levels were reported. Identify the experimental units.
A) the 79 adult women who suffer from anxiety
B) the differences between the pre- and post-therapy anxiety levels
C) the disorder (anxiety or no anxiety)
D) the therapy time period (pre or post)

Answer: A

7) A farmer wishes to test the effects of a new fertilizer on her potato yield. She has four equal-sized plots of land--one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C's are treated with no fertilizer. At harvest time, the potato yield is recorded for each section of land. What is the response variable in this experiment?
A) the potato yield recorded for each section of land
B) the type of fertilizer (old, new, or none)
C) the section of land (A, B, or C)
D) the four types of soil

Answer: A

8) A farmer wishes to test the effects of a new fertilizer on her tomato yield. She has four equal-sized plots of land--one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C's are treated with no fertilizer. At harvest time, the tomato yield is recorded for each section of land. What is the treatment in this experiment?
A) the fertilizers
B) the tomato yield recorded for each section of land
C) the section of land (A, B, or C)
D) the four types of soil

Answer: A

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9) A farmer wishes to test the effects of a new fertilizer on her tomato yield. She has four equal-sized plots of land--one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C's are treated with no fertilizer. At harvest time, the tomato yield is recorded for each section of land. How many levels does the treatment have in this experiment?

A) 3 (old, new, or no fertilizer)
B) 4 (rocky, sandy, clay, or average soil)
C) 12 (sections of land)
D) 1 (tomato yield)

Answer: A

10) A farmer wishes to test the effects of a new fertilizer on her corn yield. She has four equal-sized plots of land--one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C's are treated with no fertilizer. At harvest time, the corn yield is recorded for each section of land. What type of experimental design is this?

A) randomized block design
B) completely randomized design
C) matched-pairs design
D) double-blind design

Answer: A

11) A farmer wishes to test the effects of a new fertilizer on her soybean yield. She has four equal-sized plots of land--one with sandy soil, one with rocky soil, one with clay-rich soil, and one with average soil. She divides each of the four plots into three equal-sized portions and randomly labels them A, B, and C. The four A portions of land are treated with her old fertilizer. The four B portions are treated with the new fertilizer, and the four C's are treated with no fertilizer. At harvest time, the soybean yield is recorded for each section of land. Identify the experimental units.

A) the soybean plants on the various plots of land
B) the soybean yield at harvest time
C) the three types of fertilizer
D) the four types of soil

Answer: A

12) When the effects of the explanatory variable upon the response variable cannot be determined, then

A) confounding has occurred.
B) a lurking variable is present.
C) there is sampling error.
D) the claim is invalid.

Answer: A

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Ch. 1 Data Collection
Answer Key

1.1 Introduction to the Practice of Statistics

1 Define statistics and statistical thinking.

1) Statistics is the science of collecting, summarizing, organizing, and analyzing information in order to answer questions or draw conclusions.
2) A

2 Explain the process of statistics.

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) population: collection of all American households; sample: collection of 1,805 American households surveyed; individuals: each household
9) population: collection of all American households; sample: collection of 1,242 American households surveyed; individuals: each household
10) A
11) A
12) A
13) A
14) A
15) The population of interest is the student loan debt incurred by all graduates of the university. The sample is student loan debt of the 260 graduating seniors that were collected by the university administrators. The individuals are each graduating senior whose student loan debt was recorded.
16) (a) if listening to heavy metal music affects critical thinking
(b) the 120 subjects
(c) the mean exam score for the first group = 82, and the mean exam score for the second group was 90
(d) that heavy metal music negatively affects critical thinking
17) (a) to determine the percentage of registered voters who would vote for the current vice president if he ran for presider
(b) the 1,122 registered voters surveyed
(c) 37% of the respondents supported reelection
(d) that 37% of all registered voters would vote for the current vice president if he ran for president
18) A

3 Distinguish between qualitative and quantitative variables.

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A

4 Distinguish between discrete and continuous variables.

1) A
2) A
3) A
4) A

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5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A

5 Determine the level of measurement of a variable.

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) A

1.2 Observational Studies versus Designed Experiments

1 Distinguish between an observational study and an experiment.

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A

2 Explain the various types of observational studies.

1) A
2) A
3) A
4) A
5) A
6) A

1.3 Simple Random Sampling

1 Obtain a simple random sample.

1) A
2) A
3) A
4) A
5) A

1.4 Other Effective Sampling Methods

1 Determine the appropriate sampling type

1) A
2) A
3) A
4) A

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5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) A
15) A

2 Design a sampling method.

1) Answers will vary. One option would be stratified sampling. Since this is a national issue, different geographical locations are likely to have similar views.
2) Answers will vary. Simple random sampling will work fine here, especially because a list of 7400 individuals who meet the needs of our study already exists.

1.5 Bias in Sampling

1 Explain the sources of bias in sampling.

1) Response bias; poorly worded question
2) Sampling bias; the customers are not chosen through a random sample.
3) Nonresponse bias
4) A
5) A

1.6 The Design of Experiments

1 Describe the characteristics of an experiment.

1) A designed experiment is a controlled study in which treatments are applied to experimental units, and the effect of varying these treatments on a response variable is observed.
2) A factor is the variable whose effect on the response variable is to be assessed by the experimenter.
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A

2 Explain the steps in designing an experiment, completely randomized design, matched -pairs design, or randomized block design.

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A

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Ch. 2 Organizing and Summarizing Data

2.1 Organizing Qualitative Data

1 Organize qualitative data in tables.

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

Provide an appropriate response. Round relative frequencies to thousandths.

1) Scott Tarnowski owns a pet grooming shop. His prices for grooming dogs are based on the size of the dog. His r
from last year are summarized below. Construct a frequency distribution and a relative frequency distribution. S
the percentage represented by each relative frequency.

Class	Frequency
Large	345
Medium	830
Small	645

Answer:

Class	Frequency	Relative Frequency	Percentage
Large	345	0.190	19.0
Medium	830	0.456	45.6
Small	645	0.354	35.4
Total	1820	1.000	100.0

2) The results of a survey about a recent judicial appointment are given in the table below. Construct a relative frequency distribution.

Response	Frequency
Strongly Favor	23
Favor	14
Neutral	29
Oppose	5
Strongly Oppose	129

Answer:

Response	Frequency	Relative Frequency
Strongly Favor	23	0.115
Favor	14	0.07
Neutral	29	0.145
Oppose	5	0.025
Strongly Oppose	129	0.645

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3) The preschool children at Elmwood Elementary School were asked to name their favorite color. The results are listed below. Construct a frequency distribution and a relative frequency distribution.

purple	purple	green	blue	red
red	red	purple	red	green
red	green	blue	blue	blue
green	red	blue	red	yellow

Answer:

Color	Frequency	Relative Frequency
purple	3	0.15
green	4	0.20
blue	5	0.25
red	7	0.35
yellow	1	0.05

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

4) True or False: In fraction form, the sum of all the relative frequencies of a distribution will always add up to 1.

A) True B) False

Answer: A

5) True or False: Relative frequency is the proportion (or percent) of observations within a category and is found using the formula: relative frequency = $\frac{\text{sum of all frequencies}}{\text{frequency}}$.

A) False B) True

Answer: A

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