Ch. 1 Statistics, Data, and Statistical Thinking

1.1 The Science of Statistics

1 Define Statistics

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

Solve the problem.

- 1) Which of the following is not the job of a statistician?
 - A) implementing new procedures based on the results of a study
 - B) determining what information is relevant in a given problem
 - C) collecting numerical information in the form of data
 - D) determining whether the conclusions drawn from a study are to be trusted

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

2) What is statistics?

1.2 Types of Statistical Applications

1 Define Descriptive and Inferential Statistics

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

Solve the problem.

- 1) A recent report stated "Based on a sample of 200 truck drivers, there is evidence to indicate that, on average, independent truck drivers earn more than company hired truck drivers." Does this statement describe descriptive or inferential statistics?
 - A) inferential statistics

- B) descriptive statistics
- 2) A survey of high school teenagers reported that 77% of those sampled are interested in pursuing a college education. Does this statement describe descriptive or inferential statistics?
 - A) descriptive statistics

- B) inferential statistics
- 3) The average age of the students in a statistics class is 22 years. Does this statement describe descriptive or inferential statistics?
 - A) descriptive statistics

- B) inferential statistics
- 4) From past figures, it is predicted that 23% of the registered voters will vote in the March primary. Does this statement describe descriptive or inferential statistics?
 - A) inferential statistics

B) descriptive statistics

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

5) In a survey of 5000 high school students, 19% of those surveyed read at least one best-seller each month. Give an example of a descriptive statement and an inferential statement that could be made based on this information.

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

- 6) Which of the following is not an element of descriptive statistical problems?
 - A) predictions are made about a larger set of data
 - B) information revealed in a data set is summarized
 - C) data are displayed visually in graphs
 - D) patterns in a data set are identified

Answer the question True or False.

- 7) When we take data obtained from a sample and make generalizations or predictions about the entire population, we are utilizing inferential statistics.
 - A) True

- B) False
- 8) Statistics involves two different processes, describing sets of data and drawing conclusions about the sets of data on the basis of sampling.
 - A) True

B) False

1.3 Fundamental Elements of Statistics

1 Identify Elements of Statistics

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

Solve the problem.

- 1) Parking at a university has become a problem. University administrators are interested in determining the average time it takes a student to find a parking spot. An administrator inconspicuously followed 260 students and recorded how long it took each of them to find a parking spot. Identify the population of interest to the university administration.
 - A) the entire set of students who park at the university
 - B) the 260 students about whom the data were collected
 - C) the entire set of faculty, staff, and students who park at the university
 - D) the students who park at the university between 9 and 10 AM on Wednesdays
- 2) Parking at a university has become a problem. University administrators are interested in determining the average time it takes a student to find a parking spot. An administrator inconspicuously followed 290 students and recorded how long it took each of them to find a parking spot. Identify the variable of interest to the university administration.
 - A) time to find a parking spot

B) students who drive cars on campus

C) number of empty parking spots

D) number of students who cannot find a spot

- 3) An assembly line is operating satisfactorily if fewer than 2% of the phones produced per day are defective. To check the quality of a day's production, the company randomly samples 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 2% of the phones that are defective
- 4) An insurance company conducted a study to determine the percentage of cardiologists who had been sued for malpractice in the previous nine years. The sample was randomly chosen from a national directory of doctors. What is the variable of interest in this study?
 - A) the responses: have been sued/have not been sued for malpractice in the last nine years
 - B) the doctor's area of expertise (i.e., cardiology, pediatrics, etc.)
 - C) the number of doctors who are cardiologists
 - D) all cardiologists in the directory
- 5) A study published in 2007 attempted to estimate the proportion of Florida residents who were willing to spend more tax dollars on protecting the Florida coastline from environmental disasters. Thirty-six hundred Florida residents were surveyed. Which of the following is the population used in the study?
 - A) all Florida residents
 - B) the 3600 Florida residents who were surveyed
 - C) Florida residents willing to spend more tax dollars protecting the coastline from environmental disasters
 - D) all Florida residents who lived along the coastline
- 6) A study published in 2007 attempted to estimate the proportion of Florida residents who were willing to spend more tax dollars on protecting the Florida beaches from environmental disasters. Thirty-seven hundred Florida residents were surveyed. Which of the following describes the variable of interest in the study?
 - A) the response to the question, "Are you willing to spend more tax dollars on protecting the Florida beaches from environmental disasters?"
 - B) the response to the question "Do you live along the beach?"
 - C) the response to the question "Do you use the beach?"
 - D) the 3700 Florida residents surveyed
- 7) Which of the following is not typically an element of inferential statistical problems?

A) census

B) sample

C) variable of interest

D) measure of reliability

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

8) Parking at a university has become a problem. University administrators are interested in determining the average time it takes a student to find a parking spot. An administrator inconspicuously followed 230 students and recorded how long it took each of them to find a parking spot. Identify the population, sample, and variable of interest to the administrators.

- 9) A quality inspector tested 77 copiers in an attempt to estimate the average failure rate of the copier model. His study indicated that the number of failures decreased from two years ago, indicating an increase in the reliability of the copiers. Describe the variable of interest to the inspector.
- 10) A high school guidance counselor analyzed data from a sample of 300 community colleges throughout the United States. One of his goals was to estimate the annual tuition costs of community colleges in the United States. Describe the population and variable of interest to the guidance counselor.
- le.

11) Explain why it is not necessary to provide a measure of reliability when a census is used rather than a sample				
MULTIPLE CHOICE. Choose the one alternate	rive that best completes the statement or answers the question.			
Answer the question True or False.				
12) A variable is a characteristic or property of a population.				
A) True	B) False			
13) Measurement is the process of assigning numbers to variables of individual population units.				
A) True	B) False			
14) A census is feasible when the population of interest is small.				
A) True	B) False			
15) The process of using information from a sample to make generalizations about the larger pop statistical inference.				
A) True	B) False			
16) A measure of reliability is an important element of a descriptive statistical problem.				
A) True	B) False			
1.4 Types of Data				

1.4

1 Classify Data as Quantitative or Qualitative

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

Solve the problem.

1) T	he amount of television viewed by today's youth is of primary concern to Parents Against Watching
T	elevision (PAWT). 250 parents of elementary school-aged children were asked to estimate the number of
h	ours per week that their child watches television. Identify the type of data collected by PAWT.

A) quantitative

B) qualitative

2) The manager of a car dealership records the colors of automobiles on a used car lot. Identify the type of data collected.

A) qualitative

B) quantitative

da	y. Identify the type of	f data collected.		
-	A) quantitative		B) qualitative	
	n usher records the nu be of data collected.	ımber of unoccupied seats ir	n a movie theater during each	n viewing of a film. Identify the
	A) quantitative		B) qualitative	
5) A i	fan observes the num	bers on the shirts of a girl's s	soccer team. Identify the type	of data collected.
-	A) qualitative		B) quantitative	
6) WI	hich data about paint	ings would <i>not</i> be qualitative	e?	
	A) the value	B) the artist	C) the style	D) the theme
SHORT ANS	WER. Write the wor	d or phrase that best comple	tes each statement or answer	s the question.
the			ffectiveness of a new medicat ale and 2 for Female. Is the ge	tion. For data entry purposes, ender data quantitative or
1.5 Collec	cting Data			
1 Identify I	Oata Collection Meth	ıod		
MULTIPLE C	CHOICE. Choose the	one alternative that best con	npletes the statement or answ	vers the question.
Solve the pro	oblem.			
Te	levision (PAWT). 330	parents of elementary school	s of primary concern to Paren ol-aged children were asked dentify how the data were co	to estimate the number of
-	A) from a survey		B) from a published	source
	C) from a designed ex	xperiment	D) observationally	
em	iployees brought thei	C		irector noted whether nt out to eat lunch. This type of
	A) observational stud	ly	B) designed experin	nent
			ary and found a reference bo would report her data as bein	ook that contained the median g collected
	A) from a published s	source	B) from a designed	experiment
	C) observationally		D) from a survey	
			ollect data for a study where a ermine if the drug has an effe	a drug was given to 87 patients ect on a patient's illness?
-	A) designed experime	ent	B) published source	
(C) observational stud	ły	D) survey	

3) A postal worker counts the number of complaint letters received by the United States Postal Service in a given

	5) What method of data collection w determine if his candidate is leadi	rould you use to collect data for a studing in the polls?	ly where a political pollster wishes to
	A) survey	B) publish	ned source
	C) designed experiment	D) observa	ational study
SHOR	T ANSWER. Write the word or phras	e that best completes each statement	or answers the question.
	6) What is meant by a <i>representative</i> s	sample?	
	7) What is the most common way to	satisfy the representative sample req	uirement?
		-	group of 30 female students and 20 male a random sample of the 50 students in
MULT	IPLE CHOICE. Choose the one altern	native that best completes the stateme	nt or answers the question.
Answe	er the question True or False.		
	9) In an observational study, the rese	earcher exerts strict control over the u	nits in the study.
	A) True	B) False	
	10) When using data from a published whether randomization was used	_	now the data were collected and
	A) True	B) False	
1.6	Γhe Role of Statistics in Critical	Thinking	
1 Ide	ntify Bias		
SHOR	T ANSWER. Write the word or phras	se that best completes each statement of	or answers the question.
Solve	the problem.		
	1) Define statistical thinking.		
	2) What is meant by selection bias?		
MULT	IPLE CHOICE. Choose the one altern	native that best completes the stateme	nt or answers the question.
	3) Which type of problem has occurr	red when inaccuracies exist in the val	ues of the data recorded?
	A) measurement error	B) nonresponse bias	C) selection bias
	to a random sample of 300 people	who had recently been threatened wase the intended recipients had mov	oreclosure process. Surveys were mailed ith foreclosure. 75 of the surveys were red and left no forwarding address.
	A) nonresponse bias	B) selection bias	C) measurement error

5) A university was interested in student reaction to a proposal to spend more on athletic scholarships a academic scholarships. 35 student athletes were surveyed. What type of problem has occurred?					
A) selection bias	B) nonresponse bias	C) measurement error			
6) The way in which an interviewer asks a question about political party affiliation causes respondents to answer that they have no affiliation when they actually do. What type of problem has occurred?					
A) measurement error	B) selection bias	C) nonresponse bias			
7) A student completing a research project for a criminal justice class obtained a radar gun for determining automobile speeds and recorded the speeds of automobiles passing a fixed location over a period of several hours. The student was unaware that the device needed to be recharged after two hours of use and that the speeds recorded after two hours were not reliable. What type of problem has occurred?					
A) measurement error	B) selection bias	C) nonresponse bias			
8) Because of the possible legal consequences, many people in a sample of the U.S. population chose not to participate in a survey regarding illegal drug use. What type of problem has occurred?					
A) nonresponse bias	B) selection bias	C) measurement error			
nethical Statistics					
RT ANSWER. Write the word or phra	ase that best completes each statemen	t or answers the question.			
e the problem.					

Solve

2 U:

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- 1) Give an example of unethical statistical practice.
- 2) A health food company has the following statement on their new product packaging: "Prevents all types of cancer!" (Fact: Past studies have shown that some ingredients in the new product have been know to possibly reduce the risk of many types of cancer). Discuss why it is unethical to make this statement.

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

- 3) A researcher studying malnutrition among children in a developing country collected weights of a random sample of children using a scale that she had set to give weights 2.5 kilograms less than the actual weight. Which statement best describes this situation?
 - A) Measurement error has occurred, and the researcher is guilty of unethical statistical practice.
 - B) Measurement error has occurred, but the researcher is not guilty of unethical statistical practice.
 - C) Measurement error has not occurred, but the researcher is guilty of unethical statistical practice.
 - D) Measurement error has not occurred, and the researcher is not guilty of unethical statistical practice.

Ch. 1 Statistics, Data, and Statistical Thinking Answer Key

1.1 The Science of Statistics

- 1 Define Statistics
 - 1) A
 - 2) Statistics is the science of data that involves collecting, classifying, summarizing, organizing, analyzing, and interpreting numerical information.

1.2 Types of Statistical Applications

- 1 Define Descriptive and Inferential Statistics
 - 1) A
 - 2) A
 - 3) A
 - 4) A
 - 5) Descriptive: 19% of the students sampled (or 950) read at least one best-seller each month.

Inferential: Based on the survey, we estimate that about 19% of all high school students read at least one best-seller each month.

- 6) A
- 7) A
- 8) A

1.3 Fundamental Elements of Statistics

- 1 Identify Elements of Statistics
 - 1) A
 - 2) A
 - 3) A
 - 4) A
 - 5) A
 - 6) A
 - 7) A
 - 8) The population of interest are all students at the university who park. The sample is the parking times of the 230 students that were collected by the university administrator. The variable of interest to the administrators is the parking time variable.
 - 9) The variable of interest to the researcher is the failure rate of the copiers.
 - 10) The population of interest to the guidance counselor is all community colleges in the United States. The variable of interest is the annual tuition cost of the community college.
 - 11) When a census is used, there should be no error.
 - 12) B
 - 13) A
 - 14) A
 - 15) A
 - 16) B

1.4 Types of Data

- 1 Classify Data as Quantitative or Qualitative
 - 1) A
 - 2) A
 - 3) A
 - 4) A5) A
 - 5) 11
 - 6) A
 - 7) Qualitative; The numbers are arbitrarily selected numerical codes for the categories and have no utility beyond that.
- 1.5 Collecting Data
- 1 Identify Data Collection Method
 - 1) A

- 2) A
- 3) A
- 4) A
- 5) A
- 6) a sample that exhibits characteristics typical of those possessed by the population of interest
- 7) selecting a random sample
- 8) No; not every sample of 5 students from the group has an equal chance of selection; for example, a sample consisting of 5 males has no chance of being selected.
- 9) B
- 10) B

1.6 The Role of Statistics in Critical Thinking

1 Identify Bias

- 1) Statistical thinking involves applying rational thought and the science of statistics to critically assess data and make inferences.
- 2) Selection bias is when a subset of the experimental units in the population is excluded so that these units have no possibility of being selected in the sample.
- 3) A
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A

2 Unethical Statistics

- 1) Researchers select a biased sample, with the intention of misleading the public.
- 2) Answers may vary. One possible answer is that the past studies show that the ingredients only have possible cancer reducing effects on many, not all, types of cancer.
- 3) A