CHAPTER 1

Introduction

Summary

The overall purpose of the first chapter of the textbook is to introduce

1. a statistics class and this textbook,
2. broad categories and important terms used in statistics (such as descriptive and inferential statistics, parameter, independent variable),
3. basic research design, and
4. statistics as a field of study.

There are two main types of statistics: descriptive statistics and inferential statistics. The notion of ***descriptive statistics*** is pretty straightforward: a single number or graph is used to capture a particular characteristic of a set of data. Examples include the average of a set of scores or how spread out scores are from each other. ***Inferential statistics*** is a set of procedures that allow you to draw conclusions about a population even though all your information comes from a sample. An assumption of inferential statistics is that results are influenced by chance (random factors) not under your control. With inferential statistics, you can make predictions that are likely to be true, but cannot be proven absolutely.

The idea of using a ***sample*** (a subset of the population of interest) as a substitute for a larger, unmeasurable ***population*** is found in every chapter of the textbook. The characteristics of samples, called ***statistics***, and the characteristics of populations, called ***parameters***, are easy to keep straight. The two *p*'s go together and the two *s*'s go together.

Quantitative and categorical variables find their way into the text in several chapters after this first one. ***Continuous quantitative variables*** are expressed in amounts and have ***lower*** and ***upper limits*** that show the range of values a particular score actually represents. For example, you may write down your height as 5'8", even if you're really 5'8.125" tall. ***Discrete quantitative variables*** are also expressed in amounts, but there are no intermediate values. For example, a household cannot have 2.3 children. Because intermediate values are not possible upper and lower limits are not meaningful. ***Categorical variables*** (also called ***qualitative variables***) get their name because scores indicate members of a category. There are no intermediate values between categories, and categories may or may not convey order.

S. S. Stevens' categorization of variables focused on the kind of information conveyed in a variable (category, order, equal intervals, a true zero point). Nominal scales have the least information of all. On a ***nominal scale***, numbers name a category to which a score belongs. Different numbers mean only that the things measured are different. Numbers that are the same mean the things measured are the same. On an ***ordinal scale***, the numbers convey categories, like nominal scales, but *also* convey that one category is more or less than another. On ordinal scales, equal distances between numbers do not mean equal amounts of the variable. A larger number means more, but it does not tell you how much more. For example, the difference between 5 and 10 on an ordinal scale is not necessarily the same size difference as the difference between 10 and 15. For both ***interval scales*** and ***ratio scales***, numbers convey category and order, but now equal distances between numbers *do* mean equal amounts of the variable. Additionally, for ratio scales, zero means a complete absence of the thing measured. Statements such as "twice as much" and "reduced by one-third" are meaningful on ratio scales but not for the other three scales.

The topic of ***research design*** covers the procedures necessary to gather data. Statistics covers the task of analyzing data. A good researcher should be able to do both well.

Variables within a study can be categorized as independent, dependent, or extraneous. The ***independent variable*** in an experiment is the variable manipulated by the researcher. Changes in the independent variable may cause differences in the dependent variable. The ***dependent variable*** in an experiment is the thing being measured and is thought to "depend" on the ***level*** of the independent variable. ***Extraneous variables*** are variables that, if not controlled, can influence the relation between the independent and dependent variables. The distinctions between

independent, dependent, and extraneous variables, which can be troublesome, will appear again and again, both in the text and in your academic career.

Epistemology is the study of how we come to have knowledge. Some knowledge is created by using reason, one example is a technique called statistics. The textbook briefly describes statistics as a dynamic, changing field.

We hope you find this study guide helpful. If you have comments, suggestions, or corrections please e-mail us at info@outcroppublishers.com.

Multiple-Choice Questions

1. Nex is interested in the happiness of college students. They collect data from 100 students at their college and calculate the mean happiness score. Nex has data from a _____.

a. sample
b. population
c. extraneous variable
d. none of the above alternatives are correct

2. Nex is interested in the happiness of college students. They collect data from 100 students at their college and calculate the mean happiness score. Nex uses this number to summarize their findings about this sample. Nex is using the mean as a(n) _____. .

a. parameter
b. descriptive statistic
c. inferential statistic
d. nominal value

3. Nex is interested in the happiness of college students. They collect data from 100 students at their college and calculate the mean happiness score. Nex will use this data to draw conclusions about the population. In doing this, Nex will be working with a(n) _____. .
a. parameter
b. descriptive statistic
c. inferential statistic
d. nominal value

4. Statistics is a stable, unchanging discipline. There is no controversy about procedures to follow within the discipline.

a. true
b. false, it is stable, but there is much controversy
c. false, it is dynamic rather than stable, but no controversy
d. false, it is both dynamic and has a good deal of controversy

5. Which of these disciplines do not use statistics?

a. anthropology
b. psychology
c. biology
d. none of the above alternatives are correct; all three disciplines use statistics

6. Inferential statistics allow a researcher to _____.

a. select representative samples
b. make decisions about populations
c. characterize a set of data with one number or name
d. all of the above

7. _____ are used as estimates of parameters.

a. Statistics
b. Constants
c. Populations
d. Upper limits

8. Five means more than three on a(n) _____ scale.

a. ordinal
b. interval
c. ratio
d. all of the above

9. Many schools rank their graduates each year from highest to lowest. Graduates wind up with scores such as 21 and 111. Such a scale is one example of a(n) _____ scale.

a. nominal
b. ordinal
c. interval
d. ratio

10. On the _____ scale, zero means a complete absence of the thing measured.

a. ordinal
b. interval
c. ratio
d. all of the above

11. Epistemology deals with the nature of _____.

a. reason
b. experience
c. mathematics
d. knowledge

12. In a study of the effect of handedness on athletic ability, participants were divided into three groups: right-handed, left-handed, and ambidextrous. Athletic ability was measured on a 12-point scale. The independent variable is _____; the number of levels of the independent variable is _____.

a. athletic ability; three
b. athletic ability; twelve
c. handedness; three
d. handedness; twelve

13. In a study of the effect of handedness on athletic ability, participants were divided into three groups: right-handed, left-handed, and ambidextrous. Athletic ability was measured on a 12-point scale. The dependent variable is _____.

a. handedness
b. athletic ability
c. not described
d. both a. and b.

14. When numbers are used as substitutes for names, the numbers constitute a _____ variable.

a. categorical
b. quantitative
c. sample
d. population

15. If an experiment has two groups of participants and if the researcher made sure that *both* groups experience chronic symptoms of schizophrenia, then chronic symptoms of schizophrenia is most likely a(n) _____.

a. independent variable
b. dependent variable
c. controlled extraneous variable
d. any of the above are likely

16. In an experiment to determine the effect of a stimulant on amount of time spent studying, an extraneous variable is _____.

a. the stimulant
b. the time spent studying
c. both a. and b.
d. neither a. nor b.

17. A statistics student is interested in determining if studying in the room where class is held improves scores on a statistics exam. To conduct this experiment, she has half the class study in the room where class is held and the other half study in the library. In this experiment, an example of an extraneous variable is _____.

a. room temperature
b. where the students studied
c. both a. and b.
d. neither a. nor b.

18. In an experiment on the effect of sleep on memory, the independent variable might be _____.

a. number of hours of sleep
b. recall score on a test
c. gender of the participants
d. gender of the experimenter

19. When rats are startled or fearful, they often hold completely still (freeze). For this reason, the length of time a rat freezes is sometimes used as a measure of fear. A researcher gives 36 rats a new drug thought to reduce fear. He puts the rats in a novel environment that has the scent of a cat. The researcher measures how long the rat freezes during the first minute of time in the environment. The researcher compares this time to the time that 36 other rats freeze in the same environment after being given a placebo. What is the independent variable in this experiment?

a. time freezing
b. treatment group (drug or placebo)
c. scent of cat
d. novel environment

20. According to your text, the reason for doing an experiment using samples is to _____.

a. find out about the sample
b. find out about the population
c. obtain numbers so that statistics may be calculated
d. obtain numbers so that parameters may be calculated

21. If you were interested in what state people are from for an entire college, but collected only the data from the people in one class of students at that college, you have collected data from a _____.

a. statistic
b. population
c. sample
d. parameter

22. After a study finds a difference between two samples, inferential statistics tells you _____.

a. whether or not the descriptive statistics showing a difference were correct
b. the probability that the descriptive statistics were correct
c. the probability of the difference, if there is actually no difference between the two populations the samples were drawn from
d. the probability that chance caused the results

23. The experimenter has no direct control on the values of the _____.

a. independent variable
b. dependent variable
c. extraneous variables
d. all of these choices

24. In a typical experiment, a dependent variable is the _____ and the independent variable is the _____.

a. cause; effect
b. effect; cause
c. sample; population
d. population; sample

25. An extraneous variable is one that _____.

a. can foul up the interpretation of an experiment
b. is important but not part of the present experiment
c. is important in a theory that is not part of the present experiment
d. is more similar to the dependent variable than to the independent variable

26. According to your text, the simplest way to control an extraneous variable is to _____.

a. eliminate it before gathering data by making sure all of the participants are equal on that variable
b. eliminate it from the gathered data by using statistical techniques
c. both of these are simple ways mentioned by the text
d. neither of these are simple ways mentioned by the text

Short-Answer Questions

1. Distinguish between descriptive and inferential statistics.

2. Distinguish between populations and samples.

3. Distinguish between interval and ordinal scales of measurement.

4. Distinguish between categorical and quantitative variables.

5. Distinguish between continuous and discrete variables.

Problems

1. Marigold covered the walls of three small rooms with red, blue, or white paper. Participants in her study entered a room, worked on three difficult logic problems for 10 minutes, and then filled out a mood survey. For the 36 participants, the mood survey scores ranged from 10 (calm) to 40 (agitated). The mean mood scores for the three rooms were red-24; blue-16; white-18.
Identify:
a. the independent variable
b. the number of levels of the independent variable and their names
c. the dependent variable
d. a controlled extraneous variable
e. a variable measured with a nominal scale
f. another variable and the scale used to measure it
g. the question the study is asking

2. Khiela interviewed 60 students who were 20 years old. She used a questionnaire that allowed her to classify the parenting style of the parents of those she interviewed. The parenting style classifications were authoritarian, authoritative, and permissive. After filling out the questionnaire, the students indicated their grade point average (GPA). An inferential statistical test did not reveal any differences in GPA among the three groups of students.
Identify:
a. the independent variable
b. the number of levels of the independent variable and their names
c. the dependent variable
d. a controlled extraneous variable
e. a variable measured with a nominal scale
f. another variable and the scale used to measure it
g. the question the study is asking

3. Social loafing occurs when people do not work as hard in a group as they work alone. For example, three people pulling on a rope together exert less force than the sum of the three when each is pulling individually. Jay wondered if social loafing occurs when the task is mental rather than physical. All participants worked at small tables in groups of three. Each individual worked on a word square (a 15 x 15 array of letters) for six minutes searching for 20 words hidden in the word square. Half of the 30 participants were told that the words they found would be averaged with the other two people at their table; the other half were told that their words were scored individually. The number of words circled was recorded for each participant; the mean was 7.6 words for participants working in groups and 9.6 words for participants working alone.
Identify:

a. the independent variable
b. the number of levels of the independent variable and their names
c. the dependent variable
d. a controlled extraneous variable
e. a variable measured with a nominal scale
f. another variable and the scale used to measure it
g. the question the study is asking

4. Blaine was interested in the relationship between food spiciness and personality characteristics. The participants in Blaine's study were women who had not eaten for at least three hours. They first tasted three dips (with chips). One was mild, another medium, and one was hot. After indicating their favorite dip, the participants filled out a risk survey that indicated their desire to engage in activities such as skydiving, bungee jumping, and driving fast. The three spice preference groups averaged about the same score on the risk survey.
Identify:

a. the independent variable
b. the number of levels of the independent variable and their names
c. the dependent variable
d. a controlled extraneous variable
e. a variable measured with an ordinal scale
f. another variable and the scale used to measure it
g. the question the study is asking

5. What are the lower and upper limits of the following numbers?

a. 3 minutes
b. 8 errors
c. 23°F
d. 10 grams

6. Identify the scale of measurement that each set of values comes from (nominal, ordinal, interval, or ratio).

a. Lieutenant, Captain, Major
b. anxiety disorder, phobic disorder, adjustment disorder
c. 0°C, 20°C, 40°C
d. hat, shirt, shoes, pants
e. 1st place, 2nd place, 3rd place
f. 5 meters, 10 meters, 150 meters

7. Identify the scale of measurement that each set of values comes from (nominal, ordinal, interval, or ratio).

a. achievement-test scores
b. numbers assigned to identify individuals taking one of three different drugs (an opioid, an amphetamine, an antipsychotic)
c. numbers given to different sections of the same college course
d. win, place, and show in a horse race
e. dollar amounts in a bank statement
f. rank order of teams in a sport
g. amount of liquid measured in fluid ounces

8. Identify each measurement below as being based on a continuous quantitative, discrete quantitative, or categorical variable. For continuous quantitative variables, identify the lower and upper limits of the measurement.

a. 16, cubic yards of dirt
b. 8, identification for Druid College among private schools in Transylvania
c. 101, km/hr registered on a radar machine used by the state police
d. 23, the time in seconds required for Sam to swim 50 yards
e. 4, the time in minutes to run a mile
f. 2, visits to a doctor's office in a year
g. 1, percentage of material recalled from a text
h. 2, identification number of an individual registered as a Democrat

9. Identify each measurement below as being based on a continuous quantitative, discrete quantitative, or categorical variable. For continuous quantitative variables, identify the lower and upper limits of the measurement.

a. 2, styles of sonnets
b. 3, feet of paper
c. 4, species of protozoa
d. 5, seconds of time
e. 6, decibels of noise
f. 100, points on an IQ test
g. 118, wins in a season by a baseball team

10. A classic experiment by Warden (1931) measured the motivation of rats for food, water, or sex. After deprivation, a rat had to cross an electrified grid to get to the goal object (the whole apparatus was called the Columbia Obstruction Box). In each condition of deprivation (food, water, or sex), the amount of electrical shock a rat would tolerate and still cross to the goal object was measured. Name the dependent and independent variable. Identify an extraneous variable that should have been controlled.

11. Lu and colleagues (2018) wanted to know whether exposure to air pollution influenced unethical behavior. Half of their participants viewed a scene with polluted air and the other half viewed a scene with clean air. They asked participants to imagine that the picture was taken where they lived and what it would feel like and be like walking around and breathing the air. Next, participants were given the opportunity to solve five difficult problems and promised $0.50 for each correct solution. In addition, they were told there was a way to peek at the problem answers (i.e., to cheat) but that they should not do so. The researchers recorded the number of times the participants engaged in the unethical act of cheating. Name the independent and dependent variable and at least one extraneous variable that should have been controlled.

12. A researcher investigates whether cognitions (things you are thinking about) influence the experience of pain. Thirty women were divided into three equal groups and exposed to a painful stimulus, which was to put their hand into a bucket of ice water for 60 seconds. The three groups were all given different information about what to think about while they experienced the painful stimulus. One group was told to concentrate on their breathing, one was told to imagine that the day was very hot and that they would be allowed to place their hand in cool water, and the third group was told nothing. At the end of 60 seconds, they rated the pain they experienced on a scale of one to seven.

a. The type of instructions the females received was the _____ variable.
b. The rating of pain was the _____ variable.
c. How many levels did the independent variable have?

13. Four groups of men were monitored during their sleep for the number of minutes of REM sleep they obtained in one night. During the seven hours before going to sleep, one group watched six hours of TV, one group watched four hours, and one group watched no TV.

a. The number of minutes of REM sleep was the _____ variable.
b. The hours of viewing TV was the _____ variable.
c. How many levels did the independent variable have?

ANSWERS

Multiple-Choice Questions

1. a
2. b
   Explanation: Nex has a sample. They are using that statistics to describe that sample.
3. c
4. d
5. d
   Explanation: All three of those disciplines—and most scientific disciplines—use statistics in some form.
6. b
7. a
8. d
   Explanation: Five does not mean more than three on a nominal scale. But all three other scales of measurement convey at least order.
9. b
   Explanation: If you think about the actual Grade Point Average that led to those rankings, the person who is ranked first might have a 4.0 GPA and the person who is ranked second might have a 3.95 GPA. That is a 0.05 difference in GPA between 1 and 2 on the ranking scale. But, the person who is ranked 3 has a 3.87 GPA, which is a difference of only 0.03 GPA points, so there are not equal intervals between the ranks of 1 and 2 and 2 and 3 on the class rank variable.
10. c
11. d
12. c
    Explanation: Here the researcher is expecting that athletic ability depends on handedness. Therefore, handedness is the independent variable. There are three levels of handedness in this case: right-handed, left-handed, and ambidextrous.
13. b
    Explanation: Here the researcher is expecting that athletic ability depends on handedness. Therefore, athletic ability is the dependent variable.
14. a
    Explanation: Remember that categorical variables convey the "category" someone is in. So, to give a number to a name is to categorize those names. An example of this is identifying individuals based on what they like to drink in the morning with their breakfast with a name such as coffee-drinker, tea-drinker, orange juice-drinker, other, nothing. We could then convert those names to numbers 1=coffee-drinker, 2=tea-drinker, 3=orange juice-drinker, 4=other-drinker, 5=nothing. Five might look like it is more than one, but you can see here that drinking nothing is not more than drinking coffee. All the numbers do in this example is categorize people.
15. c
    Explanation: In an experiment, the groups differ on the independent variable. So, if both groups possess a quality, it cannot be the independent variable. The dependent variable is not determined by the experimenter.
16. d
    Explanation: The stimulant in this case is the independent variable. The time spent studying is the dependent variable. There are many possible extraneous variables, such as motivation for the class, student's level of conscientiousness, and number of other extracurricular activities.
17. a
    Explanation: In this case, where the students study is the independent variable and their exam scores are the dependent variable. There are many possible extraneous variables such as the room temperature, as indicated here in choice a., but also interest in the material, study skills used, etc.
18. a
    Explanation: In this study, you are assuming that memory *depends on* sleep, so memory is the dependent variable and sleep is the independent variable.
19. b
    Explanation: In this study, the researcher is trying to determine if the independent variable treatment (drug or placebo) has an effect on the dependent variable fear. The researcher controlled extraneous variables such as the fear stimulus (the cat scent) and where the test took place (the same novel environment).
20. b
    Explanation: It would be great if researchers could collect data from populations and then describe the truth about those populations with no uncertainty. But populations are almost always too large and

difficult to get data from (for instance, we are often interested in "all humans" as our population), so we settle on taking samples and using inferential statistics to help us draw conclusions about populations from that sample data.

21. c
    Explanation: The population you are interested in is the entire college. Because you collected data from a subset of those individuals, you collected data from a sample. If you used that data to describe the sample, you would have calculated a descriptive statistic. If you used the sample data to draw conclusions about the population, you would have calculated an inferential statistic.
22. c
23. b
    Explanation: Remember that experimenters set the independent variables, and at their discretion can control some of the extraneous variables; but the experimenter does not manipulate scores on the dependent variable.
24. b
    Explanation: Dependent variables are named "dependent" because they are thought to "depend" on the independent variable.
25. a
26. a

Short-Answer Questions

1. Descriptive statistics are numbers or graphs that convey a particular characteristic of a set of data. Inferential statistics are techniques that use sample data to draw conclusions about unmeasured populations.
2. Populations are the entire group of scores about which the researcher is interested but that are often very hard or impossible to obtain. Samples are subsets of populations that are easier to obtain but, because of chance (random factors), do not perfectly match the population.
3. Different numbers on an interval scale have the following three relationships: different numbers stand for different things (or amounts); larger numbers mean more of the thing than smaller numbers; and equal differences between numbers on the scale mean equal differences of the thing being measured. Ordinal scales have only the first and second characteristics named here.
4. Categorical variables have scores that identify groups to which the score belongs and therefore can convey differences in kind but not amount. Quantitative variables have scores that indicate different amounts.
5. Continuous variables are quantitative variables whose scores can be any value in a particular range. For example, weight is a continuous variable because someone can weigh 145 lbs, 145.1 lbs, 144.112 lbs, or 144.1134567 lbs. Upper and lower limits indicate what we mean by 145 lbs. That is, a person identified as 145 lbs. weighs between 144.5 lbs. and 145.5 lbs. A discrete variable is a variable that does not have intermediate values. For example, lightbulbs in a home. Generally speaking, you can have 10 or 11 lightbulbs but not 10.23 lightbulbs.

Problems

1.
    a. the independent variable: room color
    b. the number of levels of the independent variable and their names: three levels: red, blue, and white
    c. the dependent variable: mood survey scores
    d. a controlled extraneous variable: preliminary task (logic problems) and amount of time in the room (10 minutes)
    e. a variable measured with a nominal scale: room color
    f. another variable and the scale used to measure it: mood survey score, ordinal or interval both work here as a good answer; time in the room, ratio
    g. the question the study is asking: Does color of the room someone is working in (red, blue, or white) when doing difficult problems impact their mood (how calm/agitated they are)?

2.

a. the independent variable: parenting style
b. the number of levels of the independent variable and their names: three levels: authoritarian, authoritative, and permissive
c. the dependent variable: GPA
d. a controlled extraneous variable: age of the participants, students
e. a variable measured with a nominal scale: parenting style
f. another variable and the scale used to measure it: age, ratio; GPA, ordinal, interval, and ratio can all work as a correct answer here because the world is really messy! Everyone should be able to agree different GPAs do convey different things. Also that a higher GPA indicates higher grades than a lower GPA. Those two characteristics mean the variable is at least an ordinal scale. Here is where people may start to disagree. It is arguable whether the difference between 2.2 and 2.3 on the GPA scale and the difference between 3.9 and 4.0 are actually equal differences. If you think they represent different differences then you would classify GPA as an ordinal scale. If you think they are equal differences then you decide if a GPA of zero means *no* GPA. If you consider that a zero GPA means the person has no grade points at all, then you would classify GPA as a ratio scale. However, if you consider that GPA is supposed to be a measure of, say, one's college education and not literal grade points, then even if someone failed all of their classes, they are not completely bereft of any college education and that would make this an interval scale. What are you supposed to do when there is ambiguity in real life? Make a decision based on your study, ask a respected colleague if they agree, proceed with your study, and wait to see if reviewers agree or criticize you for your decision.
g. the question the study is asking: Is parenting style (authoritarian, authoritative, permissive) related to a 20 year old's college GPA?

3.

a. the independent variable: how participants were told they would be scored
b. the number of levels of the independent variable and their names: two levels: scores are averaged with a group and scores count individually
c. the dependent variable: number of words circled
d. a controlled extraneous variable: everyone sat at small tables of three, all had six minutes to work, other answers are possible
e. a variable measured with a nominal scale: how participants were told they would be scored (the IV)
f. another variable and the scale used to measure it: number of words circled, ratio
g. the question the study is asking: On a mental task, do people who believe they are working as a group work less than people who believe they are working on their own?

   This social loafing phenomenon has been examined in many different studies but was first examined by a French agricultural engineer Maximilien Ringelmann. He published the findings in 1913. Ringelmann, M. (1913) Recherches sur les moteurs animés: Travail de l'homme [Research on animate sources of power: The work of man]. *Annales de l'Institut National Agronomique, 12,* 1-40. Available online (in French) at: https://tinyurl.com/ydz52cr6

4.

a. the independent variable: spiciness of favorite dip
b. the number of levels of the independent variable and their names: three levels: mild, medium, and hot
c. the dependent variable: risk survey scores
d. a controlled extraneous variable: time since women last ate, all women
e. a variable measured with an ordinal scale: spiciness of favorite dip
f. another variable and the scale used to measure it: scores on the risk survey, ordinal or interval. Not nominal because higher scores do mean more riskiness and not ratio because a score of zero does not mean no risk taking at all.
g. the question the study is asking. Is there a relationship between spiciness of favorite dip and risk-taking?

5.

a. 3 minutes: lower limit is 2.5, upper limit is 3.5
b. 8 errors: lower limit is 7.5, upper limit is 8.5
c. 23°F: lower limit is 22.5, upper limit is 23.5
d. 10 grams: lower limit is 9.5, upper limit is 10.5

If you are having trouble finding upper and lower limits of a whole number, simply take ½ of the unit of measure, in this case 1, and subtract ½ of that unit from the score to find the lower limit and add ½ of that unit to the score to find the upper limit. So in the case of 3 minutes, take ½ a minute and subtract it from 3 minutes to get the lower limit of 2.5 and add a ½ a minute to 3 minutes to get the upper limit of 3.5.

If you are interested, you can find the lower and upper limits of numbers with decimals too. For example, to find the lower and upper limits of 3.3 minutes, note that the unit of measure is 0.1, not 1. So here, ½ of the unit of measure is 0.05. Now subtract 0.05 from the original score of 3.3 to get 3.25 (the lower limit) and add it to the original score of 3.3 to get 3.35 (the upper limit).

6.

a. Lieutenant, Captain, Major: ordinal
b. anxiety disorder, phobic disorder, adjustment disorder: nominal
c. 0°C, 20°C, 40°C: interval
d. hat, shirt, shoes, pants: nominal
e. 1st place, 2nd place, 3rd place: ordinal
f. 5 meters, 10 meters, 150 meters: ratio

7.

a. achievement-test scores: interval, some might argue ordinal
b. numbers assigned to identify individuals taking one of three different drugs (an opioid, an amphetamine, an antipsychotic): nominal
c. numbers given to different sections of the same college course: nominal
d. win, place, and show in a horse race: ordinal (if these are new terms to you: in horse racing, the horse that crosses the finish line first is identified as “win”, the horse that crosses second is identified as “place”, and the horse that crosses third is identified as “show”. This information will serve you well if you are ever to go to a horse race and place a bet).
e. dollar amounts in a bank statement: ratio
f. rank order of teams in a sport: ordinal
g. amount of liquid measured in fluid ounces: ratio

8.

a. 16, cubic yards of dirt
Quantitative (continuous)
lower and upper limits 15.5-16.5

b. 8, identification for Druid College among private schools in Transylvania
Categorical
lower and upper limits not applicable for categorical variables

c. 101, km/hr registered on a radar machine used by the state police
Quantitative (continuous)
lower and upper limits 100.5-101.5

d. 23, the time in seconds required for Sam to swim 50 yards
Quantitative (continuous)
lower and upper limits 22.5-23.5

e. 4, the time in minutes to run a mile
Quantitative (continuous)
lower and upper limits 3.5-4.5

f. 2, visits to a doctor's office in a year
Quantitative (discrete)
lower and upper limits not applicable for discrete variables

g. 1, percentage of material recalled from a text
Quantitative (continuous)
lower and upper limits 0.5-1.5

h. 2, identification number of an individual registered as a Democrat
Categorical
lower and upper limits not applicable for categorical variables

9.

a. 2, styles of sonnets
Categorical
lower and upper limits not applicable for categorical variables

b. 3, feet of paper
Quantitative (continuous)
lower and upper limits 2.5-3.5

c. 4, species of protozoa
Categorical
lower and upper limits not applicable for categorical variables

d. 5, seconds of time
Quantitative (continuous)
lower and upper limits 4.5-5.5

e. 6, decibels of noise
Quantitative (continuous)
lower and upper limits 5.5-6.5

f. 100, points on an IQ test
Quantitative (continuous)
lower and upper limits 99.5-100.5

g. 118, wins in a season by a baseball team
Quantitative (discrete)
lower and upper limits not applicable for discrete variables

10. Dependent variable: amount of electrical shock a rat would tolerate and still cross to the goal object
Independent variable: type of deprivation (food, water, and sex)
Here are a few extraneous variables that should have been controlled: age of rats, sex of rats, experience of the rats in the Columbia Obstruction Box, experience of the rats in deprivation studies, the time they were deprived of the specific motivator. Other answers can be correct.

If you are interested in this study, thirst turned out to be the strongest motivator, meaning the thirsty rats tolerated more shock to get to water than food- or sex-deprived rats tolerated to get to goals of food and sex.

11. Independent variable: air pollution scenes (2 levels: polluted and clean)
    Dependent variable: cheating (number of times the participant peeked at the answer)
    Here are a few extraneous variables that should have been controlled: income level (affects the motivational value of $0.50), age, gender, and exposure to air pollution outside of the study. Other answers can be correct.

    If you are interested in this study, participants were more likely to cheat after exposure to a polluted scene compared to a clean scene. You might have noticed that even though these researchers were interested in whether exposure to air pollution influenced unethical behavior, they used pictures of pollution rather than direct exposure to pollution in this study. Can you imagine why they made this decision?

12.
    a. The type of instructions the females received was the *independent* variable.
    b. The rating of pain was the *dependent* variable.
    c. The independent variable had *three* levels: concentrate on breathing, think about a hot day, and nothing.

13.
    a. The number of minutes of REM sleep was the *dependent* variable.
    b. The hours of watching TV before bed was the *independent* variable.
    c. The independent variable had *three* levels: six, four, and zero hours of pre-sleep TV watching.

References

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