

CHAPTER 1

STATISTICS AND SCIENTIFIC METHOD

LEARNING OBJECTIVES

After completing Chapter 1, students should be able to:

1. Describe the four methods of establishing truth,
2. Contrast observational and experimental research
3. Contrast descriptive and inferential statistics.
4. Define the following terms: population, sample, variable, independent variable, dependent variable, constant, data, statistic, and parameter.
5. Identify the population, sample, independent and dependent variable, data, statistic and parameter from the description of a research study
6. Specify the difference between a statistic and a parameter.
7. Give two reasons why random sampling is important.
8. Understand the illustrative example, do the practice problem and understand the solution.

DETAILED CHAPTER SUMMARY CHAPTER OUTLINE

I. Methods of Acquiring Knowledge

- A. Authority. One accepts information as being true because someone who is supposed to know tells you something is true.

- B. Rationalism. This method uses reason alone to arrive at knowledge. One analyzes a situation and draws logical conclusions based on the information at hand. The conclusion is not tested empirically to determine if it is correct. _

C. Intuition. This is a sudden insight that springs into consciousness all at once as a whole.

D. Scientific method. This method uses reasoning and intuition as a means of formulating an idea of what is true but then relies on objective assessment to verify or deny the validity of the idea.

1. Idea formed and hypothesis made.

2. Experiment designed.

3 Data collected and analyzed using statistics.

4. Hypothesis confirmed, denied or modified.

II. Scientific Research

A. Observational studies. In this research there is no direct experimental manipulation of variables. This technique employs naturalistic observation of events in their real world environment

1. Correlation. A type of observation where the relationship between two variables is studied.

2. Parameter estimation. This is when an investigator tries to determine the actual characteristics of the population, based on measuring a subset of the population.

B. True experiments. The investigator attempts to determine if changes in one variable produce changes in another. In both observational studies and true experiments, statistical analysis is usually employed.

C. Statistical analysis.

1. Descriptive statistics. Analysis is conducted to describe the obtained data.

2. Inferential statistics. Analysis is conducted to make inferences about a population using data obtained from the sample.

TEACHING SUGGESTIONS AND COMMENTS

Since this is your first lecture on content, before you plunge into the content of Chapter 1, I suggest that you first say some things about the web material and the *To The Student* section that follows the preface in the textbook.

1. Online Resources. It is a good idea for you to call the attention of your students to the *Online Study Resources* material shown at the end of the chapter, pointout the options and discuss them briefly. In fact, if your classroom allows access to the internet and has monitors that students can view, I suggest you spend a few minutes going through some of the options on the *Online Study Resources* website. The options that I recommend you demonstrate in this order are *Know and Be*

- ~~— B. True experiments. The investigator attempts to determine if changes in one variable produce changes in another. In both observational studies and true experiments, statistical analysis is usually employed.~~
- ~~— C. Statistical analysis.~~
 - ~~—— 1. Descriptive statistics. Analysis is conducted to describe the obtained data.~~
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CHAPTER SUMMARY

~~In this chapter, I have discussed how truth is established. Traditionally, four methods have been used: authority, reason, intuition, and science. At the heart of science is the scientific experiment. By reasoning or through intuition, the scientist forms a hypothesis about some feature of reality. He or she designs an experiment to objectively test the hypothesis. The data from the experiment are then analyzed statistically, and the hypothesis is either confirmed or rejected.~~

- Most scientific research falls into two categories: observational studies and true experiments. Natural observation, parameter estimation, and correlational studies are included within the observational category. Their major goal is to give an accurate description of the situation, estimate population parameters, are related. Since there is no systematic manipulation of any variable by the experimenter when doing an observational study, this type of research cannot determine whether changes in one variable will cause changes in another variable. Causal relationships can be determined only from true experiments.
- In true experiments, the investigator systematically manipulates the independent variable and observes its effect on one or more dependent variables. Due to practical considerations, data are collected on only a sample of subjects rather than on the whole population. It is important that the sample be a random sample. The obtained data are then analyzed statistically.
- The statistical analysis may be descriptive or inferential. If the analysis just describes or characterizes the obtained data, we are in the domain of descriptive statistics. If the analysis uses the obtained data to infer to populations, we are in the domain of inferential statistics. Understanding statistical analysis has important practical consequences in life.

TEACHING SUGGESTIONS AND COMMENTS

- Since this is your first lecture on content, before you plunge into the content of Chapter 1, I suggest that you first say some things about the web material and the *To The Student* section that follows the preface in the textbook.
- 1. Web material. It is a good idea for you to call the attention of your students to the *web material*, point out the options and discuss them briefly. In fact, if your classroom allows access to the internet and has monitors that students can view, I suggest you spend a few minutes going through some of the options on the *Book Companion Site*. The options that I recommend you demonstrate in this order are *Know and Be Able to Do*, *Flashcards*, *and Tutorial Quiz*, and *Glossary*. As I discussed in the general teaching advice, these are all chapter specific and I believe very helpful to students in mastering the material of each chapter. A word or two is in order regarding the option, *Know and Be Able to Do*. This option presents a listing of what I believe students should know and be able to do to successfully complete each chapter. However, my list may not agree with yours. If so, then by all means change the list so that it is yours. Of course, be sure to inform students of the list you want them to use. If you want your students to learn and use SPSS, or if you have adopted Enhanced WebAssign, since there are no problems for these applications in Chapter 1, I suggest you defer discussing them until you begin lecturing on Chapter 2. I also think it a good idea to periodically reinforce web use by briefly asking students how they are doing regarding the web material and at least once more suggesting how

valuable using them can be. (Of course, this assumes you like the web material. If not, then the above paragraph is moot).

2. SPSS. If you want your students to learn and use SPSS, since there is no instruction on SPSS in Chapter 1, I suggest you defer discussing SPSS in any detail until you begin lecturing on Chapter 2.

3. Aplia. If you are using Aplia, I suggest you go over its operation including the following:

- a. How to display the relevant chapter.
- b. How to display the relevant problems. Be sure to show students how to change the data for any problem to get additional practice with new numbers.
- c. How to have the computer score the student answers.
- d. How to access the detailed explanation of answers.
- e. How to access and use the tutorials.
- f. It may also be necessary to demonstrate to the students how to use the graphic tools supplied by Aplia.
- g. Show students how to access Aplia's help section.

In addition, in assigning homework problems, I recommend you chose among the textbook end-of-chapter problems and the additional Aplia created problems. Of course, I like the textbook problems since I wrote them, but Aplia has added good problems too. I think a mix of problems from both sources is probably the best choice for any chapter.

24. To the student. The first lecture is also a good time to mention the section titled, *To The Student*. Among other information, this section contains important studying advice. You can either just call their attention to this section, or go over it in detail. I'm not sure which is best, but I favor going over the entire list. Next, I'd like to make some comments about Chapter 1 itself.

35. Chapter 1 material. This is an easy chapter and consequently, I usually don't lecture on the whole chapter. I tell students that this is an easy chapter, that they can get the important points by just reading the chapter, and then, I just page through the chapter and point out a few things as mentioned below.

- a. Methods of knowing. For the methods of knowing material I tell students to read it and be able to write a short paragraph on each, giving the essentials and also be able to compare each. Since this is not a course in philosophy, this material is intended to give context to the role of statistics as used in science. Of course, if it is a topic of special interest to you, the opportunity is there to go deeper and have some discussion. In fact, this is an interest of mine and I enjoy discussing it. That can explain the number of questions on this topic in the *Discussion Questions* section of this manual.

- b. Definitions. I recommend going over the definitions, one by one, to be sure students understand each one. The defined terms appear over and over throughout the textbook and it is important that every student can define the terms, understand their definitions, and to be able to apply these terms to descriptions of research studies like those in the practice problem.
- c. Observational studies and true experiments. After briefly describing each, it is also important that you spend some time on the distinction between observational studies and true experiments, particularly driving home to difference regarding causality.
- d. Random sampling. I don't recommend spending much time on random sampling. It is discussed in some detail later on in Chapter 8. I suggest you just make the two points about why random sampling is important and move on.
- e. Descriptive and Inferential statistics. It is useful to say a few words regarding descriptive and inferential statistics, making clear the distinction between them. This distinction helps categorize the material they are about to learn and is useful as they proceed from chapter-to-chapter. It is also useful for them to know this distinction when discussing statistics with other students or employers and when reading journal articles.
- f. Using computers in statistics. If you intend to have your students use SPSS, as mentioned above, I suggest you defer lecturing in detail on SPSS on this section until Chapter 2. Still, I think it is a good idea to emphasize here that ~~If not, then the important point to make is that~~ computers are useful for grinding out t values, etc, but not for understanding statistics. ~~The ninth edition includes a couple of examples of solving problems using SPSS at the end of Chapters 4 and 6 to give students a idea of what using SPSS would be like.~~

DISCUSSION QUESTIONS

1. What is your plan for studying the material in this course? Why did you choose this plan? How close does it come to the studying advice given directly after the preface in the textbook? What parts of the advice have you not adopted? Why?
2. Which method of knowing do you rely on most? Discuss the advantages and disadvantages of this method.
3. Some people claim the method of science produces the most reliable knowledge. Do you agree? Discuss.
4. Which method of knowing do you think is the most reliable? Which is the least reliable? Discuss.
5. Distinguish between truth and belief. Is “truth” forever truth? Discuss.
6. Pick a belief you hold as true because of a very strong *feeling* you have that it is true. In fact the feeling is so strong that you have no doubt that the belief is true. Is your very strong feeling sufficient to establish the belief as “truth.”? Do feelings alone ever provide sufficient basis for establishing “truth?” Discuss.
7. Science relies on data for establishing truth. Will data collected in any manner do? Or should the data be collected via an objective method? What do we mean by “objective data?” Give an example of data collected via an objective method and via a nonobjective method. Discuss the importance of data to establishing truth via scientific method.
8. In this chapter, the textbook asserts that it takes an experiment to establish cause and effect, and that observational research is insufficient to do so. Do you agree? Discuss, giving examples.

TEST QUESTIONS

Multiple-Choice Questions

a—1. Which method of knowing is used in the following example? An individual accepts as true that there is an ~~the~~ afterlife because a minister asserts such is the case.

- ☐ a. Method of Authority
- ☐ b. Method of Intuition
- ☐ c. Scientific Method
- ☐ d. Rationalism

ANS: a

a—2. Which method of knowing is used in the following example? An individual accepts as true that black holes exist because 10 physics Nobel laureates assert such is the case.

- ☐ a. Method of Authority
- ☐ b. Method of Intuition
- ☐ c. Scientific Method
- ☐ d. Rationalism —(~~WWW~~)

ANS: a OTHER: [www](#)

b—3. Which method of knowing is used in the following example? You have been struggling to determine the underlying explanation for the sadness you have been feeling for the past couple of months. Since you haven't come up with the explanation, you give up on the struggle and decide to just go on with your life. To days later, an explanation pops into your consciousness that you are convinced is correct.

- ☐ a. Method of Authority

- ☐ b. Method of Intuition
- ☐ c. Scientific Method
- ☐ d. Rationalism—(WWW)

ANS: b OTHER: [www](#)

d—4. In acquiring knowledge the method that employs logic, reasoning and objective assessment is referred to as _____.

- ☐ a. the method of authority
- ☐ b. intuition
- ☐ c. rationalism
- ☐ d. scientific method—(WWW)*

ANS: d OTHER: [www](#)

d—5. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The new drug is an example of a(n) _____.

- ☐ a. dependent variable
- ☐ b. constant
- ☐ c. statistic
- ☐ d. independent variable

ANS: d

* Questions that are labeled “(WWW)” appear in the on-line tutorial quiz for this chapter.

a—6. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. Incidence of seizures is an example of a(n) _____.

- ☐ a. dependent variable
- ☐ b. constant
- ☐ c. statistic
- ☐ d. independent variable

ANS: a

b—7. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The 20 subjects constitute _____.

- ☐ a. the dependent variable
- ☐ b. the sample
- ☐ c. a statistic
- ☐ d. the independent variable

ANS: b

b8. Let's assume you are conducting an experiment to determine the effect of a new ~~8. —Let's assume you are conducting an experiment to determine the effect of a new~~ drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The 150 epileptics constitute _____.

- ☐ a. the dependent variable

- ☐ b. a parameter
- ☐ c. a statistic
- ☐ d. the independent variable

ANS: b

9. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The number of seizures for each of the 20 subjects constitutes _____.

~~**b**—9. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The number of seizures for each of the 20 subjects constitutes _____.~~

- ~~— a. the dependent variable~~
- ~~— b. data~~
- ~~— c. a statistic~~
- ~~— d. the independent variable~~

ANS: b

b—10. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. Then you record the number of seizures in each of the 20 subjects for one month without the drug. Being compulsive, you also record the number of seizures for the remaining 130 epileptics for one month. The number of seizures for each of the 130 epileptics constitutes _____.

- a. the dependent variable
- b. data
- c. a statistic
- d. independent variable

ANS: b

c—11. Let's assume you are conducting an experiment to determine the effect of a new drug on the incidence of epileptic seizures. You select 20 epileptics from the 150 epileptics being treated at a nearby hospital and administer the drug to them. You record the number of seizures in each of the 20 subjects for one month. The average (mean) number of seizures for the 20 subjects is called _____.

- a. the dependent variable

- ☐ b. data
- ☐ c. a statistic
- ☐ d. a parameter

ANS: c

d—12. In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. Weight is an example of a(n) _____.

- ☐ a. independent variable
- ☐ b. constant
- ☐ c. statistic
- ☐ d. dependent variable

ANS: d

b—13. In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. The weight of each Dallas Cowboy is(are) called _____.

- ☐ a. constants
- ☐ b. data
- ☐ c. parameters
- ☐ d. statistics

ANS: b

e—14. In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. The Dallas Cowboys are a _____.

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

ANS: c

a—15. In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. All professional football players constitute a _____.

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

ANS: a

d—16. In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. The average (mean) weight of the Dallas Cowboys is called a _____.

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

ANS: d

b—17 In order to estimate the average (mean) weight of all professional football players, an investigator determines the weight of the "Dallas Cowboy" players. The average (mean) weight of all professional football players is called a _____.

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

ANS: b

a—18. In order to estimate the amount of TV watched by New York City adults, a sociologist surveys a random sample of adults from this city. The obtained raw scores are called _____.

- ☐ a. data
- ☐ b. constants
- ☐ c. statistics
- ☐ d. populations

ANS: a

19. In order to estimate the amount of TV watched by New York City adults, a sociologist surveys a random sample of adults from this city. The average (mean) of the raw scores is a _____.

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

ANS: c

a—20 In order to estimate the amount of TV watched by New York City adults, a sociologist surveys a random sample of adults from this city. All of the New York City adults constitute a _____.

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

ANS: a

b—21. In order to estimate the height of all students at your university, let's assume you have measured the height of all psychology majors at the university. The resulting raw scores are called _____.

- ☐ a. constants
- ☐ b. data
- ☐ c. coefficients
- ☐ d. statistics

ANS: b

b—22. In order to estimate the height of all students at your university, let's assume you have measured the height of all psychology majors at the university. The height scores of all psychology majors constitute a _____.

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

ANS: b

a—23. In order to estimate the height of all students at your university, let's assume you have measured the height of all psychology majors at the university. If you had measured the height scores of all students at your university, these scores would constitute a _____.

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

ANS: a

c—24. In order to estimate the height of all students at your university, let's assume you have measured the height of all psychology majors at the university. If you had measured the height scores of all students at your university, the average (mean) of these scores would constitute a _____.

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

ANS: c

d—25. In order to estimate the height of all students at your university, let's assume you have measured the height of all psychology majors at the university. The average (mean) value of the measured height scores constitutes a _____.

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

ANS: d

c—26. In order to estimate the attention level of college undergraduates in the United States, a psychologist measures the attention span of the undergraduates at a local university. The mean of these scores is a _____.

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

ANS: c

c—27. In order to estimate the attention level of college undergraduates in the United States, a psychologist measures the attention span of the undergraduates at a local university. The undergraduates at the local university are a _____.

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

ANS: c

d—28. In order to estimate the ratio of white to black students in his college, a professor determines the proportion of whites and blacks in his class. The resulting proportion is called a _____.

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

_____ [ANS: d](#)

a—29. In order to estimate the ratio of white to black students in his college, a professor determines the proportion of whites and blacks in his class. The students in the professor's class are called a _____.

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

_____ [ANS: a](#)

b—30. In order to estimate the ratio of white to black students in his college, a professor determines the proportion of whites and blacks in his class. . The students of the entire college are called a _____.

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

_____ [ANS: b](#)

e—31. Inferential statistics _____.

- _____ a. is the same as descriptive statistics
- _____ b. also uses methods of descriptive statistics
- _____ c. allows one to make inferences about a sample based on population data
- _____ d. allows one to make inferences about a population based on sample data
- _____ e. b and d

_____ [ANS: e](#)

|

e—32. Descriptive statistics are used to _____.

- _____ a. calculate the mean and standard deviation of a sample
- _____ b. calculate the mean and standard deviation of a population
- _____ c. graph a distribution of raw scores
- _____ d. b and c
- _____ e. a, b and c —(WWW)

ANS: e OTHER: [www](#)

e—33. In the equation $Y = bX + a$, b is a(n) _____.

- _____ a. independent variable
- _____ b. dependent variable
- _____ c. constant
- _____ d. coefficient
- _____ e. c and d

ANS: e

d—34. When one analyzes data based on a sample, one calculates a _____.

- _____ a. parameter
- _____ b. variable
- _____ c. constant
- _____ d. statistic —(WWW)

ANS: d OTHER: [Study Guide; www](#)

e—35. Mathematical methods used to draw tentative conclusions about a population based on sample data are referred to as _____.

- _____ a. descriptive statistics
- _____ b. sample statistics
- _____ c. inferential statistics
- _____ d. random sampling
- _____ e. magic —(WWW)

ANS: c OTHER: [Study Guide; www](#)

a—36. The variable that the experimenter manipulates is called the _____.

- _____ a. independent variable
- _____ b. dependent variable
- _____ c. constant variable
- _____ d. experimental variable

_____ ANS: a OTHER: [Study Guide](#)

b—37. From which of the following studies can one most reasonably determine cause and effect?

- ☐ a. correlational study
- ☐ b. true experiment
- ☐ c. naturalistic observation
- ☐ d. all the above equally well —(WWW)

ANS: b OTHER: Study Guide; [www](#)

b—38. In inferential statistics the object is usually to generalize from a _____ to a _____.

- ☐ a. data; variable
- ☐ b. sample; population
- ☐ c. population; sample
- ☐ d. constant; variable —(WWW)

ANS: b OTHER: Study Guide; [www](#)

d—39. For a list of sample data the lowest and highest score values are examples of _____ statistics.

- ☐ a. inferential
- ☐ b. sample
- ☐ c. population
- ☐ d. descriptive —(WWW)

ANS: d OTHER: Study Guide; [www](#)

c—40. To avoid unknown, systematic factors that may bias the results of an experiment, the experimenter should select a _____ sample from a population and use controlled conditions.

- ☐ a. wise
- ☐ b. small
- ☐ c. random
- ☐ d. single

ANS: c OTHER: Study Guide

d—41. Descriptive statistics are helpful in _____ and _____ raw data.

- _____ a. generalizing; inferring
- _____ b. organizing; tenderizing
- _____ c. confusing; confounding
- _____ d. summarizing; characterizing —(~~www~~)

_____ ANS: d OTHER: Study Guide; [www](#)

a—42. I am certain I will find this course _____.

e

- or**— a. fun
- d**— b. fatal
- c. interesting
- d. insufficient data to answer question

ANS: a, c, or d OTHER: Study Guide

d—43. Pick the best answer from the following statements.

- a. The measurements that are made on the subjects of an experiment are called data.
- b. A statistic is a number calculated on sample data that quantifies a characteristic of the sample.
- c. A parameter is a number calculated on population data that quantifies a characteristic of the population.
- d. All of the above statements are true.

ANS: d

e—44. A statistic is defined as _____.

- a. the score on the dependent variable of a particular subject in the sample
- b. a number calculated on population data that quantifies a characteristic of the population
- c. a number calculated on sample data that quantifies a characteristic of the sample
- d. the number of subjects in the sample

ANS: c

b—45. A parameter is defined as _____.

- a. the score on the dependent variable of a particular subject in the population
- b. a number calculated on population data that quantifies a characteristic of the population
- c. a number calculated on sample data that quantifies a characteristic of the sample
- d. the number of individuals in the population

ANS: b

a—46. Data is defined as _____.

- _____ a. the measurements that are made on the subjects of an experiment
- _____ b. the score on the dependent variable of a particular subject in the sample
- _____ c. the score on the dependent variable of a particular subject in the population
- _____ d. the number of individuals in the sample

ANS: a

d—47. A sample is defined as _____.

- _____ a. the subjects in an experiment
- _____ b. the complete set of individuals, objects, or scores that the investigator is interested in studying
- _____ c. a subset of the population
- _____ d. a and c
- _____ e. a and b

ANS: d

e—48. A population is defined as _____.

- _____ a. the complete set of individuals living in Seattle in a study interested in the complete set of individuals living in the US.
- _____ b. the complete set of individuals the investigator wishes to generalize to from an experiment.
- _____ c. the complete set of individuals, objects, or scores that the investigator is interested in studying
- _____ d. a and c
- _____ e. _____ b and c

ANS: e

e—49. The independent variable in an experiment is defined or identified as _____.

- _____ a. "IQ", in an experiment studying the effect of ~~early~~ Early education Education on IQ.
- _____ b. the variable that is systematically manipulated by the experimenter

- ☐ c. the variable the experimenter measures to determine if there is a real effect
- ☐ d. "Early Education", in an experiment studying the effect of Early Education on IQ
- ☒ e. b and d

ANS: e

☒ 50. The dependent variable in an experiment is defined or identified as _____.

- ☐ a. the variable the experimenter measures to determine if there is a real effect
- ☐ b. the variable that is systematically manipulated by the experimenter
- ☐ c. "IQ", in an experiment studying the effect of Early Education on IQ
- ☐ d. "Early Education", in an experiment studying the effect of Early education on IQ
- ☐ e. a and c
- ☐ f. a and d ~~(WWW)~~

ANS: e OTHER: www

f—51. A variable is defined or identified as _____.

_____a. “Early Education”, in an experiment studying the effect of Early Education on IQ

_____b. a characteristic of some event, object or person that has the same value regardless of differing times or conditions.

_____c. a characteristic of some event, object, or person that may have different values at different times depending on the conditions.

_____d. “IQ”, in an experiment studying the effect of Early Education on IQ

_____e. a and d

_____f. a, c, and d

ANS: f

True-F/False Questions

T—1. A sample is a subset of a population.

ANS: T

F—2. The dependent variable is the variable that is systematically manipulated.

ANS: F

F—3. The independent variable is the variable that is measured to determine the effect of the independent variable.

ANS: F

T—4. A statistic is to a sample as a parameter is to a population. ~~(www)~~

ANS: T OTHER: www

T—5. Descriptive statistics involves characterizing the obtained data.

ANS: T

T—6. Inferential statistics uses the sample data to generalize to populations.

ANS: T

F—7. Observational studies involve the manipulation of variables by the investigator. (~~WWW~~)

ANS: F OTHER: [www](#)

T—8. True experiments involve the manipulation of variables by the investigator.

ANS: T

F—9. Observational studies involve the use of independent variables.

ANS: F

T—10. The method of authority is opposed to the scientific method.

ANS: T

T—11. Intuition is often used as part of scientific method.

ANS: T

T—12. Data are an indispensable part of scientific method. ~~(WWW)~~

ANS: T OTHER: [www](#)

F—13. The only value of random sampling is to achieve a representative sample. ~~(WWW)~~

ANS: F OTHER: [www](#)

F—14. One is able to determine cause and effect from observational studies.

ANS: F

F—15. In an experiment conducted to determine the effect of testosterone on aggression, testosterone is the independent variable.

ANS: F

T—16. Statistical methods that use sample data to make statements about populations are called inferential statistics.

ANS: T

- F**—17. The goal of descriptive statistics is solely to summarize, and organize data. (~~WWW~~)

ANS: F OTHER: [www](#)

- T**—18. In order to determine cause and effect, a researcher needs to do a true experiment. (~~WWW~~)

ANS: T OTHER: [www](#)

19. [Intuition is not a valid way of developing research hypotheses.](#)

ANS: F OTHER: [Study Guide; New](#)

20. [The main difference between rationalism and the scientific method is that the scientific method relies on objective assessment to test the idea.](#)

ANS: T OTHER: [Study Guide; New](#)

21. [In observational studies the researcher manipulates the experiment and observes the results closely.](#)

ANS: F OTHER: [Study Guide; New](#)

22. [One task of research is to study a subset of the population and try to make inferences about the whole population.](#)

ANS: T OTHER: [Study Guide; New](#)

23. [Naturalistic observation is rarely used by scientists because it does not make use of the scientific method.](#)

ANS: F OTHER: [Study Guide; New](#)

24. [Descriptive statistics are used to make inferences about the population.](#)

ANS: F OTHER: [Study Guide; New](#)

25. [In a study of caloric intake on weight loss, the number of pounds lost \(or gained\) is the independent variable.](#)

ANS: F OTHER: Study Guide; New

26. In inferential statistics random sampling is regarded as desirable but not essential.

ANS: F OTHER: Study Guide; New

27. If one measured the height of all the women at a university and took an average of the data, the university women would be a sample of the population of all university women in the world.

ANS: T OTHER: Study Guide; New

28. When data has not yet been analyzed, this is called raw data.

ANS: T OTHER: Study Guide; New

DefinitionsShort Answer

_1. Define parameter.

_2. Define statistic. ~~-(WWW)~~

OTHER: www

_3. Define dependent variable.

_4. Define independent variable.

-

5. Define data.

_6. Define descriptive statistics.

-

7. Define inferential statistics. ~~-(WWW)~~

OTHER: www

Additional Questions

18. A developmental psychologist conducts an experiment to determine if exposure to an enriched environment shortly after birth will cause increased brain development. Twenty, two month old rats are randomly selected from a pool of one thousand-, two month old, rat pups. Ten of the twenty pups are exposed to an enriched environment for three weeks and the other ten to the usual environment for the same period of time. At a suitable time after the exposure, the psychologist

measures the number of neurons per cm^3 in the brain of each rat. A comparison is then made of the mean number of neurons per cm^3 for each group.

Identify the following:

- a. The population
- b. The sample
- c. The independent variable
- d. T he dependent variable
- e. ~~Any~~ All statistics ~~(WWW)~~

 OTHER: www

- 29 . Compare the method of authority with scientific method.

310. What is the major difference between descriptive and inferential statistics? Illustrate, using an example. —(WWW)

____ OTHER: [www](#)

411. Compare intuition and scientific method as methods of knowing.

512. How does natural observation research differ from true experiments?

613. A scientist asserts that properly collected data are essential to scientific method. Is she correct? Explain.

14. [What is the difference between rationalism and the scientific method?](#)

____ OTHER: [Study Guide; New](#)

15. [A social scientist measured the number of years of education of a random group of people and asked them their income. The scientist then found that the longer the education, the higher the income.](#)

____ [a. What kind of study was this?](#)

____ [b. Do you think that the scientist can rightfully infer that higher education causes higher income?](#)

____ OTHER: [Study Guide; New](#)

16. [A scientist takes a random sample of 50 citizens in a city and asks them their age. The scientist then calculates the average age and uses that as an estimate of the average age of all the citizens in the city. What is this process called?](#)

____ OTHER: [Study Guide; New](#)

17. [Another scientist is interested in parameter estimation. When asked to estimate the average income in a city he went to the Millionaire's Club and asked each person their average income. What was wrong with that process?](#)

____ OTHER: [Study Guide; New](#)

18. [Consider yourself and describe 3 populations to which you belong?](#)

19. [How often are population parameters known?](#)

____ OTHER: [Study Guide; New](#)

20. [Give three examples of a variable applying to people.](#)

OTHER: Study Guide; New

21. In an experiment, a scientist is interested in the effect of a drug on reaction time. He gives various doses of the drug and then measures blood levels of the drug and reaction time in a driving task. What is the independent variable? The dependent variable?

OTHER: Study Guide; New

22. If someone asked you the average height of everyone in your family and you actually measured each of the people in your family to calculate the average, have you calculated a statistic or parameter?

OTHER: Study Guide; New

23. A student hears a lecture on the harmful effects of drug X on intellectual functioning. Based on the international reputation of the lecturer and his lecture, the student concludes that drug X is harmful. What method of inquiry has the student relied upon to learn about drug X? Discuss.

OTHER: Study Guide; New