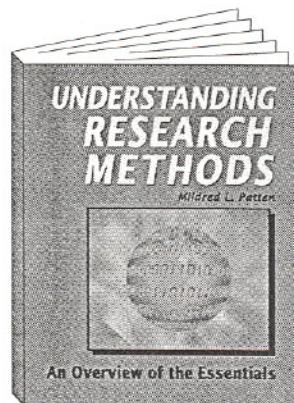


Understanding Research Methods

An Overview of the Essentials

Fourth Edition

ANSWERS



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Topic 1: Introduction to Empirical Research

1. Observation. 2. Yes. 3. The need for the study. 4. A statement of what researchers expect the results to show. 5. Yes. 6. Select among available instruments or develop new ones. 7. No. 8. Experimental research. 9. Nonexperimental research. (Note that no treatments are given.) 10. Answers will vary. 11. Answers will vary. Possible reasons are differences in the samples, differences in the observation or measurement methods, and differences in when the observations were made. 12. Answers will vary. 13. Answers will vary. 14. Answers will vary.

Topic 2: Experimental vs. Nonexperimental Studies

1. No. 2. Group B. 3. No. 4. To describe participants as they naturally exist without experimental intervention. 5. No. 6. No. 7. To explore cause-and-effect relationships. 8. Nonexperimental study. 9. Experimental study. 10. *Sample answer:* Nonexperimental, because it would be unethical to give treatments that might cause illness. 11. Answers will vary. 12. *Sample answer:* To determine the effect, an experimental study would be better. You might encourage some parents to read more than they normally would to their children and use the remaining parents as a control group. 13. Answers will vary. 14. Answers will vary.

Topic 3: Experimental vs. Causal-Comparative Studies

1. Causal-comparative. 2. Causal-comparative. 3. No. 4. No. 5. Experimental. 6. Background characteristics such as socioeconomic status. 7. Causal-comparative. 8. Experimental. 9. Ex post facto study. 10. *Sample answer:* Causal-comparative, because we would not want to impose an experimental treatment that might cause child abuse. On the other hand, we might conduct an experiment in which a treatment is given that is designed to reduce child abuse. 11. *Sample answer:* Yes. It may be that those who take vitamins are more health conscious in general. Thus, taking vitamins and maintaining a healthy body weight might both be caused by health consciousness (in this case, a common cause might be present). 12. Answers will vary. Common reasons for conducting causal-comparative research instead of an experiment are that some treatments in experiments might be unethical or illegal to administer, and the results of some experiments might not be known for many years (such as the effects of smoking on health). Note that many students will *not* be conducting either of these two types of research. Other types are discussed in the next topic.

Topic 4: Types of Nonexperimental Research

1. Longitudinal. 2. No. 3. Survey. 4. Correlational. 5. Ethnographic research. 6. One. 7. Answers will vary. 8. Answers will vary. 9. Answer should name two quantitative variables.

10. *Sample answer*: No, because there is no indication that the activity described in the question is driven by theories or hypotheses. 11. Answers will vary.

Topic 5: Variables in Nonexperimental Studies

1. Two. 2. Country of birth. 3. Number of years of formal education. 4. One variable. (Note: The one variable [extent of agreement] has four categories: strongly agree, agree, disagree, and strongly disagree. All variables have two or more categories.) 5. Each respondent or participant will belong to *only one* category. 6. Dependent. 7. Grades in high school algebra. 8. Yes. 9. One. (Note that the one variable in this question is “age.” Each of the four age groups is a category of the one variable.) 10. Two. 11. Answers will vary. 12. Answers will vary. 13. Answers will vary.

Topic 6: Variables in Experimental Studies

1. One. 2. Independent. 3. The researcher does something physical to treat the participants. 4. No. 5. Yes. 6. The type of coupon given. 7. Buying two pairs of shoes. 8. Knowledge of daily nutritional needs. 9. An educational film on nutrition vs. the handout. 10. Answers will vary. 11. Answers will vary. 12. Answers will vary.

Topic 7: Research Hypotheses, Purposes, and Questions

1. Hypothesis. 2. Directional. 3. Nonexperimental. 4. Nondirectional. 5. Purpose. 6. No, because it is stated in a way that can be answered with only a “yes” or “no.” 7. Directional. 8. Research purpose and research question. 9. *Sample answer*: The purpose is to explore differences in job satisfaction between those who receive regular feedback on their job performance and those who receive irregular feedback. 10. Nondirectional, because it does not predict which group will have greater job satisfaction. 11. *Sample answer*: Yes, because we could physically manipulate the regularity of feedback. 12. *Sample answer*: How do those who exercise regularly and those who do not differ in other behaviors that affect health? 13. Answers will vary. 14. Answers will vary.

Topic 8: Operational Definitions of Variables

1. Operational. 2. No. 3. A. 4. A. 5. Operational. 6. Yes. 7. *Sample answer*: Little credence, because it is a conceptual definition that does not give the physical steps taken to observe self-concept. In addition, there is not enough information to judge whether self-concept was measured adequately. To replicate the research, we would need to know how self-concept was measured. For example, the authors could provide the name of the test, the questions used, or describe what was observed to measure self-concept. 8. *Sample answer*: No, but definitions are almost never completely operational. In this case, it would be helpful to know the wording of all questions asked

and whether they were written questions or questions that were asked orally. **9. Sample answer:** Yes, because it does not take into account other sources of satisfaction on the job such as satisfaction with one's salary and satisfaction with the interactions with other employees. **10. Sample answer:** GPA as determined from official transcripts for the freshman year in college. **11. Sample answer:** Number of workdays during the first six months on the job that an employee arrives at work at least ten minutes early as determined by time-clock cards. **12.** Answers will vary.

Topic 9: Quantitative vs. Qualitative Research: I

1. Quantitative. **2.** Qualitative. **3.** Quantitative. **4.** Qualitative. **5.** Qualitative. **6.** Qualitative. **7.** Qualitative. **8.** Answers will vary. You might ask for a show of hands on this question and then ask for explanations. **9. Sample answer:** Both have valuable roles. Some questions are inherently more quantitative than others. Example: "What is the unemployment rate?" Other questions lend themselves as much to qualitative research as to quantitative research. Example: "What are the emotional effects on middle-aged women who are laid off from work and are unable to find comparable employment within six months?" (Point out that criteria for selecting between the two approaches are discussed in the next topic.) **10.** Answers will vary.

Topic 10: Quantitative vs. Qualitative Research: II

1. B. **2.** A. **3.** Qualitative. **4.** Qualitative. **5.** Qualitative. **6.** Quantitative. **7.** Answers will vary. **8. Sample answer:** Because there has already been considerable research on teacher effectiveness and because there are numerous theories of learning and instruction, quantitative research might be undertaken. However, qualitative research could still bring new insights to this research problem. **9.** Answers will vary. **10.** Answers will vary.

Topic 11: Program Evaluation

1. Program evaluation. **2.** Program evaluation. **3.** Yes. **4.** Summative. **5.** Formative. (Note: Measurement of job placement would be necessary to conduct a summative evaluation.) **6.** Formative. **7.** Formative. **8.** Formative. **9.** Summative. **10. Sample answer:** A program director might be more familiar with a program than an external evaluator and be in a better position to evaluate it, assuming that the program director has been trained in program evaluation. An external evaluator might be less likely to have biases regarding the program and might bring different perspectives to its assessment. **11. Sample answer:** Some programs may take several years to be fully implemented and internalized by the participants. Thus, to discontinue funding after one year (a typical timeframe) might be inappropriate. Example of a poor reason for continued

funding: Political pressure on legislators to continue a weak program because it is popular with their constituents. **12.** Answers will vary.

Topic 12: Ethical Considerations in Research

1. Yes. **2.** Yes. **3.** No. **4.** Yes. **5.** After. **6.** Reviewing the purposes of the study and the procedures used, offering to share the results when they become available, and reassurances that the data will remain confidential. **7.** Yes. **8.** *Sample answer:* A statement of purpose that is too general might be viewed as being deceptive and, therefore, unethical. An individual's occupation should not affect his or her rights in research. **9.** *Sample answer:* Harm might result from denying students the benefits of recess. Also, potential harm might result if some of the questions are on sensitive topics. Because of the potential for harm, informed consent is very highly desirable. **10.** *Sample answer:* The privacy of the other individuals would be violated. Before interviewing the participants, the researcher might ask them *not* to use the real names of other individuals they mention. **11.** Discuss with students the idea that potential participants might feel pressured to participate when asked to do so by authority figures. Researchers in a position of authority should be especially careful to stress that participation is purely voluntary and that participants may withdraw at any time without penalty. **12.** Answers will vary. **13.** Answers will vary.

Topic 13: The Role of Theory in Research

1. A unified explanation for discrete observations that might otherwise be viewed as unrelated or contradictory. **2.** Deduction. **3.** To test hypotheses derived from theory and to provide the observations and conclusions on which we can induce theory. **4.** The theory may be wrong, assuming that the research methodology was strong. **5.** Induction. **6.** Qualitative. **7.** Answers will vary. **8.** Answers will vary. **9.** Answers will vary. **10.** Answers will vary.

Topic 14: Reasons for Reviewing Literature

1. Identify a broad problem area. **2.** Modified replication. **3.** No. **4.** False. **5.** The introduction. **6.** You can use it to establish the importance of your topic and to show how your research flows from important research conducted by established researchers. **7.** Answers will vary. **8.** Answers will vary. **9.** Answers will vary.

Topic 15: Locating Literature Electronically

1. ERIC. **2.** Examine its thesaurus. **3.** A brief definition. **4.** Keywords (formerly "descriptors"). **5.** B. (Note that using *OR* identifies all articles containing *either* or *both* terms, while using *AND* identifies only articles containing *both* terms.) **6.** NOT. **7.** No. **8.** Answers will vary. **9.** Answers will vary.

Topic 16: Organizing a Literature Review

1. Describe the broad problem area and provide conceptual definitions of major terms.
2. Around topics.
3. Show that the topic was important enough to be investigated by others, and cite statistics that indicate how many people are affected by a particular problem or how many people are in a population of interest.
4. Grouped together.
5. Yes.
6. Yes, to trace the history of a topic.
7. *Sample answer:* It fails to organize the material for readers, and it is less efficient (takes more space) to present a string of summaries.
8. *Sample answer:* A thesis is, in part, a test of skill, so it might be used to see if students are able to locate and organize a large amount of literature.
9. Answers will vary.

Topic 17: Writing a Literature Review

1. That you believe that the underlying methodology or logic is reasonably sound.
2. Yes.
3. Using "e.g." followed by just a sample of the authors.
4. When the work is both important as well as central to one or more points being made in the literature review.
5. Yes.
6. When differences in research methodology might help explain differences in findings.
7. To help readers understand the organization of the paragraph.
- 8–21. Answers will vary.

Topic 18: Citing References

1. The Harvard method.
2. The content of the statement.
3. When you want to compare and contrast the findings (or thoughts) of two or more authors.
4. "e.g."
5. Only citations made in the body of the research report.
6. No.
7. Yes.
8. Answers will vary.
9. Answers will vary.

Topic 19: Biased and Unbiased Sampling

1. The group in which we are ultimately interested.
2. A census.
3. By giving every member of a population an equal chance of being included in the sample (e.g., put names on slips of paper, mix them up, and draw as many as needed).
4. Biased.
5. Biased.
6. Sample of convenience, which is a biased sample.
7. By drawing names written on slips of paper.
8. *Sample answers:* Offering a reward or prize for returning them; providing a self-addressed, stamped envelope; using official letterhead stationery; and making the questionnaire short and readable.
9. Answers will vary. (Point out that the effort is usually worth it in terms of the accuracy of the results and their likely acceptance by the academic community.)
10. *Sample answer:* Replacements, even if drawn at random, are not adequate to keep the sample from being biased. For example, those who were not available to be interviewed may have been attending a psychological convention, and such psychologists may be different from those who do not attend. Note that those who attend and,

hence, are unavailable, have no chance of being in the sample. **11.** Answers will vary.

12. Answers will vary.

Topic 20: Simple Random and Systematic Sampling

1. No. **2.** Simple random sample. **3.** Sampling errors. **4.** By using a sample of adequate size. **5.** No. **6.** 07 and 30. **7.** 332 and 170. (Note: The second number in the fifth row is 583, but in a population of 500, no one is named 583.) **8.** Systematic. **9.** Someone may have arranged or ordered the population list in such a way that it affects our sample. **10.** By using an alphabetical list and a random starting point. **11. Sample answer:** For large populations, using a table of random numbers is usually easier because names do not need to be written on slips of paper. **12. Sample answer:** People tend to associate with others who hold similar opinions. Thus, he or she might not have a good cross section of opinions, which could have been obtained by using random sampling. **13.** Answers will vary. **14.** Answers will vary.

Topic 21: Stratified Random Sampling

1. Sampling errors. **2.** Yes. **3.** Dividing a population into strata. **4.** Same percentage. **5.** No. **6.** Increases it. **7.** Yes. **8.** No. **9. Sample answer:** For the issue of whether the cafeteria should have longer hours of operation, we might stratify on the basis of day vs. evening students and whether students are commuters or live on campus—both of which might be relevant to how students feel about the hours of operation of the cafeteria. **10. Sample answer:** The instructor's rationale was probably that those students failed to indicate whether it was *simple* random sampling or *stratified* random sampling. Whether students should lose a point for this ambiguity is a matter of opinion. **11.** Answers will vary.

Topic 22: Other Methods of Sampling

1. Cluster. **2.** Snowball. **3.** Multistage. **4.** Each cluster tends to be more homogeneous in a variety of ways than the population as a whole. **5.** Snowball. **6.** Purposively selecting those whom we believe will give us the best information. **7.** Select clusters at random. **8.** Snowball. **9. Sample answer:** No, because even though there are hundreds of them, they are all employed by one type of hospital. Nurses who work in private and small hospitals are not represented. **10. Sample answer:** Professionals who overcharge their clients. Because of their inappropriate activities, they would be hard to locate without using snowball sampling. **11.** Answers will vary.

Topic 23: Introduction to Sample Size

1. No. **2.** No. **3.** Yes. **4.** Researcher A. **5.** Yes. **6.** No. **7.** 1,500. **8. Sample answer:** Readers of the magazine are self-selected and not a random sample of all adults. Those who choose to return

the questionnaire are volunteers who may have more (or less) interest in the topic than the general population. The sample is biased. 9. *Sample answer:* There are diminishing returns such as each additional subject adds less to precision than the preceding one added. Thus, there is a point where it is no longer cost-efficient or effective to add additional participants. 10. Answers will vary.

Topic 24: A Closer Look at Sample Size

1. Studies designed to obtain preliminary information on how new procedures and instruments work. 2. Small. 3. Large. 4. Qualitative, which might necessitate a small sample. 5. Large. 6. Yes. 7. 320. 8. 97. 9. *N*. 10. *Sample answer:* Yes, their publication may help others who are also working on the topic. If it is a new topic, early publication of pilot studies may be especially helpful. 11. *Sample answer:* It makes sense because if we use the same percentage for all population sizes, we would have too few participants when we sample from small populations (e.g., 10% of a population of 70 would yield only 7 participants, which would be too small to be reliable, while 10% of a population of 100,000 would yield 10,000, which would be much larger than necessary to obtain reliable results). 12. Answers will vary.

Topic 25: Introduction to Validity

1. Instrument. 2. Measures what it is designed to measure and accurately performs the function(s) it is purported to perform. 3. Yes. 4. Yes. 5. Reduces it. 6. Difficult. 7. *Sample answer:* The purpose was to measure what was learned in a psychology class. The sample of material on the test did not emphasize the material covered in classroom discussions/lectures. 8. *Sample answer:* Complex personality traits such as anxiety, fear, and love. 9. Answers will vary. 10. Answers will vary. 11. Answers will vary.

Topic 26: Judgmental Validity

1. Achievement tests. 2. Yes. 3. False. 4. No. 5. Face. 6. Content and face. 7. Yes. 8. When a researcher wants to disguise the true purpose of a study. 9. Although answers will vary, students will usually say the failure is unfair to students. 10. Answers will vary. 11. Answers will vary. 12. Answers will vary.

Topic 27: Empirical Validity

1. Criterion. 2. Relying on or based on observation rather than theory. 3. To what extent does the test predict what it is supposed to predict? 4. 1.00. 5. Yes. 6. 0.00. 7. Concurrent. 8. *Sample answer:* Teachers' judgments are not always highly valid because different teachers may use different standards when judging reading ability, and some teachers may be more skilled at making these types of judgments than other teachers. 9. *Sample answers:* Ratings by a clinical

psychologist who interviews and rates the subjects' self-esteem; scores on an existing self-esteem scale that has already been validated. **10. Sample answer:** Content validity is usually considered essential for most achievement tests. Hence, it should be studied. Concurrent validity may provide important information, however. For example, if a reading test yields scores that have no relationship to teachers' judgments, scores from the test would have little relevance for teachers when they make instructional decisions. Thus, examining both types of validity would be useful.

11. Answers will vary.

Topic 28: Judgmental–Empirical Validity

1. A collection of related behaviors that are associated in a meaningful way. **2.** Yes. **3.** About how the construct the instrument is designed to measure should affect or relate to other variables.

4. Indirect. **5.** No. **6.** Predictive and concurrent. **7.** Content and face. **8.** Construct. **9. Sample answer:** Persists at a task until completed, is punctual about arriving at work, and begins work without being prodded. **10. Sample answer:** While it may be true that industrious employees *tend* to receive more promotions, other variables such as getting along with the boss and acquiring new skills needed in a business may also lead to promotions. Thus, we might hypothesize that the correlation would be, at best, only moderate. **11. Sample answer:** Adults who are shy will be less likely to be married than adults who are not shy. **12.** Answers will vary.

Topic 29: Reliability and Its Relationship to Validity

1. Consistent scores. **2.** No. **3.** Yes. **4.** Validity. **5.** No. **6.** No. **7.** True. **8. Sample answer:** For evaluating an employee who is a salesperson, the number of units sold or dollar amount sold might be measured by examining objective sales records. This probably would be more reliable and valid than punctuality for identifying the “best” salesperson. **9. Sample answer:** The essay test contains a smaller number of items than the multiple-choice test, which might limit the reliability of the essay test, but there is less possibility of guessing on an essay test. Note that sometimes the scoring of essays is unreliable unless the scoring procedure is carefully thought out and the scorers are trained in how to score them. **10.** Answers will vary.

Topic 30: Measures of Reliability

1. Two. **2.** A correlation coefficient, which is also called a reliability coefficient. **3.** No. **4.** Yes. **5.** .80 or higher. **6.** As low as .50. **7. Sample answer:** Number of seconds would probably be more reliable if observers carefully use a stopwatch. **8. Sample answer:** Probably prejudice against minority groups because this is less likely to change substantially over a two-week period. Note that political opinions are sometimes volatile. Test-retest reliability over a period of weeks is appropriate

only when there is reason to believe that the trait being measured is stable over the time period.

9. Answers will vary.

Topic 31: Norm- and Criterion-Referenced Tests

1. The performance of a norm group. 2. No. 3. A test designed to measure the extent to which individual examinees have met performance standards. 4. Norm-referenced. 5. Criterion-referenced. 6. Criterion-referenced. 7. *Sample answer:* Norm-referenced is more important in a competitive world. Criterion-referenced gives more information on what children do and do not know, which helps parents know what specific skills their children need to learn. 8. *Sample answer:* Criterion-referenced, because it does little good to know who is best. Instead, we want to know whether students' swimming skills will enable them to save themselves in a deep pool without regard to how well other students can swim. 9. Answers will vary.

Topic 32: Measures of Optimum Performance

1. Intelligence test. 2. Aptitude test. 3. Achievement test. 4. Aptitude test. 5. Checklist. 6. By making sure that scorers know specifically what characteristics of the essays, products, or performances they are to consider and how much weight to give to each characteristic. 7. No. 8. They have low to moderate validity, with validity coefficients of up to about .60. 9. Answers will vary. 10. *Sample answer:* Achievement in physical activities such as swimming. 11. Answers will vary. 12. Answers will vary. 13. Answers will vary.

Topic 33: Measures of Typical Performance

1. No. 2. To reduce social desirability in responses. 3. Social desirability. 4. Projective techniques. 5. Projective techniques. 6. Strongly agree to strongly disagree. 7. Yes. 8. Answers will vary. 9. Answers will vary. 10. Answers will vary. 11. Answers will vary.

Topic 34: True Experimental Designs

1. To explore cause-and-effect relationships. 2. By assigning participants at random to groups. 3. Observation or measurement. 4. Treatment. 5. Pretest sensitization (i.e., the interaction of testing and the treatment), which is also known as the reactive effect of testing. 6. Posttest-only randomized control group design. 7. There must be a reasonably large pool of subjects to begin with so that when they are divided into four groups, each of the groups will have a sufficient number to yield reliable results. 8. Random assignment. 9. *Sample answer:* To study the effects of a school program mandated by law in a state, we might have to use students attending schools in another state as a control group. 10. Answers will vary.

Topic 35: Threats to Internal Validity

1. Testing.
2. History.
3. Instrumentation.
4. Selection.
5. Maturation.
6. When participants are selected on the basis of their extreme scores.
7. By using a true experimental design.
8. *Sample answer:* It is flawed because other influences (history) such as increased publicity in the media on the effects of smoking may have caused them to quit.
9. Answers will vary.

Topic 36: Threats to External Validity

1. External validity.
2. Internal validity.
3. Selection bias.
4. Multiple-treatment interference.
5. Reactive effects of experimental arrangements.
6. Reactive effects of testing or pretest sensitization.
7. *Sample answer:* An experiment in which subjects are assigned at random to treatment conditions would have high internal validity, but if the subjects were not selected at random from the population, there would be “selection bias,” which would limit its external validity.
8. Answers will vary.

Topic 37: Pre-Experimental Designs

1. No.
2. No.
3. Static-group comparison design.
4. One-group pretest-posttest design.
5. No.
6. *Sample answer:* No, because the randomization was used only to select subjects for a pre-experimental design, not to assign subjects at random to groups.
7. Answers will vary.
8. Answers will vary.

Topic 38: Quasi-Experimental Designs

1. Nonequivalent control group design.
2. The dashed line.
3. No.
4. The same individuals are serving as both the experimental and control groups. Thus, they are the same in all ways throughout the experiment.
5. Multiple-treatment interference.
6. A single-group design in which treatments are alternated.
7. *Sample answer:* Because there is much variation in Class A, we would want to observe it longer to establish the full extent of the variation. We need to know this so that when we observe variation after the treatment, we will want to know whether this variation is greater than the natural amount of variation.
8. Answers will vary.

Topic 39: Descriptive and Inferential Statistics

1. Descriptive.
2. Nine.
3. Percentage.
4. Inferential.
5. No.
6. Inferential.
7. Inferential.
8. Parameters.
9. Statistics.
10. Answers will vary.
11. Answers will vary.
12. Answers will vary.

Topic 40: Introduction to the Null Hypothesis

1. Three.
2. The observed difference was created by sampling error.
3. Random errors.

4. Zero. 5. The null hypothesis. 6. The probability that the null hypothesis is true is less than 5 in 100. 7. When it is low. 8. Fail to reject the null hypothesis. 9. By saying that a difference is statistically significant. 10. Dissertation. 11. *Sample answer*: If the probability of rain is low, we may decide not to take an umbrella with us when we go out. 12. Answers will vary.

Topic 41: Scales of Measurement

1. Nominal. 2. Interval and ratio. 3. Ordinal. 4. Ratio. 5. Nominal. 6. Interval. 7. Ordinal. 8. Ratio. 9. Ratio. 10. *Sample answers*: Religious affiliation *and* employment status (i.e., employed or unemployed). 11. Answers will vary.

Topic 42: Descriptions of Nominal Data

1. 40%. 2. Yes. 3. Bivariate. 4. 100. 5. One. 6. Percentages. 7. Convert them mentally to percentages. 8. Answers will vary. 9. Answers will vary. 10. Answers will vary. 11. Answers will vary.

Topic 43: Introduction to the Chi Square Test

1. Observed results. 2. (Random) sampling errors. 3. Chi square. 4. No. 5. p . 6. To reject it. 7. $p < .05$. 8. No. 9. Yes. 10. Answers will vary. Answers should refer to only one nominal variable and random sampling. 11. Answers will vary.

Topic 44: A Closer Look at the Chi Square Test

1. Bivariate analysis. 2. Reject it. 3. Five. 4. 1 in 100 or less. 5. Type II. 6. Type I. 7. Because it is free from bias. 8. *Sample answer*: Yes, because they both have names as categories: “yes–no” and “Methods A, B, and C.” 9. Answers will vary. Answers should refer to two nominal variables between which we are looking for a relationship. The answer should also refer to the use of random sampling, making it necessary to conduct a significance test. 10. Answers will vary.

Topic 45: Shapes of Distributions

1. 60 (accept as correct an approximation of this value from the figure). 2. Vertical. 3. The normal (bell-shaped) curve. 4. Positive (skewed to the right). 5. Negative. 6. Positive (skewed to the right). 7. Positive. 8. Answers will vary. Note that most variables associated with income have a positive skew. *Sample answer*: The prices of cars have a positive skew because there are a large number of models that are relatively inexpensive while a much smaller number are very expensive. The small number of expensive cars creates a tail to the right when the prices are plotted on a frequency polygon. 9. Answers will vary.

Topic 46: The Mean, Median, and Mode

1. Mode. 2. Mean. 3. Median. 4. The value around which the deviations sum to zero.
5. Summing (adding up) the scores and dividing by the number of scores. 6. No. 7. Yes.
8. Mode. 9. Measures of central tendency. 10. *Sample answer*: Because there are three averages, we might ask the student to name which one was used. We need to know this because different averages have different characteristics (i.e., they have different definitions). Also, we might ask whether the underlying distribution is skewed because the mean is an inappropriate average while the median is appropriate if the distribution is highly skewed. 11. Answers will vary.

Topic 47: The Mean and Standard Deviation

1. Mean. 2. The amount by which the participants vary or differ from each other. 3. Yes.
4. Zero. 5. 68%. 6. 85 and 115. (Note: The mean of 100 plus/minus the standard deviation of 15 yields the answer.) 7. 34%. 8. No. 9. Group X. 10. Group X. 11. Answers will vary. Note that in the social and behavioral sciences, it is relatively rare for researchers to address the issue of whether underlying distributions are normal. This makes it difficult for consumers of research to judge whether the 68% rule strictly applies. 12. Answers will vary.

Topic 48: The Median and Interquartile Range

1. 50%. 2. Median. 3. Subtract the lowest score from the highest. 4. Interquartile range. 5. The middle 50% of the participants. 6. Group Y. 7. Group X. 8. Range and interquartile range. (Note that the semi-interquartile range is also mentioned in a footnote.) 9. Mean and median. 10. The interquartile range. 11. When a distribution is highly skewed and when analyzing ordinal data. 12. Answers will vary.

Topic 49: The Pearson Correlation Coefficient

1. Pearson product-moment correlation coefficient. 2. -1.00. 3. Yes. 4. Yes. 5. Direct.
6. A perfect, positive or direct relationship. 7. .36. 8. Multiply it by 100. 9. 49%. 10. *Sample answer*: Vocabulary knowledge and reading ability. 11. Answers will vary.

Topic 50: The t Test

1. There is no true difference between the means; the difference was created by random sampling.
2. No. 3. No. 4. Yes. 5. Yes. 6. More. 7. More. 8. Yes. 9. Yes. 10. *Sample answer*: Sample size is the easiest for a researcher to manipulate. 11. Answers will vary.

Topic 51: One-Way Analysis of Variance

1. Analysis of variance. 2. Yes. 3. Yes. 4. No. 5. Yes. 6. No. 7. No. 8. p . 9. Multiple

comparisons test. **10. Sample answer:** One with three means such as comparing the social maturity of children at three grade levels. Because the t test can examine only two means (not three) in a given analysis, a t test would be inappropriate. **11. Sample answer:** Six because the differences are (1) A vs. B, (2) A vs. C, (3) A vs. D, (4) B vs. C, (5) B vs. D, and (6) C vs. D. **12.** Answers will vary.

Topic 52: Two-Way Analysis of Variance

1. One-way, because the participants were classified in only one way: residence in urban, suburban, and rural areas. **2.** Yes. (Note: Praise rewards are more effective for older adults while monetary rewards are more effective for young adults.) **3.** No. (Note: The column means are equal.) **4.** No. (Note: Method A is 15 points superior to Method B regardless of aptitude level.) **5.** Yes. (Note: Method A has a higher column mean.) **6.** No. (Note: The row means are equal.) **7.** No. **8. Sample answer:** One in which participants are classified in two ways such as (a) their major in college and (b) their age. **9.** Answers will vary.

Topic 53: Practical Significance of Results

1. Yes. **2.** Five. **3.** Yes. **4.** No. **5.** Yes. **6.** False. **7.** No. **8. Sample answer:** A small difference that improves a suicide prevention program. **9.** Answers will vary. **10.** Answers will vary.

Topic 54: Introduction to Effect Size (d)

1. Experimenter A, whose scores could range from only 0 to 20. (Note that Experimenter B's could range from 0 to 120.) **2.** Their standard deviations. **3.** Yes. (Note that this is the case in the example in this topic.) **4.** Yes, it is a large difference because it is close to 3.00, which is the effective top of the range for values of d because there are, for all practical purposes, only three standard-deviation units above the mean. **5.** No, because we must know the standard deviations to calculate d . **6.** 1.00. (Note: $500.00 - 400.00 = 100.00/100.00 = 1.00$.) **7.** Effect size refers to the magnitude (i.e., size) of a difference when it is expressed on a standardized scale. **8.** Wording will vary. You might want to provide this additional example: When a raw-score scale has a very limited range (e.g., 0 to 5), the difference between the means of an experimental and control group will necessarily be small (e.g., the maximum possible difference is only 5 points). In addition, the maximum value of the standard deviation will also necessarily be small because scores can only vary a small amount (e.g., from 0 to 5). Without computing a measure of effect size such as d , the raw-score mean difference is not comparable to an experiment with a large possible range of raw scores (e.g., 200 to 800), which permits a large raw-score difference between means and a large standard deviation. **9.** While answers may vary, it is a good idea to report values of d when

comparing two means. Point out to students, however, that since d is based on the difference between two means, it is not possible to compute it for certain types of data such as frequency counts or percentages.

Topic 55: Interpretation of Effect Size (d)

1. No. 2. Three. It can range three standard deviations above and three standard deviations below the mean. Less than one-half of one percent of a distribution lies above $+3.00$ and below -3.00 . 3. One standard-deviation unit. 4. 1.40 or more (i.e., 1.40+). 5. Large. 6. When the control group's mean is higher than the experimental group's mean. 7. Before. 8. Answers will vary. Students might mention a specific physical disease or mental condition for which researchers have been unable to find effective treatments. 9. Wording may vary. Students are likely to mention various practical considerations (such as cost) as well as methodological considerations (such as a biased sample or poor experimental design.) 10. Answers will vary.

Topic 56: Effect Size and Correlation (r)

1. Cohen's d and "effect size r " (i.e., the Pearson correlation coefficient [r] and its associated value of r^2). 2. $+1.00$. 3. Squaring r and multiplying it by 100%. 4. 16%. (Note: $0.40 \times 0.40 = 0.16 \times 100\% = 16\%$.) 5. r and its equivalent r^2 . 6. 0.264. (Note that the answer is obtained from Table 1.) 7. 1.50. (Note that the answer is obtained from Table 1.) 8. Answers will vary. A correct answer describes a study in which there are two groups and the researcher is interested in determining which group scored higher on the average. 9. Answers will vary. Note that students might not be conducting either type. For instance, a survey on attitudes toward school uniforms might merely describe the percentage who chose each choice on a questionnaire without the use of means or correlation coefficients.

Topic 57: Introduction to Meta-Analysis

1. Occurring later and more highly organized. (Note: See Footnote 1 in the topic.) 2. Combining the results of previous studies. 3. Random sampling errors created by random assignment and random errors of measurement. 4. Mathematical synthesis of the statistical results of previous studies. 5. It typically synthesizes the results of studies conducted by independent researchers. 6. Answers will vary. 7. Answers will vary.

Topic 58: Meta-Analysis and Effect Size

1. No. 2. Various researchers frequently use a number of different measures of the same variable. 3. Use a measure of effect size. 4. Studies with larger samples need to be given more weight than

studies with smaller samples. 5. No, because r is also used. 6. Wording may vary. It represents a relatively weak, inverse relationship. 7. Answers will vary.

Topic 59: Meta-Analysis: Strengths and Weaknesses

1. 8,025. 2. A meta-analysis. 3. No. A set of studies subjected to meta-analysis might all have a common flaw that biases (and makes invalid) the combined results from all of them. 4. Publication bias. 5. A partial solution to this problem is for those conducting meta-analyses to search for unpublished studies that might be reported in dissertations, convention papers, and government reports for inclusion in their meta-analyses. 6. Answers will vary. In this topic, the definition of a topic for a meta-analysis, the search strategies used to identify relevant studies, and the establishment of criteria for selecting among the available studies are described as being *subjective* elements in meta-analyses. 7. Answers will vary.