CONTENTS

SECTION THREE

CHAPTER MATERIALS
and TEST BANK

CHAPTER 1
INTRODUCTION TO STATISTICS

LEARNING OBJECTIVES

1. To create familiarity with basic statistical concepts
2. To define the concepts of variance and error
3. To identify criteria for defining good statistics
4. To specify the ways in which statistics differ

KEY CONCEPTS

quantitative:	numerical summary of information
descriptive statistics:	statistics that focus on the characteristics of variables, asking "What's there?"
inferential statistics:	statistics that focus on whether one variable effects another or whether a single variable matches a hypothetical distribution, asking "How is this different?"
predictive statistics:	statistics that focus on the strength of relationships or covariation, asking "What causes it?"
variance:	how things vary, caused by measurement inaccuracies and true measurement differences
error:	degree of measurement that is not "real"
constant:	unchanging measurement, getting the same number repeatedly
power:	an estimate of the ability of a statistic to find something that is really there
robustness:	the ability of a statistic to withstand violations of its assumptions

MULTIPLE CHOICE QUESTIONS

1. Which of the following is more likely to be true?
   a. small differences between things are associated with small amounts of error
   b. large differences between things are associated with large amounts of error
   c. small differences between things are probably real; large differences are probably error
   *d. large differences between things are probably real; small differences are probably error

2. Why do we have many kinds of statistics?
   a. because of many statisticians creating tools for handling special problems
   b. because of the need for different types of samples
   c. it is simply a product of 200 years of historical development
   *d. because of the many types of error and variance

3. What are most statistics primarily designed for?
   *a. to tell us something about error
   b. to provide the best measurement possible
   c. to provide estimates of probability
   d. to predict outcomes

4. Which of the following best describes the concept of "variance"?
   a. change is inevitable and all around us
   *b. differences in measurement results
   c. real fluctuations in measurement
   d. a and c above

5. Foundation concepts underlying the reason for, and the use of, statistics are:
   *a. error and variance
   b. probability and error
   c. variance and probability
   d. variance and chance

6. Accuracy:
   a. is always possible
   b. always results in larger amounts of variance
   c. solves all measurement problems
   *d. none of the above

7. There are two basic types of variance. They are:
   a. constants and variables
   *b. error variance and real variance
   c. systematic variance and random variance
   d. none of the above

8. There are three general types of statistics. Which of the following is NOT one of those?
   *a. graphic
   b. predictive
   c. descriptive
   d. inferential

9. A constant is best characterized as:
   a. a variable that only changes under certain circumstances
   b. a dependable phenomenon
   *c. unchanging measurement
   d. the absence of error

10. Before taking a statistics course, everyone has already used statistics. Which of these is (are) an example of these statistics?
   a. hash marks
   b. bar graph
   c. percentages
   *d. all of the above

11. Chapter 1 in your textbook focuses on:
   *a. the foundation of statistics
   b. the application of mathematical formulas
   c. strategies for studying statistics
   d. all of the above

12. A "good" statistic is characterized by which of the following?
   *a. provides a quick and relatively accurate "picture" of the data
   b. has the ability to reduce data to the nominal level of measurement
   c. requires a minimum of calculation
   d. all of the above

13. The power of a statistic refers to
   a. the ability to withstand violations of assumptions
   b. the ability to be calculated quickly
   *c. the ability to find something that is really there
   d. the ability to locate error variance

14. The robustness of a statistic refers to
   a. the ability to be calculated quickly
   *b. the ability to withstand violations of assumptions
   c. the ability to locate error variance
   d. the ability to find something that is really there

15. The two basic reasons for variance are
   a. estimates of error and measuring instruments
   b. robustness and power
   c. simple statistics and poor understanding of statistical assumptions
   *d. measurement inaccuracy and true differences between measurements

TRUE/FALSE QUESTIONS

1. T Statistics are merely ways to make sense of and understand quantitative information.
2. T The related concepts of variance and error are the backbone of statistics.
3. F Any two identical measurements are sufficient to identify a constant.
4. F Estimates of error will always have error in them.
5. T The different statistics we use to tell us about variance and error have different capabilities, particularly in regard to their accuracy and ability to withstand problems in the data.
6. F A constant is a variable that always demonstrates a relationship with another variable.
7. T Predictive statistics measure the strength of a relationship.
8. F Inferential statistics are used to establish the accuracy of measurement.
9. F Descriptive statistics are designed to describe statistical significance of a relationship.
10. T Predictive statistics are related to the explanatory phase of knowledge.

SHORT ESSAY QUESTIONS

1. What are the two foundational concepts of statistics? Explain what they are and how they relate to measurement.

2. There are three basic types, or families, of statistics. What are they and what kinds of questions do they answer?

3. Explain why power and robustness are important considerations in making a choice of which statistic to use.

4. Discuss what makes any statistic a “good” statistic.

CHAPTER 2
LEVELS OF MEASUREMENT

LEARNING OBJECTIVES

1. To identify the role of measurement in determining information content
2. To list the four basic levels of measurement
3. To define the four basic levels of measurement
4. To explain the rationale of introducing error by using the wrong level of measurement when operationalizing a concept or choosing a statistic

KEY CONCEPTS:

level of measurement: the type of information present in the measurement of concepts

nominal:	measurement that only conveys categorization
ordinal:	measurement that conveys categorization and ranking
metric ordinal:	measurement that conveys categorization, ranking and almost exact position
interval:	measurement that conveys categorization, ranking and exact position
ratio:	measurement that conveys categorization, ranking, exact position and absolute zero

MULTIPLE CHOICE QUESTIONS

1. The nominal level of measurement is represented in which variable below?
   a. fear of crime
   b. temperature
   c. income
   *d. gender

2. The ordinal level of measurement is represented in which variable below?
   *a. fear of crime
   b. temperature
   c. income
   d. gender

3. Ratio level of measurement is the *only* level to have:
   a. an indicator of magnitude
   b. arithmetic manipulation
   c. exhaustive categorization
   *d. absolute zero

4. Levels of measurement refers to:
   a. the stair-like process involved in measuring
   *b. the essence of what numbers mean
   c. the use of variance to determine error in numbers
   d. the difficulty involved in measuring

5. Ordinal scales have the property of:
   a. absolution
   b. metricity
   *c. ranking
   d. variability

6. Measurement is
   a. any time numbers are used
   *b. the use of numbers to represent concepts
   c. the primary concern of statistical power
   d. all of the above

7. The meaning of a number is a product of:
   a. its use in a statistic
   b. the level of measurement
   c. its relationship to some condition
   *d. b and c above

8. Numbers can be added if they are at least
   a. ordinal level
   b. nominal level
   *c. interval level
   d. metric ordinal level

9. Which of the following levels of measurement provides the most information?
   *a. ratio
   b. nominal
   c. cardinal
   d. ordinal

10. Not all numbers can be treated equally because
    a. some statistics require more information than others
    b. a “2” is different from a “3”
    c. the size of the number makes a difference
    *d. there are different ways of measuring variables

11. The current verison, or concept, of levels of measurement was created in the
    *a. 1940s
    b. 1980s
    c. late 1990s
    d. none of the above

12. The concept of metric ordinal is useful because
    a. its metric quality means that it is more useful worldwide as opposed to the English/American system of measuring in inches and ounces
    *b. there is little error involved in treating it as if it were interval level
    c. it adds information to data used with nominal-level statistics
    d. all of the above

13. Which of the following sets of ordinal scores would no longer be ordinal?
    a. 1, 2, 3, 4, 100
    b. 1, 3, 4, 5
    c. 5, 4, 3, 2, 1
    *d. 1, 3, 2, 4

14. The concept of magnitude is found in which of the levels of measurement below?
    a. nominal
    b. ordinal
    *c. ratio
    d. a and b above

15. The greatest error in treating data at one level as if it were at another is when
    a. ordinal is used as interval
    b. nominal is used as ordinal
    c. ratio is used as interval
    *d. nominal is used as interval

TRUE/FALSE QUESTIONS

1. T Variables are the way we measure concepts.
2. F Numbers all mean the same thing.
3. F Adding ordinal categories together only causes a problem when you try to divide the result.
4. F The current version, or concept, of levels of measurement was developed by Albert Gore.
5. T Level of measurement is inherent in concepts.
6. F Crime rates can only be measured at the interval level.
7. T It is better to treat metric ordinal data as interval data because there is less error.
8. F Very few important variables are measured at the nominal level.
9. T A statistic designed for the interval level can also use ratio level data.
10. T Ratio level measurement provides estimates of the relative size of numbers.

SHORT ESSAY QUESTIONS

1. Why is the level of measurement important when using statistics?

2. What happens when concepts are measured at lower levels than their inherent level?

3. Explain the problem with using the wrong level of measurement with statistics.