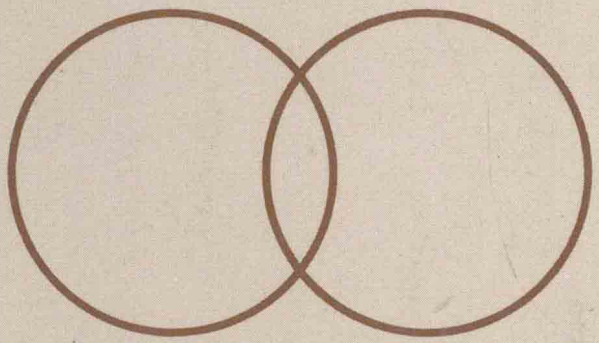
# STUDY GUIDE TO ACCOMPANY

DANIEL · TERRELL

# BUSINESS STATISTICS



SECOND EDITION

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# BUSINESS STATISTICS

## BASIC CONCEPTS AND METHODOLOGY

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# PREFACE

The purpose of this study guide is to help you, the student, learn the concepts and techniques of statistics. It is designed for use as a supplementary learning aid to accompany our textbook, *Business Statistics: Basic Concepts and Methodology*, second edition.

The chapters of this study guide correspond, section by section, to the chapters in *Business Statistics*. Before you try to answer the questions in the study guide, you should carefully study the corresponding explanatory material found in the text.

We cover both the concepts and the arithmetic and algebraic techniques necessary for an understanding of basic statistical methodology. The study guide uses a programmed approach. The questions are designed for fill-in-the-blank type responses and either blanks or blank spaces are provided for your use in responding directly on the page before you. Cover the answers with a strip of cardboard (provided for your convenience just inside the back cover of the book) until you have written down your answers.

We provide you with many computational problems which are broken down into the basic steps of their solution. You can therefore check, step-by-step, your knowledge of the computations involved in arriving at a solution. This procedure allows you to correct mistakes and learn the right procedures before arriving at the final answer.

We would like to express our appreciation to Mary Daniel, who typed the manuscript for this study guide, and to Professor Hilbert Schultz, University of Wisconsin-Oshkosh, and Mr. Jeff David, former graduate student at Iowa State University (now employed with American Telephone and Telegraph Company). They read the manuscript in detail, made many suggestions for improvement, and uncovered some errors.

Wayne W. Daniel
James C. Terrell

# CONTENTS

# 1

# THE ROLE OF STATISTICS IN THE DECISION-MAKING PROCESS

### Chapter Objectives

This chapter is concerned with the increasing complexity confronting the manager or business decision maker in today's world. It discusses the role that statistics can play in the decision-making process. It also covers the basic principles and steps that are involved in planning and conducting special statistical studies. After studying this chapter, you should be able to do the following.

1. Explain the major reasons for the increasing use of the scientific method and management-information systems by business decision makers and researchers
2. Describe how statistics relates to business decision making
3. Discuss the basic principles involved in conducting statistical studies
4. List a set of steps that can help ensure that statistical studies are properly planned and conducted

## 1.1 INTRODUCTION

1. The scientific method is characterized by _____, _____ reasoning, and a systematic _____ and _____ of facts.

objectivity, inductive

examination

measurement

2. The accumulation of facts is followed by the formulation of _____, _____, and _____, all of which may be modified later as additional facts are collected.

concepts, hypotheses

theory

3. The ultimate objective of the manager and the researcher is to assemble _____ of sufficient quantity and quality to provide a basis for making sound _____.

data

decisions

## 1.2 THE ROLE OF STATISTICS IN DECISION MAKING

1. Statistics may be described as the technology of the _____ method. It consists of a set of tools that are used to facilitate the making of _____ whenever conditions of _____ prevail.

scientific

decisions

uncertainty

2. The proper use of statistics is to _____ in decision making.

aid

## 1.3 BASIC PRINCIPLES AND CONCEPTS OF SPECIAL STUDIES

1. When proposing a study, one should determine whether the study is of _____ and whether it is _____.

value

feasible

2. In determining the feasibility of a study, you should answer the following questions.

   (a) Can the _____ be achieved?

objectives

   (b) Are required _____ readily available?

data

   (c) Will needed _____ be available?

resources

   (d) Will the study be of sufficient _____ to warrant the expenditure of resources?

value

## 1.4 STEPS INVOLVED IN PLANNING AND CONDUCTING SPECIAL STUDIES

1. The five steps of the planning phase of a study are as follows.

   (a) Prepare a clear and concise statement of _____.

purpose

   (b) Develop a set of meaningful and measurable specific _____.

objectives

   (c) Determine the _____ necessary to achieve the objectives.

analyses

   (d) Determine what _____ are required in order for the analyses to be performed.

data

(e) Specify in detail the

data collection

_____ plans.

2. The five steps in the accomplishment phase of a study are as follows.

Collect

(a) _____ the data.

Edit, organize

(b) _____ and _____ the data.

Perform

(c) _____ the planned analyses of the data.

Achieve

(d) _____ each specific objective based on the planned _____.

analyses

Evaluate

(e) _____ the general study objectives based on the results of the efforts to achieve the specific objectives.

# 2

# ORGANIZING AND SUMMARIZING DATA

### Chapter Objectives

This chapter teaches you some of the basic techniques used in describing and summarizing important characteristics of a set of data. In addition, this chapter helps you to understand and use these techniques. These skills are essential for handling much of the material in the remainder of the text. After studying this chapter and working the exercises, you should be able to do the following.

1. Use some basic vocabulary necessary for understanding statistics
2. Organize and summarize data so that they can be better understood
3. Effectively communicate the important information contained in a set of data by means of graphs
4. Compute numerical quantities that measure the central tendency and dispersion of a set of data

## 2.1 INTRODUCTION

1. Applied statistics can be considered to consist of _____ and _____.

descriptive statistics

inferential statistics

2. Methods of organizing, summarizing, and presenting statistical data are known as _____.

descriptive statistics

3. _____ is concerned with reaching conclusions (making inferences) about a body of data by examining only a part of the data.

Inferential statistics

## 2.2 SOME BASIC VOCABULARY

1. The unit on which we take a measurement or make an observation is referred to as an _____.

entity

2. If a characteristic assumes different values for different entities, then that characteristic is called a _____.

variable

3. A characteristic that retains the same value from entity to entity is called a _____.

constant

4. If you cannot predict the exact value that a particular variable will assume, but you know the different values that the variable can assume and the relative frequency with which each of these values will occur, then that variable is known as a _____.

random variable

variate

5. The term _____ is used frequently as a synonym for random variable.

6. Measurements and counts, such as weights or numbers of items sold, are examples of _____ variables.

quantitative

7. Color of paint, sex, and nationality are examples of _____ variables.

qualitative

8. The number of students attending class is an example of a _____ variable.

discrete

9. A variable—such as height, weight, or temperature—that can theoretically take on any value in an interval is a _____ variable.

continuous

10. The largest group or collection of values in which one has an interest is the _____.

population

11. A portion or fraction of a population is a _____.

sample

12. A sample selected in such a manner that the results of its analysis allow inferences to be made about the population is a _____ sample.

random

## 2.3 SUMMARIZING DATA: THE ORDERED ARRAY

1. When a group of observations is arranged in order of increasing magnitude of the values, we have an _____.

ordered array

2. An ordered array can be very useful when the tools used in the analysis are _____ _____.

pencil, paper, and calculator

3. An ordered array may be of no real value when all calculations are made by a _____.

computer

## 2.4 SUMMARIZING DATA: THE FREQUENCY DISTRIBUTION

1. Contiguous and nonoverlapping categories that are used for classifying a set of data are called _____ _____.

class intervals

2. Each class interval is clearly specified by its _____ and _____.

upper limit

lower limit

3. There is no generally accepted procedure for determining the number of class intervals needed for a frequency distribution. Usually the number of intervals should be no fewer than _____ nor more than _____. According to Sturges' rule, the number of intervals $k$ should be approximately equal to _____, where $n$ is the number of observations.

6

15

$1 + 3.322(\log_{10} n)$

4. The range of scores and number of observations in each of four sets of data are shown below. Use Sturges' rule to find a suggested number of class intervals for each, and compute an approximate interval width.

| Range of scores | No. of observations | No. of intervals | Approximate interval width |
|---|---|---|---|
| 16–38 | 100 | _____ | _____ |
| 21–87 | 50 | _____ | _____ |
| 5–34 | 150 | _____ | _____ |
| 1–20 | 40 | _____ | _____ |

$7.64 \approx 8$, $2.75 \approx 3$
$6.64 \approx 7$, $9.43 \approx 9$
$8.23 \approx 8$, $3.635 \approx 4$
$6.32 \approx 6$, $3.17 \approx 3$

5. It is usually best to have class intervals of equal _____. The width used should be _____ to work with.

width

convenient

6. Each observation in a set of data should be classified into one and only one of the _____.

class intervals

7. After you select class intervals and classify each observation into one of the intervals, you should make a count of the number (frequency) of observations falling into each interval. The result is a _____.

frequency distribution

8. We usually show a frequency distribution as a _____ or _____.

table, graph

9. If the values of a given set of observations range from 10 through 44, an acceptable set of class intervals

7

5

might be _____ intervals with widths of _____ units each.

10. From the data in the preceding exercise, compute true class limits.

-14.5

9.5-_____

14.5-19.5

_____

19.5-24.5

_____

24.5-29.5

_____

29.5-34.5

_____

34.5-39.5

_____

39.5

_____-44.5_____

11. You can convert a frequency distribution for a set of observations to a _____ distribution by dividing the _____ (number of observations) in each class interval by the total number of observations. The resulting _____ frequency for each interval is the _____ of the total number of observations that fall into that interval.

relative frequency

frequency

relative

proportion

12. You can convert a frequency distribution for a set of observations to a _____ frequency distribution by adding the frequency of each class interval to the total frequency of all _____ intervals.

cumulative

preceding