PRISCILLA CHAFFE-STENGEL
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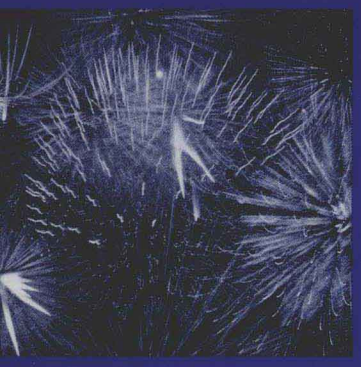
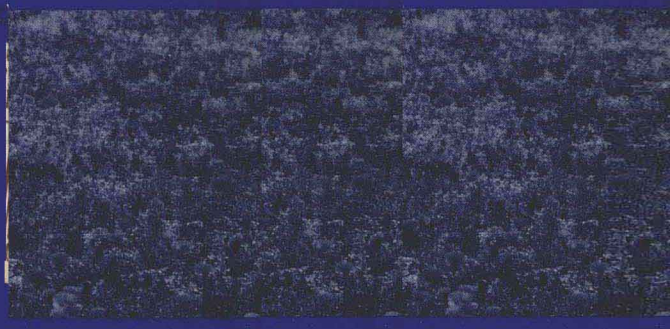


STUDY GUIDE

INTRODUCTION TO BUSINESS STATISTICS



SECOND EDITION

RONALD M. WEIERS

STUDY GUIDE

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INTRODUCTION TO BUSINESS STATISTICS

SECOND EDITION

RONALD M. WEIERS
Eberly College of Business
Indiana University of Pennsylvania

Duxbury Press
An Imprint of Wadsworth Publishing Company
Belmont, California

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ISBN: 0-534-51088-4 (previously ISBN: 0-03-097846-7)

Printed in the United States of America

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Scales of Measurement

Nominal	*Ordinal*	*Interval*	*Ratio*
Labels can be numerical for various levels of a categorical variable.	Numerical labels representing an order that indicates either preference or ranking.	Numerical labels that indicate order and distance between elements. No absolute zero and multiples of measured values are not meaningful.	Numerical labels that indicate order and distance between elements, like interval scale. Has absolute zero and multiples are meaningful.

Examples of Scales of Measurement

Nominal: Suppose we have a variable that registers what political party a voter belongs to, where the various levels are: (1) Republican (2) Democrat (3) Libertarian (4) Peace & Freedom.

Note: Republicans do not "win" because they are listed first, and a Democrat is **not** worth two Republicans, so neither order nor distance are implied.

Ordinal: Suppose we have a variable that registers my favorite lunch items, where the various levels are: (1) Sandwich (2) Salad (3) Soup.

Note: Sandwich **does** win because this is an ordinal variable and it is listed first in my preferred lunch items. But, I do **not** prefer sandwiches three times more than soup or twice as much as salad. Order is implied, but distance between choices is not implied.

Notes to the Student

The Importance of Rehearsal

Practice makes more than perfect; practice makes understanding.

Most students expect to rehearse in preparation for physical performances. Very few students bring the same preparation to mental performances. Learning is a complex process that is strengthened by practice. Each time you work a problem, different aspects of the problem become clearer, even though you move through the solution more quickly. You refine the mechanical procedures to the point that you begin to focus on the connections between the steps and the underlying logic of the solution. Practice makes more than perfect; practice makes understanding.

Your study of statistics will be greatly enhanced if you work problems several times.

Your study of statistics will be greatly enhanced if you work problems several times. Select problems for review that represent characteristic types of questions to give yourself practice at recognizing different problem types. Also include in your set of problems for review any problem that you initially had trouble solving.

If time allows, make a set of flashcards for yourself.

If time allows, make a set of "flashcards" for yourself. On one side of the card, either write out the problem and its directions or paste a photocopy of it. On the other side of the card, write down where the problem came from and its complete solution. Shuffle the flashcards. Go through them one by one, working each one on fresh paper and then checking your solution against the answer on the back of the card. If you get it right, put a mark on the back. When you have gotten the problem right several times in a row, move the card into another stack that you review less frequently.

Being able to quickly recognize the type of problem can greatly reduce the amount of time it takes you to complete quizzes and examinations.

Make out new flashcards to add to your current stack as you progress into new material. Every so often, review the stack of mastered cards to see if you can still work the problems. If you miss an old problem, move it into your current stack for more frequent review. Always reshuffle your stack before you begin to work through the cards. That way, you will get practice in deciding what kind of problem it is, a skill that can greatly reduce the amount of time it takes you to complete quizzes and examinations.

Statistics as a Foreign Language

Keep track of words that are new to you or words that have new meanings when used in statistics.

While it seems funny to say statistics is a foreign language, in a very real sense that is true. In your study of statistics, you will encounter new words, new ways of saying things and new ways of thinking about things. But you can't speak the language until you know its vocabulary. As you study statistics, keep track of words that are new to you or words that have new meaning when they are used in statistics. Also include on your list statistic symbols and what they stand for. Your list will help you be more precise in what you say and how you think about statistics. It will also be a valuable asset as you study for quizzes and examinations.

Problem-Solving Strategies

Our research has shown that good problems solvers use a number of strategies in helping themselves to understand the problem.

Read and reread the problem. Can you restate the problem?

Good problem solvers read and reread the problem. If it doesn't make sense the first time, read the problem again. Sometimes imagining you are in the problem, one of the people involved in the setting and its action, will help you see what is going on in the problem. If rereading the problem doesn't help, try restating it as if you were telling a friend about it. Restating the problem can lead you to interpret key information in a new light.

Focus on the question.

Good problem solvers focus on the question. The question must be specific enough to lead you to a single answer. Let the question tell you what to do.

Recognizing the classes of problems helps you to apply all the things you already know.

Good problem solvers recognize classes of problems and let the problem's classification help them decide how to solve it. Recognizing the problem type is valuable because it helps you apply all the things you have already learned about that kind of problem and how to solve it.

Reflect on the answer. Is it plausible?

Good problem solvers reflect on the answer they derive, checking to see if the answer and the procedure are plausible. The problem solver can be derailed by such simple errors as key formulas being miscopied or the wrong keys punched on a calculator.

Eliminate ways the problem cannot be solved.

Good problem solvers are flexible. When you continue to have trouble with the problem, try some different strategies. Sometimes it helps to recognize how the problem cannot be solved, thereby eliminating alternatives and focusing your attention on those remaining paths that represent feasible alternatives.

Ask for help. Be specific.

Good problem solvers get help when they have reached an impasse. Know where you can get help on campus. Sometimes centralized tutoring is offered, and may even be available on a 'drop-in' basis. Ask questions in class, or go see the instructor in his/her office. Work together with other students in the class. If you are still having trouble, consider hiring an individual tutor. All tutoring, whether student-to-student or instructor-to-student, is more effective when you can pinpoint where you are having trouble. Try to be as specific as possible about the trouble you are having.

Getting Organized

Organize your papers.

As the term begins, set up a notebook, a folder, or a binder in which to keep the course information. Keep there your class notes, homework assignments, study notes, quizzes and examinations to date, as well as class handouts. Don't forget to include questions from the quizzes and examinations in your set of flashcards for review.

Make study notes containing a list of equations, an outline of the chapters covered, and chapter overviews.

Study notes can be very helpful. Make a list of all the equations you have covered. Try outlining the chapters you have covered. Use the chapter summaries in this book to help you visualize the critical concepts and the connections between them. Create your own chapter overviews to supplement those provided in this book. Ask your instructor if he/she would look over your study notes to see if you have correctly characterized the important ideas. Save these notes through the year. They will not only be valuable study aids for you, but they will help you remember the information for use in other classes and in the world you enter as a college graduate.

Manage your time carefully. Set long-term goals that reflect your real aspirations, and then establish short-term goals to lead you toward achievement.

Organize and manage your time, day-by-day and week-by-week. Modern students often have many demands placed on their time, requiring them to balance time and attention given to college, work, family, personal and social lives. It's your life. Set long-term goals that reflect your real aspirations. Look at your long-term goals and see what you need to accomplish in the short term to keep you on track toward your lifetime ambitions. Set short-terms goals for yourself and achieve them, realizing short-year goals add up over time. Don't let your classwork fall behind. If you miss a class, talk with one or two students to find out what you missed.

Studying Together

Study groups are an effective way to enhance what you learn during the year.

Formal and informal study groups are very effective ways to enhance what you learn during the term.

Informal groups can operate by telephone.

Informal groups can operate by telephone. Exchange telephone numbers with a few students in the class, and find out generally when they are home and when they study for the class. When you have trouble with homework or questions while you study, call other students to see if they can explain it to you. If none of your group can answer the question, contact the instructor or a tutor for help.

Formal groups meet regularly.

Formal arrangements for a small group to meet regularly provide the most productive environment to learn in, even if it is more time-consuming in the short term. After establishing a formal study group, swap off the responsibility to explain different problems to the other group members. If no one can explain a problem, designate a member to ask for help from the instructor. Sometimes groups can contract for a tutor to join them during their study group meeting, splitting any cost amongst the members.

Handling the Stress

Stress is part of your life. Learning to manage it is crucial to your success in school and your continued health and well-being. Several strategies can help you manage it.

When the task before you looks overwhelming, cut it down into manageable pieces.

When the task before you looks overwhelming, cut it down into manageable pieces. Setting short-term, realistic goals can give you a plan for success, while at the same time relieving the sense of panic you feel when you look at the larger picture.

Decide what you want to accomplish and stick to it.

Plan your time in terms of all the deadlines you face. Prioritize your responsibilities and write them down. Develop a schedule in terms of your priorities. Sometimes it is important to realize you can't do everything. Decide what you can accomplish and stick to it.

If you feel frayed around the edges, make an appointment and go talk to a counselor.

Most campuses have counseling assistance centers available for student use. If you feel frayed around the edges, make an an appointment and go talk to a counselor. They are trained to help and they understand the pressures you face. Asking for help doesn't mean we are weak. We all need help at some point. Asking for help when we need it is a natural part of our lives.

About This Book

Unique Organization

This book has a unique organization. Every chapter has Chapter Summaries, Problem Solution, Exercise Sets, and Self Examinations. It is designed in such a way that it can be used with almost any business statistics book. See the cross-referenced table on the next page.

Chapter Summaries have been designed to highlight key concepts presented in each chapter and show the relationships between them. The Summaries are graphic overviews of the chapter's information, incorporating flow charts, graphic organizers, explanatory text, and examples. This feature is unique to this study guide. No other study guide uses the graphic design of information to the extent this book does. Take a moment and thumb through one of the chapters to see what we mean.

***Chapter Summaries** are graphic overviews of the chapter's information.*

The Chapter Summaries are not designed to replace reading the text, but to supplement your reading of it. You can review the Chapter Summaries before you read the chapter to derive a global sense of what the chapter is all about. You can review them after you read the chapter to check that you got the major ideas from your reading. You can use them to study for quizzes and examinations.

Chapter Summaries are designed to supplement your reading of the text.

Problem Solutions contain detailed solutions of each of the chapter's major types of problems. The annotated style of the Problem Solutions is exemplified here with the two-column presentation, one for the step-by-step solution and the other for what you should be thinking about as you perform the step and solve the problem. The design of the Problem Solutions is also a unique feature of this book. Take another moment and thumb through one of the chapters to see the level of detail captured in the italicized annotated comments.

The annotated style of the Problem Solutions is exemplified here with the two-column presentation.

*The **Exercise Sets** are designed to give you practice in solving problems typical of each chapter.*

Each chapter contains an Exercise Set designed to give you practice in solving problems typical of the chapter. Complete solutions to the exercises follow each set.

*The **Self-Examinations** will give you an opportunity to practice test-taking strategies.*

Each chapter closes with a Self-Examination presented in a multiple-choice format featuring problems like those you might see on examinations. Solutions are provided and annotated with relevant chapter topics, allowing you to review chapter topics if you encounter difficulty.

Using This Book with Other Texts

While this book was designed to accompany *Introduction to Business Statistics* by Ronald M. Weiers, the topics covered in it are generic to most business statistics books. Below is a cross-referenced list of topics covered in this book and their locations in other popular business statistics books to facilitate your use of this study guide.

CHAPTER AND KEY CONCEPTS FROM STUDY GUIDE	**Anderson Sweeney/ Williams 5th edition**	**Daniel/ Terrell, 6th edition**	**Hamburg 6th edition**	**Levin, 5th edition**	**McClave & Benson 6th edition**
Chapter 1—A Preview of Business Statistics					
Descriptive vs. inferential	Ch. 1	Ch. 2	Ch. 1	Ch. 1	Ch. 1
Types of variables	"	Ch. 2	"	Ch. 6	Ch. 2
Scales of measurement	"	Ch. 12	N/A	N/A	N/A
Chapter 2—Visual Description of Data					
Frequency distributions	Ch. 2	Ch. 2	Ch. 1	Ch. 2	Ch. 2
Visual displays	"	"	"	"	"
Chapter 3—Statistical Description of Data					
Measures of central tendency	Ch. 3	Ch. 2	Ch. 1	Ch. 3	Ch. 3
Measures of dispersion	"	"	"	Ch. 4	"
z-scores	"	Ch. 4	"	"	"
Grouped data	"	Ch. 2	"	Ch. 3,4	"

CHAPTER AND KEY CONCEPTS FROM STUDY GUIDE	Anderson Sweeney/ Williams 5th edition	Daniel/ Terrell, 6th edition	Hamburg 6th edition	Levin, 5th edition	McClave & Benson 6th edition
Chapter 4—Probability: Review of Basic Concepts					
Terms and approaches	Ch. 4	Ch. 3	Ch. 2	Ch. 5	Ch. 4
Unions and intersections of events	"	"	"	"	"
Addition rules	"	"	"	"	"
Multiplication rules	"	"	"	"	"
Probability trees	"	"	"	"	N/A
Independence	"	"	"	"	"
Bayes' Theorem	"	"	"	"	Ch. 20
Counting methods	"	"	"	N/A	App. A
Chapter 5—Discrete Probability Distributions					
Random variables	Ch. 5	Ch. 2,4	Ch. 3	Ch. 6	Ch. 5
Discrete vs continuous variables	"	"	"	"	"
Discrete uniform distribution	N/A	N/A	"	N/A	N/A
Binomial distribution	Ch. 5	Ch. 4	"	Ch. 6	Ch. 5
Hypergeometric distribution	"	"	"	N/A	"
Poisson distribution	"	"	"	Ch. 6	"
Chapter 6—Continuous Probability Distributions					
Continuous uniform distribution	Ch. 6	Ch. 4	N/A	N/A	Ch. 6
Normal distribution	"	"	Ch. 5	Ch. 6	"
Normal approximation to binomial	"	"	"	Ch. 6	"
Exponential distribution	"	N/A	N/A	N/A	"
Chapter 7—Sampling and Sampling Distributions					
Sample vs. census	Ch. 7	Ch. 2,14	Ch. 4	Ch. 7	Ch. 1
Error	"	Ch. 5	"	"	Ch. 7
Sampling designs	"	Ch. 14	"	"	Ch. 21
Sampling distributions	"	Ch. 5	Ch. 5	"	Ch. 7
Sampling distribution of the mean	"	"	"	"	"
Central limit theorem	"	"	"	"	"
Sampling distribution of the proportion	"	"	"	Ch. 8	Ch. 8
Finite population correction	"	"	"	Ch. 7	Ch. 7

CHAPTER AND KEY CONCEPTS FROM STUDY GUIDE	Anderson Sweeney/ Williams 5th edition	Daniel/ Terrell, 6th edition	Hamburg 6th edition	Levin, 5th edition	McClave & Benson 6th edition
Chapter 8—Estimation from Sample Data					
Point estimates	Ch. 7	Ch. 6	Ch. 6	Ch. 8	Ch. 8
Interval estimates	Ch. 8	"	"	"	"
Confidence intervals for mean	"	"	"	"	"
t-distribution	"	"	"	"	"
Confidence intervals for proportion	"	"	"	"	"
Sample size determination	"	"	"	"	"
Finite population correction	Ch. 7	"	Ch. 5	Ch. 7	Ch. 7
Chapter 9—Hypothesis Tests Involving a Sample Mean or Proportion					
Null and alternative hypotheses	Ch. 9	Ch. 7	Ch. 7	Ch. 9	Ch. 9
Two-tail vs one-tail tests	"	"	"	"	"
Errors and significance level	"	"	"	"	"
Test of the mean	"	"	"	"	"
Test of the proportion	"	"	"	"	"
p-values	"	"	"	"	"
Power of a hypothesis test	"	"	"	"	"
Chapter 10—Hypothesis Tests Involving Two Sample Means or Proportions					
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Pair differences test	"	"	"	"	"
Tests of two sample proportions	"	"	"	"	"
Test comparing the standard deviations of two independent samples	Ch. 11	"	N/A	N/A	"
Confidence intervals, two means	Ch. 10	Ch. 6	N/A	N/A	"
Confidence intervals, two proportions	"	"	N/A	N/A	"
Chapter 11—Analysis of Variance Tests					
Between and within groups variance	Ch. 13	Ch. 8	Ch. 8	Ch. 10	Ch. 17
One-way analysis of variance	"	"	"	"	"
Randomized block design	"	"	"	N/A	"
Two-way analysis of variance	"	"	"	N/A	"
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Comparing the proportions from independent samples	"	"	N/A	"	"
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Chapter 13—Nonparametric Methods					
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Wilcoxon rank sum test for two independent samples	"	"	"	"	"
Kruskal-Wallis test	"	"	"	"	"
Friedman test	N/A	"	N/A	N/A	"
Rank correlation, Spearman	Ch. 19	"	"	Ch. 13	"
Runs test for randomness	N/A	"	"	"	N/A
Kolmogorov-Smirnov test	N/A	N/A	N/A	"	N/A
Chapter 14—Simple Linear Regression and Correlation					
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Interval estimation from regression equation	"	"	"	"	"
Correlation analysis	"	"	"	"	"
Significance tests of regression coefficients	"	"	"	"	"
Residual analysis		"	N/A	N/A	N/A
Chapter 15—Multiple Regression and Correlation					
Multiple regression equation	Ch. 15	Ch. 10	Ch. 10	Ch. 12	Ch. 12
Interval estimation using multiple regression equation	"	"	N/A	"	"
Multiple correlation analysis	"	"	Ch. 10	"	"
Test of overall significance of multiple regression model	"	"	"	"	"
Significance test of multiple regression coefficients	"	"	"	"	"
Residual analysis	"	"	"	"	"

CHAPTER AND KEY CONCEPTS FROM STUDY GUIDE	Anderson Sweeney/ Williams 5th edition	Daniel/ Terrell, 6th edition	Hamburg 6th edition	Levin, 5th edition	McClave & Benson 6th edition
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