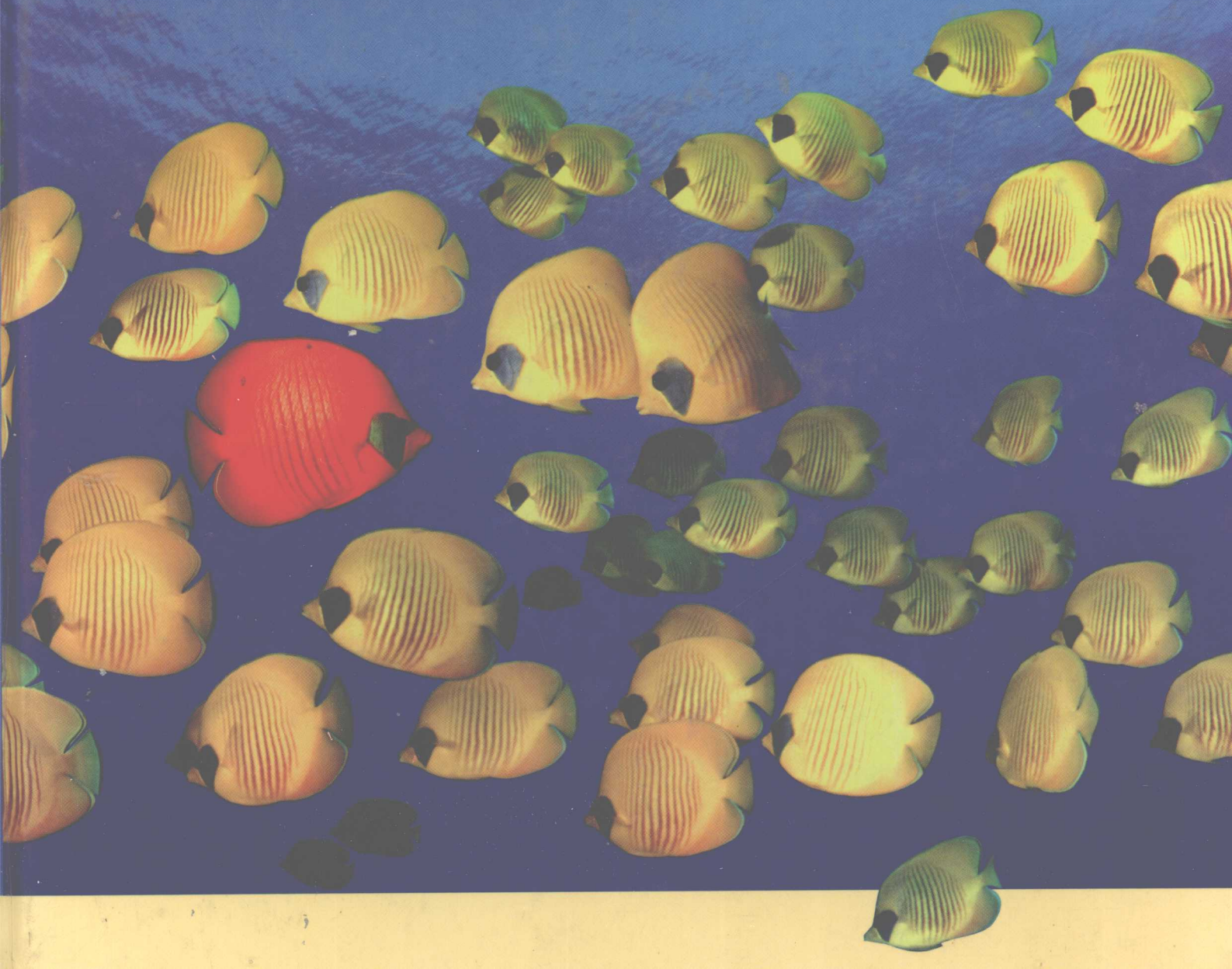
SIXTH EDITION

INTRODUCTORY STATISTICS

PREM S. MANN



Sixth Edition

INTRODUCTORY STATISTICS

PREM S. MANN

EASTERN CONNECTICUT STATE UNIVERSITY

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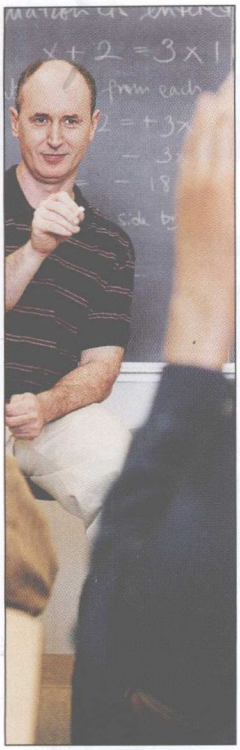

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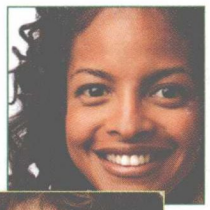

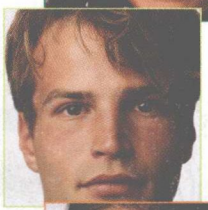

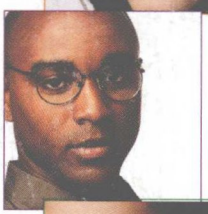

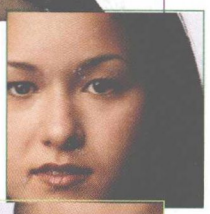

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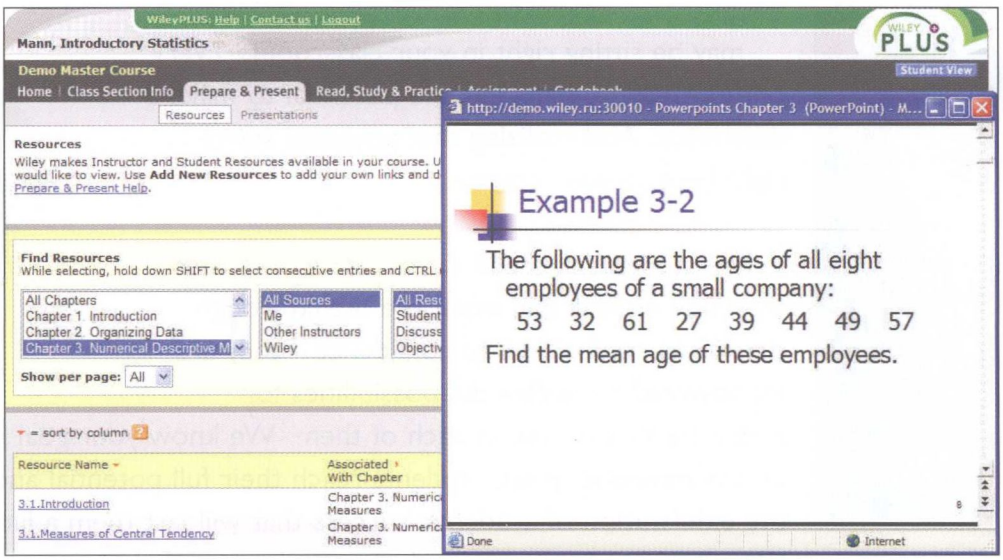

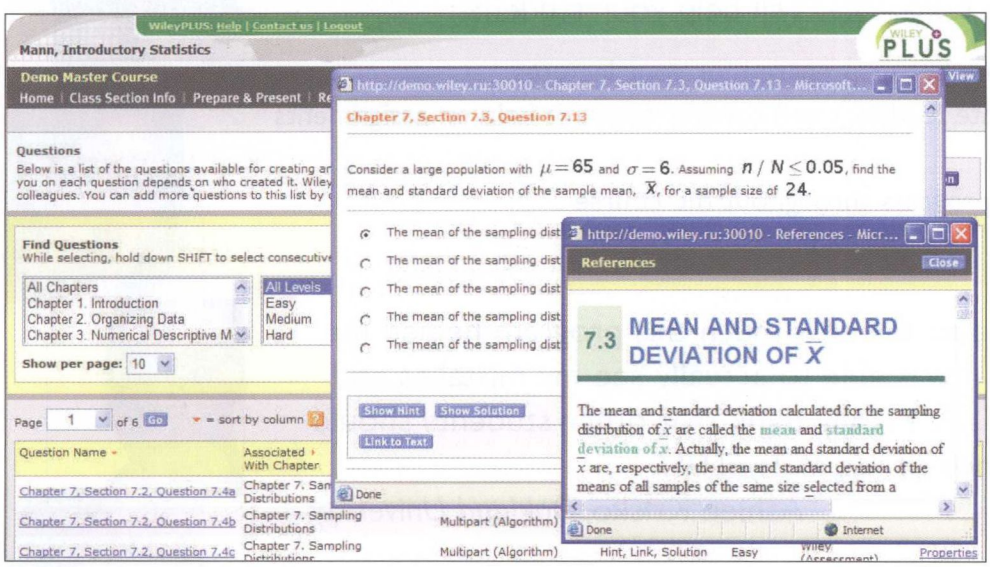

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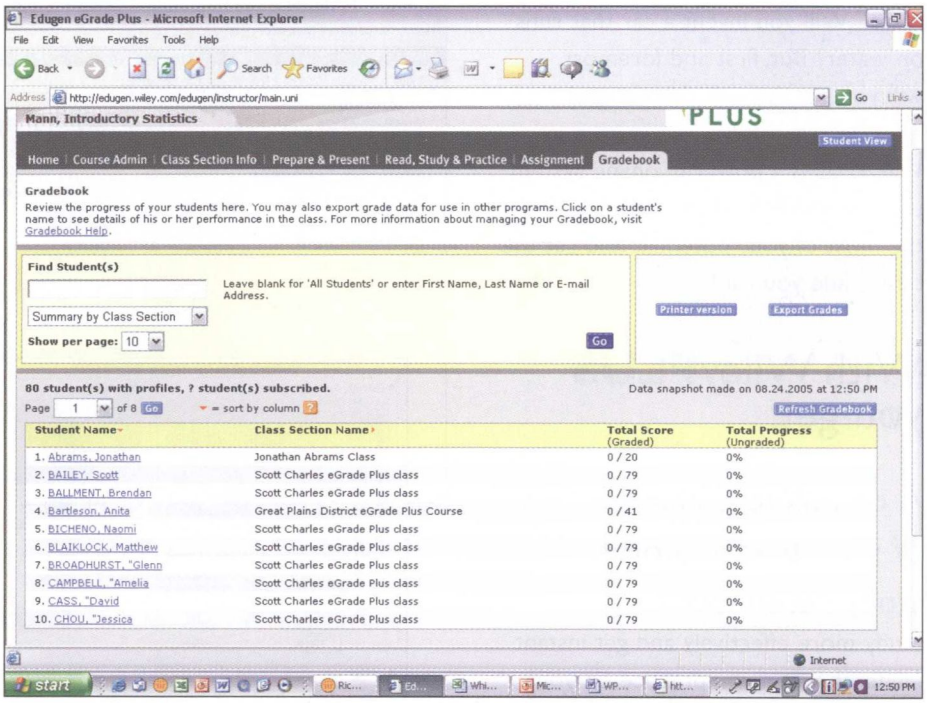

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76% of students surveyed said it made them better prepared for tests. *

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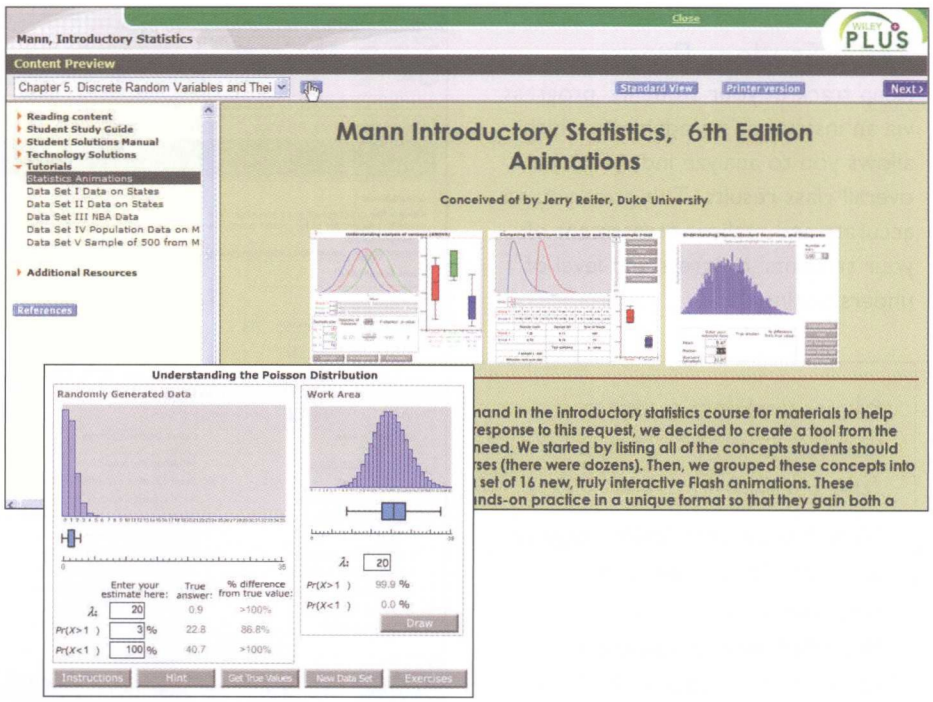

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"It has been a great help, and I believe it has helped me to achieve a better grade."

Michael Morris, *Columbia Basin College*

69% of students surveyed said it helped them get a better grade. *

WILEY PLUS

Sixth Edition

INTRODUCTORY STATISTICS

To my mother
and
to the memory of my father

PREFACE

After five very successful editions, we are honored to present the sixth edition of *Introductory Statistics* to instructors and students. This new edition features many improvements, changes, and updates.

Introductory Statistics is written for a one- or two-semester first course in applied statistics. The book is intended for students who do not have a strong background in mathematics. The only prerequisite for this text is a knowledge of elementary algebra.

Today, college students from almost all fields of study are required to take at least one course in statistics. Consequently, the study of statistical methods has taken on a prominent role in the education of students majoring in all fields of study. From the very beginning, the goal of this text has been to make the subject of statistics both interesting and accessible to such a wide and varied audience. Three major characteristics of this text support this goal:

1. The realistic content of its examples and exercises that draw on a comprehensive range of applications from all facets of life
2. The clarity and brevity of its presentation
3. The soundness of its pedagogical approach

These characteristics are exhibited through the interplay of a variety of significant text features.

The feedback received from the users of the fifth edition of *Introductory Statistics* has been very supportive and encouraging. This feedback from previous editions serves as evidence that the text is successfully making statistics interesting and accessible—a goal of the author from the very first edition. The author has pursued the same goal through the refinements and updates in this sixth edition so that *Introductory Statistics* will continue to provide a successful experience in statistics to growing numbers of students and professors.

New to the Sixth Edition

The following are some of the many significant changes made in the sixth edition of the text without changing its main features.

- A new section on dotplots has been added to Chapter 2.
- Chapters 8, 9, and 10 have been thoroughly revised to discuss the inference-making topics based on the population standard deviation σ being known and unknown.
- Chapter 9 on hypothesis testing now includes a comprehensive coverage of both the p-value approach and the critical-value approach. This feature is carried over to later chapters.
- A new chapter on multiple regression has been added (Chapter 14), which appears on the text's accompanying Web site.
- The chapter on nonparametric methods is now Chapter 15, and it also appears on the text's accompanying Web site.
- A new feature, *Decide for Yourself,* has been added to almost all chapters in the book. In these sections (which appear just before the Technology Instruction sections) real-world problems are discussed and questions are raised for readers to answer.

- The sections on Uses and Misuses of Statistics have been updated. Many new Uses and Misuses have been added to these sections.
- The Technology sections that appear at the end of chapters have been updated. These sections cover the instructions and screen shots for the TI-84 graphing calculator, MINITAB, and Excel.
- Updated chapter-opening vignettes incorporate real data presented in situations likely to be familiar to students.
- All data sets and a large number of examples and exercises have been revised and updated with current data. Many new data sets have been added. See Appendix B for details.
- Several Case Studies and Mini-Projects have been replaced or revised to reflect current data.
- The text has been rewritten wherever necessary to improve the readability and clarification of the concepts.

Hallmark Features of this Text

Style and Pedagogy

Clear and Concise Exposition The explanation of statistical methods and concepts is clear and concise. Moreover, the style is user-friendly and easy to understand. In chapter introductions and in transitions from section to section, new ideas are related to those discussed earlier.

Thorough Examples

Examples The text contains a wealth of examples, over 200 in 15 chapters and Appendix A. The examples are usually presented in a format showing a problem and its solution. They are well-sequenced and thorough, displaying all facets of concepts. Furthermore, the examples capture students' interest because they cover a wide variety of relevant topics. They are based on situations practicing statisticians encounter every day. Finally, a large number of examples are based on real data taken from sources such as books, government and private data sources and reports, magazines, newspapers, and professional journals.

Step-by-Step Solutions

Solutions A clear, concise solution follows each problem presented in an example. When the solution to an example involves many steps, it is presented in a step-by-step format. For instance, examples related to tests of hypotheses contain five steps that are consistently used to solve such examples in all chapters. Thus, procedures are presented in the concrete settings of applications rather than as isolated abstractions. Frequently, solutions contain highlighted remarks that recall and reinforce ideas critical to the solution of the problem. Such remarks add to the clarity of presentation.

Enlightening Pedagogy

Margin Notes for Examples A margin note appears beside each example that briefly describes what is being done in that example. Students can use these margin notes to assist them as they read through sections and to quickly locate appropriate model problems as they work through exercises.

Frequent Use of Diagrams Concepts can often be made more understandable by describing them visually with the help of diagrams. This text uses diagrams frequently to help students understand concepts and solve problems. For example, tree diagrams are used extensively in Chapters 4 and 5 to assist in explaining probability concepts and in computing probabilities. Similarly, solutions to all examples about tests of hypotheses contain diagrams showing rejection regions, nonrejection regions, and critical values.

Highlighting Definitions of important terms, formulas, and key concepts are enclosed in color boxes so that students can easily locate them.

Cautions Certain items need special attention. These may deal with potential trouble spots that commonly cause errors. Or they may deal with ideas that students often overlook. Special emphasis is placed on such items through the headings: *Remember*, *An Observation*, or *Warning*. An icon is used to identify such items. ◀

Case Studies Case studies, which appear in many chapters, provide additional illustrations of the applications of statistics in research and statistical analysis. Most of these case studies are based on articles/snapshots published in journals, magazines, or newspapers. All case studies are based on real data. **Realistic Applications**

Exercises and Supplementary Exercises The text contains an abundance of exercises (excluding Technology Assignments), approximately 1500 in 15 chapters and Appendix A. Moreover, a large number of these exercises contain several parts. Exercise sets appearing at the end of each section (or sometimes at the end of two or three sections) include problems on the topics of that section. These exercises are divided into two parts: **Concepts and Procedures** that emphasize key ideas and techniques, and **Applications** that use these ideas and techniques in concrete settings. Supplementary exercises appear at the end of each chapter and contain exercises on all sections and topics discussed in that chapter. A large number of these exercises are based on real data taken from varied data sources such as books, government and private data sources and reports, magazines, newspapers, and professional journals. Exercises given in the text do not merely provide practice for students, but the real data contained in exercises provide interesting information and insight into economic, political, social, psychological, and other aspects of life. The exercise sets also contain many problems that demand critical thinking skills. The answers to selected odd-numbered exercises appear in the *Answers Section* at the back of the book. **Optional exercises** are indicated by an asterisk (*). **Abundant Exercises**

Advanced Exercises All chapters (except Chapters 1 and 14) have a set of exercises that are of greater difficulty. Such exercises appear under the heading *Advanced Exercises* as part of the *Supplementary Exercises*.

Uses and Misuses of Statistics This feature at the end of each chapter (before the Glossary) points out common misconceptions and pitfalls students will encounter in their study of statistics and in everyday life. Subjects highlighted include such diverse topics as the use of the word *average* and grading on a curve.

***New!* Decide for Yourself** This new feature appears at the end of each chapter (except Chapter 1) just before the Technology Instruction section. In this section, a real-world problem is discussed and questions are raised about this problem that readers are required to answer.

Glossary Each chapter has a glossary that lists the key terms introduced in that chapter, along with a brief explanation of each term. Almost all the terms that appear in boldface type in the text are in the glossary. **Summary and Review**

Self-Review Tests Each chapter contains a *Self-Review Test*, which appears immediately after the *Supplementary Exercises*. These problems can help students test their grasp of the concepts and skills presented in respective chapters and monitor their understanding of statistical methods. The problems marked by an asterisk (*) in the *Self-Review Tests* are **optional**. The answers to almost all problems of the *Self-Review Tests* appear in the *Answer Section*.

Formula Card A formula card that contains key formulas from all chapters and the normal distribution and t distribution tables is included at the beginning of the book.

Technology Usage At the end of each chapter is a section covering uses of three major technologies of statistics and probability: the TI-84, MINITAB, and Excel. For each technology, students are guided through performing statistical analyses in a step-by-step fashion, showing them **Technology Usage**

how to enter, revise, format, and save data in a spreadsheet, workbook, or named and unnamed lists, depending on the technology used. Illustrations and screen shots demonstrate the use of these technologies. These sections are followed by *Technology Assignments* for further practice in the use of these technologies. Additional detailed technology instruction is provided in the technology manuals that are online at www.wiley.com/college/mann.

Data Sets Eight data sets appear on the Web site for the text located at www.wiley.com/college/mann. These data sets, collected from different sources, contain information on many variables. They can be used to perform statistical analyses with statistical computer software such as the TI-84 graphing calculator, MINITAB,[1] or Excel. **These data sets are available on the Web site of the text in MINITAB format, Excel format, and in Text format.**

Web Site

http://www.wiley.com/college/mann

The Web site for this text provides additional resources for instructors and students. The following resources/items are available on this Web site:

- Formula card
- Applications index
- Statistical animations
- Computerized Test Bank
- Sample tests
- Discussion questions
- Instructor's solutions manual
- Instructor's resource guide
- Eight large data sets (see Appendix B for a complete list of these data sets)
- Technology Resource Manuals (for all versions of the TI-83 and TI-84, MINITAB, and Excel)
  - **Graphing Calculator Manual** This manual is a basic guide for beginners on the TI-83, TI-83 Plus, and TI-84 graphing calculators. The authors guide students through the important facets of using a graphing calculator in statistics by presenting clear examples, calculator screen captures, and programs specific to each calculator. Note that the instructions included in this manual apply to **all versions of the TI-83 and TI-84** graphing calculators.
  - **MINITAB Manual** This manual provides step-by-step instructions, screen captures, and applications to guide students through using MINITAB for introductory statistics classes.
  - **Excel Manual** This manual contains worked examples using current real data and Excel for data analysis. The manual gives step-by-step instructions, screen captures to guide the students, as well as numerous applications of how to use Excel in statistics.
- Chapter 14: Multiple Regression
- Chapter 15: Nonparametric Methods

The users of this book can download Chapters 14 and 15 along with most of the above items from this Web site. If you need help with downloading or using any of these items please contact the publisher or the author.

[1]MINITAB is a registered trademark of Minitab, Inc., 3081 Enterprise Drive, State College, PA 16801. Phone: 814-238-3280; fax: 814-238-4383; telex: 881612.

Flexible Teaching Options

Because each instructor has different preferences, the text does not indicate optional sections. This decision has been left to the instructor. Instructors may cover the sections or chapters that they think are important. Instructors are most welcome to consult the author in this regard.

Supplements

The following supplements are available to accompany this text.

Complete Learning System

- **Instructor's Solutions Manual (ISBN 0-471-78164-9)** This manual contains complete solutions to all exercises and the *Self-Review Test* problems.
- **Instructor's Resource Guide (on the Web site only)** Sample syllabi, discussion questions, sample exams, suggested homework assignments, and transparency masters are included in this resource. Written for both the experienced and inexperienced instructor, the manual offers a clear overview of the course while outlining major topics and key points of each chapter.
- **Test Bank (ISBN 0-471-78165-7)** The **printed copy** of the test bank contains a large number of multiple-choice questions, essay questions, and quantitative problems for each chapter.
- **Computerized Test Bank** All questions that are in the printed *Test Bank* are available electronically and can be obtained from the publisher.
- **Student Solutions Manual (ISBN 0-471-75531-1)** This manual contains complete solutions to all of the odd-numbered exercises, a few even-numbered exercises, and all the *Self-Review Test* problems.
- **Student Study Guide (ISBN 0-471-75532-X)** This guide contains review material about studying and learning patterns for a first course in statistics. Special attention is given to the critical material of each chapter. Reviews of mathematical notation, formulas, and table reading are also included.
- **WileyPLUS—Expect more from your classroom technology** This text is supported by *WileyPLUS*—a powerful and highly integrated suite of teaching and learning resources. *WileyPLUS* includes a complete online version of the text, algorithmically generated exercises, all of the text supplements, plus course and homework management tools in one easy-to-use Web site. Organized around the everyday activities you perform in class, *WileyPLUS* helps you in many ways:
  - **Prepare and Present:** *WileyPLUS* lets you create class presentations quickly and easily using a wealth of Wiley-provided resources, including an online version of the textbook. You can adapt this content to meet the needs of your course.
  - **Create Assignments:** *WileyPLUS* enables you to automate the process of assigning and grading homework or quizzes. You can use algorithmically generated problems from the text's accompanying test bank, or write your own.
  - **Track Student Progress:** An instructor's gradebook allows you to analyze individual and overall class results to determine students' progress and level of understanding.
  - **Promote Strong Problem-Solving Skills:** *WileyPLUS* can link homework problems to the relevant section of the online text, providing students with context-sensitive help.
  - **Provide numerous practice opportunities:** Algorithmically generated problems provide unlimited self-practice opportunities for students, as well as problems for homework and testing.
  - **Administer Your Course:** You can easily integrate *WileyPLUS* with another course management system, gradebook, or other resources you are using in your class, enabling you to build your course your way.

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It is of utmost importance that a textbook is accompanied by complete and accurate supplements. I take pride in mentioning that the supplements prepared for this text possess these qualities and much more. I appreciatively thank the authors of all these supplements.

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Any suggestions from readers for future revisions would be greatly appreciated. Such suggestions can be sent to the author at mann@easternct.edu or premmann@yahoo.com.

Prem S. Mann
Willimantic, CT 06226
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