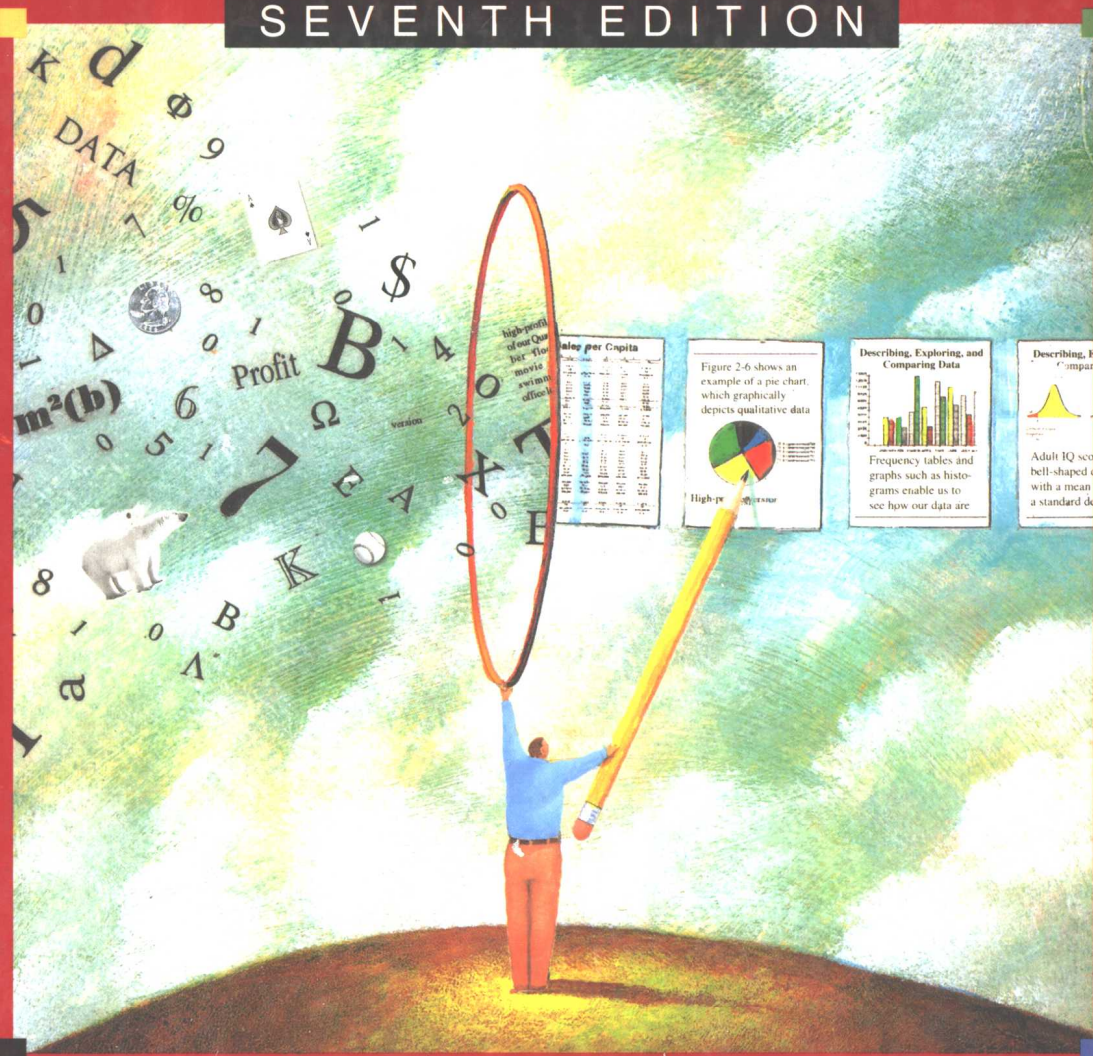


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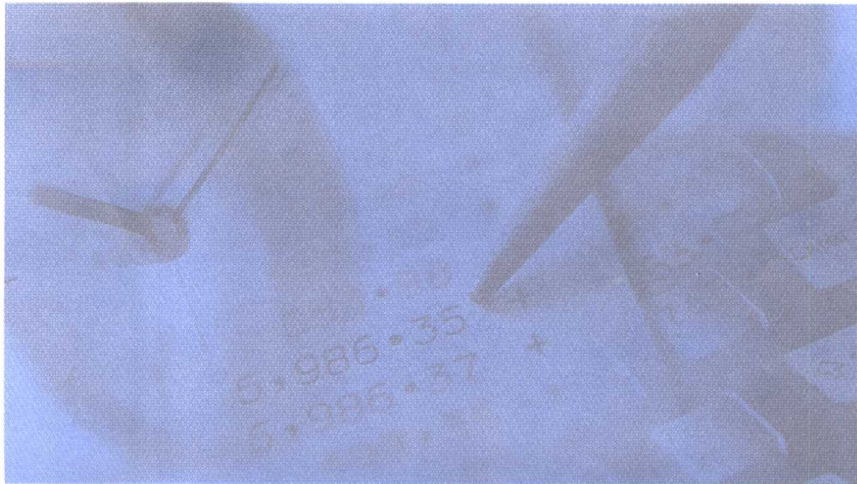
SEVENTH EDITION



MARIO F. TRIOLA

ELEMENTARY STATISTICS

SEVENTH EDITION



MARIO F. TRIOLA

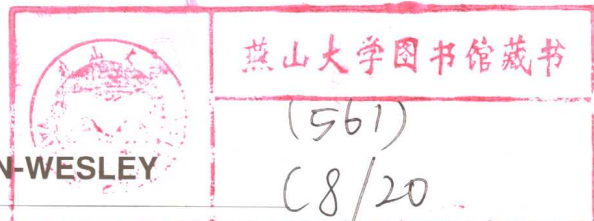


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ELEMENTARY
STATISTICS

SEVENTH EDITION

To Marc and Scott

About the Author

Mario F. Triola is a Professor of Mathematics at Dutchess Community College, where he has taught statistics, calculus, linear algebra, technical mathematics, programming, and other courses for 28 years. He is the author of *Mathematics and the Modern World* and *A Survey of Mathematics* and is a coauthor of *Introduction to Technical Mathematics* and *Business Statistics*. His consulting experience includes the mathematical design of casino slot machines, and he has worked with attorneys in determining probabilities in paternity lawsuits and identifying salary inequities based on gender. His interests include golf, running, tennis, and anything that flies. He has a commercial pilot's license with an instrument rating, and has flown airplanes, helicopters, sail planes, hang gliders, and hot air balloons. He has made parachute jumps, has flown in a Goodyear blimp, and has parasailed. He is currently a member of the Project Coalition writing team with NASA and the American Mathematics Association of Two-Year Colleges. He also enjoys travel. With his family, he has visited 49 of the United States, and he hopes to tour Kentucky soon. Other recent trips include a Kenyan photo safari, a rafting trip down the Colorado River through the Grand Canyon, hiking in Yellowstone National Park (and collecting data for the Old Faithful geyser) and travel to interesting sites in Egypt, Greece, Alaska, Scandinavia, and Eastern Europe.





Preface



Why Study Statistics?

In an interview with the author, David Hall, Division Statistical Manager for the Boeing Commercial Airplane Group, said, “Right now, American industry is crying out for people with an understanding of statistics and the ability to communicate its use.” Only a decade ago, students taking a statistics course enjoyed a competitive advantage in the job market, but today’s students suffer a competitive disadvantage if they have *not* studied basic concepts of statistics. Fortunately, technological advances in calculators and computers have made the required computations relatively easy, so we can focus more on understanding and interpreting results. It is also fortunate that dedicated educators are committed to the development of an introductory statistics course that is relevant, meaningful, interesting, and enjoyable.

Elementary Statistics, Seventh Edition, reflects the latest technological and teaching advances. Technological advances are reflected in the incorporation of, or reference to, several widely used technologies. For the first time, references to the TI-83[®] calculator, developed by Texas Instruments especially for use in statistics and business, have been included. The latest version of Minitab[®] statistical software continues to be featured in the book’s exhibits and exercises. Our free, text-specific software, STATDISK[®], has been completely reprogrammed for use with the new edition, and it now runs with Windows, Macintosh, and networks. A Web site has been developed to provide additional teaching resources for users of this edition.

Advances in teaching are incorporated through such features as the new **Cooperative Group Activities**, the **From Data to Decision** exercises, and the

Cumulative Review Exercises. We place a strong emphasis on using *real* data throughout the text and exercises, an increased emphasis on methods of data analysis, and an overall focus in examples and exercises on critical thinking and interpretation of results.

As with past editions of this book, the author and the publisher are committed to providing the best possible introductory statistics book for both instructors and students. We are gratified by the book's continued acceptance and by the positive feedback we receive from users. Any additional comments about *Elementary Statistics* are most welcome. Please send them to the Addison-Wesley Statistics Editor or e-mail them to stats@aw.com.

Audience

Elementary Statistics is written for students majoring in any field except mathematics. A strong mathematics background is not necessary, but students should have completed a high school or college elementary algebra course. Although underlying theory is included, this book does not stress the mathematical rigor more suitable for mathematics majors. Because the many examples and exercises cover a wide variety of different and interesting statistical applications, *Elementary Statistics* is appropriate for students pursuing majors in a wide variety of disciplines ranging from the social sciences of psychology and sociology to areas such as education, the allied health fields, business, economics, engineering, the humanities, the physical sciences, journalism, communications, and liberal arts.

Overview of the Seventh Edition

Highlights of the Seventh Edition include:

Content Changes

- A rewritten *Correlation and Regression* chapter (Chapter 9), which facilitates early coverage of these topics for instructors who prefer this approach. Alternative syllabi are also provided in the *Annotated Instructor's Edition* to show how this early coverage can be presented.
- Expanded coverage of design of experiments in Chapter 1.
- Increased emphasis on techniques of data analysis.
- Increased emphasis on conceptual understanding and interpretation throughout every section and exercise set.
- **NEW sections:** Estimating population means with small samples (Section 6-3), finding scores with nonstandard normal distributions

(Section 5-4), the Poisson distribution (Section 4-5), and end-of-semester group projects (Section 14-1).

New Features

- **Cooperative Group Activities** are included for the first time at the end of each chapter to provide activities that increase understanding and interest through active student participation.
- **Cumulative Review Exercises**, also included at the end of each chapter, are designed to reinforce learning and extend conceptual understanding by including topics from earlier chapters.
- **Answers to all Review Exercises and Cumulative Review Exercises** are included in both the *Annotated Instructor's Edition* and the *Student Edition*.
- **TI-83[®] calculator comments**, where appropriate, are included in the text, and there is a new supplement: *The TI-83[®] Companion to Elementary Statistics*, by Larry Morgan of Montgomery County Community College.

Exercises

There are 1357 exercises—60 percent of them new! Many more of the exercises require interpretation of results. Because exercises are of such core importance to any statistics book, great care has been taken to ensure their usefulness, relevance, and accuracy. Three statisticians have read carefully through the final stages of the book to attest to the precision of the text material, the usefulness of the annotations, and, above all, the accuracy of every exercise answer. Exercises are arranged in order of increasing difficulty by dividing them into two groups: (a) Basic Skills and Concepts and (b) Beyond the Basics. The Beyond the Basics exercises address more difficult concepts or require a somewhat stronger mathematical background. In some cases, these exercises also introduce a new concept.

Hallmark Features

Beyond an interesting and accessible (and sometimes humorous) writing style, great care has been taken to ensure that each chapter of *Elementary Statistics* will help students understand the concepts presented. The following features are designed to help meet that objective:

- **Chapter-opening features:** A list of chapter sections with a brief description of their contents previews the chapter for the student; a chapter-opening problem, using real data, then motivates the chapter material; and a chapter overview provides a statement of the chapter's objectives.
- **End-of-chapter features:** A **Vocabulary List** of important terms (a full glossary is found in Appendix D); a **Chapter Review**, which summarizes the key concepts and topics of the chapter; **Review Exercises** for practice on the chapter concepts and procedures; **Cumulative Review Exercises** to reinforce earlier material; **Computer Projects** for use with Minitab and STATDISK softwares; **From Data to Decision**, a capstone problem requiring critical thinking and a writing component; and **Cooperative Group Activities** to encourage active learning in groups.
- **Margin Essays:** The text includes 116 margin essays, which illustrate uses and abuses of statistics in real, practical applications. Topics include "Predicting the Stock Market," "Statistics: Jobs and Employers," "Statistics in Court," "Census 2000," and "Six Degrees of Separation."
- **Flowcharts:** These appear throughout the text to simplify and clarify more complex concepts and procedures.
- **Real Data Sets:** These are used extensively throughout the entire book. Appendix B lists 16 data sets, 10 of which are new. These data sets are provided in printed form in Appendix B at the back of the book, and in electronic form either on a data disk (Windows or Macintosh formats) available from the publisher, or on the Addison-Wesley Web Site for the new edition. The data sets include such varied topics as eruptions of the Old Faithful geyser, nicotine contents of cigarettes, acid rain, and measurements of wild bears, and they include such topics as how often Old Faithful erupts, the weight of household garbage for one week, and Maryland Lottery results.
- **Interviews:** The text includes nine author-conducted interviews with professionals who use statistics in their day-to-day work.
- **Six appendices:** Appendix A contains tables; Appendix B lists 16 data sets; Appendix C describes the use of the Internet and lists several relevant Web sites; Appendix D is a glossary of important terms; Appendix E is a bibliography of recommended text and reference books; Appendix F contains answers to all the odd-numbered section exercises, as well as *all* answers to Review Exercises and Cumulative Review Exercises.
- **Quick-Reference Endpapers:** A symbol table is included on the front inside cover for quick and easy reference to key symbols. Tables A-2 and A-3 (the normal and t distributions) are reproduced on the back inside cover pages.

- **Detachable Formula/Table Card:** This insert, organized by chapter, gives students a quick reference for studying, or for use when taking tests (if allowed by the instructor).

Technology Usage

Elementary Statistics, Seventh Edition, can be used without reference to any specific technology. However, for those who choose to supplement the course with technology, **Computer Projects** are included at the end of each chapter, and particular examples and exercises are designated with a graphing calculator symbol to indicate that they are highlighted in an accompanying TI-83® graphing calculator manual designed specifically for this text.

Two different levels of software are available—STATDISK and Minitab—and their use is discussed with sample displays throughout the book. The data sets in Appendix B (except Data Set 2) are available on disk for use with either software.

STATDISK STATDISK is an easy-to-use statistical software package developed specifically for use with *Elementary Statistics*, and it is *free* to college-level adopters of the book. The new Version 7.0 of STATDISK is available for IBM PC and compatible computers using Windows and for Macintosh systems.

The *STATDISK Student Laboratory Manual and Workbook* includes instructions on the use of the STATDISK software package, as well as experiments to be conducted by students. The software and manual/workbook have been designed so that instructors can assign computer experiments without using valuable class time.

Minitab For those who wish to use Minitab, Minitab displays have been included throughout the text, and references are made to Minitab Release 11 for Windows, Windows 95, or Windows NT.

The *Minitab® Student Laboratory Manual and Workbook* is designed specifically for *Elementary Statistics*. It includes instructions on the use of Minitab, as well as experiments to be conducted by students.

Calculators

New to this edition are examples and exercises designated with a graphing calculator icon identifying those examples and exercises that are particularly good for graphing calculator usage. Though many calculators can be used in introductory statistics courses, the TI-83® calculator is the one specifically referred to in this text. The TI-83® is the first calculator to have fairly extensive statistics functions.

The TI-83[®] Companion to Elementary Statistics, Seventh Edition, by Larry Morgan (Montgomery County Community College) is organized to follow the sequence of the text topics. It includes step-by-step instructions on the use of the TI-83[®], along with worked-out examples. Additional TI-83[®] programs are located on the Data/Program Disk that accompanies the textbook, and these programs are also available on the Web site for the Triola textbook.

Supplements

The student and instructor supplements packages are intended to be the most complete and helpful learning system possible for the introductory statistics course. The following are available from Addison Wesley Longman Publishing Company. Contact your local sales consultant, or call the company directly at 1-800-552-2499 for examination copies.

For the Instructor

- *Annotated Instructor's Edition*, by Mario F. Triola, contains answers to all exercises in the margin, recommended assignments, and teaching suggestions. ISBN: 0-201-85921-1. (Student for-sale edition ISBN: 0-201-85920-3).
- *Instructor's Guide and Solutions Manual*, by Mario F. Triola, contains solutions to all the exercises, quizzes (with answers), transparency masters, and sample course syllabi. ISBN: 0-201-85922-X.
- *Data/Program Disk*, prepared by Mario F. Triola, includes the data sets (except for Data Set 2) from Appendix B in the textbook. These data sets are stored both as text files and as Minitab worksheets. The disk also includes programs for the TI-83[®] graphing calculator. Windows Data/Program Disk ISBN: 0-201-85931-9; Macintosh Data/Program Disk ISBN: 0-201-85932-7.
- **STATDISK Statistical Software**, developed by Password, Inc., specifically for the Triola text, is a statistical software package (for both Windows and Macintosh) licensed *free* to adopters of *Elementary Statistics*, Seventh Edition. This software is provided to the instructor in a variety of ways—either on disk for loading on to school computers, or for the students to copy onto their own disks. STATDISK Windows Software ISBN: 0-201-85926-2; STATDISK Macintosh Software ISBN: 0-201-85927-0.
- **Testing System**: Great care has been taken to ensure the strongest possible testing system for the new edition of *Elementary Statistics*. Not only is there a printed test bank, there is also a *new* computerized test generator, **TestGen-EQ**, that lets you view and edit testbank questions, transfer them to tests, and print in a variety of formats. The program

also offers many options for organizing and displaying test banks and tests. A built-in random number and test generator makes **TestGen-EQ** ideal for creating multiple versions of tests and provides more possible test items than print testbank questions. Powerful search and sort functions let the instructor easily locate questions and arrange them in the preferred order. Printed Testbank ISBN: 0-201-85930-0; TestGen-EQ Windows ISBN: 0-201-85928-9; TestGen-EQ Macintosh ISBN: 0-201-85929-7.

- **PowerPoint® Lecture Presentation:** Free classroom lecture presentation software geared specifically to the sequence and philosophy of *Elementary Statistics*, prepared by Cheryl Slayden and Bob Maschak of Pellissippi State Technical College. Key graphics from the book are also included. Windows version ISBN: 0-201-31612-9; Macintosh version ISBN: 0-201-33154-3.
- **Triola Elementary Statistics Web Site:** This Web site can be accessed at <http://www.triolastats.com>, and will be continually changing to provide dynamic resources for the teaching of introductory statistics.

For the Student

- ***Student Solutions Manual***, by Milton Loyer, provides detailed, worked-out solutions to all odd-numbered exercises. ISBN: 0-201-85923-8.
- ***STATDISK Student Laboratory Manual and Workbook***, written by Mario F. Triola, includes experiments to be conducted by students using STATDISK software, either in the computer lab, or for out-of-class assignments. ISBN: 0-201-85925-4.
- ***Minitab® Student Laboratory Manual and Workbook***, written by Mario F. Triola, includes instructions on and examples of Minitab use. It also supplies many computer experiments to be conducted, which allows further exploration of statistical concepts. ISBN: 0-201-85924-6.
- ***TI-83® Companion to Elementary Statistics***, Seventh Edition, by Larry Morgan (Montgomery County Community College) is organized to follow the sequence of topics in the text, and is a careful, step-by-step guide to how to use the TI-83® graphing calculator. It provides worked-out examples to help students fully understand and use the graphing calculator. ISBN: 0-201-30727-8.

Also Available from the Publisher . . .

For the last decade, Addison-Wesley Publishing Company has enjoyed an important partnership with Minitab, Inc., through our publication of the popular *Student Editions of Minitab*. *The Student Editions of Minitab* provide a somewhat reduced version of Minitab professional software (which

allows the user access to 3500 data points and to a full range of Minitab functionalities and graphics capabilities), and an accompanying manual (which includes case studies and hands-on tutorials). Currently available Student Editions are:

Student Edition of Minitab for Windows ISBN: 0-201-59157-X

Student Edition of Minitab, Release 8 for DOS ISBN: 0-201-83590-8

Student Edition of Minitab, Release 8 for the Macintosh ISBN: 0-201-83591-6

Addison-Wesley is also pleased to offer yet another statistical software product, *Data Desk Version 5.0 for Macintosh* and *Data Desk 6.0 for Windows*. *Data Desk*® is an interactive and highly graphical statistics software program originally developed by Paul Velleman, a recognized leader in statistics education, at Cornell University in the mid-1980s. It is now used by thousands of institutions and individuals around the world in both teaching and research. Combining the philosophy and concepts of Exploratory Data Analysis with a full range of traditional statistical techniques, *Data Desk*'s dynamic displays, drag-and-drop interface, and linked plots allow users to gain exciting insights into the nature and uses of data.

Data Desk Student Version 6.0 for Windows ISBN: 0-201-25831-1

Data Desk Student Version 5.0 for the Macintosh ISBN: 0-201-57124-2


Any of these products can be purchased separately, or bundled with Addison-Wesley texts. Instructors can contact local sales consultants for details or contact the company at 1-800-552-2499 for examination copies of any of these items.

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M.F.T.
LaGrange, New York
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