

About the Book

Yes, a preface is supposed to be “about this book”—and we’ll get there—but first we want to talk about the bigger picture: the ongoing growth of interest in Statistics. These days it seems Statistics is everywhere, from Major League Baseball’s innovative StatsCast analytics to the challenges of predicting election outcomes to *Wall Street Journal* and *New York Times* articles touting the explosion of job opportunities for graduates with degrees in Statistics. Public awareness of the widespread applicability, power, and importance of statistical analysis has never been higher. Each year, more students sign up for Stats courses and discover what drew us to this field: it’s interesting, stimulating, and even fun. Statistics helps students develop key tools and critical thinking skills needed to become well-informed consumers, parents, and citizens. We think Statistics isn’t as much a math course as a civics course, and we’re delighted that our books can play a role in preparing a generation for life in the Information Age.

New to the Fifth Edition

This new edition of *Stats: Modeling the World* extends the series of innovations pioneered in our books, teaching Statistics and statistical thinking as it is practiced today. We’ve made some important revisions and additions, each with the goal of making it even easier for students to put the concepts of Statistics together into a coherent whole.

- ◆ **More extensive, and more integrated, use of simulations.** Previous editions all incorporated simulations, but in the fifth edition we’ve incorporated even more of them, and they’re now integrated more fluidly with the text. There’s hardly a chapter that doesn’t use simulations to motivate a new topic, or to illustrate a concept, or to assist in analyzing data when traditional methods requiring strong assumptions or cumbersome computations are insufficient.
- ◆ **Applets.** Margin pointers alert students to an innovative set of applets allowing them to explore important concepts and develop deeper understanding of key ideas. Among these: What does standard deviation mean? How might outliers affect our analyses? What does a correlation reveal about a relationship? How does linear regression work? How large should a sample be? What does the all-important Central Limit Theorem say? What does “95% confident” mean? How does hypothesis testing work, and what is a P-value? What are power and Type I and II errors, and how are they interrelated? The applets are found on the book’s Web site.
- ◆ **Updated examples, exercises, and data.** We’ve updated our innovative *Think/Show/ Tell Step-by-Step* examples with new contexts and data. We’ve added hundreds of new exercises and updated continuing exercises with the most recent data. Whenever possible, we’ve provided those data on the book’s Web site. Most of the examples and exercises are based on recent news stories, research articles, and other real-world sources. We’ve listed many of those sources so students can explore them further.

Our Goal: Read This Book!

The best text in the world is of little value if students don't read it. Starting with the first edition, our goal has been to create a book that students would willingly read, easily learn from, and even like. We've been thrilled with the glowing feedback we've received from instructors and students using the first four editions of *Stats: Modeling the World*. Our conversational style, our interesting anecdotes and examples, and even our humor¹ engage students' interest as they learn statistical thinking. We hear from grateful instructors that their students actually do read this book (sometimes even voluntarily reading ahead of the assignments). And we hear from (often amazed) students that they actually enjoyed their textbook.

Here are some of the ways we have made *Stats: Modeling the World*, Fifth Edition, engaging:

- ◆ **Readability.** You'll see immediately that this book doesn't read like other Statistics texts. The style is both colloquial and informative, enticing students to actually read the book to see what it says.
- ◆ **Informality.** Our informal style doesn't mean that the subject matter is covered superficially. Not only have we tried to be precise, but wherever possible we offer deeper explanations and justifications than those found in most introductory texts.
- ◆ **Focused lessons.** The chapters are shorter than in most other texts, making it easier for both instructors and students to focus on one topic at a time.
- ◆ **Consistency.** We've worked hard to demonstrate how to do Statistics well. From the very start and throughout the book we model the importance of plotting data, of checking assumptions and conditions, and of writing conclusions that are clear, concise, and in context.
- ◆ **The need to read.** Because the important concepts, definitions, and sample solutions aren't set in boxes, students won't find it easy to just to skim this book. We intend that it be read, so we've tried to make the experience enjoyable.

Continuing Features

Along with the improvements we've made, you'll still find the many engaging, innovative, and pedagogically effective features responsible for the success of our earlier editions.

- ◆ **Chapter 1 (and beyond).** Chapter 1 gets down to business immediately, looking at data. And throughout the book chapters lead with new up-to-the-minute motivating examples and follow through with analyses of the data, and real-world examples provide a basis for sample problems and exercises.
- ◆ **Think, Show, Tell.** The worked examples repeat the mantra of *Think*, *Show*, and *Tell* in every chapter. They emphasize the importance of thinking about a Statistics question (What do we know? What do we hope to learn? Are the assumptions and conditions satisfied?) and reporting our findings (the *Tell* step). The *Show* step contains the mechanics of calculating results and conveys our belief that it is only one part of the process.
- ◆ **Step-by-Step** examples guide students through the process of analyzing a problem by showing the general explanation on the left and the worked-out solution on the right. The result: better understanding of the concept, not just number crunching.

¹And, yes, those footnotes!

- ◆ **For Example.** In every chapter, an interconnected series of *For Example* elements present a continuing discussion, recapping a story and moving it forward to illustrate how to apply each new concept or skill.
- ◆ **Just Checking.** At key points in each chapter, we ask students to pause and think with questions designed to be a quick check that they understand the material they've just read. Answers are at the end of the exercise sets in each chapter so students can easily check themselves.
- ◆ **Updated TI Tips.** Each chapter's easy-to-read "TI Tips" now show students how to use TI-84 Plus CE Statistics functions with the StatWizard operating system. (Help using a TI-Nspire appears in Appendix B, and help with a TI-89 is on the book's companion Web site www.pearsonhighered.com/bock.) As we strive for a sound understanding of formulas and methods, we want students to use technology for actual calculations. We do emphasize that calculators are just for "Show"—they cannot Think about what to do or Tell what it all means.
- ◆ **Math Boxes.** In many chapters we present the mathematical underpinnings of the statistical methods and concepts. By setting these proofs, derivations, and justifications apart from the narrative, we allow students to continue to follow the logical development of the topic at hand, yet also explore the underlying mathematics for greater depth.
- ◆ **TI-Nspire Activities.** Margin pointers identify demonstrations and investigations for TI-Nspire handhelds to enhance each chapter. They're found at the book's Web site (www.pearsonhighered.com/bock).
- ◆ **What Can Go Wrong?** Each chapter still contains our innovative *What Can Go Wrong?* sections that highlight the most common errors people make and the misconceptions they have about Statistics. Our goals are to help students avoid these pitfalls and to arm them with the tools to detect statistical errors and to debunk misuses of statistics, whether intentional or not.
- ◆ **What Have We Learned?** Chapter-ending study guides help students review key concepts and terms.
- ◆ **Exercises.** We've maintained the pairing of examples so that each odd-numbered exercise (with an answer in the back of the book) is followed by an even-numbered exercise illustrating the same concept. Exercises are ordered by approximate level of complexity.
- ◆ **Practice Exams.** At the end of each of the book's seven parts you'll find a practice exam, consisting of both multiple choice and free response questions. These cumulative exams encourage students to keep important concepts and skills in mind throughout the course while helping them synthesize their understanding as they build connections among the various topics.
- ◆ **Reality Check.** We regularly remind students that Statistics is about understanding the world with data. Results that make no sense are probably wrong, no matter how carefully we think we did the calculations. Mistakes are often easy to spot with a little thought, so we ask students to stop for a reality check before interpreting their result.
- ◆ **Notation Alerts.** Clear communication is essential in Statistics, and proper notation is part of the vocabulary students need to learn. We've found that it helps to call attention to the letters and symbols statisticians use to mean very specific things.
- ◆ **On the Computer.** Because real-world data analysis is done on computers, at the end of each chapter we summarize what students can find in most Statistics software, usually with an annotated example.

Our Approach

We've been guided in the choice of topics and emphasis on clear communication by the requirements of the Advanced Placement Statistics course. In our order of presentation, we have tried to ensure that each new topic fits logically into the growing structure of understanding that we hope students will build.

GAISE Guidelines

We have worked to provide materials to help each class, in its own way, follow the guidelines of the GAISE (Guidelines for Assessment and Instruction in Statistics Education) project sponsored by the American Statistical Association. That report urges that Statistics education should

1. emphasize statistical literacy and develop statistical thinking,
2. use real data,
3. stress conceptual understanding rather than mere knowledge of procedures,
4. foster active learning,
5. use technology for developing concepts and analyzing data, and
6. make assessment a part of the learning process.

Mathematics

Mathematics traditionally appears in Statistics texts in several roles:

1. It can provide a concise, clear statement of important concepts.
2. It can embody proofs of fundamental results.
3. It can describe calculations to be performed with data.

Of these, we emphasize the first. Mathematics can make discussions of Statistics concepts, probability, and inference clear and concise. We have tried to be sensitive to those who are discouraged by equations by also providing verbal descriptions and numerical examples.

This book is not concerned with proving theorems about Statistics. Some of these theorems are quite interesting, and many are important. Often, though, their proofs are not enlightening to Introductory Statistics students and can distract the audience from the concepts we want them to understand. However, we have not shied away from the mathematics where we believed that it helped clarify without intimidating. You will find some important proofs, derivations, and justifications in the Math Boxes that accompany the development of many topics.

Nor do we concentrate on calculations. Although statistics calculations are generally straightforward, they are also usually tedious. And, more to the point, they are often unnecessary. Today, virtually all statistics are calculated with technology, so there is little need for students to work by hand. The equations we use have been selected for their focus on understanding concepts and methods.

Technology and Data

To experience the real world of Statistics, it's best to explore real data sets using modern technology. This fact permeates *Stats: Modeling the World*, Fifth Edition, where we use real data for the book's examples and exercises. Technology lets us focus on teaching statistical thinking rather than getting bogged down in calculations. The questions that motivate each of our hundreds of examples are not "How do you find the answer?" but "How do you think about the answer?"

Technology. We assume that students are using some form of technology in this Statistics course. That could include a graphing calculator along with a Statistics package or spreadsheet. Rather than adopt any particular software, we discuss generic computer output. “TI-Tips”—included in most chapters—show students how to use Statistics features of the TI-84 Plus series. In Appendix B, we offer general guidance (by chapter) to help students get started on common software platforms (StatCrunch, Excel, MINITAB, Data Desk, JMP, and SPSS) and a TI-Nspire. The book’s Web site includes additional guidance for students using a TI-89. Students will also find on the Web site applets that let them explore key concepts.

Data. Because we use technology for computing, we don’t limit ourselves to small, artificial data sets. In addition to including some small data sets, we have built examples and exercises on real data with a moderate number of cases—usually more than you would want to enter by hand into a program or calculator. These data are included on the book’s Web site, www.pearsonhighered.com/bock.