

How Are Chapters Organized to

Chapter Goals

Each chapter begins with a set of goals, or learning objectives, designed to provide focus for the chapter and motivate student learning. These objectives indicate what the student should be able to do after completing the chapter.

Chapter Opening Exercise

A representative exercise opens the chapter and shows how the chapter content can be applied to a real world situation.

Describing Data:

Numerical Measures

3



U. S. housing prices reached their peak in July of 2006. Based on the data given in the table, showing the ratio of the prices reported in a recent month to the July 2006 figure, find the mean, median, and mode of these statistics. (Exercise 83, Goal 1)

GOALS
When you have completed this chapter you will be able to:

- 1 Calculate the arithmetic mean, weighted mean, median, mode, and geometric mean.
- 2 Explain the characteristics, uses, advantages, and disadvantages of each measure of location.
- 3 Identify the position of the mean, median, and mode for both symmetric and skewed distributions.
- 4 Compute and interpret the range, mean deviation, variance, and standard deviation.
- 5 Understand the characteristics, uses, advantages, and disadvantages of each measure of dispersion.
- 6 Understand Chebyshev's theorem and the Empirical Rule as they relate to a set of observations.

Introduction to the Topic

Each chapter starts with a review of the important concepts of the previous chapter and provides a link to the material in the current chapter. This step-by-step approach increases comprehension by providing continuity across the concepts.

Introduction


The highly competitive automotive retailing business has changed significantly over the past 5 years, due in part to consolidation by large, publicly owned dealership groups. Traditionally, a local family owned and operated the community dealership, which might have included one or two manufacturers, like Pontiac and GMC Trucks or Chrysler and the popular Jeep line. Recently, however, skillfully managed and well-financed companies have been acquiring local dealerships across large regions of the country. As these groups acquire the local dealerships, they often bring standard selling practices, common software and hardware technology platforms, and management reporting techniques. The goal is to provide an improved buying experience for the consumer, while increasing the profitability of



Example/Solution

After important concepts are introduced, a solved example is given to provide a how-to illustration for students and to show a relevant business or economics-based application that helps answer the question, "What will I use this for?" All examples provide a realistic scenario or application and make the math size and scale reasonable for introductory students.

Example



The number of cappuccinos sold at the Starbucks location in the Orange County Airport between 4 and 7 p.m. for a sample of 5 days last year were 20, 40, 50, 60, and 80. In the LAX airport in Los Angeles, the number of cappuccinos sold at a Starbucks location between 4 and 7 p.m. for a sample of 5 days last year were 20, 49, 50, 51, and 80. Determine the mean, median, range, and mean deviation for each location. Compare the differences.

Solution


For the Orange County location the mean, median, and range are:

Mean	50 cappuccinos per day
Median	50 cappuccinos per day
Range	60 cappuccinos per day

The mean deviation is the mean of the absolute

Self-Reviews

Self-Reviews are interspersed throughout each chapter and closely patterned after the preceding Examples. They help students monitor their progress and provide immediate reinforcement for that particular technique.




Self-Review 3-2 Springers sold 95 Antonelli men's suits for the regular price of \$400. For the spring sale the suits were reduced to \$200 and 126 were sold. At the final clearance, the price was reduced to \$100 and the remaining 79 suits were sold.

(a) What was the weighted mean price of an Antonelli suit?
 (b) Springers paid \$200 a suit for the 300 suits. Comment on the store's profit per suit if a salesperson receives a \$25 commission for each one sold.

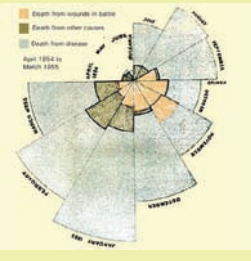
Engage Students and Promote Learning?

Statistics in Action

Statistics in Action articles are scattered throughout the text, usually about two per chapter. They provide unique and interesting applications and historical insights in the field of statistics.



Statistics in Action
Florence Nightingale is known as the founder of the nursing profession. However, she also saved many lives by using statistical analysis. When she encountered an unsanitary condition or an undersupplied hospital, she improved the conditions and then used statistical data to document the improvement. Thus, she was able to convince others of the need for medical reform, particularly in the area of sanitation. She developed original graphs to demonstrate that, during the Crimean War, more soldiers died from unsanitary conditions than were killed in combat. The adjacent graph by Nightingale is a polar-area graph showing the relative monthly proportions of causes of death from April 1854 to March 1855.



Margin Notes

There are more than 300 concise notes in the margin. Each is aimed at reemphasizing the key concepts presented immediately adjacent to it.

Definitions

Definitions of new terms or terms unique to the study of statistics are set apart from the text and highlighted for easy reference and review.

Formulas

Formulas that are used for the first time are boxed and numbered for reference. In addition, a formula card is bound into the back of the text, which lists these key formulas.

Exercises

Exercises are included after sections within the chapter and at the end of the chapter. Section exercises cover the material studied in the section.

Variance and Standard Deviation

Variance and standard deviation are based on the squared deviations from the mean.

The **variance** and **standard deviation** are also based on the deviations from the mean. However, instead of using the absolute value of the deviations, the variance and the standard deviation square the deviations.

VARIANCE The arithmetic mean of the squared deviations from the mean.

The variance is nonnegative and is zero only if all observations are the same.

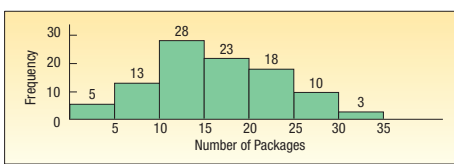
POPULATION VARIANCE

$$\sigma^2 = \frac{\sum(X - \mu)^2}{N}$$

[3-8]

Exercises

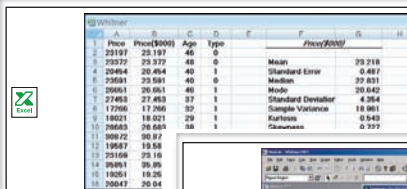
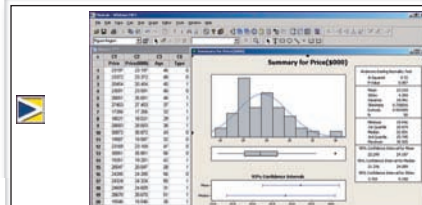
15. Molly's Candle Shop has several retail stores in the coastal areas of North and South Carolina. Many of Molly's customers ask her to ship their purchases. The following chart shows the number of packages shipped per day for the last 100 days.



a. What is this chart called?
b. What is the total number of frequencies?

Computer Output

The text includes many software examples, using Excel, MegaStat®, and MINITAB. Screen captures are highlighted with either a MINITAB or Excel logo in the margin.

How Does This Text

BY CHAPTER

Chapter Summary

Each chapter contains a brief summary of the chapter material, including the vocabulary and the critical formulas.

Chapter Summary

- I. A frequency table is a grouping of qualitative data into mutually exclusive classes showing the number of observations in each class.
- II. A relative frequency table shows the fraction of the number of frequencies in each class.
- III. A bar chart is a graphic representation of a frequency table.
- IV. A pie chart shows the proportion each distinct class represents of the total number of frequencies.

Pronunciation Key

This tool lists the mathematical symbol, its meaning, and how to pronounce it. We believe this will help the student retain the meaning of the symbol and generally enhance course communications.

SYMBOL	MEANING	PRONUNCIATION
μ	Population mean	<i>mu</i>
Σ	Operation of adding	<i>sigma</i>
ΣX	Adding a group of values	<i>sigma X</i>
\bar{X}	Sample mean	<i>X bar</i>

Chapter Exercises

Generally, the end of chapter exercises are the most challenging and integrate the chapter concepts. The answers and worked-out solutions for all odd-numbered exercises appear at the end of the text. For exercises with more than 20 observations, the data can be found on the Student CD and on the text's Web site. These files are in Excel and MINITAB formats.

Chapter Exercises

23. Describe the similarities and differences of qualitative and quantitative variables. Be sure to include:

- a. What level of measurement is required for each variable type?
- b. Can both types be used to describe both samples and populations?

Data Set Exercises

The last several exercises at the end of each chapter are based on four large data sets. These data sets are printed in Appendix A in the text and are also on the Student CD and on the text's Web site. These data sets present the students with real-world and more complex applications.

Data Set Exercises

46. Refer to the Real Estate data, which report information on the homes sold in the Denver, Colorado, area last year.

- a. Compute the mean and the standard deviation of the distribution of the selling prices for the homes. Assume this to be the population. Develop a histogram of the data. Would it seem reasonable from this histogram to conclude that the population of selling prices follows the normal distribution?
- b. Let's assume a normal population. Select a sample of 10 homes. Compute the mean and the standard deviation of the sample. Determine the likelihood of finding a sample mean this large or larger from the population.

47. Refer to the CIA data, which report demographic and economic information on 46 countries. Select a random sample of 10 countries. For this sample calculate the mean GDP/capita. Repeat this sampling and calculation process five more times. Then find the mean and standard deviation of your six sample means.

- a. How do this mean and standard deviation compare with the mean and standard deviation of the original "population" of 46 countries?
- b. Make a histogram of the six means and discuss whether the distribution is normal.
- c. Suppose the population distribution is normal. For the first sample mean you computed, determine the likelihood of finding a sample mean this large or larger from the population.


Software Commands

Software examples using Excel, MegaStat[®], and MINITAB are included throughout the text. But, the explanations of the computer input commands for each program are placed at the end of the chapter. This allows students to focus on the statistical techniques rather than how to input data.

Software Commands

1. The Excel commands to select a simple random sample on page 261 are:

- a. Select the **Data** tab on the top of the menu. Then on the far right select **Data Analysis**, then **Sampling** and **OK**.
- b. For **Input Range** insert **B7:B31**. Since the column is named, click the **Labels** box. Select **Random**, and enter the sample size for the **Number of Samples**, in this case 5. Click on **Output Range** and indicate the place in the spreadsheet you want the sample information. Note that your sample results will differ from those in the text. Also recall that Excel samples with replacement, so it is possible for a population value to appear more than once in the sample.



Reinforce Student Learning?

Answers to Self-Review

The worked-out solutions to the Self-Reviews are provided at the end of each chapter.

Chapter 2 Answers to Self-Review

2-1 a. Qualitative data, because the customers' response to the taste test is the name of a beverage.
 b. Frequency table. It shows the number of people who prefer each beverage.
 c.

2-2 a. The raw data or ungrouped data.

Commission	Number of Salespeople
\$1,400 up to \$1,500	2
1,500 up to 1,600	5
1,600 up to 1,700	3
1,700 up to 1,800	1
Total	11

b. Class frequencies.
 c. The largest concentration of commissions is \$1,500 up to \$1,600. The smallest commission is about \$1,400 and the largest is about \$1,800. The typical amount earned is \$15,500.

2-3 a. $2^2 = 64 < 73 < 128 = 2^7$. So 7 classes are recommended.
 b. The interval width should be at least $(488 - 320) / 7 = 24$. Class intervals of 25 or 30 feet are both reasonable.
 c. If we use a class interval of 25 feet and begin

BY SECTION

Section Reviews

After selected groups of chapters (1–4, 5–7, 8 and 9, 10–12, 13 and 14, 15 and 16, and 17 and 18), a Section Review is included. Much like a review before an exam, these include a brief **overview** of the chapters, **glossary** of key terms, **multiple-choice questions**, and **problems for review**.

A Review of Chapters 1–4

This section is a review of the major concepts and terms introduced in Chapters 1–4. Chapter 1 began by describing the meaning and purpose of statistics. Next we described the different types of variables and the four levels of measurement. Chapter 2 was concerned with describing a set of observations by organizing it into a frequency distribution and then portraying the frequency distribution as a histogram or a frequency polygon. Chapter 3 began by describing measures of location, such as the mean, weighted mean, median, geometric mean, and mode. This chapter also included measures of dispersion, or spread. Discussed in this section were the range, mean deviation, variance, and standard deviation. Chapter 4 included several graphing techniques such as dot plots, box plots, and scatter diagrams. We also discussed the coefficient of skewness, which reports the lack of symmetry in a set of data.

Throughout this section we stressed the importance of statistical software, such as Excel and MINITAB. Many computer outputs in these chapters demonstrated how quickly and effectively a large data set can be organized into a frequency distribution, several of the measures of location or measures of variation calculated, and the information presented in graphical form.

Glossary

Chapter 1
Descriptive statistics The techniques used to describe the important characteristics of a set of data. This includes organizing the data values into a frequency distribution, computing measures of location, and computing mea-

Sample A portion, or subset, of the population being studied.
Statistics The science of collecting, organizing, analyzing, and interpreting numerical data for the purpose of making more effective decisions.

Cases

The review also includes continuing cases and several small cases that let students make decisions using tools and techniques from a variety of chapters.

Cases

A. Century National Bank

The following case will appear in subsequent review sections. Assume that you work in the Planning Department of the Century National Bank and report to Ms. Lamberg. You will need to do some data analysis and prepare a short written report. Remember, Mr. Selig is the president of the bank, so you will want to ensure that your report is complete and accurate. A copy of the data appears in Appendix A.6.

Century National Bank has offices in several cities in the Midwest and the southeastern part of the United States. Mr. Dan Selig, president and CEO, would like to know the characteristics of his checking account customers. What is the balance of a typical customer?

How many other bank services do the checking account customers use? Do the customers use the ATM service and, if so, how often? What about debit cards? Who uses them, and how often are they used?

To better understand the customers, Mr. Selig asked Ms. Wendy Lamberg, director of planning, to select a sample of customers and prepare a report. To begin, she has appointed a team from her staff. You are the head of the team and responsible for preparing the report. You select a random sample of 60 customers. In addition to the balance in each account at the end of last month, you determine: (1) the number of ATM (auto-

B. Wildcat Plumbing Supply, Inc.: Do We Have Gender Differences?

Wildcat Plumbing Supply has served the plumbing needs of Southwest Arizona for more than 40 years. The company was founded by Mr. Terrence St. Julian and is run today by his son Cory. The company has grown from a handful of employees to more than 500 today. Cory is concerned about several positions within the company where he has men and women doing essentially the same job but at different pay. To investigate, he collected the information below. Suppose you are a student intern in the Accounting Department and have been given the task to write a report summarizing the situation.

Yearly Salary (\$000)	Women	Men
Less than 30	2	0
30 up to 40	3	1
40 up to 50	17	4
50 up to 60	17	24
60 up to 70	8	21
70 up to 80	3	7
80 or more	0	3

Practice Test

The Practice Test is intended to give students an idea of content that might appear on a test and how the test might be structured. The Practice Test includes both objective questions and problems covering the material studied in the section.

Practice Test

There is a practice test at the end of each review section. The tests are in two parts. The first part contains several objective questions, usually in a fill-in-the-blank format. The second part is problems. In most cases it should take 30 to 45 minutes to complete the test. The problems require a calculator. Check the answers in the Answer Section in the back of the book.

Part I Objective

- The science of collecting, organizing, presenting, analyzing, and interpreting data to assist in making effective decisions is called _____ 1.
- Methods of organizing, summarizing, and presenting data in an informative way is called _____ 2.
- The entire set of individuals or objects of interest or the measurements obtained from all individuals or objects of interest is called the _____ 3.
- List the two types of variables. _____ 4.
- The number of bedrooms in a house is an example of a _____ discrete variable, continuous variable, qualitative variable—pick one) _____ 5.
- The jersey numbers of Major League baseball players is an example of what level of measurement? _____ 6.
- The classification of students by eye color is an example of what level of measurement? _____ 7.
- The sum of the differences between each value and the mean is always equal to what value? _____ 8.
- A set of data contained 70 observations. How many classes would you suggest in order to construct a frequency distribution? _____ 9.
- What percent of the values in a data set are always larger than the median? _____ 10.
- The square of the standard deviation is the _____ 11.
- The standard deviation assumes a negative value when _____ (All the values are negative, when at least half the values are negative, or never—pick one.) _____ 12.
- Which of the following is least affected by an outlier? (mean, median, or range—pick one) _____ 13.

Part II Problems

- The Russell 2000 index of stock prices increased by the following amounts over the last three years.

18%	4%	2%
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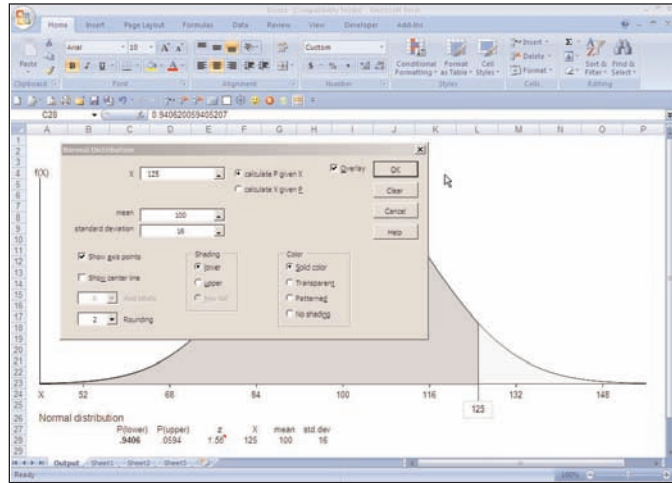
- What is the geometric mean increase for the three years?
 2. The information below refers to the selling prices (\$000) of homes sold in Warren, PA during 2007.

What Software Is

MegaStat[®] for Excel 2007

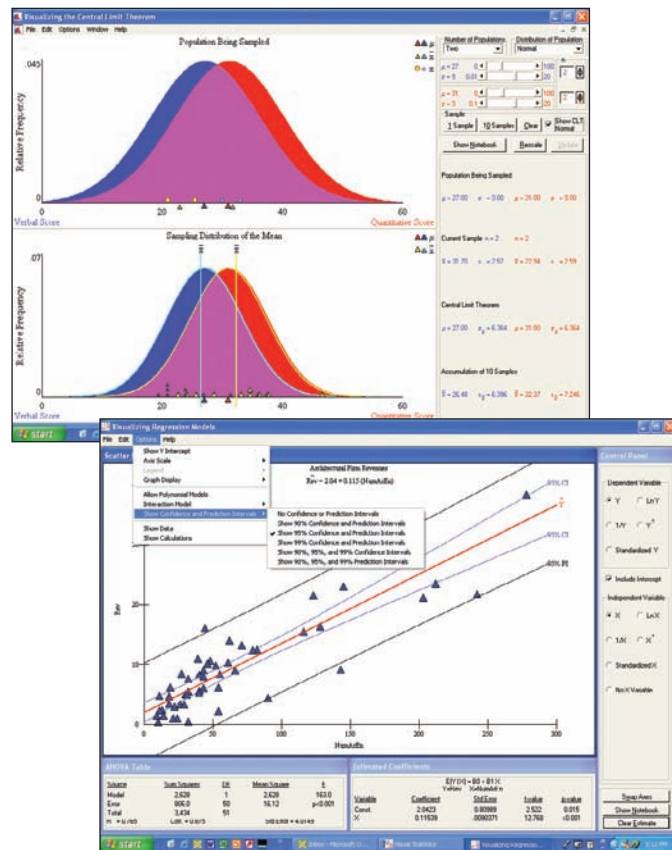
MegaStat[®] for Excel 2007 by J. B. Orris of Butler University is a full-featured Excel add-in that is included on the Student CD packaged with this text. The software performs statistical analyses within an Excel workbook. It does basic functions, such as descriptive statistics, frequency distributions, and probability calculations as well as hypothesis testing, ANOVA, and regression.

MegaStat output is carefully formatted and ease-of-use features include Auto Expand for quick data selection and Auto Label detect. Since *MegaStat* is easy to use, students can focus on learning statistics without being distracted by the software. *MegaStat* is always available from Excel's main menu. Selecting a menu item pops up a dialog box. *MegaStat* works with all recent versions of Excel including Excel 2007. Help files are built in and an introductory user's manual is also included.



Visual Statistics

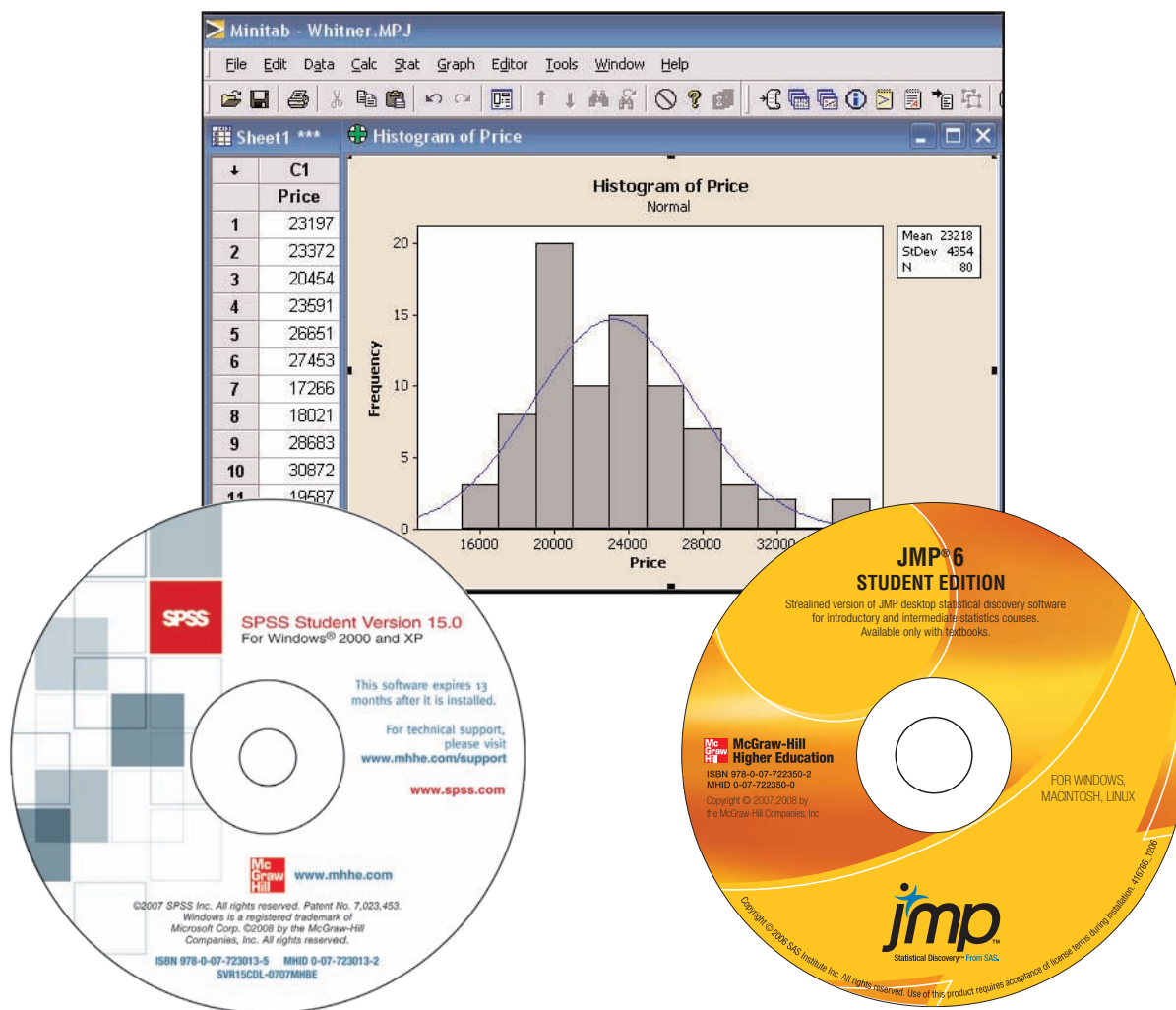
Visual Statistics 2.2 by Doane, Mathieson, and Tracy is a package of 21 software programs for teaching and learning statistics concepts. It is unique in that it allows students to learn the concepts through interactive experimentation and visualization. The software and worktext promote active learning through competency building exercises, individual and team projects, and built-in data bases. Over 400 data sets from business settings are included within the package as well as a worktext in electronic format.



Available with This Text?

MINITAB®/SPSS®/JMP®

MINITAB® Student Version 14, SPSS® Student Version 15, and JMP® Student Edition 6 are software tools that are available to help students solve the business statistics exercises in the text. Each is available in the student version and can be packaged with any McGraw-Hill business statistics text.



How Can Technology



McGraw-Hill Connect™ Business Statistics

McGraw-Hill *Connect Business Statistics* is an online assignment and assessment system customized to the text and available as an option for students. With *Connect Business Statistics*, instructors can deliver assignments, quizzes, and tests online. The system utilizes the exercises from the text both in a static one-problem-at-a-time fashion as well as algorithmically where problems generate multiple data possibilities and answers. In addition, instructors can edit existing questions and author entirely new problems.

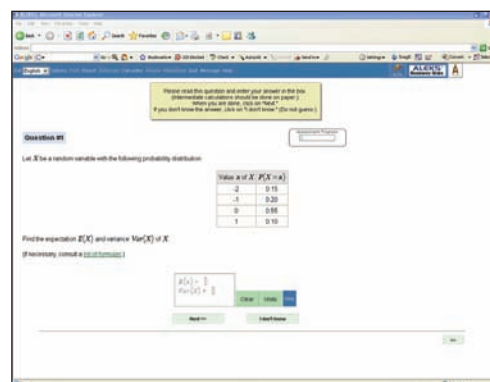
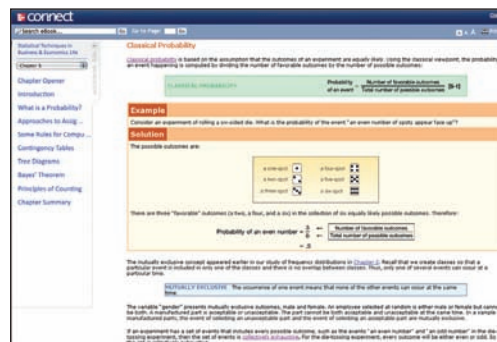
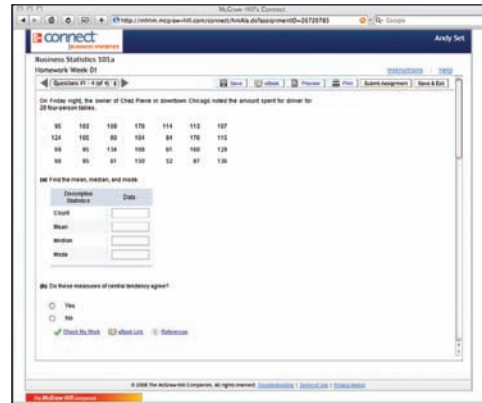
You choose or create the problems. Assignments are graded automatically, and the results are stored in your private gradebook. You can track individual student performance by question, assignment, or in comparison to the rest of the class. Detailed grade reports are easily integrated with Learning Management Systems, such as WebCT and Blackboard.

McGraw-Hill Connect Business Statistics is also available with the interactive online version of the text—*Connect Business Statistics Plus*. Like *Connect Business Statistics*, *Connect Business Statistics Plus* provides students with online assignments and assessments, plus 24/7 online access to an eBook, an identical, online edition of the printed text, to aid them in successfully completing their work, wherever and whenever they choose.



ALEKS is an assessment and learning system that provides individualized instruction in Business Statistics. ALEKS delivers precise assessments of students' knowledge, guides them in the selection of appropriate new study material, and records their progress toward mastery of goals.

ALEKS interacts with students much as a skilled human tutor would, moving between explanation and practice as needed, correcting and analyzing errors, defining terms and changing topics on request. By accurately assessing their knowledge, ALEKS focuses precisely on what to learn next, helping students master the course content more quickly and easily.



Aid Student Learning?

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Green . . . it's on everybody's mind these days. It's not only about saving trees, it's also about saving money. At 55 percent of the bookstore price, McGraw-Hill eBooks are an eco-friendly and cost-saving alternative to the traditional printed textbook. So, you do some good for the environment and . . . you do some good for your wallet.

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Online Learning Center: www.mhhe.com/lind14e

The Online Learning Center (OLC) is the text Web site with online content for both students and instructors.

Instructor Content

- Solutions Manual
- Solutions to Study Guide
- Test Bank
- PowerPoint
- Image Library
- MegaStat User's Guide
- Instructor Updates and Errata

Student Content

- Quizzes
- PowerPoint
- Data Sets
- Data Files
- Appendices
- Updates and Errata
- Screencam Tutorials
- MegaStat User's Guide
- iPod® Content
- Chapter 20

WebCT/Blackboard/eCollege

All of the material in the Online Learning Center is also available in portable WebCT, Blackboard, or eCollege content "cartridges" provided free to adopters of this text.



Business Statistics Center (BSC): www.mhhe.com/bstat/



The BSC contains links to statistical publications and resources, software downloads, learning aids, statistical Web sites and databases, and McGraw-Hill/Irwin product Web sites and online courses.

What Resources Are Available for Instructors?

Instructor's Resources CD-ROM (ISBN: 007727007X)

This resource allows instructors to conveniently access the Instructor's Solutions Manual, Test Bank in Word and EZ Test formats, Instructor PowerPoint slides, data files, and data sets.

Online Learning Center: www.mhhe.com/lind14e

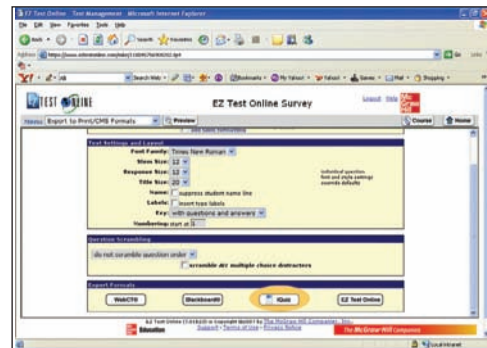
The Online Learning Center (OLC) provides the instructor with a complete Instructor's Manual in Word format, the complete Test Bank in both Word files and computerized EZ Test format, Instructor PowerPoint slides, text art files, an introduction to ALEKS®, an introduction to McGraw-Hill Connect Business Statistics™, access to the eBook, and more.

EZ Test

All test bank questions are available in an EZ Test electronic format. Included are a number of multiple-choice, true/false, and short-answer questions and problems. The answers to all questions are given, along with a rating of the level of difficulty, chapter goal the question tests, Bloom's taxonomy question type, and AACSB knowledge category.

AACSB Statement

The McGraw-Hill Companies is a proud corporate member of AACSB International. Understanding the importance and value of AACSB accreditation, Lind, Marchal, and Wathen *Statistical Techniques in Business and Economics*, 14e, has connected questions in the Test Bank to the six general knowledge and skill guidelines found in the AACSB standards.



What Resources Are Available for Students?

Student CD-ROM

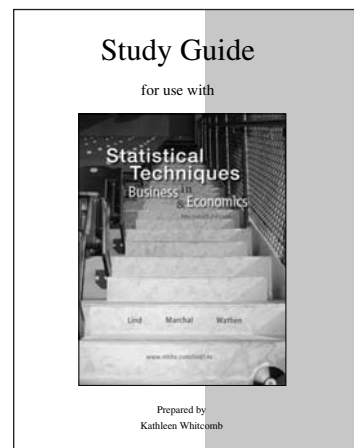
The Student CD-ROM packaged with each copy of the text contains software resources for student self-study and tools for working the exercises in the text. These resources include:

- Visual Statistics
- MegaStat® for Excel 2007
- Data sets
- Data files
- Chapter 20
- Link to the Online Learning Center (OLC) for quizzes, PowerPoint, and other resources.



Student Study Guide (ISBN: 0077270134)

This supplement has been created to help students master the course content. It highlights the important ideas in the text and provides opportunities for students to review the worked-out solutions, review terms and concepts, and practice.



Basic Statistics Using Excel 2007 (ISBN: 0077270010)

This workbook introduces students to Excel and shows how to apply it to introductory statistics. This manual presumes no prior familiarity with Excel or statistics and provides step-by-step directions in a how-to style using Excel 2007 with text examples and problems.

