



Elementary Statistics

Picturing the World

SEVENTH EDITION

Ron Larson • Betsy Farber



SEVENTH EDITION

Elementary Statistics

PICTURING THE WORLD

GLOBAL EDITION

Ron Larson

The Pennsylvania State University
The Behrend College

Betsy Farber

Bucks County Community College



Pearson

Harlow, England • London • New York • Boston • San Francisco • Toronto • Sydney • Dubai • Singapore • Hong Kong
Tokyo • Seoul • Taipei • New Delhi • Cape Town • Sao Paulo • Mexico City • Madrid • Amsterdam • Munich • Paris • Milan

Elementary Statistics: Picturing the World, Global Edition

Table of Contents

Front Cover

Title Page

Copyright Page

Contents

Preface

Acknowledgements

Index of Applications

Part 1 Introduction to Statistics

1 Introduction to Statistics

Where Youve Been

Where Youre Going

1.1 An Overview o f Statistics

1.2 Data Classification

Case Study: Reputations of Companies in the U.S.

1.3 Data Collection and Experimental Design

Activity: Random Numbers

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

History of StatisticsTimeline

Technology: Using Technology in Statistics

2 Descriptive Statistics

Where Youre Going

Where Youve Been

2.1 Frequency Distributions and Their Graphs

2.2 More Graphs and Displays

2.3 Measures of Central Tendency

Activity: Mean Versus Median

Table of Contents

2.4 Measures of Variation

Activity: Standard Deviation

Case Study: Business Size

2.5 Measures of Position

Uses and Abuses: Statistics In The Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Technology: Parking Tickets

Using Technology to Determine Descriptive Statistics

Cumulative Review: Chapters 1 and 2

Part 2 Probability and Probability Distributions

3 Probability

Where Youre Going

Where Youve Been

3.1 Basic Concepts of Probability and Counting

Activity: Simulating the Stock Market

3.2 Conditional Probability and the Multiplication Rule

3.3 The Addition Rule

Activity: Simulating the Probability of Rolling a 3 or 4

Case Study: United States Congress

3.4 Additional Topics in Probability and Counting

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Technology: Simulation: Composing Mozart Variations with Dice

4 Discrete Probability Distributions

Where Youve Been

Where Youre Going

4.1 Probability Distributions

4.2 Binomial Distributions

Activity: Binomial Distribution

Case Study: Distribution of Number of Hits in Baseball Games

Table of Contents

4.3 More Discrete Probability Distributions

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Technology: Using Poisson Distributions as Queuing Models

5 Normal Probability Distributions

Where You're Going

Where You've Been

5.1 Introduction to Normal Distributions and the Standard Normal Distribution

5.2 Normal Distributions: Finding Probabilities

5.3 Normal Distributions: Finding Values

Case Study: Birth Weights in America

5.4 Sampling Distributions and the Central Limit Theorem

Activity: Sampling Distributions

5.5 Normal Approximations to Binomial Distributions

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Real StatisticsReal Decisions: Putting it all together

Technology: Age Distribution in California

Cumulative Review: Chapters 3–5

Part 3 Statistical Inference

6 Confidence Intervals

Where You're Going

Where You've Been

6.1 Confidence Intervals for the Mean (Known)

6.2 Confidence Intervals for the Mean (Unknown)

Activity: Confidence Intervals for a Mean

Case Study: Marathon Training

6.3 Confidence Intervals for Population Proportions

Activity: Confidence Intervals for a Proportion

6.4 Confidence Intervals for Variance and Standard Deviation

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Table of Contents

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Technology: United States Foreign Policy Polls

Using Technology to Construct Confidence Intervals

7 Hypothesis Testing with One Sample

Where You're Going

Where You've Been

7.1 Introduction to Hypothesis Testing

7.2 Hypothesis Testing for the Mean (Known)

7.3 Hypothesis Testing for the Mean (Unknown)

Activity: Hypothesis Tests for a Mean

Case Study: Human Body Temperature: What's Normal?

7.4 Hypothesis Testing for Proportions

Activity: Hypothesis Tests for a Proportion

7.5 Hypothesis Testing for Variance and Standard Deviation

A Summary of Hypothesis Testing

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Technology: The Case of the Vanishing Women

Using Technology to Perform Hypothesis Tests

8 Hypothesis Testing with Two Samples

Where You're Going

Where You've Been

8.1 Testing the Difference Between Means (independent Samples, and Known)

8.2 Testing the Difference Between Means (independent Samples, and Unknown)

Case Study: How Protein Affects Weight Gain in Overeaters

8.3 Testing the Difference Between Means (Dependent Samples)

8.4 Testing the Difference Between Proportions

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real StatisticsReal Decisions: Putting it all together

Table of Contents

Technology: Tails over Heads

Using Technology to Perform Two-Sample Hypothesis Tests

Cumulative Review: Chapters 6–8

Part 4 More Statistical Inference

9 Correlation and Regression

Where You've Been

Where You're Going

9.1 Correlation

Activity: Correlation by Eye

9.2 Linear Regression

Activity: Regression by Eye

Case Study: Correlation of Body Measurements

9.3 Measures of Regression and Prediction Intervals

9.4 Multiple Regression

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real Statistics/Real Decisions: Putting it all together

Technology: Nutrients in Breakfast Cereals

10 Chi-Square Tests and the F-Distribution

Where You're Going

Where You've Been

10.1 Goodness-of-Fit Test

10.2 Independence

Case Study: Food Safety Survey

10.3 Comparing Two Variances

10.4 Analysis of Variance

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real Statistics/Real Decisions: Putting it all together

Technology: Teacher Salaries

Cumulative Review: Chapters 9 and 10

11 Nonparametric Tests

Where You've Been

Table of Contents

Where You're Going

11.1 The Sign Test

11.2 The Wilcoxon Tests

Case Study: College Ranks

11.3 The Kruskal-Wallis Test

11.4 Rank Correlation

11.5 The Runs Test

Uses and Abuses: Statistics in the Real World

Chapter Summary

Review Exercises

Chapter Quiz

Chapter Test

Real Statistics/Real Decisions: Putting it all together

Technology: U.S. Income and Economic Research

Try It Yourself Answers

Odd Answers

Appendices

Appendix A Alternative Presentation of the Standard Normal Distribution

Standard Normal Distribution Table (0-to-z)

Alternative Presentation of the Standard Normal Distribution

Appendix B Tables

Table 1 Random Numbers

Table 2 Binomial Distribution

Table 3 Poisson Distribution

Table 4 Standard Normal Distribution

Table 5 t-Distribution

Table 6 Chi-Square Distribution

Table 7 F-Distribution

Table 8 Critical Values for the Sign Test

Table 9 Critical Values for the Wilcoxon Signed-Rank Test

Table 10 Critical Values for the Spearman Rank Correlation Coefficient

Table 11 Critical Values for the Pearson Correlation Coefficient

Table 12 Critical Values for the Number of Runs

Appendix C Normal Probability Plots

Answers to the Try It Yourself Exercises

Answers to the Odd-Numbered Exercises

Index

Table of Contents

Photo Credits

Back Cover