CONTENTS

	1
AN OVERVIEW	3
1.1 Nonmathematical Description 3	
1.2 Data 6	
1.3 Error 10	
1.4 Statistics 13	
1.5 Gathering Data 15	
1.6 Calculations 17	
Review 18	
Projects 18	
Problems 19	
PICTURES OF A DISTRIBUTION: HISTOGRAMS	23
2.1 Graphical Techniques 23	
2.2 Bar Charts 24	
2.3 Histograms 25	
2.4 Areas 29	
2.5 Grouping and Measurement Data 29	
2.6 Cumulative Frequency Diagrams 35	
2.7 Shape of the Distribution 39	
2.8 Describing a Distribution 40	
Review 43	
Problems 43	
	1.1 Nonmathematical Description 3 1.2 Data 6 1.3 Error 10 1.4 Statistics 13 1.5 Gathering Data 15 1.6 Calculations 17 Review 18 Projects 18 Problems 19 PICTURES OF A DISTRIBUTION: HISTOGRAMS 2.1 Graphical Techniques 23 2.2 Bar Charts 24 2.3 Histograms 25 2.4 Areas 29 2.5 Grouping and Measurement Data 29 2.6 Cumulative Frequency Diagrams 35 2.7 Shape of the Distribution 39 2.8 Describing a Distribution 40 Review 43

viii	CONTENTS	
CHAPTER 3	MATHEMATICAL DESCRIPTIONS	49
	3.1 General Characteristics 49	
	3.2 Central Values or Averages 50	
	3.3 Which Average to Choose 57	
	3.4 Spread 60	
	3.5 Variance and Standard Deviation 61	
	3.6 Interpretation of Standard Deviation and Variance 67	
	Review 72	
	Project 72	
	Problems 72	
CHAPTER 4	PROBABILITY AND DISTRIBUTIONS	80
	4.1 Probability and Statistics 80	
	4.2 Possibilities and Probabilities 81	
	4.3 Some Rules of Probability 86	
	4.4 Some Additional Probability Rules 93	
	4.5 Probability and Statistics Again 98	
	Review 100	
	Problems 100	
CHAPTER 5	NORMAL DISTRIBUTION	105
	5.1 The Need for a Theoretical Distribution 105	
	5.2 Discrete and Continuous Distributions 106	
	5.3 Nature of the Normal Distribution 107	
	5.4 Using the Tables 113	
	Review 122	
	Problems 122	
CHAPTER 6	BINOMIAL DISTRIBUTION	125
	6.1 The Binomial Distribution 125	
	*6.2 Calculating Values of Binomial Distribution 133	
	6.3 Means and Standard Deviations 135	
	6.4 Normal Approximation to the Binomial Distribution 137	
	Review 140	
	Problems 140	

	CONTENTS	ix
CHAPTER 7	SAMPLING AND ESTIMATION	144
	7.1 What is Sampling? 144	
	7.2 Distributions of Sample Values 146	
	7.3 Distributions of Sample Means 150	
	7.4 Interval Estimation 157	
	Review 165	
	Problems 165	
CHAPTER 8	AN INTRODUCTION TO HYPOTHESIS TESTING	169
	8.1 What is a Hypothesis? 169	
	8.2 Kinds of Errors: Decision Problems 170	
	Review 179	
	Problems 179	
CHAPTER 9	HYPOTHESIS TESTS AND ESTIMATION UNDER AN ASSUMPTION OF NORMALITY	183
	9.1 An Overview of the Chapter 183	
	9.2 Comparing the Mean of a Sample to a Theoretical or Hypothesized Mean–Variance Known 188	
	9.3 Comparing the Mean of a Sample to a Theoretical Population Mean—Variance Unknown: <i>t</i> -Test 193	
	9.4 Difference in the Means for Two Independent Samples 197	
	9.5 A Statistical Test for Comparing Two Related Samples: Paired <i>t</i> -Test 201	
	9.6 Comparing a Variance to a Theoretical Variance 203	
	9.7 Difference in Variances: <i>F</i> -Test 207	
	Review 209	
	Problems 210	
CHAPTER 10	HYPOTHESIS TESTING AND ESTIMATION UNDER ASSUMPTIONS OF BINOMIAL DISTRIBUTION	219
	10.1 Comparing the Sample Proportion to a Theoretical Value 219	
	10.2 Difference in Proportions Test: Independent Samples 225	
	10.3 The Sign Test—A Test For Related Data 227	
	Review 230	
	Problems 230	

x	CONTENTS	
CHAPTER 11	 SOME NONPARAMETRIC METHODS 11.1 Overview 234 11.2 The χ² Test 234 11.3 Mann–Whitney U-Test 243 11.4 A Test for Extreme Values 246 Review 249 Problems 249 	234
CHAPTER 12	MULTIPLE SAMPLE CASES—ANALYSIS OF VARIANCE 12.1 Investigating Multiple Sets of Data 256 12.2 The Basic Principle of Analysis of Variance (ANOVA) 258 12.3 One-Way or Single-Factor ANOVA 263 12.4 Two-Way Design and Interaction 269 Review 274 Problems 274	256
CHAPTER 13	CORRELATION AND REGRESSION 13.1 Descriptions of Pairs of Quantities 277 13.2 Correlation 279 13.3 Cause and Effect 282 13.4 Regression 282 *13.5 Examining the Regression Equation 288 13.6 Correlation Coefficient 293 13.7 Significance Test for Correlation Coefficient 296 13.8 Coefficient of Determination: r² 298 13.9 Some Additional Considerations 299 Review 303 Problems 303	277
APPENDIX A	APPENDIX TABLES A.1 Normal Distribution 309 A.2 t-Distribution 314 A.3 χ^2 (Chi-Square) Distribution 317 A.4 F-Distribution 317 A.5 Graph For Finding σ/\sqrt{n} 323	309

	CONTENTS	xi
	A.6 Individual Terms, Binomial Distribution 324	
	A.7 Random Numbers 334	
	A.8 Squares, Square Roots, and Reciprocals 334	
	A.9 Sampling Pieces 336	
	A.10 Critical Values of the Pearson Product Moment Correlation Coefficient 339	
	A.11 Test for Extreme Values: Critical Values 341	
	A.12 Critical Values of U and U' 343	
APPENDIX B	SUMMATION AND SUBSCRIPT NOTATION	346
BIBLIOGRAPHY		353
ANSWERS	Most Odd Problems and Portions of Some Even Problems	357
INDEX		369