

Brief Contents

Preface	xxv
About the Authors	xxix
Chapter 1	Data and Statistics 1
Chapter 2	Descriptive Statistics: Tabular and Graphical Presentations 31
Chapter 3	Descriptive Statistics: Numerical Measures 85
Chapter 4	Introduction to Probability 148
Chapter 5	Discrete Probability Distributions 193
Chapter 6	Continuous Probability Distributions 232
Chapter 7	Sampling and Sampling Distributions 265
Chapter 8	Interval Estimation 308
Chapter 9	Hypothesis Tests 348
Chapter 10	Inference About Means and Proportions with Two Populations 406
Chapter 11	Inferences About Population Variances 448
Chapter 12	Tests of Goodness of Fit and Independence 472
Chapter 13	Experimental Design and Analysis of Variance 506
Chapter 14	Simple Linear Regression 560
Chapter 15	Multiple Regression 642
Chapter 16	Regression Analysis: Model Building 712
Chapter 17	Index Numbers 763
Chapter 18	Time Series Analysis and Forecasting 784
Chapter 19	Nonparametric Methods 855
Chapter 20	Statistical Methods for Quality Control 903
Chapter 21	Decision Analysis 937
Chapter 22	Sample Survey On Website
Appendix A	References and Bibliography 976
Appendix B	Tables 978
Appendix C	Summation Notation 1005
Appendix D	Self-Test Solutions and Answers to Even-Numbered Exercises 1007
Appendix E	Using Excel Functions 1062
Appendix F	Computing p -Values Using Minitab and Excel 1067
Index	1071

Contents

Preface xxv
About the Authors xxix

Chapter 1 Data and Statistics 1

Statistics in Practice: BusinessWeek 2

1.1 Applications in Business and Economics 3

Accounting 3
Finance 4
Marketing 4
Production 4
Economics 4

1.2 Data 5

Elements, Variables, and Observations 5
Scales of Measurement 6
Categorical and Quantitative Data 7
Cross-Sectional and Time Series Data 7

1.3 Data Sources 10

Existing Sources 10
Statistical Studies 11
Data Acquisition Errors 13

1.4 Descriptive Statistics 13

1.5 Statistical Inference 15

1.6 Computers and Statistical Analysis 17

1.7 Data Mining 17

1.8 Ethical Guidelines for Statistical Practice 18

Summary 20

Glossary 20

Supplementary Exercises 21

Appendix: An Introduction to StatTools 28

Chapter 2 Descriptive Statistics: Tabular and Graphical Presentations 31

Statistics in Practice: Colgate-Palmolive Company 32

2.1 Summarizing Categorical Data 33

Frequency Distribution 33
Relative Frequency and Percent Frequency Distributions 34
Bar Charts and Pie Charts 34

2.2 Summarizing Quantitative Data	39
Frequency Distribution	39
Relative Frequency and Percent Frequency Distributions	41
Dot Plot	41
Histogram	41
Cumulative Distributions	43
Ogive	44
2.3 Exploratory Data Analysis: The Stem-and-Leaf Display	48
2.4 Crosstabulations and Scatter Diagrams	53
Crosstabulation	53
Simpson's Paradox	56
Scatter Diagram and Trendline	57
Summary	63
Glossary	64
Key Formulas	65
Supplementary Exercises	65
Case Problem 1: Pelican Stores	71
Case Problem 2: Motion Picture Industry	72
Appendix 2.1 Using Minitab for Tabular and Graphical Presentations	73
Appendix 2.2 Using Excel for Tabular and Graphical Presentations	75
Appendix 2.3 Using StatTools for Tabular and Graphical Presentations	84

Chapter 3 Descriptive Statistics: Numerical Measures **85**

Statistics in Practice: Small Fry Design 86

3.1 Measures of Location	87
Mean	87
Median	88
Mode	89
Percentiles	90
Quartiles	91
3.2 Measures of Variability	95
Range	96
Interquartile Range	96
Variance	97
Standard Deviation	99
Coefficient of Variation	99
3.3 Measures of Distribution Shape, Relative Location, and Detecting Outliers	102
Distribution Shape	102
z-Scores	103
Chebyshev's Theorem	104
Empirical Rule	105
Detecting Outliers	106

3.4 Exploratory Data Analysis	109
Five-Number Summary	109
Box Plot	110
3.5 Measures of Association Between Two Variables	115
Covariance	115
Interpretation of the Covariance	117
Correlation Coefficient	119
Interpretation of the Correlation Coefficient	120
3.6 The Weighted Mean and Working with Grouped Data	124
Weighted Mean	124
Grouped Data	125
Summary	129
Glossary	130
Key Formulas	131
Supplementary Exercises	133
Case Problem 1: Pelican Stores	137
Case Problem 2: Motion Picture Industry	138
Case Problem 3: Business Schools of Asia-Pacific	139
Case Problem 4: Heavenly Chocolates Website Transactions	139
Appendix 3.1 Descriptive Statistics Using Minitab	142
Appendix 3.2 Descriptive Statistics Using Excel	143
Appendix 3.3 Descriptive Statistics Using StatTools	146

Chapter 4 Introduction to Probability 148

Statistics in Practice: Oceanwide Seafood	149
4.1 Experiments, Counting Rules, and Assigning Probabilities	150
Counting Rules, Combinations, and Permutations	151
Assigning Probabilities	155
Probabilities for the KP&L Project	157
4.2 Events and Their Probabilities	160
4.3 Some Basic Relationships of Probability	164
Complement of an Event	164
Addition Law	165
4.4 Conditional Probability	171
Independent Events	174
Multiplication Law	174
4.5 Bayes' Theorem	178
Tabular Approach	182
Summary	184
Glossary	184

Key Formulas	185
Supplementary Exercises	186
Case Problem: Hamilton County Judges	190

Chapter 5 Discrete Probability Distributions 193

Statistics in Practice: Citibank	194
5.1 Random Variables	194
Discrete Random Variables	195
Continuous Random Variables	196
5.2 Discrete Probability Distributions	197
5.3 Expected Value and Variance	202
Expected Value	202
Variance	203
5.4 Binomial Probability Distribution	207
A Binomial Experiment	208
Martin Clothing Store Problem	209
Using Tables of Binomial Probabilities	213
Expected Value and Variance for the Binomial Distribution	214
5.5 Poisson Probability Distribution	218
An Example Involving Time Intervals	218
An Example Involving Length or Distance Intervals	220
5.6 Hypergeometric Probability Distribution	221
Summary	225
Glossary	225
Key Formulas	226
Supplementary Exercises	227
Appendix 5.1 Discrete Probability Distributions with Minitab	230
Appendix 5.2 Discrete Probability Distributions with Excel	230

Chapter 6 Continuous Probability Distributions 232

Statistics in Practice: Procter & Gamble	233
6.1 Uniform Probability Distribution	234
Area as a Measure of Probability	235
6.2 Normal Probability Distribution	238
Normal Curve	238
Standard Normal Probability Distribution	240
Computing Probabilities for Any Normal Probability Distribution	245
Great Tire Company Problem	246
6.3 Normal Approximation of Binomial Probabilities	250
6.4 Exponential Probability Distribution	253
Computing Probabilities for the Exponential Distribution	254
Relationship Between the Poisson and Exponential Distributions	255

Summary	257
Glossary	258
Key Formulas	258
Supplementary Exercises	258
Case Problem: Specialty Toys	261
Appendix 6.1 Continuous Probability Distributions with Minitab	262
Appendix 6.2 Continuous Probability Distributions with Excel	263

Chapter 7 Sampling and Sampling Distributions 265

Statistics in Practice: MeadWestvaco Corporation	266
7.1 The Electronics Associates Sampling Problem	267
7.2 Selecting a Sample	268
Sampling from a Finite Population	268
Sampling from an Infinite Population	270
7.3 Point Estimation	273
Practical Advice	275
7.4 Introduction to Sampling Distributions	276
7.5 Sampling Distribution of \bar{x}	278
Expected Value of \bar{x}	279
Standard Deviation of \bar{x}	280
Form of the Sampling Distribution of \bar{x}	281
Sampling Distribution of \bar{x} for the EAI Problem	283
Practical Value of the Sampling Distribution of \bar{x}	283
Relationship Between the Sample Size and the Sampling Distribution of \bar{x}	285
7.6 Sampling Distribution of \bar{p}	289
Expected Value of \bar{p}	289
Standard Deviation of \bar{p}	290
Form of the Sampling Distribution of \bar{p}	291
Practical Value of the Sampling Distribution of \bar{p}	291
7.7 Properties of Point Estimators	295
Unbiased	295
Efficiency	296
Consistency	297
7.8 Other Sampling Methods	297
Stratified Random Sampling	297
Cluster Sampling	298
Systematic Sampling	298
Convenience Sampling	299
Judgment Sampling	299
Summary	300
Glossary	300
Key Formulas	301

Supplementary Exercises 302**Appendix 7.1 The Expected Value and Standard Deviation of \bar{x} 304****Appendix 7.2 Random Sampling with Minitab 306****Appendix 7.3 Random Sampling with Excel 306****Appendix 7.4 Random Sampling with StatTools 307****Chapter 8 Interval Estimation 308****Statistics in Practice: Food Lion 309****8.1 Population Mean: σ Known 310**

Margin of Error and the Interval Estimate 310

Practical Advice 314

8.2 Population Mean: σ Unknown 316

Margin of Error and the Interval Estimate 317

Practical Advice 320

Using a Small Sample 320

Summary of Interval Estimation Procedures 322

8.3 Determining the Sample Size 325**8.4 Population Proportion 328**

Determining the Sample Size 330

Summary 333**Glossary 334****Key Formulas 335****Supplementary Exercises 335****Case Problem 1: Young Professional Magazine 338****Case Problem 2: Gulf Real Estate Properties 339****Case Problem 3: Metropolitan Research, Inc. 341****Appendix 8.1 Interval Estimation with Minitab 341****Appendix 8.2 Interval Estimation with Excel 343****Appendix 8.3 Interval Estimation with StatTools 346****Chapter 9 Hypothesis Tests 348****Statistics in Practice: John Morrell & Company 349****9.1 Developing Null and Alternative Hypotheses 350**

The Alternative Hypothesis as a Research Hypothesis 350

The Null Hypothesis as an Assumption to Be Challenged 351

Summary of Forms for Null and Alternative Hypotheses 352

9.2 Type I and Type II Errors 353**9.3 Population Mean: σ Known 356**

One-Tailed Test 356

Two-Tailed Test 362

Summary and Practical Advice 365

	Relationship Between Interval Estimation and Hypothesis Testing	366
9.4	Population Mean: σ Unknown	370
	One-Tailed Test	371
	Two-Tailed Test	372
	Summary and Practical Advice	373
9.5	Population Proportion	376
	Summary	379
9.6	Hypothesis Testing and Decision Making	381
9.7	Calculating the Probability of Type II Errors	382
9.8	Determining the Sample Size for a Hypothesis Test About a Population Mean	387
	Summary	391
	Glossary	392
	Key Formulas	392
	Supplementary Exercises	393
	Case Problem 1: Quality Associates, Inc.	396
	Case Problem 2: Ethical Behavior of Business Students at Bayview University	397
	Appendix 9.1 Hypothesis Testing with Minitab	398
	Appendix 9.2 Hypothesis Testing with Excel	400
	Appendix 9.3 Hypothesis Testing with StatTools	404

Chapter 10 Inference About Means and Proportions with Two Populations 406

	Statistics in Practice: U.S. Food and Drug Administration	407
10.1	Inferences About the Difference Between Two Population Means: σ_1 and σ_2 Known	408
	Interval Estimation of $\mu_1 - \mu_2$	408
	Hypothesis Tests About $\mu_1 - \mu_2$	410
	Practical Advice	412
10.2	Inferences About the Difference Between Two Population Means: σ_1 and σ_2 Unknown	415
	Interval Estimation of $\mu_1 - \mu_2$	415
	Hypothesis Tests About $\mu_1 - \mu_2$	417
	Practical Advice	419
10.3	Inferences About the Difference Between Two Population Means: Matched Samples	423
10.4	Inferences About the Difference Between Two Population Proportions	429
	Interval Estimation of $p_1 - p_2$	429
	Hypothesis Tests About $p_1 - p_2$	431
	Summary	436

Glossary	436
Key Formulas	437
Supplementary Exercises	438
Case Problem: Par, Inc.	441
Appendix 10.1 Inferences About Two Populations Using Minitab	442
Appendix 10.2 Inferences About Two Populations Using Excel	444
Appendix 10.3 Inferences About Two Populations Using StatTools	446

Chapter 11 Inferences About Population Variances 448

Statistics in Practice: U.S. Government Accountability Office	449
11.1 Inferences About a Population Variance	450
Interval Estimation	450
Hypothesis Testing	454
11.2 Inferences About Two Population Variances	460
Summary	466
Key Formulas	467
Supplementary Exercises	467
Case Problem: Air Force Training Program	469
Appendix 11.1 Population Variances with Minitab	470
Appendix 11.2 Population Variances with Excel	470
Appendix 11.3 Population Standard Deviation with StatTools	471

Chapter 12 Tests of Goodness of Fit and Independence 472

Statistics in Practice: United Way	473
12.1 Goodness of Fit Test: A Multinomial Population	474
12.2 Test of Independence	479
12.3 Goodness of Fit Test: Poisson and Normal Distributions	487
Poisson Distribution	487
Normal Distribution	491
Summary	496
Glossary	497
Key Formulas	497
Supplementary Exercises	497
Case Problem: A Bipartisan Agenda for Change	501
Appendix 12.1 Tests of Goodness of Fit and Independence Using Minitab	502
Appendix 12.2 Tests of Goodness of Fit and Independence Using Excel	503

Chapter 13 Experimental Design and Analysis of Variance 506

Statistics in Practice: Burke Marketing Services, Inc.	507
13.1 An Introduction to Experimental Design and Analysis of Variance	508

	Data Collection	509
	Assumptions for Analysis of Variance	510
	Analysis of Variance: A Conceptual Overview	510
13.2	Analysis of Variance and the Completely Randomized Design	513
	Between-Treatments Estimate of Population Variance	514
	Within-Treatments Estimate of Population Variance	515
	Comparing the Variance Estimates: The F Test	516
	ANOVA Table	518
	Computer Results for Analysis of Variance	519
	Testing for the Equality of k Population Means: An Observational Study	520
13.3	Multiple Comparison Procedures	524
	Fisher's LSD	524
	Type I Error Rates	527
13.4	Randomized Block Design	530
	Air Traffic Controller Stress Test	531
	ANOVA Procedure	532
	Computations and Conclusions	533
13.5	Factorial Experiment	537
	ANOVA Procedure	539
	Computations and Conclusions	539
	Summary	544
	Glossary	545
	Key Formulas	545
	Supplementary Exercises	547
	Case Problem 1: Wentworth Medical Center	552
	Case Problem 2: Compensation for Sales Professionals	553
	Appendix 13.1 Analysis of Variance with Minitab	554
	Appendix 13.2 Analysis of Variance with Excel	555
	Appendix 13.3 Analysis of Variance with StatTools	557

Chapter 14 Simple Linear Regression 560

	Statistics in Practice: Alliance Data Systems	561
14.1	Simple Linear Regression Model	562
	Regression Model and Regression Equation	562
	Estimated Regression Equation	563
14.2	Least Squares Method	565
14.3	Coefficient of Determination	576
	Correlation Coefficient	579
14.4	Model Assumptions	583
14.5	Testing for Significance	585
	Estimate of σ^2	585
	t Test	586

	Confidence Interval for β_1	587
	F Test	588
	Some Cautions About the Interpretation of Significance Tests	590
14.6	Using the Estimated Regression Equation for Estimation and Prediction	594
	Point Estimation	594
	Interval Estimation	594
	Confidence Interval for the Mean Value of y	595
	Prediction Interval for an Individual Value of y	596
14.7	Computer Solution	600
14.8	Residual Analysis: Validating Model Assumptions	605
	Residual Plot Against x	606
	Residual Plot Against \hat{y}	607
	Standardized Residuals	607
	Normal Probability Plot	610
14.9	Residual Analysis: Outliers and Influential Observations	614
	Detecting Outliers	614
	Detecting Influential Observations	616
	Summary	621
	Glossary	622
	Key Formulas	623
	Supplementary Exercises	625
	Case Problem 1: Measuring Stock Market Risk	631
	Case Problem 2: U.S. Department of Transportation	632
	Case Problem 3: Alumni Giving	633
	Case Problem 4: PGA Tour Statistics	633
	Appendix 14.1 Calculus-Based Derivation of Least Squares Formulas	635
	Appendix 14.2 A Test for Significance Using Correlation	636
	Appendix 14.3 Regression Analysis with Minitab	637
	Appendix 14.4 Regression Analysis with Excel	638
	Appendix 14.5 Regression Analysis with StatTools	640
	Chapter 15 Multiple Regression	642
	Statistics in Practice: dunnhumby	643
15.1	Multiple Regression Model	644
	Regression Model and Regression Equation	644
	Estimated Multiple Regression Equation	644
15.2	Least Squares Method	645
	An Example: Butler Trucking Company	646
	Note on Interpretation of Coefficients	648
15.3	Multiple Coefficient of Determination	654
15.4	Model Assumptions	657

15.5	Testing for Significance	658
	<i>F</i> Test	658
	<i>t</i> Test	661
	Multicollinearity	662
15.6	Using the Estimated Regression Equation for Estimation and Prediction	665
15.7	Categorical Independent Variables	668
	An Example: Johnson Filtration, Inc.	668
	Interpreting the Parameters	670
	More Complex Categorical Variables	672
15.8	Residual Analysis	676
	Detecting Outliers	678
	Studentized Deleted Residuals and Outliers	678
	Influential Observations	679
	Using Cook's Distance Measure to Identify Influential Observations	679
15.9	Logistic Regression	683
	Logistic Regression Equation	684
	Estimating the Logistic Regression Equation	685
	Testing for Significance	687
	Managerial Use	688
	Interpreting the Logistic Regression Equation	688
	Logit Transformation	691
	Summary	694
	Glossary	695
	Key Formulas	696
	Supplementary Exercises	698
	Case Problem 1: Consumer Research, Inc.	704
	Case Problem 2: Alumni Giving	705
	Case Problem 3: PGA Tour Statistics	705
	Case Problem 4: Predicting Winning Percentage for the NFL	708
	Appendix 15.1 Multiple Regression with Minitab	708
	Appendix 15.2 Multiple Regression with Excel	709
	Appendix 15.3 Logistic Regression with Minitab	710
	Appendix 15.4 Multiple Regression with StatTools	711

Chapter 16 Regression Analysis: Model Building 712

Statistics in Practice: Monsanto Company 713

16.1 General Linear Model 714

 Modeling Curvilinear Relationships 714

 Interaction 718

Transformations Involving the Dependent Variable	720
Nonlinear Models That Are Intrinsically Linear	724
16.2 Determining When to Add or Delete Variables	729
General Case	730
Use of p -Values	732
16.3 Analysis of a Larger Problem	735
16.4 Variable Selection Procedures	739
Stepwise Regression	739
Forward Selection	740
Backward Elimination	741
Best-Subsets Regression	741
Making the Final Choice	742
16.5 Multiple Regression Approach to Experimental Design	745
16.6 Autocorrelation and the Durbin-Watson Test	750
Summary	754
Glossary	754
Key Formulas	754
Supplementary Exercises	755
Case Problem 1: Analysis of PGA Tour Statistics	758
Case Problem 2: Fuel Economy for Cars	759
Appendix 16.1 Variable Selection Procedures with Minitab	760
Appendix 16.2 Variable Selection Procedures with StatTools	761

Chapter 17 Index Numbers 763

Statistics in Practice: U.S. Department of Labor, Bureau of Labor Statistics	764
17.1 Price Relatives	765
17.2 Aggregate Price Indexes	765
17.3 Computing an Aggregate Price Index from Price Relatives	769
17.4 Some Important Price Indexes	771
Consumer Price Index	771
Producer Price Index	771
Dow Jones Averages	772
17.5 Deflating a Series by Price Indexes	773
17.6 Price Indexes: Other Considerations	777
Selection of Items	777
Selection of a Base Period	777
Quality Changes	777
17.7 Quantity Indexes	778
Summary	780

Glossary 780
Key Formulas 780
Supplementary Exercises 781

Chapter 18 Time Series Analysis and Forecasting 784

Statistics in Practice: Nevada Occupational Health Clinic 785

18.1 Time Series Patterns 786
Horizontal Pattern 786
Trend Pattern 788
Seasonal Pattern 788
Trend and Seasonal Pattern 789
Cyclical Pattern 789
Selecting a Forecasting Method 791

18.2 Forecast Accuracy 792

18.3 Moving Averages and Exponential Smoothing 797
Moving Averages 797
Weighted Moving Averages 800
Exponential Smoothing 800

18.4 Trend Projection 807
Linear Trend Regression 807
Holt's Linear Exponential Smoothing 812
Nonlinear Trend Regression 814

18.5 Seasonality and Trend 820
Seasonality Without Trend 820
Seasonality and Trend 823
Models Based on Monthly Data 825

18.6 Time Series Decomposition 829
Calculating the Seasonal Indexes 830
Deseasonalizing the Time Series 834
Using the Deseasonalized Time Series to Identify Trend 834
Seasonal Adjustments 836
Models Based on Monthly Data 837
Cyclical Component 837

Summary 839
Glossary 840
Key Formulas 841
Supplementary Exercises 842
Case Problem 1: Forecasting Food and Beverage Sales 846
Case Problem 2: Forecasting Lost Sales 847
Appendix 18.1 Forecasting with Minitab 848
Appendix 18.2 Forecasting with Excel 851
Appendix 18.3 Forecasting with StatTools 852

Chapter 19 Nonparametric Methods 855

Statistics in Practice: West Shell Realtors 856

19.1 Sign Test 857

Hypothesis Test About a Population Median 857

Hypothesis Test with Matched Samples 862

19.2 Wilcoxon Signed-Rank Test 865

19.3 Mann-Whitney-Wilcoxon Test 871

19.4 Kruskal-Wallis Test 882

19.5 Rank Correlation 887

Summary 891

Glossary 892

Key Formulas 893

Supplementary Exercises 893

Appendix 19.1 Nonparametric Methods with Minitab 896

Appendix 19.2 Nonparametric Methods with Excel 899

Appendix 19.3 Nonparametric Methods with StatTools 901

Chapter 20 Statistical Methods for Quality Control 903

Statistics in Practice: Dow Chemical Company 904

20.1 Philosophies and Frameworks 905

Malcolm Baldrige National Quality Award 906

ISO 9000 906

Six Sigma 906

20.2 Statistical Process Control 908

Control Charts 909

\bar{x} Chart: Process Mean and Standard Deviation Known 910

\bar{x} Chart: Process Mean and Standard Deviation Unknown 912

R Chart 915

p Chart 917

np Chart 919

Interpretation of Control Charts 920

20.3 Acceptance Sampling 922

KALI, Inc.: An Example of Acceptance Sampling 924

Computing the Probability of Accepting a Lot 924

Selecting an Acceptance Sampling Plan 928

Multiple Sampling Plans 930

Summary 931

Glossary 931

Key Formulas 932

Supplementary Exercises 933

Appendix 20.1 Control Charts with Minitab 935

Appendix 20.2 Control Charts with StatTools 935

Chapter 21 Decision Analysis 937

Statistics in Practice: Ohio Edison Company 938

21.1 Problem Formulation 939

Payoff Tables 940

Decision Trees 940

21.2 Decision Making with Probabilities 941

Expected Value Approach 941

Expected Value of Perfect Information 943

21.3 Decision Analysis with Sample Information 949

Decision Tree 950

Decision Strategy 951

Expected Value of Sample Information 954

21.4 Computing Branch Probabilities Using Bayes' Theorem 960

Summary 964

Glossary 965

Key Formulas 966

Supplementary Exercises 966

Case Problem: Lawsuit Defense Strategy 969

Appendix: An Introduction to PrecisionTree 970

Chapter 22 Sample Survey On Website

Statistics in Practice: Duke Energy 22-2

22.1 Terminology Used in Sample Surveys 22-2

22.2 Types of Surveys and Sampling Methods 22-3

22.3 Survey Errors 22-5

Nonsampling Error 22-5

Sampling Error 22-5

22.4 Simple Random Sampling 22-6

Population Mean 22-6

Population Total 22-7

Population Proportion 22-8

Determining the Sample Size 22-9

22.5 Stratified Simple Random Sampling 22-12

Population Mean 22-12

Population Total 22-14

Population Proportion 22-15

Determining the Sample Size 22-16

22.6 Cluster Sampling 22-21

Population Mean 22-23

Population Total 22-24

Population Proportion 22-25

Determining the Sample Size 22-26

22.7 Systematic Sampling 22-29

Summary 22-29

Glossary 22-30

Key Formulas 22-30

Supplementary Exercises 22-34

Appendix: Self-Test Solutions and Answers to Even-Numbered Exercises 22-37

Appendix A **References and Bibliography 976**

Appendix B **Tables 978**

Appendix C **Summation Notation 1005**

Appendix D **Self-Test Solutions and Answers to Even-Numbered Exercises 1007**

Appendix E **Using Excel Functions 1062**

Appendix F **Computing p -Values Using Minitab and Excel 1067**

Index 1071