

BRIEF CONTENTS

CHAPTER 1:	Introduction to Statistics	2
CHAPTER 2:	Descriptive Statistics	56
CHAPTER 3:	Probability Concepts and Theory	120
CHAPTER 4:	Discrete Probability Distributions	162
CHAPTER 5:	Continuous Probability Distributions	212
CHAPTER 6:	Sampling Distributions	254
CHAPTER 7:	Estimation and Confidence Intervals	282
CHAPTER 8:	One-Sample Hypothesis Tests	320
CHAPTER 9:	Inference from Two Samples	372
CHAPTER 10:	Chi-Square Tests	424
CHAPTER 11:	Analysis of Variance	462
CHAPTER 12:	Simple Linear Regression	518
CHAPTER 13:	Nonparametric Tests (Part A)	566
CHAPTER 14:	Statistical Quality Control	620
ADDITIONAL CHAPTERS ON CD:		
CHAPTER 15:	Multiple Linear Regression	15-2
CHAPTER 16:	Nonparametric Tests (Part B)	16-2
CHAPTER 17:	Time Series, Forecasting, and Index Numbers	17-2

CONTENTS

PREFACE	XV		
ACKNOWLEDGMENTS	XX		
<hr/>			
CHAPTER 1			
INTRODUCTION TO STATISTICS	2		
What is Statistics?	4		
Data Collection	6		
Concepts in Statistics	7		
Levels of Data Measurement	10		
Types of Statistics	11		
Descriptive Statistics	11		
Inferential Statistics	11		
Sampling Methods	12		
Simple Random Sampling	12		
Systematic Sampling	13		
Stratified Sampling	14		
Cluster Sampling	14		
Frequency Distribution	15		
Qualitative Data	15		
Quantitative Data	16		
Check your Understanding	20		
Graphic Presentations of a Frequency Distribution	22		
Bar Chart	22		
Histogram	23		
Technology: Histograms	24		
Frequency Polygon	26		
Technology: Frequency Polygons	26		
Ogive	27		
Technology: Ogives	28		
Pie Chart	29		
Technology: Pie Charts	30		
Stem and Leaf Display	32		
Other Graphic Presentations of Data	35		
Time Series	35		
Technology: Time Series	37		
Scatter Plots	37		
Technology: Scatter Plots	40		
Pareto Chart	41		
Technology: Pareto Chart	42		
Check your Understanding	44		
Chapter Summary	46		
Key Terms	46		
Solved Problems	47		
Problem A	47		
Problem B	47		
Problem C	49		
Problems	49		
Miniprojects	54		
<hr/>			
CHAPTER 2			
DESCRIPTIVE STATISTICS	56		
Measures of Central Tendency	58		
Mean	59		
Weighted mean	62		
Median	65		
Midrange	68		
Mode	68		
Geometric Mean	70		
Trimmed Mean	73		
Harmonic Mean	74		
Technology: Measures of Central Tendency	75		
Check your Understanding	75		
Measures of Dispersion	77		
Range	78		
Variance	79		
Standard Deviation	84		
Coefficient of Variation	85		
Chebyshev's Theorem	87		
Technology: Measures of Dispersion	88		
Check your Understanding	89		
Measures of Location	90		
Z-Score	90		
Percentile	92		
Quartiles	97		
Technology: Percentile Graphs	98		
Exploratory Data Analysis	98		
Outliers	98		
Box Plots	102		
Measures of Shape	103		
Skewness	103		
Kurtosis	105		
Technology: Measures of Location and Shape	106		
Check your Understanding	107		
Chapter Summary	108		
Key Terms	109		
Key Formulas	110		
Solved Problems	110		
Problem A	110		
Problem B	111		
Problem C	111		
Problem D	112		
Problems	114		
Miniprojects	119		
<hr/>			
CHAPTER 3			
PROBABILITY CONCEPTS AND THEORY	120		
The Concept of Probability	122		
Classical Approach	124		
Empirical Approach	124		
Subjective Approach	125		
Counting Rules	125		
The Multiplication Rule	126		
The Permutation Rule	127		
The Combination Rule	129		
Technology: Counting Rules	130		
Check your Understanding	131		
Laws of Probabilities	132		
Addition Law of Probability	135		
Conditional Law of Probability	138		
Relationship among Joint, Conditional and Marginal Probabilities	141		
Technology: Conditional Probabilities	147		
Check your Understanding	148		
Posterior Probabilities and Bayes' Theorem	150		
Technology: Bayesian Probabilities	153		
Check your Understanding	154		
Chapter Summary	155		
Key Terms	155		
Key Formulas	156		
Solved Problems	156		
Problem A	156		
Problem B	156		
Problem C	157		
Problems	158		
Miniprojects	161		

CHAPTER 4			
DISCRETE PROBABILITY DISTRIBUTIONS	162		
Random Variables	164		
Probability Distribution	165		
Discrete Probability Distributions	167		
Mean, Variance and Standard Deviation of a Probability Distribution	169		
Technology: Discrete Random Variables	173		
The Binomial Distribution	173		
Binomial Probability Tables	176		
Mean of the Binomial Distribution	177		
Variance of the Binomial Distribution	178		
Technology: the Binomial Distribution	178		
Check your Understanding	182		
The Negative Binomial Distribution	184		
Mean and Variance of the Negative Binomial Distribution	186		
Technology: the Negative Binomial Distribution	187		
The Geometric Distribution	188		
Mean and Variance of the Geometric Distribution	189		
Technology: the Geometric Distribution	190		
Check your Understanding	191		
The Hypergeometric Distribution	192		
Mean and Variance of the Hypergeometric Distribution	194		
Technology: the Hypergeometric Distribution	196		
The Poisson Distribution	197		
Poisson Probability Tables	198		
Mean and Variance of the Poisson Distribution	199		
Poisson Approximation to the Binomial	200		
Technology: the Poisson Distribution	201		
Check your Understanding	202		
Chapter Summary	203		
Key Terms	203		
Key Formulas	203		
Solved Problems	205		
Problem A	205		
Problem B	205		
Problem C	206		
Problems	206		
Miniprojects	210		
<hr/>			
CHAPTER 5			
CONTINUOUS PROBABILITY DISTRIBUTIONS	212		
The Uniform Distribution	214		
Mean and Variance of the Uniform Distribution	217		
Technology: the Uniform Distribution	218		
The Exponential Distribution	219		
Mean and Variance of the Exponential Distribution	222		
Technology: the Exponential Distribution	222		
Check your Understanding	223		
The Normal Distribution	225		
Standard Normal Table	227		
Finding Probabilities of the Normal Distribution	229		
Finding Values of Z Given Probabilities	232		
The Inverse Transformation	234		
Approximation of the Binomial Distribution by the Normal Distribution	237		
Technology: the Normal Distribution	241		
Technology: the Normal Approximation to Binomial Distributions	243		
<hr/>			
Check your Understanding	244		
Chapter Summary	246		
Key Terms	246		
Key Formulas	246		
Solved Problems	247		
Problem A	247		
Problem B	247		
Problem C	248		
Problem D	248		
Problems	248		
Miniprojects	252		
<hr/>			
CHAPTER 6			
SAMPLING DISTRIBUTIONS	254		
Sampling	256		
Population Parameters and Sample Statistics	256		
Reasons for Sampling	257		
Random Sampling	258		
Sampling Distribution of the Mean	259		
The Central Limit Theorem	262		
Technology: the Sampling Distribution of the Mean	266		
Check your Understanding	266		
Sampling Distribution of the Sample Proportion	268		
Technology: the Sampling Distribution of the Proportion	272		
The Correction Factor	272		
Technology: Finite Correction Factor	275		
Check your Understanding	276		
Chapter Summary	276		
Key Terms	277		
Key Formulas	277		
Solved Problems	278		
Problem A	278		
Problem B	278		
Problems	279		
Miniprojects	281		
<hr/>			
CHAPTER 7			
ESTIMATION AND CONFIDENCE INTERVALS	282		
Estimation	284		
Confidence Interval for the Population Mean	286		
Confidence Interval for the Population Mean when σ is Known	287		
Finite Correction Factor	289		
Technology: Confidence Intervals for Means with σ known	290		
Confidence Interval for the Mean when σ is Unknown	291		
Technology: Confidence Intervals for Means with σ unknown	297		
Check your Understanding	298		
Confidence Interval for a Proportion	299		
Technology: Confidence Intervals for Proportions	301		
Confidence Interval for the Variance	302		
Using the Chi-Square Table	303		
Confidence Intervals with the Chi-Square Distribution	304		
Technology: Confidence Intervals for Variances	306		
Check your Understanding	306		
Estimation of the Sample Size	307		
Sample Size for Estimating μ when σ is Known	307		
Sample Size for Estimating μ when σ is Unknown	308		

Sample Size when Estimating the Population Proportion	310	Testing the Difference between Two Means for Paired Samples	382
Technology: Sample Size Determination	311	Confidence Intervals for the Difference of Two Means	385
Check your Understanding	311	Confidence Intervals for the Difference between Two Means for Paired Samples	386
Chapter Summary	312	Technology: Templates for Testing the Difference between Two Means	387
Key Terms	313	Check your Understanding	389
Key Formulas	313	Testing the Difference between Two Proportions	391
Solved Problems	314	Confidence Intervals for the Difference of Two Proportions	396
Problem A	314	Technology: Testing the Difference between Two Proportions	397
Problem B	314	Check your Understanding	398
Problem C	314	Testing the Difference between Two Variances	399
Problems	315	Use of <i>F</i> -Tables	400
Miniprojects	318	The <i>F</i> -Test for Two Population Variances	401
<hr/>		Technology: Testing the Difference between Two Variances	406
CHAPTER 8		Check your Understanding	407
ONE-SAMPLE HYPOTHESIS TESTS	320	Testing the Difference between Two Means for Small and Independent Samples when the Variances are Unknown and Equal	407
Hypothesis Testing: a Preview	322	Confidence Intervals for Means with Equal Variances	410
Hypothesis Testing Procedure	324	Technology: Testing the Difference between Two Means for Small Samples and Equal Variances	411
Types of Hypothesis Tests	328	Check your Understanding	411
One-Tailed Test	329	Chapter Summary	412
Two-Tailed Test	330	Key Terms	413
Test for a Population Mean with Known Variance	331	Key Formulas	413
The Critical Value Approach	332	Solved Problems	415
The <i>p</i> -Value Approach	335	Problem A	415
Technology: Hypothesis Test on the Mean with Known Variance	338	Problem B	416
Test for a Population Mean with Unknown Variance	339	Problem C	416
Technology: Hypothesis Test on the Mean with Unknown Variance	343	Problems	418
Check your Understanding	343	Miniprojects	423
Test for a Population Proportion	345	<hr/>	
Technology: Hypothesis Tests for Proportions	347	CHAPTER 10	
Check your Understanding	348	CHI-SQUARE TESTS	424
Test for a Population Variance	349	Goodness-of-Fit Test	426
Technology: Hypothesis Tests for Variances	352	Application to a Uniform Distribution	427
Check your Understanding	353	Application to a Multinomial Distribution	429
Confidence Interval versus Hypothesis Test	354	Application to a Normal Distribution	431
Test of Type II Errors	355	Application to a Poisson Distribution	433
Technology: Beta and Power	361	Technology: Templates for Goodness-of-Fit Test	436
Check your Understanding	362	Check your Understanding	438
Chapter Summary	362	Contingency Analysis: a Chi-Square Test for Independence	440
Key Terms	363	Technology: Contingency Analysis: a Chi-Square Test for Independence	444
Key Formulas	363	Contingency Analysis: a Test for Homogeneity of Proportions	447
Solved Problems	364	Technology: Contingency Analysis: a Test for Homogeneity of Proportions	449
Problem A	364	Check your Understanding	451
Problem B	364	Chapter Summary	453
Problem C	365	Key Terms	453
Problems	366	Key Formulas	453
Miniprojects	370	Solved Problems	454
<hr/>		<hr/>	
CHAPTER 9			
INFERENCE FROM TWO SAMPLES	372		
One-sample versus Two-sample Test	374		
Testing the Difference between Two Means	375		
Testing the Difference between Two Means for Large and Independent Samples with Known Variances	376		
Testing the Difference between Two Means for Large and Independent Samples with Unknown Variances	378		
Testing the Difference between Two Means for Small and Independent Samples with Unknown and Unequal Variances	379		

Problem A	454	CHAPTER 13	
Problem B	455	NONPARAMETRIC TESTS (PART A)	566
Problem C	456	Nonparametric Tests	568
Problems	457	The Sign Test	569
Miniprojects	460	Tests on Categorical Data	569
		Tests on the Median	574
		Technology: Templates for the Sign Test	577
CHAPTER 11		The Runs Test	579
ANALYSIS OF VARIANCE	462	Small Samples	579
One-Way Analysis of Variance	464	Large Samples	582
Technology: One-Way ANOVA	471	Technology: the Runs Test	584
Multiple Comparison Tests	471	Check your Understanding	585
Test of Homogeneity of Variances	475	The Wilcoxon Signed-Rank Test	
Technology: One-Way ANOVA with Tukey-Kramer Criterion	476	for Paired Data	586
Check your Understanding	479	Small Samples	588
Randomized Complete Block ANOVA	482	Large Samples	592
Technology: Randomized Complete Block ANOVA	489	Technology: the Wilcoxon Signed-Rank Test	594
Two-Way ANOVA with Replication	489	The Mann-Whitney <i>U</i> -Test for Independent	
A Word about Interaction	496	Samples	596
Technology: Two-Way ANOVA	498	Small Samples	597
Check your Understanding	499	Large Samples	602
Chapter Summary	501	Technology: the Mann-Whitney <i>U</i>-Test	605
Key Terms	502	Check your Understanding	606
Key Formulas	502	Chapter Summary	607
Solved Problems	503	Key Terms	607
Problem A	503	Key Formulas	608
Problem B	504	Solved Problems	609
Problems	505	Problem A	609
Miniprojects	516	Problem B	609
		Problem C	610
CHAPTER 12		Problems	612
SIMPLE LINEAR REGRESSION	518	Miniprojects	618
Linear Regression: a Preview	520		
Simple Linear Regression	521	CHAPTER 14	
Scatter Diagram	523	STATISTICAL QUALITY CONTROL	620
Least-squares Line	524	A Brief History of Modern Quality Management	622
Technology: Simple Linear Regression	527	Tools of Total Quality Management	623
Check your Understanding	529	Process Map	624
The Standard Error	531	Check Sheets	624
The Coefficient of Determination	533	Histograms	625
The Coefficient of Correlation	535	Scatter Diagrams	625
Inference about the Regression Relationship	537	Pareto Analysis	626
Tests of Hypotheses	537	Cause-and-Effect Diagrams	626
Confidence Intervals	541	Control Charts	627
Analysis of Variance and the <i>F</i> -test of the Regression Model	541	Check your Understanding	628
Check your Understanding	543	Statistical Process Control	629
Prediction of <i>Y</i> Using the Regression Model	545	Causes of Variation	629
Analysis of Residuals	546	Statistical Process Control Charts	630
Normality Assumption	547	Statistical Process Control Charts for Variables	632
Constant Variance Assumption	547	Technology: \bar{X} and R Charts	637
Independence Assumption	548	Technology: \bar{X} and MR Charts	641
Technology: Linear Regression Model	551	Technology: \bar{X} and S Charts	644
Check your Understanding	552	Check your Understanding	645
Chapter Summary	553	Statistical Process Control Charts for Attributes	647
Key Terms	553	Technology: the <i>p</i> Chart	649
Key Formulas	553	Technology: the <i>c</i> Chart	652
Solved Problems	555	Check your Understanding	652
Problem A	555	Chapter Summary	654
Problem B	557	Key Terms	655
Problems	558	Key Formulas	655
Miniprojects	565	Solved Problems	657

Problem A	657	Group Averaging	75
Problem B	658	Group Consensus	76
Problem C	659	Historical Analogy	76
Problems	660	Delphi Method	76
Miniprojects	666	Time Series Forecasting Methods	77
<hr/>		Time Series Forecasting Based on	
CHAPTER 15		Averages	78
MULTIPLE LINEAR REGRESSION	2	Technology: Simple Moving	
Multiple Linear Regression Model	4	Average	88
The <i>F</i> -Test for Overall Significance	7	Technology: Weighted Moving	
The Coefficient of Determination	9	Average	89
Significance Tests for Regression Parameters	10	Technology: Templates for Single	
Confidence Intervals for Regression Coefficients	12	Exponential Smoothing	89
Technology: Multiple		Check your Understanding	91
Linear Regression with Excel	12	Time Series Forecasting Based on Trend	93
Technology: Multiple Linear		Technology: Simple Linear	
Regression with Minitab	14	Regression	97
Check your Understanding	15	Exponential Trend Model	97
Prediction using the Multiple		Quadratic Trend Model	101
Regression Model	17	Technology: Templates for Double	
Binary Independent Variables	18	Exponential Smoothing	105
Multicollinearity	23	Technology: Templates for	
Model Building	27	Ratio-to-Moving-Average	
Stepwise Regression	27	Model with Seasonality	105
Forward Selection	29	Check your Understanding	107
Backward Elimination	30	Time Series Forecasting Based on	
Check your Understanding	30	Seasonal Patterns	108
Chapter Summary	31	Technology: Templates for Linear	
Key Terms	32	Trend Model with Seasonality	120
Key Formulas	32	Check your Understanding	123
Solved Problems	33	Causal Models	125
Problem A	33	Controlling the Forecast	128
Problem B	34	Tracking Signal	128
Problems	35	Control Chart	129
Miniprojects	38	Technology: Tracking	
<hr/>		Signal and Control Chart	129
CHAPTER 16		Check your Understanding	132
NONPARAMETRIC TESTS (PART B)	40	Index Numbers	132
The Kruskal-Wallis Test	42	Unweighted Aggregate Price Index	133
Technology: the Kruskal-Wallis Test	46	Weighted Aggregate Price Index	135
Check your Understanding	48	Laspeyres Price Index	135
The Friedman Test	50	Paasche Price Index	136
Technology: the Friedman Test	54	Fisher's Ideal Price Index	139
Check your Understanding	55	Technology: Template for Index	
The Spearman Rank Correlation Test	56	Numbers	139
Technology: the Spearman Rank		Check your Understanding	140
Correlation Test	60	Chapter Summary	141
Check your Understanding	61	Key Terms	142
Chapter Summary	62	Key Formulas	143
Key Terms	62	Solved Problems	145
Key Formulas	63	Problem A	145
Solved Problems	63	Problem B	146
Problem A	63	Problem C	148
Problem B	64	Problems	149
Problem C	66	Miniprojects	155
Problems	67	<hr/>	
Miniprojects	71	ANSWERS TO SELECTED ODD-NUMBERED	
<hr/>		PROBLEMS	665
CHAPTER 17		LIST OF APPENDIX TABLES	A1
TIME SERIES, FORECASTING,		BIBLIOGRAPHY	B1
AND INDEX NUMBERS	72	GLOSSARY	G1
Forecasting	74	INDEX	I2
Qualitative Forecasting Methods	75		