

# Contents

Acknowledgments .....	ix
<b>Chapter 1: Using This Student Guide .....</b>	<b>1</b>
Introduction .....	3
Introduction to the SAS System .....	4
Contents of This <i>Student Guide</i> .....	6
Conclusion .....	11
<b>Chapter 2: Terms and Concepts Used in This Guide .....</b>	<b>13</b>
Introduction .....	15
Research Hypotheses and Statistical Hypotheses .....	16
Data, Variables, Values, and Observations .....	21
Classifying Variables According to Their Scales of Measurement.....	24
Classifying Variables According to the Number of Values They Display .....	27
Basic Approaches to Research.....	29
Using Type-of-Variable Figures to Represent Dependent and Independent Variables .....	32
The Three Types of SAS Files .....	37
Conclusion .....	45
<b>Chapter 3: Tutorial: Writing and Submitting SAS Programs .....</b>	<b>47</b>
Introduction .....	48
Tutorial Part I: Basics of Using the SAS Windowing Environment.....	50
Tutorial Part II: Opening and Editing an Existing SAS Program .....	75
Tutorial Part III: Submitting a Program with an Error .....	94
Tutorial Part IV: Practicing What You Have Learned .....	102
Summary of Steps for Frequently Performed Activities .....	105
Controlling the Size of the Output Page with the OPTIONS Statement.....	109
For More Information.....	110
Conclusion .....	110
<b>Chapter 4: Data Input .....</b>	<b>111</b>
Introduction .....	113
Example 4.1: Creating a Simple SAS Data Set .....	117
Example 4.2: A More Complex Data Set .....	122
Using PROC MEANS and PROC FREQ to Identify Obvious Problems with the Data Set.....	131
Using PROC PRINT to Create a Printout of Raw Data.....	139
The Complete SAS Program.....	142
Conclusion .....	144
<b>Chapter 5: Creating Frequency Tables .....</b>	<b>145</b>
Introduction .....	146
Example 5.1: A Political Donation Study.....	147
Using PROC FREQ to Create a Frequency Table.....	152

Examples of Questions That Can Be Answered by Interpreting a Frequency Table .....	155
Conclusion .....	157
<b>Chapter 6: Creating Graphs .....</b>	<b>159</b>
Introduction .....	160
Reprise of Example 5.1: the Political Donation Study.....	161
Using PROC CHART to Create a Frequency Bar Chart .....	162
Using PROC CHART to Plot Means for Subgroups.....	174
Conclusion .....	177
<b>Chapter 7: Measures of Central Tendency and Variability .....</b>	<b>179</b>
Introduction .....	181
Reprise of Example 5.1: The Political Donation Study.....	181
Measures of Central Tendency: The Mode, Median, and Mean .....	183
Interpreting a Stem-and-Leaf Plot Created by PROC UNIVARIATE .....	187
Using PROC UNIVARIATE to Determine the Shape of Distributions .....	190
Simple Measures of Variability: The Range, the Interquartile Range, and the Semi-Interquartile Range .....	200
More Complex Measures of Central Tendency: The Variance and Standard Deviation.....	204
Variance and Standard Deviation: Three Formulas .....	207
Using PROC MEANS to Compute the Variance and Standard Deviation .....	210
Conclusion .....	214
<b>Chapter 8: Creating and Modifying Variables and Data Sets .....</b>	<b>215</b>
Introduction .....	217
Example 8.1: An Achievement Motivation Study .....	218
Using PROC PRINT to Create a Printout of Raw Data.....	222
Where to Place Data Manipulation and Data Subsetting Statements.....	225
Basic Data Manipulation .....	228
Recoding a Reversed Item and Creating a New Variable for the Achievement Motivation Study.....	235
Using IF-THEN Control Statements .....	239
Data Subsetting.....	248
Combining a Large Number of Data Manipulation and Data Subsetting Statements in a Single Program.....	256
Conclusion .....	260
<b>Chapter 9: z Scores .....</b>	<b>261</b>
Introduction .....	262
Example 9.1: Comparing Mid-Term Test Scores for Two Courses.....	266
Converting a Single Raw-Score Variable into a z-Score Variable .....	268
Converting Two Raw-Score Variables into z-Score Variables .....	278
Standardizing Variables with PROC STANDARD.....	285
Conclusion .....	286

<b>Chapter 10: Bivariate Correlation .....</b>	<b>287</b>
Introduction .....	290
Situations Appropriate for the Pearson Correlation Coefficient.....	290
Interpreting the Sign and Size of a Correlation Coefficient .....	293
Interpreting the Statistical Significance of a Correlation Coefficient .....	297
Problems with Using Correlations to Investigate Causal Relationships.....	299
Example 10.1: Correlating Weight Loss with a Variety of Predictor Variables.....	303
Using PROC PLOT to Create a Scattergram.....	307
Using PROC CORR to Compute the Pearson Correlation between Two Variables.....	313
Using PROC CORR to Compute All Possible Correlations for a Group of Variables .....	320
Summarizing Results Involving a Nonsignificant Correlation.....	324
Using the VAR and WITH Statements to Suppress the Printing of Some Correlations .....	329
Computing the Spearman Rank-Order Correlation Coefficient for Ordinal-Level Variables.....	332
Some Options Available with PROC CORR .....	333
Problems with Seeking Significant Results.....	335
Conclusion .....	338
<b>Chapter 11: Bivariate Regression.....</b>	<b>339</b>
Introduction .....	341
Choosing between the Terms Predictor Variable, Criterion Variable, Independent Variable, and Dependent Variable .....	341
Situations Appropriate for Bivariate Linear Regression .....	344
Example 11.1: Predicting Weight Loss from a Variety of Predictor Variables.....	346
Using PROC REG: Example with a Significant Positive Regression Coefficient .....	350
Using PROC REG: Example with a Significant Negative Regression Coefficient .....	371
Using PROC REG: Example with a Nonsignificant Regression Coefficient.....	379
Conclusion .....	383
<b>Chapter 12: Single-Sample <i>t</i> Test.....</b>	<b>385</b>
Introduction .....	387
Situations Appropriate for the Single-Sample <i>t</i> Test .....	387
Results Produced in a Single-Sample <i>t</i> Test.....	388
Example 12.1: Assessing Spatial Recall in a Reading Comprehension Task (Significant Results) .....	393
One-Tailed Tests versus Two-Tailed Tests .....	406
Example 12.2: An Illustration of Nonsignificant Results.....	407
Conclusion .....	412
<b>Chapter 13: Independent-Samples <i>t</i> Test .....</b>	<b>413</b>
Introduction .....	415
Situations Appropriate for the Independent-Samples <i>t</i> Test .....	417
Results Produced in an Independent-Samples <i>t</i> Test.....	420

Example 13.1: Observed Consequences for Modeled Aggression: Effects on Subsequent Subject Aggression (Significant Differences).....	428
Example 13.2: An Illustration of Results Showing Nonsignificant Differences.....	446
Conclusion .....	450
<b>Chapter 14: Paired-Samples <i>t</i> Test.....</b>	<b>451</b>
Introduction .....	453
Situations Appropriate for the Paired-Samples <i>t</i> Test.....	453
Similarities between the Paired-Samples <i>t</i> Test and the Single-Sample <i>t</i> Test .....	457
Results Produced in a Paired-Samples <i>t</i> Test .....	461
Example 14.1: Women's Responses to Emotional versus Sexual Infidelity .....	463
Example 14.2: An Illustration of Results Showing Nonsignificant Differences.....	483
Conclusion .....	487
<b>Chapter 15: One-Way ANOVA with One Between-Subjects Factor .....</b>	<b>489</b>
Introduction .....	491
Situations Appropriate for One-Way ANOVA with One Between-Subjects Factor .....	491
A Study Investigating Aggression .....	494
Treatment Effects, Multiple Comparison Procedures, and a New Index of Effect Size ...	497
Some Possible Results from a One-Way ANOVA .....	500
Example 15.1: One-Way ANOVA Revealing a Significant Treatment Effect .....	505
Example 15.2: One-Way ANOVA Revealing a Nonsignificant Treatment Effect .....	529
Conclusion .....	537
<b>Chapter 16: Factorial ANOVA with Two Between-Subjects Factors.....</b>	<b>539</b>
Introduction .....	542
Situations Appropriate for Factorial ANOVA with Two Between-Subjects Factors .....	542
Using Factorial Designs in Research.....	546
A Different Study Investigating Aggression.....	546
Understanding Figures That Illustrate the Results of a Factorial ANOVA.....	550
Some Possible Results from a Factorial ANOVA.....	553
Example of a Factorial ANOVA Revealing Two Significant Main Effects and a Nonsignificant Interaction.....	565
Example of a Factorial ANOVA Revealing Nonsignificant Main Effects and a Nonsignificant Interaction.....	607
Example of a Factorial ANOVA Revealing a Significant Interaction .....	617
Using the LSMEANS Statement to Analyze Data from Unbalanced Designs.....	625
Learning More about Using SAS for Factorial ANOVA .....	627
Conclusion .....	628
<b>Chapter 17: Chi-Square Test of Independence .....</b>	<b>629</b>
Introduction .....	631
Situations That Are Appropriate for the Chi-Square Test of Independence.....	631
Using Two-Way Classification Tables.....	634
Results Produced in a Chi-Square Test of Independence .....	637
A Study Investigating Computer Preferences .....	640
Computing Chi-Square from Raw Data versus Tabular Data .....	642

Example of a Chi-Square Test That Reveals a Significant Relationship .....	643
Example of a Chi-Square Test That Reveals a Nonsignificant Relationship .....	661
Computing Chi-Square from Raw Data.....	668
Conclusion .....	671
<b>References .....</b>	<b>673</b>
<b>Index.....</b>	<b>675</b>