

Contents

1	Introduction	3
1.1	Statistics and Data	4
1.2	Sampling	6
1.3	Lying with Statistics and Percentages	8
	Discussion Problems	11
	Summary Worksheet	12
	Problem Set	14
2	Descriptive Statistics	17
2.1	Averages	17
2.2	Range, Standard Deviation and Variance	19
2.3	Measures of Relative Standing: z -scores	22
2.4	Measures of Relative Standing: Quartiles, Percentiles, and Box Plots	23
2.5	Weighted Averages & Simpson's Paradox	26
	Discussion Problems	28
	Summary Worksheet	29
	Problem Set	31
3	Statistical Tables and Graphics	37
3.1	Frequency Distributions	37
3.2	Histograms	40
3.3	Other Statistical Graphics	42
	Summary Worksheet	44
	Problem Set	45
4	Introduction to Probability	50
4.1	Basics	50
4.2	Conditional Probability	53
4.3	The Addition Rule	55
4.4	The Multiplication Rule	57
4.5	One Bad Apple - Probabilities of At Least One	60
	Discussion Problems	61
	Summary Worksheet	62
	Problem Set	64
5	Discrete Probability Distributions - Binomial Distributions	71
5.1	Discrete Random Variables and Probability Distributions	71
5.2	Binomial Probability Distributions	73
5.3	Mean and Standard Deviation of a Binomial Distribution	76
	Discussion Problems	77
	Summary Worksheet	78
	Problem Set	80
6	Continuous Probability Distributions - Normal Distributions	84
6.1	Continuous Random Variables and The Standard Normal Distribution	85
6.2	Normal Distributions in General	89
6.3	Sampling Distributions	91
6.4	The Central Limit Theorem	92
6.5	The Normal Approximation to the Binomial Distribution	96

Summary Worksheet	98
Problem Set	100
7 Confidence Intervals	105
7.1 Introduction to Confidence Intervals	105
7.2 Estimating a Population Mean and Sample Size (σ known)	107
7.3 Estimating a Population Proportion and Sample Size	110
7.4 Estimating a Population Mean (σ unknown)	113
7.5 A summary and some loose ends	115
Discussion 1: <i>Nate Silver - 2012 Election</i>	117
Discussion 2: <i>Estimating a Population Size</i>	118
Summary Worksheet	119
Problem Set	121
8 Hypothesis Testing - One Sample	126
8.1 Foundations of Hypothesis Testing	126
8.2 Hypothesis Tests About a Proportion	132
8.3 Hypothesis Tests About a Mean: σ Not Known	136
8.4 Hypothesis Tests About a Mean: σ Known (Optional)	141
Summary Worksheet	144
Problem Set	147
9 Hypothesis Testing - Two Samples	152
9.1 Hypothesis Tests for Mean Differences: Paired Data	152
9.2 Hypothesis Tests for Two Means: Independent Data	155
9.3 Hypothesis Tests for Two Proportions	160
Summary Worksheet	164
Problem Set	167
10 Correlation and Regression	172
10.1 Correlation	172
10.2 Linear Regression	177
10.3 The Hypothesis Test Behind the Scenes	181
10.4 Multiple Linear Regression: Controlling for Variables - An Introduction	182
Summary Worksheet	184
Problem Set	185
11 Additional Hypothesis Tests	193
11.1 Chi-Squared Test for Goodness of Fit	193
11.2 Chi-Squared Test of Independence	198
11.3 ANOVA - An Introduction	204
Summary Worksheet	210
Problem Set	213
Detailed Solutions to Summary Worksheets	219
Detailed Solutions to Selected Problems	243
Tables	284
Index	294