
Contents

Preface	v
Introduction	1
1 The Algebra of Events	3
1.1 Sample Spaces, Statements, Events	3
1.2 Operations with Sets	7
1.3 Relationships between Compound Statements and Events	11
2 Combinatorial Problems	15
2.1 The Addition Principle	15
2.2 Tree Diagrams and the Multiplication Principle	18
2.3 Permutations and Combinations	23
2.4 Some Properties of Binomial Coefficients and the Binomial Theorem	27
2.5 Permutations with Repetitions	32
3 Probabilities	37
3.1 Relative Frequency and the Axioms of Probabilities	37
3.2 Probability Assignments by Combinatorial Methods	42
3.3 Independence	48
3.4 Conditional Probabilities	54
3.5 The Theorem of Total Probability and the Theorem of Bayes	60
4 Random Variables	71
4.1 Probability Functions and Distribution Functions	71
4.2 Continuous Random Variables	80
4.3 Functions of Random Variables	87
4.4 Joint Distributions	96
4.5 Independence of Random Variables	106
4.6 Conditional Distributions	117

5	Expectation, Variance, Moments	127
5.1	Expected Value	127
5.2	Variance and Standard Deviation	140
5.3	Moments and Generating Functions	149
5.4	Covariance and Correlation	156
5.5	Conditional Expectation	163
5.6	Median and Quantiles	169
6	Some Special Distributions	177
6.1	Poisson Random Variables	177
6.2	Normal Random Variables	185
6.3	The Central Limit Theorem	193
6.4	Negative Binomial, Gamma and Beta Random Variables	201
6.5	Multivariate Normal Random Variables	211
7	The Elements of Mathematical Statistics	221
7.1	Estimation	221
7.2	Testing Hypotheses	231
7.3	The Power Function of a Test	239
7.4	Sampling from Normally Distributed Populations	244
7.5	Chi-Square Tests	253
7.6	Two-Sample Tests	263
7.7	Kolmogorov–Smirnov Tests	271
	Appendix I: Tables	277
	Appendix II: Answers and Hints for Selected Odd-Numbered Exercises ..	283
	References	307
	Index	309