

Contents

PREFACE

1	A FIRST GLIMPSE OF PROBABILITY	1
1-1	What Is Probability?	1
1-2	Experiments: Deterministic or Random	4
1-3	The Role of Probability in Statistical Inference	4
1-4	Interpreting Probability	5
2	BASIC CONCEPTS OF PROBABILITY	11
2-1	Sample Space	11
2-2	Events and Their Probabilities	12
2-3	Combining Events	15
2-4	Probabilities Associated with Combined Events	18
2-5	Finding Probabilities	26
3	COUNTING PROCEDURES AND THEIR APPLICATIONS IN COMPUTING PROBABILITIES	39
3-1	The Need for Counting Techniques: The Uniform Model	39
3-2	Counting Procedures Involving Order Restrictions	41
3-3	Counting Procedures Not Involving Order Restrictions	45
3-4	Applications of Counting Procedures	47
3-5	Occupancy Problems: Role of Distinguishability	56
3-6	Random Sampling	59
4	CONDITIONAL PROBABILITY	75
4-1	Reduction of the Sample Space	75
4-2	The Multiplication Rule and Assigning Probabilities	82
4-3	Stagewise Experiments	85
4-4	Posterior Probabilities: Bayes' Rule	88

5	INDEPENDENCE	103
5-1	Independence of Two Events	103
5-2	Independence of More than Two Events	108
5-3	Probabilities Associated with Mutually Independent Events	110
6	RANDOM VARIABLES	124
6-1	Quantifying the Random Experiment	124
6-2	Cumulative Distribution Function	130
6-3	Functions of a Random Variable	134
6-4	Joint Probability Functions	136
6-5	Marginal Probability Functions	138
6-6	Independence	139
7	DESCRIBING RANDOM VARIABLES AND THEIR DISTRIBUTIONS	152
7-1	Expectation	152
7-2	Laws of Expectation for a Single Random Variable	156
7-3	Variance	159
7-4	Laws of Variance for a Single Random Variable	163
7-5	Chebyshev's Inequality	164
8	DESCRIBING THE JOINT BEHAVIOR OF SEVERAL RANDOM VARIABLES	177
8-1	Expectation of a Function of Two Random Variables	177
8-2	Covariance	178
8-3	Expectation of the Sum of Several Random Variables	183
8-4	Variance of the Sum of Several Random Variables	184
8-5	Correlation Coefficient	189
8-6	Problems Concerning Several Random Variables	192
8-7	Random Variables Based on Samples	198
9	SPECIAL DISCRETE PROBABILITY MODELS	211
9-1	Binomial Distribution	211
9-2	Waiting Time Distributions	222
9-3	Poisson Distribution	229
9-4	Hypergeometric Distribution	233
9-5	Sums of Binomial Random Variables	240
APPENDIXES		
A	Summation and Subscripts	259
B	Set Theory	265

C	Mathematical Induction as a Method of Proof	271
D	Binomial Expansions	274
E	Infinite Series	280
TABLES		285
ANSWERS TO SELECTED PROBLEMS		296
INDEX		323