

Contents

<i>Preface</i>	<i>page vii</i>
PART ONE BASIC PROBABILITY	1
1 Discrete outcomes	3
1.1 A uniform distribution	3
1.2 Conditional probabilities	9
1.3 The exclusion–inclusion formula	39
1.4 Random variables	47
1.5 The binomial, Poisson and geometric distributions	75
1.6 Chebyshev’s and Markov’s inequalities	98
1.7 Branching processes	122
2 Continuous outcomes	136
2.1 Uniform distribution	136
2.2 Expectation, conditional expectation, variance	182
2.3 Normal distribution	214
PART TWO BASIC STATISTICS	247
3 Parameter estimation	249
3.1 Preliminaries. Some important probability distributions	249
3.2 Estimators. Unbiasedness	260
3.3 Sufficient statistics. The factorisation criterion	267
3.4 Maximum likelihood estimators	271
3.5 Normal samples. The Fisher Theorem	273
3.6 Mean square errors	276
3.7 Exponential families	285

3.8	Confidence intervals	289
3.9	Bayesian estimation	294
4	Hypothesis testing	304
4.1	Type I and type II error probabilities	304
4.2	Likelihood ratio tests	306
4.3	Goodness of fit. Testing normal distributions, 1	316
4.4	The Pearson χ^2 test	321
4.5	Generalised likelihood ratio tests	326
4.6	Contingency tables	335
4.7	Testing normal distributions, 2	342
4.8	Linear regression. The least squares estimators	356
4.9	Linear regression for normal distributions	361
5	Cambridge University Mathematical Tripos examination questions in IB Statistics	369
<i>Appendix</i> Tables of random variables and probability distributions		448
<i>Bibliography</i>		450
<i>Index</i>		458