

# CONTENTS

## Preface

<b>Chapter 1:</b>	<b>Set</b>	<b>1</b>
1.1	Sample sets	1
1.2	Operations with sets	3
1.3	Various relations	6
1.4	Indicator	12
<b>Chapter 2:</b>	<b>Probability</b>	<b>18</b>
2.1	Examples of probability	18
2.2	Definition and illustrations	21
2.3	Deductions from the axioms	28
2.4	Independent events	31
2.5	Arithmetical density	36
<b>Chapter 3:</b>	<b>Counting</b>	<b>43</b>
3.1	Fundamental rule	43
3.2	Diverse ways of sampling	46
3.3	Allocation models; binomial coefficients	52
3.4	How to solve it	59
<b>Chapter 4:</b>	<b>Random Variables</b>	<b>71</b>
4.1	What is a random variable?	71
4.2	How do random variables come about?	75
4.3	Distribution and expectation	80
4.4	Integer-valued random variables	86
4.5	Random variables with densities	90
4.6	General case	100
<b>Appendix 1:</b>	<b>Borel Fields and General Random Variables</b>	<b>109</b>
<b>Chapter 5:</b>	<b>Conditioning and Independence</b>	<b>111</b>
5.1	Examples of conditioning	111
5.2	Basic formulas	116
5.3	Sequential sampling	125
5.4	Pólya's urn scheme	129
5.5	Independence and relevance	134
5.6	Genetical models	144

<b>Chapter 6: Mean, Variance and Transforms</b>	<b>156</b>
6.1 Basic properties of expectation	156
6.2 The density case	160
6.3 Multiplication theorem; variance and covariance	164
6.4 Multinomial distribution	171
6.5 Generating function and the like	177
 <b>Chapter 7: Poisson and Normal Distributions</b>	 <b>192</b>
7.1 Models for Poisson distribution	192
7.2 Poisson process	199
7.3 From binomial to normal	210
7.4 Normal distribution	217
7.5 Central limit theorem	220
7.6 Law of large numbers	227
 <b>Appendix 2: Stirling's Formula and DeMoivre-Laplace's Theorem</b>	 <b>237</b>
 <b>Chapter 8: From Random Walks to Markov Chains</b>	 <b>240</b>
8.1 Problems of the wanderer or gambler	240
8.2 Limiting schemes	246
8.3 Transition probabilities	252
8.4 Basic structure of Markov chains	260
8.5 Further developments	267
8.6 Steady state	274
8.7 Winding up (or down?)	286
 <b>Appendix 3: Martingale</b>	 <b>305</b>
 <b>General References</b>	 <b>306</b>
 <b>Answers to Problems</b>	 <b>309</b>
 <b>Index</b>	 <b>323</b>