

Contents

	3
Foreword	3
About this book	3
Features	3
R	5
Getting Started in R	5
Functions	5
Looping	5
Graphics	5
Glossary	5
Practice	5
1 Counting	7
Sets	7
Naive Probability	7
Sampling Table	7
1.1 part c.	7
1.2 part d.	7
Story Proofs	7
Symmetry	7
Practice	7
2 Conditional Probability	9
Conditional Probability	9
The Birthday Problem	9
Monty Hall	9
Gambler's Ruin	9
Introduction to Random Variables	9
Practice	9
3 Discrete Random Variables	11
Random Variable Recap	11
Bernoulli	11
Geometric	11
First Success	11
Negative Binomial	11
Poisson	11
Hypergeometric	11
Expectation, Indicators and Memorylessness	11
Practice	11

4	Continuous Random Variables	13
	Discrete vs. Continuous	13
	LoTUS	13
	Uniform	13
	Normal	13
	Exponential	13
	Practice	13
5	Moment Generating Functions	15
	Moments and Taylor Series	15
	MGF Properties	15
	Using MGFs	15
	Practice	15
6	Joint Distributions	17
	Joint and Conditional Distributions	17
	2-D LoTUS	17
	Multinomial	17
	Chicken and Egg	17
	Practice	17
7	Covariance and Correlation	19
	Covariance	19
	Correlation	19
	Transformations	19
	MVN	19
	Practice	19
8	Beta and Gamma	21
	Beta	21
	Gamma	21
	Beta and Gamma	21
	Pattern Integration	21
	Poisson Process	21
	Practice	21
9	Limit Theorems and Conditional Expectation	23
	Law of Large Numbers	23
	Central Limit Theorem	23
	Conditional Expectation	23
	Adam and Eve	23
	Practice	23
10	Markov Chains	25
	Introduction to Markov Chains	25
	Characteristics of Markov Chains	25
	Stationary Distributions	25
	Hidden Markov Models	25
	Practice	25
	Epilogue	27
	Academic Resources	27
	Statistics in the World	27
	Probability Playlist	27
	Final Words	27

Probability!

An interactive introduction.

This book is currently undergoing editing, and we welcome your feedback. Please follow the survey links at the beginning of each chapter to give us your suggestions.

Foreword

About this book

Features

R

Placeholder

Getting Started in R

Functions

Looping

For loop

While Loop

Graphics

Plot()

Plotting Techniques

Glossary

Practice

Problems

Chapter 1

Counting

Placeholder

Sets

Naive Probability

Sampling Table

1.0.1 part a.

1.0.2 part b.

1.1 part c.

1.2 part d.

Story Proofs

Symmetry

Practice

Problems

BH Problems

Chapter 2

Conditional Probability

Placeholder

Conditional Probability

The Birthday Problem

Monty Hall

Gambler's Ruin

Introduction to Random Variables

Properties of Random Variables

Binomial

Practice

Problems

BH Problems

Chapter 3

Discrete Random Variables

Placeholder

Random Variable Recap

Bernoulli

Geometric

First Success

Negative Binomial

Poisson

Hypergeometric

Expectation, Indicators and Memorylessness

Expectation

Indicators

Memorylessness

Practice

Problems

BH Problems

Chapter 4

Continuous Random Variables

Placeholder

Discrete vs. Continuous

LoTUS

Uniform

Universality

Normal

Exponential

Practice

Problems

BH Problems

Chapter 5

Moment Generating Functions

Placeholder

Moments and Taylor Series

MGF Properties

Using MGFs

Practice

Problems

BH Problems

Chapter 6

Joint Distributions

Placeholder

Joint and Conditional Distributions

2-D LoTUS

Multinomial

Chicken and Egg

Practice

Problems

BH Problems

Chapter 7

Covariance and Correlation

Placeholder

Covariance

Correlation

Transformations

Convolutions

MVN

Practice

Problems

BH Problems

Chapter 8

Beta and Gamma

Placeholder

Beta

Priors

Order Statistics

Gamma

Beta and Gamma

Pattern Integration

Poisson Process

Practice

Problems

BH Problems

Chapter 9

Limit Theorems and Conditional Expectation

Placeholder

Law of Large Numbers

Central Limit Theorem

Conditional Expectation

Adam and Eve

Practice

Problems

BH Problems

Chapter 10

Markov Chains

Placeholder

Introduction to Markov Chains

Characteristics of Markov Chains

Stationary Distributions

Hidden Markov Models

Practice

Problems

BH Problems

Epilogue

Placeholder

Academic Resources

Statistics in the World

Probability Playlist

Final Words