

# CONTENTS

<b>Chapter 3—Random Numbers . . . . .</b>	<b>1</b>
3.1. Introduction . . . . .	1
3.2. Generating Uniform Random Numbers . . . . .	10
3.2.1. The Linear Congruential Method . . . . .	10
3.2.1.1. Choice of modulus . . . . .	12
3.2.1.2. Choice of multiplier . . . . .	16
3.2.1.3. Potency . . . . .	23
3.2.2. Other Methods . . . . .	26
3.3. Statistical Tests . . . . .	41
3.3.1. General Test Procedures for Studying Random Data . . . . .	42
3.3.2. Empirical Tests . . . . .	61
*3.3.3. Theoretical Tests . . . . .	80
3.3.4. The Spectral Test . . . . .	93
3.4. Other Types of Random Quantities . . . . .	119
3.4.1. Numerical Distributions . . . . .	119
3.4.2. Random Sampling and Shuffling . . . . .	142
*3.5. What Is a Random Sequence? . . . . .	149
3.6. Summary . . . . .	184
<b>Chapter 4—Arithmetic . . . . .</b>	<b>194</b>
4.1. Positional Number Systems . . . . .	195
4.2. Floating Point Arithmetic . . . . .	214
4.2.1. Single-Precision Calculations . . . . .	214
4.2.2. Accuracy of Floating Point Arithmetic . . . . .	229
*4.2.3. Double-Precision Calculations . . . . .	246
4.2.4. Distribution of Floating Point Numbers . . . . .	253
4.3. Multiple-Precision Arithmetic . . . . .	265
4.3.1. The Classical Algorithms . . . . .	265
*4.3.2. Modular Arithmetic . . . . .	284
*4.3.3. How Fast Can We Multiply? . . . . .	294
4.4. Radix Conversion . . . . .	319
4.5. Rational Arithmetic . . . . .	330
4.5.1. Fractions . . . . .	330
4.5.2. The Greatest Common Divisor . . . . .	333
*4.5.3. Analysis of Euclid’s Algorithm . . . . .	356
4.5.4. Factoring into Primes . . . . .	379

4.6. Polynomial Arithmetic . . . . .	418
4.6.1. Division of Polynomials . . . . .	420
*4.6.2. Factorization of Polynomials . . . . .	439
4.6.3. Evaluation of Powers . . . . .	461
4.6.4. Evaluation of Polynomials . . . . .	485
*4.7. Manipulation of Power Series . . . . .	525
<b>Answers to Exercises</b> . . . . .	538
<b>Appendix A — Tables of Numerical Quantities</b> . . . . .	726
1. Fundamental Constants (decimal) . . . . .	726
2. Fundamental Constants (octal) . . . . .	727
3. Harmonic Numbers, Bernoulli Numbers, Fibonacci Numbers . . . . .	728
<b>Appendix B — Index to Notations</b> . . . . .	730
<b>Appendix C — Index to Algorithms and Theorems</b> . . . . .	735
<b>Index and Glossary</b> . . . . .	737