CONTENTS

PREFACE ix

1 BASICS 1
1.1 Ideas 1
1.2 Logic 5
1.3 Counting 13
1.4 Probability 19

2 COMPLEXITY 25
2.1 Counting Time 27
2.2 The Big-O Notation 30
2.3 Exponentials 31
2.4 Counting Memory 33

3 STRATEGY 35
3.1 Iteration 35
3.2 Recursion 38
3.3 Brute Force 40
3.4 Backtracking 43
3.5 Heuristics 46
3.6 Divide and Conquer 49
3.7 Dynamic Programming 55
3.8 Branch and Bound 58

4 DATA 65
4.1 Abstract Data Types 67
4.2 Common Abstractions 68
4.3 Structures 72

5 ALGORITHMS 85
5.1 Sorting 86
5.2 Searching 88
5.3 Graphs 89
5.4 Operations Research 95

6 Databases **101**
6.1 Relational 102
6.2 Non-Relational 110
6.3 Distributed 115
6.4 Geographical 119
6.5 Serialization Formats 120

7 Computers **123**
7.1 Architecture 123
7.2 Compilers 131
7.3 Memory Hierarchy 138

8 Programming **147**
8.1 Linguistics 147
8.2 Variables 150
8.3 Paradigms 152

Conclusion **163**

Appendix **165**
I Numerical Bases 165
II Gauss' trick 166
III Sets 167
IV Kadane's Algorithm 168