

Contents

Chapter 1. Sets, Relations, and Mappings	1
1. Introduction and notation	1
2. Some special sets	3
3. Combinations of sets	6
4. Set algebra	9
5. Product sets, relations, mappings	13
6. The subset relation	15
Chapter 2. Boolean Algebras	17
1. Definition	17
2. Duality and other basic properties	18
3. Boolean functions	21
4. Minimization of Boolean functions	25
5. Applications to switching networks	35
6. From sets to logic	39
Chapter 3. The Propositional Calculus	42
1. Basic notation and concepts	42
2. Well-formed formulas	47
3. Truth tables	50
4. Argumentation and evaluation	54
5. Logical equivalence and logical consequence	56
6. Normal forms	59
7. “Polish” notation and the tree of a formula	67
8. Minimal sets of connectives	74
9. An axiomatic approach to logic	75
Chapter 4. A View of Binary Vectors	82
1. Sets	82
2. Logic	83
3. Numbers	85

Chapter 5. Algorithms and Computing Machines	88
1. Algorithms: Methods of solving problems	88
2. Characteristics and descriptions of algorithms	92
3. Markov algorithms	99
4. Turing machines	106
5. The Busy Beaver and halting problems	112
6. Digital computers	114
7. Programming languages	121
Chapter 6. The First-Order Predicate Calculus	125
1. Definitions and basic properties	125
2. Free and bound variables; substitution	129
3. Validity and satisfiability	131
4. The determination of truth values	134
5. The prenex normal form	137
6. Axioms and theorems	140
Chapter 7. Formal Languages	144
1. Post languages	144
2. Recent advances in formal languages	148
Chapter 8. A Brief History	152
Answers to the Exercises	157
Index	191