

Discrete Mathematics with Applications



Table of Contents

	Preface	xiii
	A Word to the Student	
1	The Language of Logic 1.1 Propositions. 1.2 Logical Equivalences. 1.3 Quantifiers. *1.4 Arguments (optional) 1.5 Proof Methods. Chapter Summary. Review Exercises Supplementary Exercises Computer Exercises Exploratory Writing Projects Enrichment Readings.	1 2 20 32 38 49 56 58 62 63 63 64
2	The Language of Sets 2.1 The Concept of a Set 2.2 Operations with Sets *2.3 Computer Operations with Sets (optional) 2.4 The Cardinality of a Set	67 67 78 94 98
	2.5 Recursively Defined Sets Chapter Summary Review Exercises Supplementary Exercises Computer Exercises Exploratory Writing Projects Enrichment Readings	104 109 111 113 114 114 115
3	Functions and Matrices 3.1 The Concept of a Function. 3.2 Special Functions. 3.3 Properties of Functions 3.4 The Pigeonhole Principle. 3.5 Composition of Functions 3.6 Sequences and the Summation Notation.	117 125 136 144 150

Contracts

	5.7	Matrices.	16
		plor Summery and and in the standard of the Property of the Committee of t	
	Box	low Exercises	.17
		plementary Exercises	17
		sputer Exercises	
		doratory Writing Projects	1/8
		ichment Rendings	18
,	Ind	luction and Algorithms	180
4	4.1	The Division Algorithm	18
	4.3	Divisibility Properties	186
	4.3	Nondecimal Bases	19
	4.4	Mathematical Induction	201
	4.5	Algorithm Correctness	22
	4.6	The Growth of Functions	23
	*4.7		24
		Control of the contro	251
		pter Summary	254
		tew Exercises	254
		plementary Exercises	
	Eve	Sputer Exercises	251
	Eng	dorutory Writing Projects	256
	Est	ichment Readings	200
~	Rec	menion.	501
0	5.1	Bernston Policel Francisco	261
	5.2	Recursively Defined Functions	262
	5.3	Solving Recurrence Relations	278
	5.4	Solving Recurrence Relations Revisited	286
	5.5	Generating Functions	296
	5.6	Recursive Algorithms	307
		Correctness of Recursive Algorithms	316
	Char	Complexities of Recursive Algorithms (optional)	319
	Danie	pter Summary	333
	Bern	iew Exercises	334
	Could	plementary Exercises	339
	Com	puter Exercises	340
	Esqu	loratory Writing Projects	342
	Ann	chment Readings	342
C	Con	abinatorics and Discrete Probability	
6	6.1	The Fundamental Counting Principles	343
	6.2	The Fundamental Counting Principles	344
	6.3	Permutations	351
	6.4	Combinations	360
	6.5	Combinations and Combinations with D	365
	_	Permutations and Combinations with Repetitions The Binomial Theorem	375
	- Contract	THE RESIDENCE OF THE PERSON OF	386

Contents

		Probable Principle (GIEP) (optional)	399		
	*6.7		409		
	*6.8	Discrete Probability (optional)	417		
	*6.9	Additional Topics in Probability (optional)	427		
	Cha	apter Summary	429		
	Rev	plementary Exercises	432		
	Sup	nputer Exercises	434		
	Con	oloratory Writing Projects	434		
	Exp	ichment Readings	435		
	Enr	schment Keadings			
_	Dal	lations	437		
7		49 - 4	438		
•	7.1		443		
	7.2	C . n	449		
	*7.3	Properties of Relations	454		
	7.4		461		
	7.5	AND AND THE PARTY OF THE PARTY	471		
	*7.6	and the second s	475		
	*7.7	Equivalence Relations	482		
	7.8	m at a 1 m at 1	493		
	7.9	A	506		
	Daniel	Law Dunmings	508		
	Revi	plementary Exercises	511		
	444		512		
	-	Whiting Decinets	513		
	Exp	ichment Readings	514		
0	Gra	A Comment of the Property of the Comment of the Com	515		
8	8.1		516		
. J.		Computer Representations of Graphs (optional)	538		
	*8.2	The Country Co	541		
	8.3	Paths, Cycles, and Circuits	546		
	8.4	Eulerian and Hamiltonian Graphs	556		
	8.5	Dissor Combs	576		
	8.6	Planar Graphs	586		
	8.7	oter Summary	598		
	Review Exercises				
	Revie	ew Exercises	604		
	Supp	dementary Exercises	606		
	Comp	Duter Exercises	607		
	Explo	chment Readings	608		
	Enric	chment Readings	000		
~	m-		609		
1	Tree	Trees	610		
-			100		
	9.2	Spanning trees	614		

Contents

	9.3 Minimal Spanning Trees	626
	9.3 Minimal Spanning Trees	635
	9.5 Binary Trees	664
	9.6 Binary Search Trees* *9.7 Huffman Trees (optional)	670
	*9.7 Huffman Trees (optional)	676
	*9.7 Huffman Trees (optional)	680
	*9.8 Decision Trees (optional)	681
		1000
	The second secon	171714
		688
	Continue Welting Projects	900
	Enrichment Readings	688
10	Digraphs	691
10	10.1 Digraphs	691
	10.2 Dags	707
	10.3 Weighted Digraphs	715
	Chapter Summary	726
	Review Exercises	727
	Supplementary Exercises	730
	Computer Exercises	731
	Exploratory Writing Projects	732
	TOTAL STATE OF THE PROPERTY OF	732
11	Formal Languages and Finite-State Machines	733
11		734
		743
	4 4 40 400 14 14 14 14 14 14 14 14 14 14 14 14 14	759
	44 4 William State Africa	
	T. S. Photogram in Latin Wilesian Charles Assessment Assessment Assessment	771
		779
	11.7 Automata and Regular Languages	782
		787
	Review Exercises	792
		794
	Computer Exercises	798
	A STATE OF THE PARTY OF THE PAR	800
	Enrichment Readings	801
10	Roolean Alashes and Control	nrao
12	Boolean Algebra and Combinatorial Circuits	103
		304
	12.2 Boolean functions	113
	12.3 Logic Gates	124
	12.4 Combinatorial Circuits	130
	12.5 Minimization of Combinatorial Circuita	40
		and the

12.6 [Don't Care Condition	
Chapter	Don't Care Conditions	851
Chapter Summary		
Supplen	nentary Exercises	859
Comput	or Exercises	862
Explora	tory Writing Projects	863
Enrichn	Exploratory Writing Projects	
		864
Appene	dix A	
A.I AS	CII Character Set	867
A.2 De	CII Character Set	
A.3 Ex	ponential and Logarithmic Functions	867
A.4 Ge	ponential and Logarithmic Functions	874
A.5 Th	nerating Permutations and Combinations	883
A.6 Th	e Multinomial Theorem	866
A.7 We	e Greek Alphabet	894
	b Sites	895
Referen	ices	899
Solution		
	ns to Odd-Numbered Exercises	907
Credits		1029
Index		1031