## **Table of Contents**

ın	troauc	tion	1
I	The	e Interview	6
1	Getti	ng Ready	7
2	Strate	egies For A Great Interview	12
3	Cond	ucting An Interview	19
4	Probl	lem Solving	23
II	Pro	blems	42
5	Primi	itive Types	43
	5.1	Computing the parity of a word	43
	5.2	Swap bits	45
	5.3	Reverse bits	47
	5.4	Find a closest integer with the same weight	47
	5.5	Compute $x \times y$ without arithmetical operators	49
	5.6	Compute $x/y$	50
	5.7	Compute $x^y$	51
	5.8	Reverse digits	52
	5.9	Check if a decimal integer is a palindrome	53
	5.10	Generate uniform random numbers	54
	5.11	Rectangle intersection	55
6	Array	78	57
	6.1	The Dutch national flag problem	57
	6.2	Increment an arbitrary-precision integer	61

	6.3	Multiply two arbitrary-precision integers	62
	6.4	Advancing through an array	63
	6.5	Delete a key from an array	64
	6.6	Delete duplicates from a sorted array	65
	6.7	Buy and sell a stock once	66
	6.8	Buy and sell a stock twice	67
	6.9	Enumerate all primes to <i>n</i>	68
	6.10	Permute the elements of an array	70
	6.11	Compute the next permutation	73
	6.12	Sample offline data	75
	6.13	Sample online data	76
	6.14	Compute a random permutation	78
	6.15	Compute a random subset	79
	6.16	Generate nonuniform random numbers	81
	6.17	The Sudoku checker problem	83
	6.18	Compute the spiral ordering of a 2D array	85
	6.19	Rotate a 2D array	88
	6.20	Compute rows in Pascal's Triangle	89
7	String	<b>75</b>	91
	7.1	Interconvert strings and integers	91
	7.2	Base conversion	93
	7.3	Compute the spreadsheet column encoding	94
	7.4	Replace and remove	95
	7.5	Test palindromicity	96
	7.6	Reverse all the words in a sentence	97
	7.7	Compute all mnemonics for a phone number	98
	7.8	The look-and-say problem	100
	7.9	Convert from Roman to decimal	101
	7.10	Compute all valid IP addresses	102
	7.11	Write a string sinusoidally	104
	7.12	Implement run-length encoding	105
	7.13	Implement the UNIX tail command	106
	7.14	Find the first occurrence of a substring	107
8	Linke	d Lists	109
	8.1	Merge two sorted lists	110
	8.2	Reverse a singly linked list	111
	8.3	Reverse a single sublist	112
	8.4	Test for cyclicity	113
	8.5	Test for overlapping lists—lists are cycle-free	115
	8.6	Test for overlapping lists—lists may have cycles	116
	8.7	Delete a node from a singly linked list	118
	8.8	Remove the <i>k</i> th last element from a list	119
	8.9	Remove duplicates from a sorted list	120

	8.10	Implement cyclic right shift for singly linked lists	121	
	8.11	Implement even-odd merge	122	
	8.12	Test whether a singly linked list is palindromic	123	
	8.13	Implement list pivoting	124	
	8.14	Add list-based integers	125	
9	Stacks	s and Queues	127	
	9.1	Implement a stack with max API	127	
	9.2	Evaluate RPN expressions	130	
	9.3	Test a string over "{,},(,),[,]" for well-formedness	132	
	9.4	Normalize pathnames	133	
	9.5	BST keys in sort order	134	
	9.6	Search a postings list	135	
	9.7	Compute buildings with a sunset view	136	
	9.8	Sort a stack	138	
	9.9	Compute binary tree nodes in order of increasing depth	139	
	9.10	Implement a circular queue	141	
	9.11	Implement a queue using stacks	142	
	9.12	Implement a queue with max API	143	
10	Binar	y Trees	146	
	10.1	Test if a binary tree is balanced	148	
	10.2	Test if a binary tree is symmetric	150	
	10.3	Compute the lowest common ancestor in a binary tree	151	
	10.4	Compute the LCA when nodes have parent pointers	152	
	10.5	Sum the root-to-leaf paths in a binary tree	153	
	10.6	Find a root to leaf path with specified sum	155	
	10.7	Compute the <i>k</i> th node in an inorder traversal	156	
	10.8	Compute the successor	157	
	10.9	Implement an inorder traversal with $O(1)$ space	158	
	10.10	Reconstruct a binary tree from traversal data	159	
	10.11	Reconstruct a binary tree from a preorder traversal with markers .	162	
	10.12	Form a linked list from the leaves of a binary tree	163	
	10.13	Compute the exterior of a binary tree	163	
	10.14	Compute the right sibling tree	165	
	10.15	Implement locking in a binary tree	167	
11	Heaps 169			
	11.1	Merge sorted files	170	
	11.2	Sort an increasing-decreasing array	172	
	11.3	Sort an almost-sorted array	173	
	11.4	Compute the <i>k</i> closest stars	174	
	11.5	Compute the median of online data	176	
	11.6	Compute the $k$ largest elements in a max-heap	178	
	11.7	Implement a stack API using a heap	179	

12	Search	ning	181
	12.1	Search a sorted array for first occurrence of $k$	183
	12.2	Search a sorted array for the first element greater than $k  cdots  cdots$	184
	12.3	Search a sorted array for entry equal to its index	186
	12.4	Search a cyclically sorted array	186
	12.5	Compute the integer square root	188
	12.6	Compute the real square root	189
	12.7	Search in a 2D sorted array	191
	12.8	Find the min and max simultaneously	193
	12.9	Find the <i>k</i> th largest element	194
	12.10	Compute the optimum mailbox placement	196
	12.11	Find the missing IP address	197
	12.12	Find the duplicate and missing elements	199
12	Hash '	Tablas	203
13	13.1	Partition into anagrams	203
	13.1	Test for palindromic permutations	205
	13.2		206
	13.4	Is an anonymous letter constructible?	208
	13.4	Implement an ISBN cache	210
	13.6	Compute the <i>k</i> most frequent queries	211
	13.7	Find the nearest repeated entries in an array	212
	13.7	Find the smallest subarray covering all values	212
	13.9	Find smallest subarray sequentially covering all values	217
	13.10	Find the longest subarray with distinct entries	219
	13.11	Find the length of a longest contained interval	220
	13.11	Compute the average of the top three scores	222
	13.12	Compute all string decompositions	224
	13.14	Find a highest affinity pair	225
	13.15	Test the Collatz conjecture	227
	13.16	Implement a hash function for chess	229
	15.10	implement a flash function for cliess	227
14	Sortin	•	231
	14.1	Compute the intersection of two sorted arrays	232
	14.2	Implement mergesort in-place	234
	14.3	Count the frequencies of characters in a sentence	235
	14.4	Remove first-name duplicates	236
	14.5	Render a calendar	237
	14.6	Sets of disjoint intervals	239
	14.7	Compute the union of intervals	241
	14.8	Partitioning and sorting an array with many repeated entries	243
	14.9	Team photo day—1	246
	14.10	Implement a fast sorting algorithm for lists	248
	14.11	Compute a salary threshold	249

15	Binar	y Search Trees	252
	15.1	Test if a binary tree satisfies the BST property	252
	15.2	Find the first occurrence of a key in a BST	255
	15.3	Find the first key larger than a given value in a BST	257
	15.4	Find the $k$ largest elements in a BST	258
	15.5	Compute the LCA in a BST	259
	15.6	Reconstruct a BST from traversal data	260
	15.7	Find the closest entries in three sorted arrays	263
	15.8	Enumerate numbers of the form $a + b\sqrt{2}$	265
	15.9	The most visited pages problem	268
	15.10	Build a minimum height BST from a sorted array	270
	15.11	Insertion and deletion in a BST	271
	15.12	Test if three BST nodes are totally ordered	274
	15.13	The range lookup problem	275
	15.14	Add credits	278
	15.15	Count the number of entries in an interval	280
16	Recur	sion	282
	16.1	The Tower of Hanoi problem	283
	16.2	Generate all nonattacking placements of <i>n</i> -Queens	285
	16.3	Generate permutations	287
	16.4	Generate the power set	289
	16.5	Generate all subsets of size $k$	291
	16.6	Generate strings of matched parens	292
	16.7	Generate palindromic decompositions	294
	16.8	Generate binary trees	295
	16.9	Implement a Sudoku solver	296
	16.10	Compute a Gray code	298
	16.11	Compute the diameter of a tree	300
17	Dyna	mic Programming	304
	17.1	Count the number of score combinations	306
	17.2	Compute the Levenshtein distance	309
	17.3	Count the number of ways to traverse a 2D array	311
	17.4	Plan a fishing trip	314
	17.5	Search for a sequence in a 2D array	314
	17.6	The knapsack problem	316
	17.7	Divide the spoils fairly	318
	17.8	The bedbathandbeyond.com problem	320
	17.9	Find the minimum weight path in a triangle	322
	17.10	Pick up coins for maximum gain	323
	17.11	Count the number of moves to climb stairs	325
	17.12	Compute the probability of a Republican majority	325
	17.13	The pretty printing problem	327
	17.14	Find the longest nondecreasing subsequence	329

18	Greed	ly Algorithms and Invariants	332
	18.1	Implement Huffman coding	333
	18.2	Compute an optimum assignment of tasks	336
	18.3	Implement a schedule which minimizes waiting time	338
	18.4	The interval covering problem	339
	18.5	The 3-sum problem	343
	18.6	Find the majority element	344
	18.7	The gasup problem	345
	18.8	Compute the maximum water trapped by a pair of vertical lines	347
	18.9	Compute the largest rectangle under the skyline	349
19	Graph	ns	352
	19.1	Identify the celebrity	354
	19.2	Search a maze	355
	19.3	Paint a Boolean matrix	358
	19.4	Compute enclosed regions	360
	19.5	Degrees of connectedness—1	362
	19.6	Clone a graph	364
	19.7	Making wired connections	365
	19.8	Transform one string to another	367
	19.9	The shortest straight-line program for $x^n$	368
	19.10	Team photo day—2	370
	19.11	Compute a shortest path with fewest edges	372
20	Parall	el Computing	375
	20.1	Implement caching for a multithreaded dictionary	376
	20.2	Analyze two unsynchronized interleaved threads	378
	20.3	Implement synchronization for two interleaving threads	379
	20.4	Implement a thread pool	381
	20.5	Implement asynchronous callbacks	382
	20.6	Implement a Timer class	383
	20.7	The readers-writers problem	384
	20.8	The readers-writers problem with write preference	386
	20.9	Test the Collatz conjecture in parallel	386
	20.10	Design TeraSort and PetaSort	388
	20.11	Implement distributed throttling	389
21	Desig	n Problems	390
	21.1	Design a spell checker	392
	21.2	Design a solution to the stemming problem	392
	21.3	Plagiarism detector	393
	21.4	Pair users by attributes	394
	21.5	Design a system for detecting copyright infringement	395
	21.6	Design $T_EX$	396
	21.7	Design a search engine	397

	21.8	Implement PageRank	398
	21.9	Design a scalable priority system	399
	21.10	Create photomosaics	400
	21.11	Implement Mileage Run	400
	21.12	Implement Connexus	402
	21.13	Design an online advertising system	402
	21.14	Design a recommendation system	403
	21.15	Design an optimized way of distributing large files	404
	21.16	Design the World Wide Web	405
	21.17	Estimate the hardware cost of a photo sharing app	406
22	Hono	rs Class	407
	22.1	Compute the greatest common divisor	408
	22.2	Find the first missing positive entry •	409
	22.3	Buy and sell a stock $k$ times	410
	22.4	Compute the maximum product of all entries but one	411
	22.5	Compute the longest contiguous increasing subarray	413
	22.6	Rotate an array 🖭	415
	22.7	Identify positions attacked by rooks	417
	22.8	Justify text 🖭	419
	22.9	Reverse sublists $k$ at a time	421
	22.10	Implement list zipping •	422
	22.11	Copy a postings list •	423
	22.12	Compute the median of a sorted circular linked list	424
	22.13	Compute the longest substring with matching parens	425
	22.14	Compute the maximum of a sliding window	426
	22.15	Implement preorder and postorder traversals without recursion	429
	22.16	Compute fair bonuses	432
	22.17	Find $k$ elements closest to the median	434
	22.18	Search a sorted array of unknown length	436
	22.19	Search in two sorted arrays	437
	22.20	Find the $k$ th largest element—large $n$ , small $k$	439
	22.21	Find an element that appears only once	440
	22.22	Find the line through the most points •	441
	22.23	Find the shortest unique prefix •	444
	22.24	Compute the smallest nonconstructible change	446
	22.25		447
	22.26	Convert a sorted doubly linked list into a BST 🚭	448
	22.27	Convert a BST to a sorted doubly linked list 💿	450
	22.28	Merge two BSTs 🚭	452
	22.29	Test if a binary tree is an almost BST	453
	22.30	The view from above	455
	22.31	Searching a min-first BST 💿	459
	22.32	Implement regular expression matching	460

	22.33	Synthesize an expression	463
	22.34	Count inversions	466
	22.35	Draw the skyline 🔮	468
	22.36	Find the two closest points •	472
	22.37	Measure with defective jugs 💿	475
	22.38	Compute the maximum subarray sum in a circular array	477
	22.39	Determine the critical height	479
	22.40	Voltage selection in a logic circuit 🔮	481
	22.41	Find the maximum 2D subarray 🔮	482
	22.42	Trapping water •	486
	22.43	Load balancing 🍑	487
	22.44	Search for a pair-sum in an abs-sorted array 💿	489
	22.45	The heavy hitter problem	492
	22.46	Find the longest subarray whose sum $\leq k$	494
	22.47	Degrees of connectedness—2 🔮	496
	22.48	Compute a minimum delay schedule, unlimited resources 💿	497
	22.49	Road network	498
	22.50	Test if arbitrage is possible 💿	500
	22.51	The readers-writers problem with fairness	502
	22.52	Implement a producer-consumer queue	502
II	Not	ation, Language, and Index	503
No	otation		504
Ja	va		506
23	Java		506
20	23.1	The JVM	508
	23.2	throw vs. throws	509
	23.3	final, finally, and finalizer	509
	23.4	equals() vs. ==	510
	23.5	equals() and hashCode()	510
	23.6	List, ArrayList, and LinkedList	510
	23.7	String vs. StringBuilder	511
	23.8	Autoboxing	512
	23.9	Static initialization	513
In	dex of [	Terms	514