Table of Contents

In	troduct	ion	1
I	The	Interview	6
1	Gettir	ng Ready	7
2	Strate	gies For A Great Interview	12
3	Cond	ucting An Interview	19
4	Proble	em Solving	23
II	Pro	blems	41
5	Primi	tive Types	42
	5.1	Compute parity	42
	5.2	Swap bits	44
	5.3	Reverse bits	45
	5.4	Find a closest integer with the same weight	46
	5.5	Compute $x \times y$ without multiply or add	46
	5.6	Compute x/y	47
	5.7	Compute x^y	48
	5.8	Convert base	49
	5.9	Compute the spreadsheet column encoding	50
	5.10	Reverse digits	50
	5.11	Check if a decimal integer is a palindrome	51
	5.12	Generate uniform random numbers	52
	5.13	Check if rectangles intersect	53

6	Array	78	55
	6.1	The Dutch national flag problem	55
	6.2	Increment a BigInteger	57
	6.3	Multiply two BigIntegers	58
	6.4	Check if a board game is winnable	59
	6.5	Delete a key from an array	60
	6.6	Delete duplicates from a sorted array	61
	6.7	Buy and sell a stock once	62
	6.8	Buy and sell a stock twice	63
	6.9	Enumerate all primes to n	63
	6.10	Permute the elements of an array	65
	6.11	Compute the next permutation	67
	6.12	Sample offline data	69
	6.13	Compute a random permutation	70
	6.14	Compute a random subset of $\{0, 1, \dots, n-1\}$	70
	6.15	Sample online data	71
	6.16	Generate nonuniform random numbers	72
	6.17	The Sudoku checker problem	73
	6.18	Compute the spiral ordering of a 2D array	75
	6.19	Rotate a 2D array	77
	6.20	Compute rows in Pascal's Triangle	78
7	String	gs	80
	7.1	Interconvert strings and integers	80
	7.2	Replace and remove	81
	7.3	Test palindromicity	83
	7.4	Reverse all the words in a sentence	84
	7.5	Compute all mnemonics for a phone number	85
	7.6	The look-and-say problem	86
	7.7	Convert from Roman to decimal	87
	7.8	Compute all valid IP addresses	88
	7.9	Write a string sinusoidally	90
	7.10	Implement run-length encoding	90
	7.11	Implement the UNIX tail command	91
	7.12	Find the first occurrence of a substring	92
8	Linke	ed Lists	95
	8.1	Merge two sorted lists	96
	8.2	Reverse a singly linked list	97
	8.3	Reverse a single sublist	98
	8.4	Test for cyclicity	99
	8.5	Test for overlapping lists—lists are cycle-free	101
	8.6	Test for overlapping lists—lists may have cycles	102
	8.7		104
	8.8	· ·	104

	8.9	Remove duplicates from a sorted list	105	
	8.10	Implement cyclic right shift for singly linked lists	106	
	8.11	Implement even-odd merge	107	
	8.12	Test whether a singly linked list is palindromic	109	
	8.13	Implement list pivoting	110	
	8.14	Add list-based integers	111	
9	Stack	s and Queues	113	
	9.1	Implement a stack with max API	113	
	9.2	Evaluate RPN expressions	116	
	9.3	Test a string over " $\{,\},(,),[,]$ " for well-formedness	117	
	9.4	Normalize pathnames	118	
	9.5	BST keys in sort order	120	
	9.6	Search a postings list	121	
	9.7	Compute buildings with a sunset view	122	
	9.8	Sort a stack	123	
	9.9	Compute binary tree nodes in order of increasing depth	125	
	9.10	Implement a circular queue	126	
	9.11	Implement a queue using stacks	127	
	9.12	Implement a queue with max API	128	
10	Binary Trees 13			
	10.1	Test if a binary tree is balanced	134	
	10.2	Test if a binary tree is symmetric	135	
	10.3	Compute the lowest common ancestor in a binary tree	136	
	10.4	Compute the LCA when nodes have parent pointers	138	
	10.5	Sum the root-to-leaf paths in a binary tree	139	
	10.6	Find a root to leaf path with specified sum	140	
	10.7	Compute the k -th node in an inorder traversal	141	
	10.8	Implement an inorder traversal with $O(1)$ space	142	
	10.9	Compute the successor	143	
	10.10	Reconstruct a binary tree from traversal data	145	
	10.11	Reconstruct a binary tree from a preorder traversal with markers .	147	
	10.12	Form a linked list from the leaves of a binary tree	148	
	10.13	Compute the exterior of a binary tree	148	
	10.14	Compute the right sibling tree	150	
	10.15	Implement locking in a binary tree	152	
11	Heaps	Heaps 15		
	11.1	Merge sorted files	155	
	11.2	Sort an increasing-decreasing array	156	
	11.3	Sort an almost-sorted array	157	
	11.4	Compute the k closest stars	158	
	11.5	Compute the median of online data	160	
	11.6	Compute the k largest elements in a max-heap	161	

	11.7	Implement a stack API using a heap	163	
12	Searching 165			
	12.1	Search a sorted array for first occurrence of k	167	
	12.2	Search a sorted array for the first element greater than $k cdots cdots cdots$.	168	
	12.3	Search a sorted array for entry equal to its index	170	
	12.4	Search a cyclically sorted array	170	
	12.5	Compute the integer square root	172	
	12.6	Compute the real square root	173	
	12.7	Search in a 2D sorted array	175	
	12.8	Find the min and max simultaneously	176	
	12.9	Find the <i>k</i> -th largest element	178	
	12.10	Compute the optimum mailbox placement	179	
	12.11	Find the missing IP address	180	
	12.12	Find the duplicate and missing elements	182	
	12.12	That the duplicate and missing elements	102	
13	Hash	Tables	185	
	13.1	Partition into anagrams	186	
	13.2	Test for palindromic permutations	187	
	13.3	Is an anonymous letter constructible?	188	
	13.4	Implement an ISBN cache	189	
	13.5	Compute the LCA, optimizing for close ancestors	191	
	13.6	Compute the k most frequent queries	192	
	13.7	Find the nearest repeated entries in an array	193	
	13.8	Find the smallest subarray covering all values	194	
	13.9	Find smallest subarray that sequentially covering all values	197	
	13.10	Find the longest subarray with distinct entries	199	
	13.11	Find the length of a longest contained range	200	
	13.12	Compute the average of the top three scores	202	
	13.13	Compute all string decompositions	203	
	13.14	Find a highest affinity pair	205	
	13.15	Test the Collatz conjecture	206	
	13.16	Implement a hash function for chess	208	
	c .:		•	
14	Sortin	_	210	
	14.1	Compute the intersection of two sorted arrays	211	
	14.2	Implement mergesort in-place	213	
	14.3	Count the frequencies of characters in a sentence	214	
	14.4	Find unique elements	215	
	14.5	Render a calendar	215	
	14.6	Sets of disjoint intervals	217	
	14.7	Compute the union of intervals	219	
	14.8	Partitioning and sorting an array with many repeated entries	221	
	14.9	Team photo day—1	223	
	14.10	Implement a fast sorting algorithm for lists	225	

	14.11	Compute a salary threshold	226
15	Binar	y Search Trees	228
	15.1	Test if a binary tree satisfies the BST property	228
	15.2	Find the first occurrence of a key in a BST	231
	15.3	Find the first key larger than a given value in a BST	233
	15.4	Find the k largest elements in a BST	234
	15.5	Compute the LCA in a BST	235
	15.6	Reconstruct a BST from traversal data	236
	15.7	Find the closest entries in three sorted arrays	239
	15.8	Enumerate numbers of the form $a + b\sqrt{2}$	240
	15.9	The most visited pages problem	243
	15.10	Build a BST from a sorted array	244
	15.11	Insertion and deletion in a BST	245
	15.12	Test if three BST nodes are totally ordered	248
	15.13	The range lookup problem	250
	15.14	Add credits	252
	15.15	Count the number of entries in an interval	254
16	Recur	sion	256
	16.1	The Tower of Hanoi problem	256
	16.2	Generate all nonattacking placements of <i>n</i> -Queens	259
	16.3	Generate permutations	261
	16.4	Generate the power set	262
	16.5	Generate all subsets of size $k \dots \dots \dots \dots \dots$	264
	16.6	Generate strings of matched parens	265
	16.7	Generate palindromic decompositions	267
	16.8	Generate binary trees	269
	16.9	Implement a Sudoku solver	270
	16.10	Compute a Gray code	272
	16.11	Compute the diameter of a tree	274
17	Dyna	mic Programming	276
	17.1	Count the number of score combinations	278
	17.2	Compute the Levenshtein distance	279
	17.3	Count the number of ways to traverse a 2D array	282
	17.4	Plan a fishing trip	284
	17.5	Search for a sequence in a 2D array	285
	17.6	The knapsack problem	286
	17.7	Divide the spoils fairly	287
	17.8	The bedbathandbeyond.com problem	289
	17.9	Find the maximum weight path in a triangle	291
	17.10	Pick up coins for maximum gain	291
	17.11	Count the number of steps in a board game	293
	17.12	Compute the probability of a Republican majority	294

	17.13	The pretty printing problem	296	
	17.14	Find the longest nondecreasing subsequence	297	
18	Greed	ly Algorithms and Invariants	300	
	18.1	Implement Huffman coding	301	
	18.2	Compute an optimum assignment of tasks	304	
	18.3	Implement a schedule which minimizes waiting time	305	
	18.4	The interval covering problem	306	
	18.5	The 3-sum problem	309	
	18.6	Find the majority element	310	
	18.7	The gasup problem	311	
	18.8	Compute the maximum water trapped by a pair of vertical lines	312	
	18.9	Compute the largest rectangle under the skyline	314	
19	Graph	ns	317	
	19.1	Identify the celebrity	319	
	19.2	Search a maze	320	
	19.3	Paint a Boolean matrix	322	
	19.4	Compute enclosed regions	324	
	19.5	Clone a graph	326	
	19.6	Making wired connections	327	
	19.7	Transform one string to another	329	
	19.8	The shortest straight-line program for x^n	330	
	19.9	Team photo day—2	332	
	19.10	Compute a shortest path with fewest edges	334	
20	Parall	el Computing	337	
	20.1	Implement caching for a multithreaded dictionary	338	
	20.2	Analyze two unsynchronized interleaved threads	340	
	20.3	Implement synchronization for two interleaving threads	341	
	20.4	Implement a thread pool	343	
	20.5	Implement asynchronous callbacks	344	
	20.6	Implement a Timer class	345	
	20.7	The readers-writers problem	346	
	20.8	The readers-writers problem with write preference	347	
	20.9	Test the Collatz conjecture in parallel	348	
	20.10	Design TeraSort and PetaSort	350	
	20.11	Implement distributed throttling	351	
21	Desig	Design Problems 35		
	21.1	Design a spell checker	354	
	21.2	Design a solution to the stemming problem	354	
	21.3	Plagiarism detector	355	
	21.4	Pair users by attributes	356	
	21.5	Design a system for detecting copyright infringement	357	

	21.6	Design T _E X	358
	21.7	Design a search engine	359
	21.8	Implement PageRank	360
	21.9	Design a scalable priority system	361
	21.10	Create photomosaics	362
	21.11	Implement Mileage Run	362
	21.12	Implement Connexus	364
	21.13	Design an online advertising system	364
	21.14	Design a recommendation system	365
	21.15	Design an optimized way of distributing large files	366
	21.16	Design the World Wide Web	367
	21.17	Estimate the hardware cost of a photo sharing app	368
22	Hono	rs Class	369
	22.1	Compute the greatest common divisor 🍑	370
	22.2	Find the first missing positive entry	371
	22.3	Buy and sell a stock k times	372
	22.4	Compute the maximum product of all but one entries	373
	22.5	Compute the longest contiguous increasing subarray 🔮	376
	22.6	Rotate an array 🔮	377
	22.7	Identify positions attacked by rooks Output Description:	379
	22.8	Justify text 💇	381
	22.9	Reverse sublists k at a time	382
	22.10	Implement list zipping 💿	383
	22.11	Copy a postings list 💇	384
	22.12	Compute the median of a sorted circular linked list 💿	386
	22.13	Compute the longest substring with matching parens	387
	22.14	Compute the maximum of a sliding window 💿	388
	22.15	Implement preorder and postorder traversals without recursion	390
	22.16	Compute fair bonuses 🔮	393
	22.17	Find k elements closest to the median	395
	22.18	Search a sorted array of unknown length 💿	397
	22.19	Search in two sorted arrays 🍑	398
	22.20	Find the k -th largest element—large n , small k	400
	22.21	Find an element that appears only once	401
	22.22	Find the line through the most points 💿	402
	22.23	Find the shortest unique prefix ••	405
	22.24	Compute the smallest nonconstructible change	407
	22.25	Find the most visited pages in a window	408
	22.26	Convert a sorted doubly linked list into a BST 🍑	409
	22.27	Convert a BST to a sorted doubly linked list 💿	411
	22.28	Merge two BSTs 🚭	412
	22.29	Test if a binary tree is an almost BST 💿	414
	22.30	The view from above	416

22.31	Searching a min-first BST 💿	418
22.32	Implement regular expression matching	420
22.33	Synthesize an expression	423
22.34		425
22.35	Draw the skyline 🔮	427
22.36	Find the two closest points	430
22.37	Measure with defective jugs	433
22.38	Compute the maximum subarray sum in a circular array 🔮	434
22.39	Determine the critical height 💿	436
22.40	Voltage selection in a logic circuit 💿	438
22.41	Find the maximum 2D subarray 🚭	439
22.42	Trapping water	442
22.43	Load balancing 🍑	443
22.44	Search for a pair-sum in an abs-sorted array 💿	445
22.45	The heavy hitter problem 💿	448
22.46	Find the longest subarray whose sum $\leq k$	449
22.47	Test degrees of connectedness	451
22.48	Compute a minimum delay schedule, unlimited resources 🔮	454
22.49	Road network 💁	454
22.50	Test if arbitrage is possible	456
22.51	The readers-writers problem with fairness 💿	458
22.52	Implement a producer-consumer queue 🍲	459
III Not	tation, Language, and Index	460
Notation		461
C++11. a	nd C++ for Java developers	463
	•	
THUEN UL	ICINIO	465