1 CheatSheet: Leetcode Common Templates & Common Code Problems Interview

- PDF Link: cheatsheet-behavior-A4.pdf, Category: interview
- Blog URL: `https://cheatsheet.dennyzhang.com/cheatsheet-leetcode-A4`
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- CheatSheet: Common Code Problems & Follow-ups

1.1 Top 25 Code Templates

Num	Category/Tag	Example
1	#bfs	Leetcode: Binary Tree Level Order Traversal
2	#dfs	Leetcode: Island Perimeter, Surrounded Regions
3	#binarysearch	Leetcode: Search Insert Position
4	#interval, #mergetwolist	Leetcode: Interval List Intersections
5	#twopointer, #array	Leetcode: Reverse Words in a String II
6	#twopointer	Leetcode: Two Sum
7	#backtracking, #subset	Leetcode: Subsets II
8	#linkedlist, #presum	Leetcode: Remove Zero Sum Consecutive Nodes from Linked List
9	#unionfind	Leetcode: Accounts Merge
10	#trie	Leetcode: Longest Word in Dictionary
11	#stack	Leetcode: Valid Parentheses
12	#stack	Leetcode: Reverse Substrings Between Each Pair of Parentheses
13	#heap	Leetcode: Top K Frequent Elements
14	#baseconversion	Leetcode: Base 7, Leetcode: Convert to Base -2
15	#interval	Leetcode: Meeting Rooms II, Leetcode: My Calendar I
16	#monotone	Leetcode: Daily Temperatures
17	#knapsack	Leetcode: Coin Change
18	#sortbyfunction	Leetcode: Relative Sort Array
19	#slidingwindow	Leetcode: Longest Substring Without Repeating Characters
20	#editdistance, #dynamicprogramming	Leetcode: Longest Common Subsequence
21	#twopointer, #mergetwolist	Leetcode: Merge Sorted Array
22	#topologicalsort	Leetcode: Course Schedule
23	#bfs, bidirectional bfs	Leetcode: Word Ladder
24	#monotonicfunc, #binarysearch	Leetcode: Kth Smallest Number in Multiplication Table
25	#divideconquer, #recursive	

1.2 Top 25 Graph Problems

Num	Problem	Category/Tag	Summary
1	Graph Connectivity: Count islands in a 2D matrix	#dfs, #unionfind	Leetcode: N
2	Get the size of the largest island	#dfs	Leetcode: M
3	Find shortest distance for two nodes in an undirected graph	#bfs	
4	Cycle detection in an undirected graph		
5	Cycle detection in a directed graph	#topologicalsort	Leetcode: R
6	Detect all cycles in a directred graph	#dfs, #bfs	Leetcode: F
7	Whether a graph is a tree	#unionfind, #bfs	Leetcode: G
8	Minimum Spanning Tree(MST) of a weighted graph - Kruskal's algorithm	#unionfind	Leetcode: C
9	Shortest path for two nodes in a weighted graph - Dijkstra's algorithm		
10	Find shortest paths in a weighted graph - Floyd-Warshall algorithm	#dfs, #dynamicprogramming	
11	Update a specific region	#dfs	Leetcode: F
12	Update regions for a given rule		Leetcode: Su
13	Number of Distinct Islands	#island, #dfs, #hashmap	Leetcode: N
14	Mark levels		Leetcode: 01
15	Duplicate edges		Leetcode: R
16	Find a certain node in a graph	#unionfind	Leetcode: F
17	Coloring graph	#colorgraph, #bfs, #dfs	Leetcode: M
18	Find a certain path from source to destination in a graph		Leetcode: P
19	Find the minimum steps from point1 to point2		Leetcode: W
20	Find all minimum paths from point1 to point2		Leetcode: W
21	All Paths from Source Lead to Destination		Leetcode: A
22	Node connectivity problem for a sparse 2D matrix	#dfs, #bfs	Leetcode: E
23	Bricks Falling When Hit	#unionfind	Leetcode: B
24	Bridges in a connected graph - Tarjan's algorithm		Leetcode: C
25			

https://cdn.dennyzhang.com/images/brain/denny$_{\text{leetcode.png}}$

1.3 Top 10 Binarysearch Problems

Num	Problem	Category/Tag	Summary
1	Find the first true	#binarysearch	Leetcode: First Bad Ver
2	Find the last true	#binarysearch	Leetcode: Longest Repe
3	Search Insert Position	#binarysearch	Leetcode: Search Insert
4	Leetcode: Random Point in Non-overlapping Rectangles	#binarysearch	Leetcode: Random Poin
5	Binary search on monotonic function	#monotonicfunc, #binarysearch	Leetcode: Sqrt(x), Leetc
6	Place k elements such that minimum distance is maximized	#monotonicfunc, #float	Leetcode: Minimize Ma
7	Missing Element in Sorted Array	#binarysearch	Leetcode: Missing Elem
8	Kth Smallest Number in Multiplication Table	#monotonicfunc, #binarysearch	Leetcode: Kth Smallest

1.4 Top 15 Dynamic Programming Problems

Num	Problem	Time Complexity	Category/Tag	S
1	Maximum subarray problem - Kadane's algorithm	O(n)	#maxsubarraysum, #dynamicprogramming	I
2	LIS - Longest increasing subsequence	O(n)	#lis, #string, #dynamicprogramming	I
3	LCS - Longest Common Subsequence	O(n*m)	#lcs, #editdistance, #dynamicprogramming	I
4	LPS - Longest Palindromic Subsequence	O(n)	#palindrome, #dynamicprogramming	I
5	Longest Palindromic Substring	$O(n^2)$/O(n)	#palindrome,#dynamicprogramming	I
6	Edit distance of two strings	$O(n^2)$	#editdistance, #dynamicprogramming	I
7	Maximum profits with certain costs	$O(n^2)$	#maxprofitwithcost, #dynamicprogramming	I
8	Regular Expression Matching	O(n*m)	#editdistance, #dynamicprogramming	I
9	Count of distinct subsequence	O(n)	#countdistinctmoves, #hashmap	I
10	Count out of boundary paths in a 2D matrix	O(n*m*N)	#countdistinctmoves, #bfs	I
11	Get two subset with the same sum	O(n*s)	#knapsack, #dynamicprogramming	I
12	Multiple choices for each step	O(n*m)	#dynamicprogramming	I
13	DP breaks down into 2 subproblems	O(n*n*n)	#dynamicprogramming	I

1.5 Top 10 BinaryTree Problems

Num	Problem	Category/Tag	Summary
1	Binary Tree Level Order Traversal	#bfs	Leetcode: Binary Tree Right Side View
2	Height of binary tree	#dfs	Leetcode: Balanced Binary Tree
3	LCA - Lowest Common Ancestor of a binary Tree	#dfs	Leetcode: Lowest Common Ancestor of a Binary Tr
4	Check whether a binary tree is a full binary tree	#dfs, #bfs	
5	Construct binary tree	#recursive	Leetcode: Construct Binary Tree from Preorder and
6	Right view of a tree		
7	Validate Binary Search Tree	#dfs	Leetcode: Validate Binary Search Tree

1.6 Top 5 String Problems

Num	Problem	Category/Tag	Summary
1	Edit distance of two strings	#editdistance, #dynamicprogramming	Leetcode: Edit Distance
2	Remove duplicate letters	#stack, #greedy	Remove Duplicate Letters
3	Word ladder	#string, #bfs, #backtracking	Leetcode: Word Ladder
4	lrs - Longest repeating substring	#lrs, #rollinghash	Leetcode: Longest Repeating Substring
5			

1.7 Top 10 Math Problems

Num	Problem	Category/Tag	Summary
1	Check prime - Sieve of Eratosthenes	#prime	Leetcode: Count Primes
2	Check leap year	#leapyear	Leetcode: Day of the Week
3	gcd	#gcd	
4	Rectangle	#rectangle	
5	Rotate Array by k steps	#rotatelist	Leetcode: Rotate Array
6	Mapping data range of getRand algorithm	#random	Leetcode: Implement Rand10() Using Rand7()
7	Deal with float	#float	Leetcode: Minimize Max Distance to Gas Station

1.8 Top 5 Greedy Problems

Num	Problem	Category/Tag	Summary
1	Next Permutation	#nextpermutation, #greedy	Leetcode: Next Permutation
2	Split Array into Consecutive Subsequences	#splitarray, #greedy	Leetcode: Split Array into Consecutive Subse
3	Remove duplicate letters	#stack, #greedy	Remove Duplicate Letters
4			
5			

1.9 Top 50 General Problems

Num	Problem	Category/Tag	Example
1	Longest substring with at most K distinct characters	#slidingwindow, #atmostkdistinct	Leetcode: Longest Substri
2	Longest subarray with maximum K 0s	#slidingwindow	Leetcode: Max Consecutiv
3	Seperate a list into several groups	#groupelements, #twopointer	Leetcode: Summary Rang
4	Split string	#string	Leetcode: License Key For
5	TopK problem	#heap, #topk	Leetcode: Top K Frequent
6	Longest Palindromic Subsequence	#dynamicprogramming	Leetcode: Longest Palindr
7	Sort one array based on another array	#sortbyfunction	Leetcode: Relative Sort A
8	Range update with lazy propagation	#combinedcaculation, #rangesum	Leetcode: Corporate Fligh
9	Monotone stack for consecutive subarrays	#montone	Leetcode: Online Stock Sp
10	Get all possibilities of subsets	#subset, #backtracking	Leetcode: Subsets II, Leet
11	Choose k numbers from a list	#combination, #backtracking	Leetcode: Combination Su
12	Combination from multiple segments	#combination, #backtracking	Leetcode: Letter Combina
13	Remove nodes from linked list	#linkedlist, #presum	Leetcode: Remove Zero Su
14	Check whether a linked list has a loop		
15	Two pointers	#twosum, #twopointer	Leetcode: Two Sum
16	Buy stock for maximum profit list	#array, #greedy, #buystock	Leetcode: Best Time to B
17	Prefix search from a list of strings	#trie	Leetcode: Longest Word i
18	Factor Combinations	#combination, #backtracking	Leetcode: Factor Combina
19	Permutation without duplicates	#permutation, #backtracking	Leetcode: Palindrome Per
20	Int to string or string to int	#bitmanipulation	
21	Convert a number into negative base representation	#bitmanipulation, #baseconversion	Leetcode: Convert to Base
22	Network connectivity	#unionfind	Leetcode: Friend Circles
23	Build relationship among different sets	#unionfind	Leetcode: Accounts Merge
24	Knapsack problem to maximize benefits	#knapsack	Leetcode: Coin Change
25	Find the next greater value	#monotone	Leetcode: Daily Temperat
26	Meeting conflict	#interval	Leetcode: Meeting Rooms
27	Minimum conference rooms	#interval, #meetingconflict	Leetcode: Meeting Rooms
28	Quick slow pointers	#twopointer	LintCode: Middle of Linke
29	Longest Repeating Character with at most K changes	#slidingwindow	Leetcode: Longest Repeat
30	Prefix and Suffix Search	#trie	Leetcode: Prefix and Suffi
31	Remove duplicate letters	#greedy, #string, #stack	Leetcode: Remove Duplica
32	Beautiful array	#divideconquer	Leetcode: Beautiful Array
33	Whether 132 pattern exists in array	#stack	Leetcode: 132 Pattern
34	Detect conflicts of intervals	#interval	Leetcode: Non-overlapping
35	Segment tree: solves range query problems quickly	#segmenttree	Leetcode: Range Sum Que
36	Find best meeting points for a list of nodes	#meetingpoint	Leetcode: Best Meeting Po
37	Find the size of longest wiggle subsequence	#subsequence, #wiggle	Leetcode: Wiggle Subsequ
38	Sequence reconstruction	#topologicalsort	Leetcode: Sequence Recon
39	Construct Binary Tree from String	#stack	Construct Binary Tree fro
40	Use more space to save time	#stack	Leetcode: Min Stack
41	Min max game problems	#minmax, #dynamicprogramming	Leetcode: Predict the Win
42	Shortest Subarray with Sum at Least K	#monotone	Leetcode: Shortest Subarr
43	Wiggle sort		Leetcode: Wiggle Sort II
44			Travelling salesman proble
45			Leetcode: Remove Duplica
46			
47			

1.10 Basic Thinking Methodologies

Num	Name	Summary
1	Trial and error	
2	Divide and Conquer	
3	Start with naive algorithm, then identify useless steps	

1.11 Tips: Think From The Other Direction

Num	Name	Summary
1	In graph, instead of deleting edges, add edge in reverse	Leetcode: Bricks Falling When Hit
2	Instead of BFS from empty to islands, do the otherwise	Leetcode: As Far from Land as Possible
3	Avoid deleting element from hashmaps	

1.12 Common Tips For Clean Code

Num	Name	Summary
1	Caculate sum of a range quickly	#presum,Leetcode: Maximum Subarray
2	Move in four directions for a matrix	Leetcode: Sliding Puzzle
3	Split string by multiple seperator	Leetcode: Brace Expansion
4	Add a dummy tailing element to simplify code	Leetcode: Brace Expansion
5	Fast slow pointers	LintCode: Middle of Linked List
6	Deep copy an array	Leetcode: Combination Sum
7	Use arrays instead of hashmaps, if possible	Leetcode: Number of Days in a Month
8	Control the order of dfs	Leetcode: Subsets II
9	Avoid inserting into the head of an array	Leetcode: Path In Zigzag Labelled Binary Tree
10	From right to left, instead of left to right	Leetcode: Merge Sorted Array
11	Think the other way around	`Add Items` vs `Remove Items`, `Increase Counter`
12	Avoid uncessary if...else...	res[i] = (diff/2 <= k), Leetcode: Can Make Palin
13	To get the case of K, solve: at most K - at most (K-1)	Leetcode: Subarrays with K Different Integers
14	Instead of deleting entry from hashmap, decrease counter	Leetcode: Longest Substring with At Most K Dis
15	Find the max/min; If not found, return 0	Leetcode: Minimum Area Rectangle
16	With helper function vs without helper function	Leetcode: Longest Repeating Character Replacem
17	Instead of adding a character, try to delete one	Leetcode: Longest String Chain
18	#roudtrippass: from left to right, then right to left	Leetcode: Shortest Distance to a Character
19	Delayed caculation to simplify the code	Leetcode: Interval List Intersections
20	Instead of removing, add padding elements	Leetcode: Duplicate Zeros
21	Initialize array with n+1 length to simplify code	Leetcode: Range Addition
22	Look for off-by-one errors, sometimes use i+1<len(l) vs i<len(l)	Leetcode: Previous Permutation With One Swap
23	Hashmap can reduce caculation, but may complicate things too	Leetcode: Maximum Frequency Stack
24	Sliding window to get the longest size of subarray	Leetcode: Max Consecutive Ones III
25	In matrix dfs, change cell to impossible value to avoid state hashmap	Leetcode: Word Search II
26	For palindrome check, check the whole string, instead of the left half	Leetcode: Longest Chunked Palindrome Decompo
27	Avoid unnecessary precheck	
28	One pass instead of two pass	
29	Swiping line algorithm	
30	Add a dummy head node for linked list	
31	Hide details which are irrelevant	

1.13 Golang Tips

Name	Summary
Golang return a tuple	`func dfs(root *TreeNode, max *float64) (sum int, cnt int)`, Leetcode:
Use strings.Builder, instead of string	Leetcode: Unique Email Addresses
Variable Conversion	`float64(x_int/y_int)` != `float64(x_int)/float64(y_int)`, Leetcode: Maxi
For a list of objects, pass by value or reference	`f(l []*TreeNode)` vs `f(l *[]*TreeNode)`, Leetcode: Lowest Common Ancesto

1.14 Whiteboard Tips

Name	Summary
Focus on your key motivations or thinkings	Pivot quickly from interviewers' feedback
Brute force algorithm add values	Intuitive algorithms are usually the starting points of optimal ones
Work through specific test case clearly	Reduce bugs, and help to obtain interviewers' feedback early
Naming variables could be tricky	Settle down a set of variables per your preference
You don't have to crack all problems/optimal algorithms	

1.15 More Data Structure

Name	Summary
Tree map	
Inverted Index	

1.16 Resource For Code Problems

Name	Summary
Leetcode summary	Link: Top Google Questions, Link: Top 100 Liked Questions, Link: Top Interview Questions
Leetcode summary	GitHub: kdn251/interviews, Github: Algorithms-and-Coding-Interviews
YouTube	How to: Work at Google - Example Coding/Engineering Interview, lee 215, Aoxiang Cui, happygirlzt
Online test websites	codeforces.com, spoj.com, Google - codejam, hackerrank.com, hackerrank - hard, poj.org
Online test websites	acm.hdu.edu.cn, acm.zju.edu.cn, acm.timus.ru, uva.onlinejudge.org
visualgo	visualising data structures and algorithms through animation
Reference	geeksforgeeks.org, Youtube: Abdul Bari - Algorithm
Reference	COS 423 Theory of Algorithms

1.17 More Resources


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https://www.cs.princeton.edu/~rs/AlgsDS07/
https://www.geeksforgeeks.org/top-10-algorithms-in-interview-questions/
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