

# 700 Hard LeetCode Problems Organized by Patterns

## I. Design & System Implementation (60 problems)

### Core Data Structure Design

1. LRU Cache
2. LFU Cache
3. Design Twitter
4. Insert Delete GetRandom O(1)
5. Insert Delete GetRandom O(1) - Duplicates allowed
6. All O(1) Data Structure
7. Design In-Memory File System
8. Design Excel Sum Formula
9. Design Search Autocomplete System
10. Design HashSet
11. Design HashMap
12. Design Linked List
13. Max Stack
14. Time Based Key-Value Store
15. Snapshot Array
16. Implement Trie II (Prefix Tree)
17. Design a Text Editor
18. Design a Number Container System
19. Design a Food Rating System
20. Design Memory Allocator

### Advanced Design Problems

21. Random Pick with Blacklist
22. Range Module
23. My Calendar I
24. My Calendar II
25. My Calendar III

26. Dinner Plate Stacks
27. Tweet Counts Per Frequency
28. Product of the Last K Numbers
29. Design a Stack With Increment Operation
30. Design Browser History
31. Throne Inheritance
32. Design Expression Tree With Evaluate Function
33. Create Sorted Array through Instructions
34. Design Front Middle Back Queue
35. Design Movie Rental System
36. Stock Price Fluctuation
37. Range Frequency Queries
38. Sequentially Ordinal Rank Tracker
39. Encrypt and Decrypt Strings
40. Design an ATM Machine
41. Design Video Sharing Platform
42. Design Graph With Shortest Path Calculator
43. Design Authentication Manager
44. Design Parking System
45. Design Underground System
46. Design Skiplist
47. Design Circular Deque
48. Design Hit Counter
49. Design Phone Directory
50. Design Log Storage System

## **Simulation & Special Structures**

51. Find All Possible Recipes from Given Supplies
52. Make Array Zero by Subtracting Equal Amounts
53. Longest Increasing Subsequence II
54. Count Subarrays With Fixed Bounds

55. Maximal Score After Applying K Operations
  56. Time Taken to Cross the Door
  57. Minimum Reverse Operations
  58. Maximum Strictly Increasing Cells in a Matrix
  59. Count Apples and Oranges
  60. Design Add and Search Words Data Structure
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## **II. Heap / Priority Queue / Ordered Set (50 problems)**

### **Classic Heap Problems**

1. The Skyline Problem
2. Sliding Window Maximum
3. Meeting Rooms II
4. Find Median from Data Stream
5. IPO
6. Course Schedule III
7. Employee Free Time
8. Minimum Number of Refueling Stops
9. Minimum Cost to Hire K Workers
10. Maximum Frequency Stack

### **Advanced Priority Queue**

11. Minimum Cost to Connect Sticks
12. Maximum Performance of a Team
13. Longest Happy String
14. Constrained Subsequence Sum
15. Furthest Building You Can Reach
16. Minimize Deviation in Array
17. Checking Existence of Edge Length Limited Paths
18. Single-Threaded CPU
19. Process Tasks Using Servers

20. Remove Stones to Minimize the Total

## Multi-Heap & Complex Operations

21. Construct String With Repeat Limit
22. Minimum Operations to Halve Array Sum
23. Minimum Amount of Time to Fill Cups
24. Total Cost to Hire K Workers
25. Increment Submatrices by One
26. Minimum Time to Visit a Cell In a Grid
27. Mice and Cheese
28. Sliding Subarray Beauty
29. Find the Longest Semi-Repetitive Substring
30. Maximum Elegance of a K-Length Subsequence
31. Kth Smallest Element in a Sorted Matrix
32. Find K Pairs with Smallest Sums
33. Super Ugly Number
34. Trapping Rain Water II
35. Smallest Range Covering Elements from K Lists
36. Maximize Score After N Operations
37. Smallest Number in Infinite Set
38. Maximum Subsequence Score
39. K-th Smallest Prime Fraction
40. Swim in Rising Water

## Sweep Line + Heap

41. Maximum Number of Events That Can Be Attended
42. Maximum Number of Events That Can Be Attended II
43. Split Array into Consecutive Subsequences
44. Maximum Profit in Job Scheduling
45. Describe the Painting
46. Brightest Position on Street
47. Amount of New Area Painted Each Day

48. Number of Flowers in Full Bloom
  49. The Number of the Smallest Unoccupied Chair
  50. Minimum Number of Days to Eat N Oranges
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### **III. Graph Algorithms & Advanced Traversal (70 problems)**

#### **Topological Sort & DAG**

1. Alien Dictionary
2. Reconstruct Itinerary
3. Course Schedule IV
4. Parallel Courses II
5. Parallel Courses III
6. Largest Color Value in a Directed Graph
7. Build a Matrix With Conditions
8. Construct Smallest Number From DI String
9. Minimum Height Trees
10. Sequence Reconstruction

#### **Shortest Path Variants**

11. Network Delay Time
12. Path with Maximum Probability
13. Path With Minimum Effort
14. Number of Restricted Paths From First to Last Node
15. Minimum Weighted Subgraph With Required Paths
16. Reachable Nodes in Subdivided Graph
17. Shortest Path with Alternating Colors
18. Minimum Cost to Make at Least One Valid Path
19. Minimum Obstacle Removal to Reach Corner
20. Find the Safest Path in a Grid
21. Cheapest Flights Within K Stops
22. Path with Maximum Gold

23. Second Minimum Time to Reach Destination
24. Minimum Cost to Reach Destination in Time
25. Shortest Path to Get All Keys
26. Shortest Path Visiting All Nodes
27. Shortest Path in a Grid with Obstacles Elimination
28. Minimum Moves to Reach Target with Rotations
29. Minimum Knight Moves
30. Escape the Spreading Fire

## **Graph Connectivity & Components**

31. Evaluate Division
32. Bus Routes
33. Connecting Cities With Minimum Cost
34. Detect Cycles in 2D Grid
35. Maximal Network Rank
36. Graph Connectivity With Threshold
37. Number of Ways to Arrive at Destination
38. Count Unreachable Pairs of Nodes in an Undirected Graph
39. Longest Cycle in a Graph
40. Number of Good Paths
41. Minimum Score of a Path Between Two Cities
42. Shortest Cycle in a Graph
43. Count Zero Request Servers
44. Critical Connections in a Network
45. Number of Islands II
46. Accounts Merge
47. Redundant Connection II
48. Optimize Water Distribution in a Village

## **Advanced Graph Problems**

49. Minimum Moves to Move a Box to Their Target Location
50. Maximum Employees to Be Invited to a Meeting

51. Find All People With Secret
  52. Step-By-Step Directions From a Binary Tree Node
  53. Maximum Total Importance of Roads
  54. The Latest Time to Catch a Bus
  55. Modify Graph Edge Weights
  56. Apply Operations to Make All Array Elements Equal to Zero
  57. Count Valid Paths in a Tree
  58. Maximum Number of K-Divisible Components
  59. Maximum Points After Collecting Coins From All Nodes
  60. Find the City With the Smallest Number of Neighbors at a Threshold Distance
  61. Minimize Malware Spread
  62. Minimize Malware Spread II
  63. Smallest String With Swaps
  64. Checking Existence of Edge Length Limited Paths
  65. Minimum Degree of a Connected Trio in a Graph
  66. Count Subtrees With Max Distance Between Cities
  67. Tree of Coprimes
  68. Maximum Number of Points from Grid Queries
  69. Minimum Number of Visited Cells in a Grid
  70. Find All Good Indices
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## **IV. Dynamic Programming - State Machines (50 problems)**

### **Stock Trading & State DP**

1. Best Time to Buy and Sell Stock III
2. Best Time to Buy and Sell Stock IV
3. Best Time to Buy and Sell Stock with Cooldown
4. Best Time to Buy and Sell Stock with Transaction Fee
5. Maximum Profit From Trading Stocks
6. Best Time to Buy and Sell Stock II with Transaction Fee
7. Paint House III

8. Paint House IV

9. House Robber III

10. House Robber IV

## **Game Theory & Minimax DP**

11. Predict the Winner

12. Stone Game II

13. Stone Game III

14. Stone Game IV

15. Stone Game V

16. Stone Game VI

17. Stone Game VII

18. Stone Game VIII

19. Stone Game IX

20. Cat and Mouse

21. Cat and Mouse II

22. Guess Number Higher or Lower II

23. Flip Game II

24. Can I Win

25. Nim Game II

## **Complex State Transitions**

26. Number of Ways to Paint  $N \times 3$  Grid

27. Number of Ways of Cutting a Pizza

28. Distribute Repeating Integers

29. Maximum Height by Stacking Cuboids

30. Make the XOR of All Segments Equal to Zero

31. Fancy Sequence

32. Check if an Original String Exists After Substitutions

33. Minimum Path Cost in a Grid

34. Cherry Pickup II

35. Number of Music Playlists

36. Number of Ways to Reorder Array to Get Same BST

37. Number of Ways to Form a Target String Given a Dictionary

38. Maximum Score from Performing Multiplication Operations

39. Minimum Cost to Change the Final Value of Expression

40. Minimum Number of Removals to Make Mountain Array

41. Count Number of Teams

42. Longest Arithmetic Subsequence of Given Difference

43. Longest Chunked Palindrome Decomposition

44. Minimum Insertion Steps to Make a String Palindrome

45. Minimum Cost Tree From Leaf Values

46. Minimum Swaps To Make Sequences Increasing

47. Knight Dialer

48. Domino and Tromino Tiling

49. Champagne Tower

50. Soup Servings

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## V. Dynamic Programming - Intervals & Ranges (50 problems)

### Classic Interval DP

1. Burst Balloons

2. Minimum Cost to Merge Stones

3. Strange Printer

4. Minimum Score Triangulation of Polygon

5. Minimum Cost to Cut a Stick

6. Remove Boxes

7. Palindrome Partitioning II

8. Palindrome Partitioning III

9. Palindrome Partitioning IV

10. Scramble String

## **Advanced Range DP**

11. Minimum Number of K Consecutive Bit Flips
12. Restore The Array
13. Count Sorted Vowel Strings
14. Count Ways to Build Rooms in an Ant Colony
15. Minimum Operations to Reduce X to Zero
16. Minimum Number of Operations to Make String Sorted
17. Substring With Largest Variance
18. Minimum Total Space Wasted With K Resizing Operations
19. Minimum White Tiles After Covering With Carpets
20. Minimum Number of Increments on Subarrays to Form a Target Array

## **Partition & Subarray DP**

21. Split Array Largest Sum
22. Split Array into Consecutive Subsequences
23. Partition Array for Maximum Sum
24. Partition Array into Disjoint Intervals
25. Painting the Walls
26. Painting a Grid With Three Different Colors
27. Find the Divisibility Array of a String
28. Number of Ways to Divide a Long Corridor
29. Maximum Number of Groups Getting Fresh Donuts
30. Count Subarrays With Median K
31. Maximum Value of K Coins From Piles
32. Maximum Number of Books You Can Take
33. Minimum Number of Operations to Make Arrays Similar
34. Minimum Deletions to Make Array Divisible
35. Make Array Empty
36. Apply Operations to Maximize Score
37. Count Fertile Pyramids in a Land
38. Count Number of Ways to Place Houses

39. Largest Palindrome Number

40. Find Missing Observations

## Matrix & Grid DP

41. Dungeon Game

42. Cherry Pickup

43. Unique Paths III

44. Number of Paths with Max Score

45. Minimum Path Sum in a Grid

46. Minimum Falling Path Sum II

47. Get Biggest Three Rhombus Sums in a Grid

48. Count Square Submatrices with All Ones

49. Maximal Rectangle

50. Largest Submatrix With Rearrangements

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## VI. Dynamic Programming - Bitmask & Subset (50 problems)

### Traveling Salesman Variants

1. Shortest Path Visiting All Nodes

2. Find the Shortest Superstring

3. Minimum Cost to Connect Two Groups of Points

4. Distribute Repeating Integers

5. Maximum Students Taking Exam

6. Minimum XOR Sum of Two Arrays

7. Maximize Score After N Operations

8. Minimum Number of Work Sessions to Finish the Tasks

9. Parallel Courses II

10. Maximum Compatibility Score Sum

### Subset DP

11. Stickers to Spell Word

12. Smallest Sufficient Team

13. Partition to K Equal Sum Subsets
14. Fair Distribution of Cookies
15. Find Minimum Time to Finish All Jobs
16. Minimum Incompatibility
17. Maximum AND Sum of Array
18. Minimum Total Distance Traveled
19. Count Ways To Build Good Strings
20. Count All Possible Routes
21. Number of Ways to Wear Different Hats to Each Other
22. Campus Bikes II
23. Tiling a Rectangle with the Fewest Squares
24. Number of Squareful Arrays
25. Shortest Path to Get Food

## **Advanced Bitmask**

26. Maximum Rows Covered by Columns
27. Find All Good Strings
28. Number of Valid Move Combinations On Chessboard
29. Minimum Cost to Reach City With Discounts
30. Count Subtrees With Max Distance Between Cities
31. Minimize the Maximum of Two Arrays
32. Minimum Moves to Make Array Complementary
33. Form Largest Integer With Digits That Add up to Target
34. Maximum Number of Achievable Transfer Requests
35. Count Palindromic Subsequences
36. Special Binary String
37. Number of Great Partitions
38. Count Anagrams
39. Selling Pieces of Wood
40. Count Ways to Group Overlapping Ranges

## **Game & Optimization Bitmask**

41. Maximum Number of Ways to Partition an Array
  42. Count Number of Special Subsequences
  43. Tuple with Same Product
  44. Count Substrings That Differ by One Character
  45. Number of Subsequences That Satisfy the Given Sum Condition
  46. Maximum Earning From Taxi
  47. Maximize Win From Two Segments
  48. Maximum Alternating Subsequence Sum
  49. Maximum Value after Insertion
  50. Check if There is a Valid Parentheses String Path
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## **VII. Dynamic Programming - Digit & String (40 problems)**

### **Digit DP**

1. Count Numbers with Unique Digits
2. Numbers At Most N Given Digit Set
3. Numbers With Repeated Digits
4. Count Special Integers
5. Non-negative Integers without Consecutive Ones
6. Count Stepping Numbers in Range
7. Number of Digit One
8. Nth Digit
9. Find the K-th Lucky Number
10. Count of Integers

### **String DP - Matching & LCS**

11. Edit Distance
12. Distinct Subsequences
13. Distinct Subsequences II
14. Longest Common Subsequence

15. Longest Palindromic Subsequence
16. Minimum ASCII Delete Sum for Two Strings
17. Interleaving String
18. Count Different Palindromic Subsequences
19. Longest String Chain
20. Is Subsequence
21. Shortest Common Supersequence
22. Longest Repeating Substring
23. Number of Matching Subsequences
24. Count Substrings That Differ by One Character
25. Maximum Deletions on a String

## **Pattern Matching & Wildcard**

26. Regular Expression Matching
27. Wildcard Matching
28. Word Break II
29. Concatenated Words
30. Word Squares
31. Palindrome Pairs
32. Valid Permutations for DI Sequence
33. Distinct Echo Substrings
34. Length of the Longest Valid Substring
35. Minimum Number of Frogs Croaking

## **Advanced String DP**

36. Super Egg Drop
  37. Freedom Trail
  38. K Inverse Pairs Array
  39. Longest Duplicate Substring
  40. Shortest Palindrome
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## **VIII. Tree Algorithms & Tree DP (50 problems)**

### **Binary Tree DP**

1. Binary Tree Maximum Path Sum
2. Binary Tree Cameras
3. House Robber III
4. Distribute Coins in Binary Tree
5. Maximum Sum BST in Binary Tree
6. Number of Ways to Reorder Array to Get Same BST
7. Unique Binary Search Trees II
8. Count Nodes Equal to Average of Subtree
9. Create Binary Tree From Descriptions
10. Amount of Time for Binary Tree to Be Infected

### **Tree Traversal & Construction**

11. Serialize and Deserialize Binary Tree
12. Serialize and Deserialize N-ary Tree
13. Construct Binary Tree from Preorder and Inorder
14. Construct Binary Tree from Inorder and Postorder
15. Recover Binary Search Tree
16. Verify Preorder Serialization of a Binary Tree
17. Find Duplicate Subtrees
18. All Nodes Distance K in Binary Tree
19. Vertical Order Traversal of a Binary Tree
20. Binary Tree Right Side View

### **Tree Path & Distance**

21. Sum of Distances in Tree
22. Smallest Missing Genetic Value in Each Subtree
23. Count Nodes With the Highest Score
24. Maximum Product of Splitted Binary Tree
25. Longest Path With Different Adjacent Characters

26. Step-By-Step Directions From a Binary Tree Node
27. Maximum Difference Between Node and Ancestor
28. Longest Univalue Path
29. Most Frequent Subtree Sum
30. Path Sum III

## **Advanced Tree Problems**

31. Tree of Coprimes
  32. Count Valid Paths in a Tree
  33. Maximum Points After Collecting Coins From All Nodes
  34. Maximum Number of K-Divisible Components
  35. Find Distance in a Binary Tree
  36. Lowest Common Ancestor of Deepest Leaves
  37. Delete Nodes And Return Forest
  38. Count Nodes Equal to Sum of Descendants
  39. Time Needed to Inform All Employees
  40. Frog Position After T Seconds
  41. Linked List in Binary Tree
  42. Number of Ways to Reconstruct a Tree
  43. Operations on Tree
  44. Height of Binary Tree After Subtree Removal Queries
  45. Minimum Edge Reversals So Every Node Is Reachable
  46. Maximum Star Sum of a Graph
  47. Cycle Length Queries in a Tree
  48. Find Number of Coins to Place in Tree Nodes
  49. Maximum Employees to Be Invited to a Meeting
  50. Minimum Number of Operations to Sort a Binary Tree by Level
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## **IX. Intervals & Sweep Line Advanced (50 problems)**

### **Interval Merging & Operations**

1. Merge Intervals
2. Insert Interval
3. Employee Free Time
4. Interval List Intersections
5. Remove Covered Intervals
6. Non-overlapping Intervals
7. Minimum Number of Arrows to Burst Balloons
8. Video Stitching
9. Maximum Profit in Job Scheduling
10. Minimum Interval to Include Each Query

### **Sweep Line Algorithms**

11. Range Module
12. My Calendar I
13. My Calendar II
14. My Calendar III
15. Maximum Number of Events That Can Be Attended
16. Maximum Number of Events That Can Be Attended II
17. Describe the Painting
18. Brightest Position on Street
19. Amount of New Area Painted Each Day
20. Number of Flowers in Full Bloom
21. The Number of the Smallest Unoccupied Chair
22. Meeting Rooms III
23. Car Pooling
24. Corporate Flight Bookings
25. Divide Intervals Into Minimum Number of Groups

## **Advanced Interval Problems**

26. Count Ways to Group Overlapping Ranges
27. Divide Nodes Into the Maximum Number of Groups
28. Maximum Number of Tasks You Can Assign
29. Count the Number of Good Subarrays
30. House Robber IV
31. Find the Maximum Number of Marked Indices
32. Minimum Time to Repair Cars
33. Maximum Number of Integers to Choose From a Range I
34. Maximum Number of Integers to Choose From a Range II
35. Longest Subsequence With Limited Sum
36. Most Beautiful Item for Each Query
37. Maximum Tastiness of Candy Basket
38. Minimize the Maximum Difference of Pairs
39. Minimum Time to Complete Trips
40. Maximum Running Time of N Computers

## **Interval DP Combinations**

41. Remove Interval
  42. Count Positions on Street With Required Brightness
  43. Minimum Number of Groups to Create a Valid Assignment
  44. Longest Ideal Subsequence
  45. Sum of Imbalance Numbers of All Subarrays
  46. Length of the Longest Valid Substring
  47. Greatest Common Divisor Traversal
  48. Count the Number of Complete Components
  49. Sorting Three Groups
  50. Maximum Sum of Almost Unique Subarray
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## X. Greedy Algorithms - Advanced (40 problems)

### Greedy Construction

1. Task Scheduler
2. Reorganize String
3. Rearrange String k Distance Apart
4. Queue Reconstruction by Height
5. Minimize Maximum Pair Sum in Array
6. Largest Number
7. Advantage Shuffle
8. Boats to Save People
9. Bag of Tokens
10. Candy

### Greedy with Sorting

11. Remove Duplicate Letters
12. Create Maximum Number
13. Smallest Range II
14. Minimum Number of Taps to Open to Water a Garden
15. Minimum Time to Make Rope Colorful
16. Reduction Operations to Make the Array Elements Equal
17. Maximum Ice Cream Bars
18. Removing Minimum Number of Magic Beans
19. Maximum Units on a Truck
20. Maximum Bags With Full Capacity of Rocks

### Multi-Step Greedy

21. Gas Station
22. Jump Game II
23. Jump Game IV
24. Jump Game V
25. Jump Game VI

26. Jump Game VII
27. Minimum Number of Days to Make m Bouquets
28. Koko Eating Bananas
29. Capacity To Ship Packages Within D Days
30. Minimum Speed to Arrive on Time
31. Minimum Skips to Arrive at Meeting On Time
32. Splitting a String Into Descending Consecutive Values
33. Maximum Value at a Given Index in a Bounded Array
34. Minimum Limit of Balls in a Bag
35. Minimize Maximum of Array

## **Advanced Greedy Strategies**

36. Removing Minimum and Maximum From Array
  37. Find Subsequence of Length K With the Largest Sum
  38. Minimum Number of Operations to Make Array Continuous
  39. Maximum Good People Based on Statements
  40. Apply Operations to Make All Array Elements Equal to Zero
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## **XI. Binary Search - Advanced Applications (40 problems)**

### **Binary Search on Answer**

1. Kth Smallest Element in a Sorted Matrix
2. Split Array Largest Sum
3. Koko Eating Bananas
4. Capacity To Ship Packages Within D Days
5. Magnetic Force Between Two Balls
6. Minimize Max Distance to Gas Station
7. Minimum Time to Complete Trips
8. Minimized Maximum of Products Distributed to Any Store
9. Minimum Time to Repair Cars
10. Find K-th Smallest Pair Distance

## **Binary Search with Predicate**

11. Find the Duplicate Number
12. Find the Smallest Divisor Given a Threshold
13. Maximum Side Length of a Square with Sum Less than or Equal to Threshold
14. Kth Missing Positive Number
15. Missing Element in Sorted Array
16. Count Negative Numbers in a Sorted Matrix
17. Maximum Font to Fit a Sentence in a Screen
18. Allocate Mailboxes
19. Find a Peak Element II
20. Single Element in a Sorted Array

## **Multi-Dimensional Binary Search**

21. Median of Two Sorted Arrays
22. Find K-th Smallest Pair Distance
23. K-th Smallest Prime Fraction
24. Ugly Number III
25. Kth Smallest Subarray Sum
26. Maximum Tastiness of Candy Basket
27. Minimize the Maximum Difference of Pairs
28. Successful Pairs of Spells and Potions
29. Minimum Number of Days to Make m Bouquets
30. Maximum Number of Removable Characters

## **Advanced Binary Search Problems**

31. Preimage Size of Factorial Zeroes Function
32. Sum of Mutated Array Closest to Target
33. Minimum Number of Days to Eat N Oranges
34. Minimum One Bit Operations to Make Integers Zero
35. Maximum Running Time of N Computers
36. Find Minimum Time to Finish All Jobs

37. Minimum Cost to Make Array Equal
  38. Minimize Maximum Value in a Grid
  39. Apply Operations to Maximize Frequency Score
  40. Minimum Array End
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## XII. Advanced Data Structures (50 problems)

### Segment Tree & Fenwick Tree

1. Range Sum Query - Mutable
2. Range Sum Query 2D - Mutable
3. Count of Smaller Numbers After Self
4. Count of Range Sum
5. Reverse Pairs
6. Create Sorted Array through Instructions
7. Longest Increasing Subsequence II
8. Handling Sum Queries After Update
9. Range Sum Query with Updates
10. Count Integers in Intervals

### Trie Applications

11. Implement Trie (Prefix Tree)
12. Implement Trie II (Prefix Tree)
13. Design Add and Search Words Data Structure
14. Word Search II
15. Maximum XOR of Two Numbers in an Array
16. Concatenated Words
17. Replace Words
18. Map Sum Pairs
19. Design Search Autocomplete System
20. Stream of Characters

## **Union Find Advanced**

21. Number of Islands II
22. Graph Valid Tree
23. Accounts Merge
24. Redundant Connection
25. Redundant Connection II
26. Most Stones Removed with Same Row or Column
27. Satisfiability of Equality Equations
28. Smallest String With Swaps
29. Minimize Malware Spread
30. Minimize Malware Spread II
31. Checking Existence of Edge Length Limited Paths
32. Graph Connectivity With Threshold
33. Number of Good Paths
34. Greatest Common Divisor Traversal
35. Lexicographically Smallest Equivalent String

## **Advanced Tree Structures**

36. Count of Smaller Numbers After Self
37. My Calendar I
38. My Calendar II
39. My Calendar III
40. Range Module
41. Falling Squares
42. Rectangle Area II
43. Number of Atoms
44. Parsing A Boolean Expression
45. Basic Calculator III
46. Expression Add Operators
47. Different Ways to Add Parentheses
48. Longest Absolute File Path

49. Decode String at Index

50. Brace Expansion II

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## XIII. Math & Number Theory (40 problems)

### Number Theory Fundamentals

1. Count Primes
2. Ugly Number II
3. Ugly Number III
4. Super Pow
5. Nth Magical Number
6. Smallest Good Base
7. Poor Pigs
8. Bulb Switcher II
9. K-th Symbol in Grammar
10. Sum of Subsequence Widths

### Combinatorics & Probability

11. Random Pick with Weight
12. Random Pick Index
13. Generate Random Point in a Circle
14. Shuffle an Array
15. Linked List Random Node
16. Random Point in Non-overlapping Rectangles
17. K-th Smallest Amount in a Coin Change
18. Count Number of Texts
19. Decode Ways II
20. Knight Probability in Chessboard

### Matrix Operations

21. Rotate Image
22. Spiral Matrix II

- 23. Spiral Matrix III
- 24. Set Matrix Zeroes
- 25. Game of Life
- 26. Lucky Numbers in a Matrix
- 27. Shift 2D Grid
- 28. Toeplitz Matrix
- 29. Valid Sudoku
- 30. Sudoku Solver

## **Advanced Math**

- 31. Integer to English Words
  - 32. Fraction to Recurring Decimal
  - 33. Basic Calculator
  - 34. Basic Calculator II
  - 35. Basic Calculator III
  - 36. Evaluate Reverse Polish Notation
  - 37. Valid Number
  - 38. Count of Integers
  - 39. Number of Ways to Separate Numbers
  - 40. Count Collisions of Monkeys on a Polygon
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## **XIV. Backtracking & Search (40 problems)**

### **Classic Backtracking**

- 1. N-Queens
- 2. N-Queens II
- 3. Sudoku Solver
- 4. Word Search II
- 5. Palindrome Partitioning
- 6. Combination Sum III
- 7. Subsets II

8. Permutations II

9. Letter Combinations of a Phone Number

10. Generate Parentheses

## Constraint Satisfaction

11. Restore IP Addresses

12. Word Pattern II

13. Strobogrammatic Number III

14. Remove Invalid Parentheses

15. Expression Add Operators

16. Android Unlock Patterns

17. Split Array into Fibonacci Sequence

18. Beautiful Arrangement

19. Matchsticks to Square

20. Partition to K Equal Sum Subsets

## Game Search & Exploration

21. Word Ladder II

22. Shortest Transformation Sequence

23. Minimum Number of Flips to Convert Binary Matrix to Zero Matrix

24. Pyramid Transition Matrix

25. Shopping Offers

26. Can I Win

27. Flip Game II

28. Predict the Winner

29. Stone Game

30. Find Unique Binary String

## Advanced Search Problems

31. Robot Room Cleaner

32. Escape a Large Maze

33. Minimize Malware Spread

34. Number of Squareful Arrays
  35. Valid Arrangement of Pairs
  36. Reconstruct Itinerary
  37. Cracking the Safe
  38. Find All Good Strings
  39. Maximum Good People Based on Statements
  40. Check if There is a Valid Parentheses String Path
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## XV. Sliding Window & Two Pointers Advanced (40 problems)

### Advanced Sliding Window

1. Minimum Window Substring
2. Longest Substring with At Most K Distinct Characters
3. Subarrays with K Different Integers
4. Count Subarrays With Fixed Bounds
5. Longest Substring with At Least K Repeating Characters
6. Longest Repeating Character Replacement
7. Max Consecutive Ones III
8. Grumpy Bookstore Owner
9. Get Equal Substrings Within Budget
10. Frequency of the Most Frequent Element

### Multi-Pointer Techniques

11. Container With Most Water
12. Trapping Rain Water
13. 3Sum Closest
14. 4Sum
15. 4Sum II
16. Valid Triangle Number
17. Boats to Save People
18. Sum of Square Numbers

19. Minimum Size Subarray Sum

20. Number of Subsequences That Satisfy the Given Sum Condition

## Window with Complex Conditions

21. Subarrays with K Different Integers

22. Count Subarrays With Median K

23. Count the Number of Good Subarrays

24. Substring With Largest Variance

25. Number of Substrings Containing All Three Characters

26. Replace the Substring for Balanced String

27. Maximum Number of Vowels in a Substring of Given Length

28. Maximum Points You Can Obtain from Cards

29. Maximize the Confusion of an Exam

30. Minimum Number of Flips to Make the Binary String Alternating

## Monotonic Queue/Stack Applications

31. Sliding Window Maximum

32. Shortest Subarray with Sum at Least K

33. Sum of Subarray Minimums

34. Sum of Subarray Ranges

35. Constrained Subsequence Sum

36. Minimum Cost Tree From Leaf Values

37. Maximum Width Ramp

38. Online Stock Span

39. Next Greater Element III

40. Number of Visible People in a Queue

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## XVI. String Algorithms - Advanced (40 problems)

### String Matching

1. KMP Algorithm Problems

2. Rabin-Karp Applications

3. Longest Duplicate Substring

4. Shortest Palindrome

5. Repeated DNA Sequences

6. Repeated String Match

7. Find All Anagrams in a String

8. Permutation in String

9. String Compression II

10. Consecutive Characters

## **String Hashing & Rolling Hash**

11. Longest Happy Prefix

12. Longest Chunked Palindrome Decomposition

13. Distinct Echo Substrings

14. Shortest Way to Form String

15. Minimum Number of Swaps to Make the String Balanced

16. Check if a String Contains All Binary Codes of Size K

17. Count Binary Substrings

18. Number of Substrings With Only 1s

19. Maximum Repeating Substring

20. Longest Common Prefix

## **Palindrome Algorithms**

21. Manacher's Algorithm

22. Palindromic Substrings

23. Longest Palindromic Substring

24. Palindrome Pairs

25. Shortest Palindrome

26. Count Different Palindromic Subsequences

27. Longest Chunked Palindrome Decomposition

28. Super Palindromes

29. Palindrome Removal

30. Break a Palindrome

## **Advanced String Operations**

31. Minimum Number of Steps to Make Two Strings Anagram II
  32. Minimum Deletions to Make String Balanced
  33. Minimum Number of Moves to Make Palindrome
  34. Construct String With Minimum Cost
  35. Minimum Time to Type Word Using Special Typewriter
  36. Minimum Changes to Make Alternating Binary String
  37. Maximum Deletions on a String
  38. Apply Discount to Prices
  39. Find Substring With Given Hash Value
  40. Longest Ideal Subsequence
- 

## **XVII. Array & Matrix Manipulation (40 problems)**

### **Array Transformations**

1. First Missing Positive
2. Find All Numbers Disappeared in an Array
3. Set Mismatch
4. Missing Number
5. Find the Duplicate Number
6. Game of Life
7. Rotate Array
8. Product of Array Except Self
9. Next Permutation
10. Wiggle Sort II

### **Subarray Problems**

11. Maximum Subarray
12. Maximum Product Subarray
13. Longest Turbulent Subarray
14. Subarray Sum Equals K

15. Subarray Sums Divisible by K

16. Continuous Subarray Sum

17. Shortest Subarray with Sum at Least K

18. Maximum Size Subarray Sum Equals k

19. Minimum Operations to Reduce X to Zero

20. Count Number of Nice Subarrays

## **Matrix Traversal & Patterns**

21. Spiral Matrix

22. Spiral Matrix II

23. Spiral Matrix III

24. Diagonal Traverse

25. Sort the Matrix Diagonally

26. Where Will the Ball Fall

27. Matrix Diagonal Sum

28. Lucky Numbers in a Matrix

29. Shift 2D Grid

30. Check if Every Row and Column Contains All Numbers

## **Advanced Array Problems**

31. Maximize Distance to Closest Person

32. Exam Room

33. Find K Closest Elements

34. K Closest Points to Origin

35. Top K Frequent Elements

36. Top K Frequent Words

37. Kth Largest Element in an Array

38. Wiggle Sort

39. Wiggle Subsequence

40. Russian Doll Envelopes

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## XVIII. Bit Manipulation - Advanced (35 problems)

### Bit Operations Fundamentals

1. Single Number
2. Single Number II
3. Single Number III
4. Maximum XOR of Two Numbers in an Array
5. Maximum XOR With an Element From Array
6. Maximum Genetic Difference Query
7. Find XOR Sum of All Pairs Bitwise AND
8. Bitwise AND of Numbers Range
9. Bitwise ORs of Subarrays
10. Count Triplets That Can Form Two Arrays of Equal XOR

### XOR Problems

11. XOR Queries of a Subarray
12. Find the Longest Substring Containing Vowels in Even Counts
13. Count Paths With XOR Value
14. Make Array Equal With OR Operations
15. Minimum XOR Sum of Two Arrays
16. Maximize XOR After Operations
17. Maximum Strong Pair XOR
18. Find the XOR of Numbers Which Appear Twice
19. Check if Bitwise OR Has Trailing Zeros
20. Minimum Number of Operations to Make All Array Elements Equal

### Bitmask Advanced

21. Maximum Students Taking Exam
22. Smallest Sufficient Team
23. Fair Distribution of Cookies
24. Partition to K Equal Sum Subsets
25. Shortest Path Visiting All Nodes

26. Find the Shortest Superstring
27. Number of Ways to Wear Different Hats to Each Other
28. Minimum Cost to Connect Two Groups of Points
29. Maximum Compatibility Score Sum
30. Maximum AND Sum of Array

## Bit Tricks & Optimization

31. Gray Code
  32. Reverse Bits
  33. Number of 1 Bits
  34. Counting Bits
  35. Power of Two
- 

## XIX. Monotonic Stack & Deque (30 problems)

### Monotonic Stack Patterns

1. Largest Rectangle in Histogram
2. Maximal Rectangle
3. Trapping Rain Water
4. Next Greater Element I
5. Next Greater Element II
6. Next Greater Element III
7. Daily Temperatures
8. Remove K Digits
9. Remove Duplicate Letters
10. Create Maximum Number

### Stack Applications

11. Sum of Subarray Minimums
12. Sum of Subarray Ranges
13. Online Stock Span
14. Number of Visible People in a Queue

15. Find the Most Competitive Subsequence
16. Maximum Width Ramp
17. Minimum Cost Tree From Leaf Values
18. Maximum Binary Tree
19. Construct Smallest Number From DI String 20.132 Pattern

## **Deque Applications**

21. Sliding Window Maximum
  22. Shortest Subarray with Sum at Least K
  23. Jump Game VI
  24. Constrained Subsequence Sum
  25. Longest Continuous Subarray With Absolute Diff Less Than or Equal to Limit
  26. Maximum Number of Robots Within Budget
  27. Maximize the Minimum Powered City
  28. Maximum Number of Tasks You Can Assign
  29. Find Building Where Alice and Bob Can Meet
  30. Count Subarrays With Fixed Bounds
- 

## **XX. Game Theory & Interactive (25 problems)**

### **Minimax Games**

1. Stone Game
2. Stone Game II
3. Stone Game III
4. Stone Game IV
5. Stone Game V
6. Stone Game VI
7. Stone Game VII
8. Stone Game VIII
9. Stone Game IX
10. Nim Game

## **Interactive Problems**

11. Guess the Word
12. Find K-th Smallest Pair Distance (Interactive)
13. Guess Number Higher or Lower II
14. Flip Game II
15. Can I Win
16. Cat and Mouse
17. Cat and Mouse II
18. Predict the Winner
19. Chalkboard XOR Game
20. Minimum Cost to Merge Stones

## **Two-Player Games**

21. Flip Columns For Maximum Number of Equal Rows
  22. Maximum Score From Removing Stones
  23. Remove Boxes
  24. Burst Balloons
  25. Zuma Game
- 

## **XXI. Prefix Sum & Difference Array (30 problems)**

### **Prefix Sum Applications**

1. Subarray Sum Equals K
2. Continuous Subarray Sum
3. Subarray Sums Divisible by K
4. Find the Middle Index in Array
5. Find Pivot Index
6. Range Sum Query - Immutable
7. Range Sum Query 2D - Immutable
8. Maximum Size Subarray Sum Equals k
9. Minimum Operations to Reduce X to Zero

10. Count Number of Nice Subarrays

## 2D Prefix Sums

11. Range Sum Query 2D - Mutable

12. Matrix Block Sum

13. Get Biggest Three Rhombus Sums in a Grid

14. Count Square Submatrices with All Ones

15. Maximal Square

16. Number of Submatrices That Sum to Target

17. Maximum Side Length of a Square with Sum Less than or Equal to Threshold

18. Stamping the Grid

19. Difference Between Element Sum and Digit Sum of an Array

20. Sum of Total Strength of Wizards

## Difference Array Techniques

21. Corporate Flight Bookings

22. Car Pooling

23. Brightest Position on Street

24. Describe the Painting

25. Increment Submatrices by One

26. Range Addition

27. My Calendar III

28. Amount of New Area Painted Each Day

29. Minimum Number of Operations to Make Array Continuous

30. Apply Operations to Make All Array Elements Equal to Zero

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## XXII. Reservoir Sampling & Randomization (20 problems)

### Reservoir Sampling

1. Linked List Random Node

2. Random Pick Index

3. Random Pick with Weight

4. Random Pick with Blacklist
5. Random Point in Non-overlapping Rectangles
6. Generate Random Point in a Circle
7. Shuffle an Array
8. Implement Rand10() Using Rand7()
9. Insert Delete GetRandom O(1)
10. Insert Delete GetRandom O(1) - Duplicates allowed

## Probability & Sampling

11. Random Flip Matrix
  12. Shuffle the Array
  13. Shuffle String
  14. Random Number in Range
  15. Minimum Number of Days to Eat N Oranges
  16. Generate Binary Strings Without Adjacent Zeros
  17. K-th Symbol in Grammar
  18. Poor Pigs
  19. Bulb Switcher
  20. Bulb Switcher II
- 

## XXIII. Simulation & Complex Logic (30 problems)

### Game Simulation

1. Tic-Tac-Toe
2. Design Tic-Tac-Toe
3. Valid Tic-Tac-Toe State
4. Snakes and Ladders
5. Race Car
6. Robot Bounded In Circle
7. Walking Robot Simulation
8. Walking Robot Simulation II

9. Robot Return to Origin

10. Minimum Knight Moves

## **Process Simulation**

11. Asteroid Collision

12. Design Parking System

13. Design Underground System

14. Design A Leaderboard

15. Logger Rate Limiter

16. Design Hit Counter

17. Number of Recent Calls

18. Find All Groups of Farmland

19. Minimum Number of Food Buckets to Feed the Hamsters

20. Earliest Possible Day of Full Bloom

## **Complex State Management**

21. Throne Inheritance

22. Design Browser History

23. Design a File Sharing System

24. Design Authentication Manager

25. Design Bitset

26. Design Circular Queue

27. Design Circular Deque

28. Design Front Middle Back Queue

29. Dinner Plate Stacks

30. Tweet Counts Per Frequency

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## **XXIV. Sorting & Custom Comparators (25 problems)**

### **Custom Sort Problems**

1. Largest Number

2. Reorder Data in Log Files

3. Custom Sort String
4. Sort Array by Increasing Frequency
5. Sort the Jumbled Numbers
6. Sort the People
7. Sort Integers by The Number of 1 Bits
8. Relative Sort Array
9. Sort Features by Popularity
10. Sort Items by Groups Respecting Dependencies

## Merge & External Sort

11. Merge k Sorted Lists
12. Merge Sorted Array
13. Merge Two Sorted Lists
14. Sort List
15. Insertion Sort List
16. Wiggle Sort
17. Wiggle Sort II
18. Pancake Sorting
19. Sort an Array
20. Sort Colors

## Counting & Bucket Sort

21. Top K Frequent Elements
  22. Top K Frequent Words
  23. Sort Characters By Frequency
  24. Kth Largest Element in an Array
  25. Maximum Gap
- 

## XXV. Geometry & Computational Geometry (25 problems)

### Line & Point Problems

1. Max Points on a Line

2. Valid Square
3. Minimum Area Rectangle
4. Minimum Area Rectangle II
5. Rectangle Area
6. Rectangle Area II
7. Rectangle Overlap
8. Erect the Fence
9. Convex Polygon
10. Check if It Is a Straight Line

## **Distance & Closest Points**

11. K Closest Points to Origin
12. Find K Closest Elements
13. Closest Binary Search Tree Value
14. Closest Binary Search Tree Value II
15. Best Meeting Point
16. Shortest Distance to Target Color
17. Minimum Time Visiting All Points
18. Check If It Is a Good Array
19. Reach a Number
20. Minimum Moves to Reach Target Score

## **Area & Perimeter**

21. Largest Rectangle in Histogram
  22. Maximal Rectangle
  23. Maximal Square
  24. Perfect Rectangle
  25. Projection Area of 3D Shapes
- 

## **Pattern Summary**

**Total: 700+ Hard Problems**

## **Study Approach Recommendations:**

### **1. Core Foundations** (Start here - 150 problems)

- Design & Data Structures (I)
- Basic DP patterns (IV, V)
- Graph fundamentals (III)

### **2. Advanced Techniques** (200 problems)

- Bitmask DP (VI)
- Tree algorithms (VIII)
- Advanced data structures (XII)

### **3. Optimization Masters** (200 problems)

- Heap/PQ (II)
- Binary Search (XI)
- Greedy (X)
- Intervals (IX)

### **4. Specialized Patterns** (150 problems)

- String algorithms (XVI, XVI)
- Bit manipulation (XVIII)
- Math & Number Theory (XIII)
- Monotonic structures (XIX)

### **5. Problem-Solving Mastery** (100 problems)

- Backtracking (XIV)
- Sliding Window (XV)
- Game Theory (XX)
- Complex simulations (XXIII)

## **Practice Strategy:**

- Solve 3-5 problems daily
- Focus on one pattern for 1-2 weeks
- Review and optimize solutions
- Time yourself after initial learning
- Practice explaining solutions

- Implement without IDE help eventually

This comprehensive list covers all major patterns seen in FAANG+ interviews!