TCS NQT 2026
Coding Practice Questions

50 Carefully Curated Questions | 7 Topics | Easy → Hard

Total Questions	Topics Covered	Easy	Medium	Hard
50	8	12	26	12

Arrays 13 Qs	Strings 11 Qs	Math 10 Qs	Recursion 7 Qs
Sorting 4 Qs	Hashing 3 Qs	Searching 1 Qs	Patterns 1 Qs

Exam Tips

- Read the problem statement carefully — edge cases matter in TCS NQT
- Time limit is usually 30 minutes for coding section
- Optimize for correctness first, then time complexity
- TCS NQT tests C, C++, Java, and Python — practice in your preferred language

ARRAYS

Q01 Find the Second Largest Element

Easy

Problem Statement	Constraints
Given an array of N integers, write a program to find the second largest element in the array without sorting it.	2 ≤ N ≤ 10^5, -10^9 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line contains N (size). Second line contains N integers.	Print the second largest element.
Sample Input	**Sample Output**
`6` `12 35 1 10 34 1`	`34`
Hint	
Use two variables to track max and second max in a single pass.	

STRINGS

Q02 Reverse Words in a Sentence

Easy

Problem Statement	Constraints
Given a sentence (string), reverse the order of words in it. Multiple spaces between words should be reduced to a single space.	1 ≤ |S| ≤ 10^4
Input Format	**Output Format**
A single line string S.	Print the sentence with words in reversed order.
Sample Input	**Sample Output**
`Hello World from TCS`	`TCS from World Hello`
Hint	
Split by spaces, reverse the list, and join.	

MATH

Q03 Check Armstrong Number

Easy

Problem Statement	Constraints
A number is an Armstrong number if the sum of its digits each raised to the power of the number of digits equals the number itself. Given N, check if it is an Armstrong number.	1 ≤ N ≤ 10^9
Input Format	**Output Format**
A single integer N.	Print 'YES' if Armstrong, else 'NO'.
Sample Input	**Sample Output**
`153`	YES
Hint	
153 = 1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153	

ARRAYS

Q04 Rotate Array by K Positions

Medium

Problem Statement	Constraints
Given an array of N integers and a number K, rotate the array to the left by K positions.	1 ≤ N ≤ 10^5, 0 ≤ K ≤ N
Input Format	**Output Format**
First line: N and K. Second line: N integers.	Print the rotated array.
Sample Input	**Sample Output**
`5 2` `1 2 3 4 5`	`3 4 5 1 2`
Hint	
Use K = K % N to handle cases where K ≥ N. Slice and concatenate.	

STRINGS

Q05 Count Vowels and Consonants

Easy

Problem Statement	Constraints
Given a string S, count the number of vowels and consonants (ignoring spaces and special characters, case-insensitive).	1 ≤ |S| ≤ 10^4
Input Format	**Output Format**
A single string S.	Print 'Vowels: X' and 'Consonants: Y' on separate lines.
Sample Input	**Sample Output**
`Hello World`	`Vowels: 3` `Consonants: 7`
Hint	
Convert to lowercase and check each character against 'aeiou'.	

MATH

Q06 Prime Number Check

Easy

Problem Statement	Constraints
Given an integer N, determine whether it is a prime number. A prime number has exactly two factors: 1 and itself.	2 ≤ N ≤ 10^9
Input Format	**Output Format**
A single integer N.	Print 'Prime' or 'Not Prime'.
Sample Input	**Sample Output**
`29`	`Prime`
Hint	
Check divisors only up to sqrt(N) for efficiency.	

ARRAYS

Q07 Kadane's Algorithm – Maximum Subarray Sum

Medium

Problem Statement	Constraints
Given an array of integers (which may include negatives), find the contiguous subarray with the maximum sum.	1 ≤ N ≤ 10^5, -10^4 ≤ arr[i] ≤ 10^4
Input Format	**Output Format**
First line: N. Second line: N integers.	Print the maximum subarray sum.
Sample Input	**Sample Output**
`8` `-2 1 -3 4 -1 2 1 -5`	`6`
Hint	
Track current_sum and max_sum. Reset current_sum to 0 when it goes negative.	

RECURSION

Q08 Fibonacci Series (Recursive)

Easy

Problem Statement	Constraints
Print the first N terms of the Fibonacci series using recursion. The series starts: 0, 1, 1, 2, 3, 5, ...	1 ≤ N ≤ 20
Input Format	**Output Format**
A single integer N.	Print N Fibonacci numbers separated by spaces.
Sample Input	**Sample Output**
`7`	`0 1 1 2 3 5 8`
Hint	
fib(n) = fib(n-1) + fib(n-2), base cases: fib(0)=0, fib(1)=1.	

SORTING

Q09 Bubble Sort Implementation

Medium

Problem Statement	Constraints
Implement Bubble Sort to sort an array of N integers in ascending order. Print the number of swaps performed.	1 ≤ N ≤ 10^3
Input Format	**Output Format**
First line: N. Second line: N integers.	First line: Sorted array. Second line: Number of swaps.
Sample Input	**Sample Output**
`5` `5 1 4 2 8`	`1 2 4 5 8` `Swaps: 5`
Hint	
Outer loop N-1 times; inner loop compares adjacent pairs.	

HASHING

Q10 Find Duplicate Elements

Easy

Problem Statement	Constraints
Given an array of N integers, find and print all the duplicate elements (elements appearing more than once). Print each duplicate only once in the order of first occurrence.	1 ≤ N ≤ 10^5, 1 ≤ arr[i] ≤ 10^5
Input Format	**Output Format**
First line: N. Second line: N integers.	Print duplicates space-separated, or 'No Duplicates'.
Sample Input	**Sample Output**
`7` `1 2 3 2 4 3 5`	`2 3`
Hint	
Use a dictionary/set to count frequency. Collect those with count > 1.	

STRINGS

Q11 Check Anagram

Medium

Problem Statement	Constraints
Given two strings A and B, determine if they are anagrams of each other. Two strings are anagrams if one is a rearrangement of the other (case-insensitive, ignoring spaces).	1 ≤ |A|, |B| ≤ 10^4
Input Format	**Output Format**
Two strings A and B on separate lines.	Print 'Anagram' or 'Not Anagram'.
Sample Input	**Sample Output**
`Listen` `Silent`	`Anagram`
Hint	
Sort both strings after making lowercase and compare, or use character frequency maps.	

MATH

Q12 GCD and LCM

Easy

Problem Statement	Constraints
Given two positive integers A and B, compute their GCD (Greatest Common Divisor) and LCM (Least Common Multiple).	1 ≤ A, B ≤ 10^9
Input Format	**Output Format**
Two integers A and B on a single line.	Print 'GCD: X' and 'LCM: Y'.
Sample Input	**Sample Output**
`12 18`	`GCD: 6` `LCM: 36`
Hint	
*Use Euclidean algorithm for GCD. LCM(A,B) = (A*B) / GCD(A,B).*	

ARRAYS

Q13 Two Sum Problem

Medium

Problem Statement	Constraints
Given an array of N integers and a target sum T, find all pairs of elements that add up to T. Print each pair in sorted order.	2 ≤ N ≤ 10^5, -10^9 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N and T. Second line: N integers.	Print each pair on a new line, or 'No Pair Found'.
Sample Input	**Sample Output**
`6 9` `1 5 3 4 6 2`	`3 6` `4 5`
Hint	
Use a hash set: for each element x, check if (T-x) exists in set.	

STRINGS

Q14 Longest Common Prefix

Medium

Problem Statement	Constraints
Given N strings, find the longest common prefix shared by all strings. If no common prefix exists, return an empty string.	1 ≤ N ≤ 200, 0 ≤ |each string| ≤ 200
Input Format	**Output Format**
First line: N. Next N lines: one string each.	Print the longest common prefix or 'No Common Prefix'.
Sample Input	**Sample Output**

`4`
`flower`
`flow`
`flight`
`flap`
	`fl`

Hint	
Take the first string as prefix; trim it comparing with each subsequent string.	

RECURSION

Q15 Tower of Hanoi — Medium

Problem Statement	Constraints
Solve the Tower of Hanoi problem for N disks. Print each move in the format 'Move disk X from A to C'. Count and print the total number of moves.	1 ≤ N ≤ 10
Input Format	**Output Format**
A single integer N (number of disks).	All moves, then 'Total Moves: 2^N - 1'.
Sample Input	**Sample Output**

`3`	`Move disk 1 from A to C`
	`Move disk 2 from A to B`
	`...`
	`Total Moves: 7`

Hint	
hanoi(n, src, dest, aux): recursively move n-1 disks, then move disk n.	

SEARCHING

Q16 Binary Search — Easy

Problem Statement	Constraints
Given a sorted array of N integers and a target value T, implement Binary Search to find the index of T. If not found, print -1.	1 ≤ N ≤ 10^6, -10^9 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N and T. Second line: N sorted integers.	Print the 0-based index or -1.
Sample Input	**Sample Output**
`7 23` `2 5 8 12 16 23 38`	`5`
Hint	
Use low, high, mid pointers. Compare mid element with target and halve search space.	

ARRAYS

Q17 Leaders in an Array — Medium

Problem Statement	Constraints
An element is a 'leader' if it is greater than all elements to its right. The rightmost element is always a leader. Find all leaders in an array.	1 ≤ N ≤ 10^5, 1 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N. Second line: N integers.	Print all leaders from left to right.
Sample Input	**Sample Output**
`6` `16 17 4 3 5 2`	`17 5 2`
Hint	
Traverse from right to left, track the running maximum.	

STRINGS

Q18 Palindrome Check — Easy

Problem Statement	Constraints
Given a string S, determine if it is a palindrome. Ignore spaces, punctuation, and case while checking.	1 ≤ |S| ≤ 10^5
Input Format	**Output Format**
A single string S.	Print 'Palindrome' or 'Not Palindrome'.
Sample Input	**Sample Output**
`A man a plan a canal Panama`	`Palindrome`
Hint	
Filter only alphanumeric chars, convert to lowercase, compare with reverse.	

MATH

Q19 Sieve of Eratosthenes

Medium

Problem Statement	Constraints
Given a number N, find all prime numbers from 2 to N using the Sieve of Eratosthenes algorithm.	2 ≤ N ≤ 10^6
Input Format	**Output Format**
A single integer N.	Print all primes up to N, space-separated.
Sample Input	**Sample Output**
`30`	`2 3 5 7 11 13 17 19 23 29`
Hint	
Mark multiples of each prime starting from 2 as composite.	

PATTERNS

Q20 Diamond Star Pattern

Easy

Problem Statement	Constraints
Given an odd number N, print a diamond star pattern of height N.	1 ≤ N ≤ 21 (odd)
Input Format	**Output Format**
A single odd integer N.	Diamond pattern with N rows in upper half (including middle).
Sample Input	**Sample Output**

`5`	`*`
	`* * *`
	`* * * * *`
	`* * *`
	`*`

Hint	
Upper half: increase stars; Lower half: decrease. Handle spaces for alignment.	

ARRAYS

Q21 Find Missing Number in Array

Medium

Problem Statement	Constraints
An array contains N-1 distinct integers from 1 to N with exactly one number missing. Find the missing number without extra space using arithmetic.	1 ≤ N ≤ 10^6
Input Format	**Output Format**
First line: N. Second line: N-1 integers.	Print the missing number.
Sample Input	**Sample Output**
`6` `1 2 4 5 6`	`3`
Hint	
Expected sum = N(N+1)/2. Subtract actual sum to find missing element.*	

STRINGS

Q22 Count and Say Sequence

Medium

Problem Statement	Constraints
The Count-and-Say sequence starts with '1'. Each subsequent term is obtained by reading the previous term: '1' is read as 'one 1' = '11'. Generate the Nth term.	1 ≤ N ≤ 30
Input Format	**Output Format**
A single integer N.	Print the Nth term of the Count-and-Say sequence.
Sample Input	**Sample Output**
`5`	`111221`
Hint	
Iterate N-1 times. Group consecutive same digits, prepend count.	

RECURSION

Q23 Power Function (Fast Exponentiation) — Medium

Problem Statement	Constraints
Given base B and exponent E, compute B^E using fast exponentiation (binary exponentiation). Time complexity should be O(log E).	1 ≤ B ≤ 100, 0 ≤ E ≤ 10^9
Input Format	**Output Format**
Two integers B and E.	Print B^E.
Sample Input	**Sample Output**
`2 10`	`1024`
Hint	
*If E is even: B^E = (B^(E/2))^2. If odd: B^E = B * B^(E-1).*	

ARRAYS

Q24 Merge Intervals — Hard

Problem Statement	Constraints
Given N intervals [start, end], merge all overlapping intervals and return the result as a list of non-overlapping intervals.	1 ≤ N ≤ 10^4, 0 ≤ start ≤ end ≤ 10^4
Input Format	**Output Format**
First line: N. Next N lines: start and end of each interval.	Print merged intervals.
Sample Input	**Sample Output**

`5`
`1 3`
`2 6`
`8 10`
`15 18`
`9 11`
	`[1,6] [8,11] [15,18]`

Hint	
Sort by start time. Merge current interval with last merged if overlapping.	

MATH

Q25 Pascal's Triangle

Medium

Problem Statement	Constraints
Print the first N rows of Pascal's Triangle. Each element equals the sum of the two elements directly above it.	1 ≤ N ≤ 15
Input Format	**Output Format**
A single integer N.	Print N rows of Pascal's triangle, each row space-separated.
Sample Input	**Sample Output**

`5`	`1`
	`1 1`
	`1 2 1`
	`1 3 3 1`
	`1 4 6 4 1`

Hint	
*Each row i has i+1 elements. C(row, col) = C(row, col-1) * (row-col+1) / col.*	

SORTING

Q26 Sort Array of 0s, 1s, and 2s

Medium

Problem Statement	Constraints
Given an array containing only 0s, 1s, and 2s, sort it in O(N) time without using any built-in sort function. (Dutch National Flag Problem)	1 ≤ N ≤ 10^6
Input Format	**Output Format**
First line: N. Second line: N integers (each 0, 1, or 2).	Print the sorted array.
Sample Input	**Sample Output**
`8` `0 1 2 1 0 2 1 0`	`0 0 0 1 1 1 2 2`
Hint	
Use three pointers: low, mid, high. Partition in one pass.	

STRINGS

Q27 Longest Palindromic Substring

Hard

Problem Statement	Constraints
Given a string S, find the longest palindromic substring. If there are multiple of the same length, return the first one.	1 ≤ |S| ≤ 10^3
Input Format	**Output Format**
A single string S.	Print the longest palindromic substring.
Sample Input	**Sample Output**
`babad`	`bab`
Hint	
Expand around center for each character (and each pair) as potential center.	

MATH

Q28 Digit Frequency Count

Easy

Problem Statement	Constraints
Given a number N, count the frequency of each digit (0-9) that appears in it. Print only those digits that appear at least once.	1 ≤ N ≤ 10^18
Input Format	**Output Format**
A single integer N.	Print each digit and its count in ascending order of digit.
Sample Input	**Sample Output**

`122333`	`1: 1`
	`2: 2`
	`3: 3`

Hint	
Convert number to string and use a frequency array of size 10.	

ARRAYS

Q29 Trapping Rain Water

Hard

Problem Statement	Constraints
Given N non-negative integers representing elevation heights of bars, compute how much water can be trapped between the bars after raining.	1 ≤ N ≤ 3*10^4, 0 ≤ height[i] ≤ 10^5
Input Format	**Output Format**
First line: N. Second line: N non-negative integers.	Print the total units of water trapped.
Sample Input	**Sample Output**
`12` `0 1 0 2 1 0 1 3 2 1 2 1`	`6`
Hint	
For each bar, water = min(max_left, max_right) - height. Precompute left/right max arrays.	

RECURSION

Q30 Generate All Subsets

Medium

Problem Statement	Constraints
Given an array of N distinct integers, generate and print all possible subsets (including the empty set and the full set) in lexicographic order.	1 ≤ N ≤ 15
Input Format	**Output Format**
First line: N. Second line: N distinct integers.	Each subset on a new line, elements space-separated. Empty set as '{}'.
Sample Input	**Sample Output**

`3`
`1 2 3`
	`{}`
	`1`
	`1 2`
	`1 2 3`
	`1 3`
	`2`
	`2 3`
	`3`

Hint	
For each element, decide to include or exclude. Total subsets = 2^N.	

STRINGS

Q31 Roman to Integer Conversion

Medium

Problem Statement	Constraints
Convert a Roman numeral string to its integer equivalent. Handle subtraction cases: IV=4, IX=9, XL=40, XC=90, CD=400, CM=900.	1 ≤ |S| ≤ 15, S is a valid Roman numeral for 1-3999
Input Format	**Output Format**
A single Roman numeral string S.	Print the integer equivalent.
Sample Input	**Sample Output**
`MCMXCIV`	`1994`
Hint	
If a smaller value precedes a larger one, subtract it; otherwise add.	

ARRAYS

Q32 Stock Buy Sell to Maximize Profit

Medium

Problem Statement	Constraints
Given daily prices of a stock, find the maximum profit if you can perform at most one transaction (buy low, sell high). If no profit is possible, print 0.	2 ≤ N ≤ 10^5, 0 ≤ price[i] ≤ 10^4
Input Format	**Output Format**
First line: N. Second line: N prices.	Print the maximum profit.
Sample Input	**Sample Output**
`6` `7 1 5 3 6 4`	`5`
Hint	
Track min price so far. At each day, profit = price - min_price.	

MATH

Q33 Matrix Multiplication

Medium

Problem Statement	Constraints
Given two matrices A (P×Q) and B (Q×R), compute their product matrix C (P×R). Print the resulting matrix.	$1 \le P, Q, R \le 100$
Input Format	**Output Format**
First line: P Q R. Next P lines: A's rows. Next Q lines: B's rows.	Print the P×R product matrix.
Sample Input	**Sample Output**

`2 3 2`
`1 2 3`
`4 5 6`
`7 8`
`9 10`
`11 12`
	`58 64`
	`139 154`

Hint	
*C[i][j] = sum of A[i][k] * B[k][j] for k from 0 to Q-1.*	

RECURSION

Q34 Generate All Permutations

Medium

Problem Statement	Constraints
Given a string S of distinct characters, generate and print all permutations of the string in lexicographic order.	$1 \le \lvert S \rvert \le 8$
Input Format	**Output Format**
A single string S.	Each permutation on a new line, sorted lexicographically.
Sample Input	**Sample Output**

`ABC`	`ABC`
	`ACB`
	`BAC`
	`BCA`
	`CAB`
	`CBA`

Hint	
Sort the string first. Swap each character with every subsequent character, recurse.	

SORTING

Q35 Merge Sort Implementation

Hard

Problem Statement	Constraints
Implement Merge Sort algorithm to sort an array of N integers. Print the sorted array and count total number of comparisons made.	1 ≤ N ≤ 10^6
Input Format	**Output Format**
First line: N. Second line: N integers.	First line: Sorted array. Second line: 'Comparisons: X'.
Sample Input	**Sample Output**
`5` `38 27 43 3 9`	`3 9 27 38 43` `Comparisons: 8`
Hint	
Divide array in half, recursively sort, then merge. Time: O(N log N).	

HASHING

Q36 Group Anagrams Together

Medium

Problem Statement	Constraints
Given an array of N strings, group all anagrams together. Anagrams should be in sorted order within each group, and groups in order of first occurrence.	1 ≤ N ≤ 10^4, 0 ≤ |each string| ≤ 100
Input Format	**Output Format**
First line: N. Next N lines: one string each.	Each group on a new line, strings separated by spaces.
Sample Input	**Sample Output**

`6`
`eat`
`tea`
`tan`
`ate`
`nat`
`bat`
	`eat tea ate`
	`tan nat`
	`bat`

Hint	
Sort each string as a key, group values by key.	

STRINGS

Q37 Valid Parentheses

Medium

Problem Statement	Constraints
Given a string of brackets '(', ')', '{', '}', '[', ']', determine if the brackets are balanced and properly closed in correct order.	1 ≤ |S| ≤ 10^4
Input Format	**Output Format**
A single string S.	Print 'Valid' or 'Invalid'.
Sample Input	**Sample Output**
`{[()]}`	`Valid`
Hint	
Use a stack. Push opening brackets; on closing, check if top matches.	

ARRAYS

Q38 Largest Rectangle in Histogram

Hard

Problem Statement	Constraints
Given N bars of a histogram with heights given, find the area of the largest rectangle that can be formed using consecutive bars.	1 ≤ N ≤ 10^5, 0 ≤ height[i] ≤ 10^4
Input Format	**Output Format**
First line: N. Second line: N non-negative heights.	Print the maximum rectangle area.
Sample Input	**Sample Output**
`6` `2 1 5 6 2 3`	`10`
Hint	
Use a stack to find previous smaller and next smaller element for each bar.	

MATH

Q39 Number to Words Conversion — Medium

Problem Statement	Constraints
Given a non-negative integer N (up to 9999), convert it to its English words representation.	$0 \leq N \leq 9999$
Input Format	**Output Format**
A single non-negative integer N.	Print the number in words.
Sample Input	**Sample Output**
`1234`	`One Thousand Two Hundred Thirty Four`
Hint	
Handle thousands, hundreds, tens, and ones separately. Use lookup arrays.	

RECURSION

Q40 N-Queens Problem — Hard

Problem Statement	Constraints
Place N queens on an N×N chessboard such that no two queens attack each other (no two in the same row, column, or diagonal). Print the number of valid arrangements.	$1 \leq N \leq 10$
Input Format	**Output Format**
A single integer N.	Print total number of valid arrangements.
Sample Input	**Sample Output**
`4`	`2`
Hint	
Use backtracking. Check column and both diagonals for conflicts before placing.	

ARRAYS

Q41 Longest Increasing Subsequence — Hard

Problem Statement	Constraints
Given an array of N integers, find the length of the longest strictly increasing subsequence (not necessarily contiguous).	1 ≤ N ≤ 2500, -10^4 ≤ arr[i] ≤ 10^4
Input Format	**Output Format**
First line: N. Second line: N integers.	Print the length of the LIS.
Sample Input	**Sample Output**
`8` `10 9 2 5 3 7 101 18`	`4`
Hint	
dp[i] = max LIS ending at index i. Check all j < i where arr[j] < arr[i].	

HASHING

Q42 Subarray with Zero Sum — Medium

Problem Statement	Constraints
Given an array of N integers (may include negatives), find if there exists a subarray with sum equal to zero. If yes, print its start and end indices (0-based).	1 ≤ N ≤ 10^5, -10^9 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N. Second line: N integers.	Print start and end indices or 'No such subarray'.
Sample Input	**Sample Output**
`6` `4 2 -3 1 6 -6`	`1 5`
Hint	
If prefix_sum[i] == prefix_sum[j], then subarray (j+1, i) has sum 0. Use HashMap.	

STRINGS

Q43 Wildcard Pattern Matching

Hard

Problem Statement	Constraints
Given a string S and pattern P containing '?' (matches any single char) and '*' (matches any sequence including empty), check if P matches S entirely.	1 ≤ |S|, |P| ≤ 1000
Input Format	**Output Format**
First line: string S. Second line: pattern P.	Print 'Match' or 'No Match'.
Sample Input	**Sample Output**
`aab` `a*b`	`Match`
Hint	
Use DP. dp[i][j] = True if S[0..i-1] matches P[0..j-1].	

MATH

Q44 Modular Exponentiation

Medium

Problem Statement	Constraints
Compute (B^E) % M efficiently for large values. Output the result of (B raised to E) modulo M.	1 ≤ B, M ≤ 10^9, 0 ≤ E ≤ 10^18
Input Format	**Output Format**
Three integers B, E, M on a single line.	Print (B^E) % M.
Sample Input	**Sample Output**
`2 10 1000`	`24`
Hint	
Use fast exponentiation with modular arithmetic at each step.	

ARRAYS

Q45 Majority Element (Boyer-Moore Voting) — Medium

Problem Statement	Constraints
Find the majority element in an array — the element that appears more than N/2 times. Guaranteed to exist. Use O(1) space.	1 ≤ N ≤ 5*10^4, -10^9 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N. Second line: N integers.	Print the majority element.
Sample Input	**Sample Output**
`7` `3 2 3 1 3 2 3`	`3`
Hint	
Maintain a candidate and count. Increment if same, decrement if different. Reset at 0.	

SORTING

Q46 Count Inversions in Array — Medium

Problem Statement	Constraints
Count the number of inversions in an array. An inversion is a pair (i, j) where i < j but arr[i] > arr[j]. Use a modified Merge Sort.	1 ≤ N ≤ 10^5, 1 ≤ arr[i] ≤ 10^9
Input Format	**Output Format**
First line: N. Second line: N integers.	Print the number of inversions.
Sample Input	**Sample Output**
`5` `5 3 2 4 1`	`8`
Hint	
During merge step, count inversions: when right element is picked, all remaining left elements form inversions.	

STRINGS

Q47 Minimum Window Substring

Hard

Problem Statement	Constraints
Given string S and pattern P, find the minimum-length substring of S that contains all characters of P (including duplicates). Return the substring or 'Not Possible'.	1 ≤ |P| ≤ |S| ≤ 10^5
Input Format	**Output Format**
First line: string S. Second line: pattern P.	Print the minimum window substring.
Sample Input	**Sample Output**
`ADOBECODEBANC` `ABC`	`BANC`
Hint	
Use sliding window with two pointers. Expand right until valid, then shrink left.	

MATH

Q48 Unique Paths in Grid

Hard

Problem Statement	Constraints
A robot starts at top-left of an M×N grid and can only move right or down. Count the total number of unique paths to reach the bottom-right corner. Use combinatorics.	1 ≤ M, N ≤ 100
Input Format	**Output Format**
Two integers M and N.	Print the total unique paths.
Sample Input	**Sample Output**
`3 7`	`28`
Hint	
Answer = C(M+N-2, M-1). Robot must make exactly (M-1) down and (N-1) right moves.	

RECURSION

Q49 Word Break Problem

Hard

Problem Statement	Constraints
Given a string S and a dictionary of words, determine if S can be segmented into a space-separated sequence of one or more dictionary words.	1 ≤ |S| ≤ 300, 1 ≤ N ≤ 1000
Input Format	**Output Format**
First line: string S. Second line: N (dict size). Next N lines: dictionary words.	Print 'Yes' if possible and the segmentation, else 'No'.
Sample Input	**Sample Output**

`leetcode`
`3`
`leet`
`code`
`lee`
	`Yes`
	`leet code`

Hint	
Use DP: dp[i] = True if S[0..i-1] can be segmented. Try all prefixes.	

ARRAYS

Q50 Maximum Product Subarray

Hard

Problem Statement	Constraints
Given an array of integers (may include negatives and zeros), find the contiguous subarray that has the maximum product. Return the maximum product value.	1 ≤ N ≤ 2*10^4, -10 ≤ arr[i] ≤ 10
Input Format	**Output Format**
First line: N. Second line: N integers.	Print the maximum product.
Sample Input	**Sample Output**
`6` `2 3 -2 4 -1 2`	`48`
Hint	
Track both max and min products up to current index (negatives can flip the sign).	
