Carwale Test Questions

Q1. Infection Spread in Grid

You are given an N × N grid (N ≤ 10■). At time = 1, one man at coordinates (x, y) is infected.
At each unit time, infection spreads to the adjacent cells (up, down, left, right).
Your task is to determine the time T when the number of infected people will be greater than or equal to the number of uninfected people in the entire grid.

Constraints:
- 1 ≤ N ≤ 10■
- 1 ≤ x, y ≤ N

Example:
N = 5, x = 3, y = 3
Initially infected = 1
At t=1 → (3,3)
At t=2 → (2,3), (4,3), (3,2), (3,4) + center
Keep spreading until infected ≥ uninfected
Answer = ?

Q2. Perfect Subarray Counting

You are given an array of length N (N ≤ 10■).
A subarray is called perfect if it does not contain any subarray whose sum is 0.
Your task is to count all perfect subarrays in the given array and return the result modulo 1e9+7.

Constraints:
- 1 ≤ N ≤ 10■
- Array elements can be negative/positive/zero

Example:
Input: arr = [1, -1, 2]
Subarrays: [1], [-1], [2], [1,-1], [-1,2], [1,-1,2]
[1,-1] → sum = 0, so invalid
[1,-1,2] → contains [1,-1] = 0 → invalid
Valid = [1], [-1], [2], [-1,2]
Answer = 4

Q3. Lexicographically Smallest Modular Array

You are given two arrays A and B of length N.
You are allowed to reorder one of them (either A or B, not both).
Then you form an array C of length min(N, P) where:
C[i] = (A[i] + B[i]) % N

Your task is to find the lexicographically smallest array C.

Constraints:
- 1 ≤ N ≤ 10■
- 1 ≤ P ≤ 10■

Example:
A = [1, 2, 3], B = [3, 2, 1], N = 3, P = 3
Option 1: reorder A
Option 2: reorder B
Construct C and pick lexicographically smallest

Q4. Hard Picking with Distance Constraint

You are given an array of size N and two integers K and D.
You must select exactly K elements from the array such that the distance between any two selected elements satisfies:
$|i - j| \leq D$, where i and j are indices of selected elements.

Your task is to maximize the sum of the selected K elements.

Constraints:
- $1 \leq N, D \leq 4 \times 10$■
- $1 \leq K \leq N$

Example:
Input: arr = [5, 1, 2, 10, 6], N=5, K=2, D=2
Possible picks:
- Pick (arr[1], arr[3]) = 5+2 = 7 (valid, distance=2)
- Pick (arr[2], arr[4]) = 1+10 = 11 (valid, distance=2)
- Pick (arr[1], arr[4]) = 5+10 = 15 (invalid, distance=3 > D)
Answer = 11