GLAB 1

Generated Lab (GLAB) — Problem Set

Purpose: Expand your critical thinking by generating and solving new problems. After solving your selected dynamic labs, design and generate similar new problems for additional practice. Submit both problems below as one DOCX.

• Glab1_1

Name of the problem: Strictly Increasing Array — Minimum Increments
Time limit: 1.00 s   Memory limit: 512 MB

Problem:
You are given an array of n integers a_1, a_2, …, a_n. In one move, you may increase any single element by any non-negative integer (you cannot decrease any element). Your goal is to make the array strictly increasing, i.e., $a_i > a_{i-1}$ for all $2 \leq i \leq n$, while minimizing the total amount added across all moves. Compute the minimum total increments needed.

Input:

The first line contains an integer n.
The second line contains n integers a_1, a_2, …, a_n.

Output:

Print a single integer — the minimum total increments required to make the array strictly increasing.

Constraints:

$1 \leq n \leq 2 \cdot 10^5$
$-10^9 \leq a_i \leq 10^9$

Example 1:

Input:

4
3 3 3 3

Output:

6

Example 2:

Input:

5
1 2 2 2 5

Output:

3

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• Glab1_2

Name of the problem: Subarray Sum Modulo — Count of Divisible Subarrays
Time limit: 1.00 s   Memory limit: 512 MB

Problem:
You are given an array of n integers and an integer m ($m \geq 1$). A subarray is any contiguous segment of the array. Count how many subarrays have a sum that is divisible by m.

Input:

The first line contains two integers n and m.
The second line contains n integers a_1, a_2, ..., a_n.

Output:

Print a single integer — the number of subarrays whose sum is divisible by m.

Constraints:

$1 \leq n \leq 2 \cdot 10^5$
$-10^9 \leq a_i \leq 10^9$
$1 \leq m \leq 10^9$

Example 1:

Input:

5 3
1 2 3 4 1

Output:

4

Example 2:

Input:

4 2
1 3 5 7

Output:

4

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