



System of Infinite Oscillators

Problem Statement

Oski is conducting an experiment in signal processing. He manages a network of N linear signal generators arranged in a straight line, numbered 1 to N from left to right. Each generator i emits a real-valued signal $x_i(t)$ at discrete time steps $t \geq 0$.

At time $t = 0$, the generators are initialized with non-negative signal values $x_1(0), x_2(0), \dots, x_N(0)$.

At each subsequent time step $t \geq 1$, each generator updates its signal value to the average of its own previous value and the previous values of its adjacent neighbors:

- For interior generators ($1 < i < N$):

$$x_i(t) = \frac{x_{i-1}(t-1) + x_i(t-1) + x_{i+1}(t-1)}{3}$$

- For boundary generators ($i = 1$ and $i = N$):

$$x_1(t) = \frac{x_1(t-1) + x_2(t-1)}{2}, \quad x_N(t) = \frac{x_{N-1}(t-1) + x_N(t-1)}{2}$$

As time approaches infinity ($t \rightarrow \infty$), the system reaches thermal equilibrium and all signal values converge to a single steady-state value L :

$$\lim_{t \rightarrow \infty} x_i(t) = L \quad \text{for all } 1 \leq i \leq N$$

Help Oski compute this steady-state limit L .

It can be shown that L can be uniquely expressed as an irreducible fraction $\frac{P}{Q}$. Output the value of $P \cdot Q^{-1} \pmod{998244353}$.

Input Format

- The first line contains an integer N ($2 \leq N \leq 2 \cdot 10^5$) — the number of generators.
- The second line contains N integers $A_1, A_2, \dots, A_N$ ($0 \leq A_i < 998244353$) — the initial signal values $x_i(0) \pmod{998244353}$.

Output Format

Print a single integer — the steady-state value $L \pmod{998244353}$.

Sample Input 1

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3
1 2 9
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Sample Output 1

285212676

Explanation

As $t \rightarrow \infty$, all values converge to $L = 26/7 = 3,71428\dots$

Sample Input 2

Input:

4
0 0 0 10

Sample Input 2

2

Explanation

The initial configuration is symmetric. The system converges symmetrically to $L = 2$.