

2024 Canadian Computing Olympiad
Day 2, Problem 2
Heavy Light Decomposition

Time Limit: 4 seconds

Problem Description

In an array containing only positive integers, we say an integer is heavy if it appears more than once in the array, and light otherwise.

An array is good if the integers in the array alternate between light and heavy.

Given an array a_1, \dots, a_N , count the number of ways to partition it into some number of contiguous subarrays such that each subarray, when considered as an array on its own, is good. As the answer may be large, output it modulo 1 000 003.

Input Specification

The first line of input contains a single integer, N .

The next line contains N integers a_1, \dots, a_N ($1 \leq a_i \leq N$).

Marks Awarded	Bounds on N	Additional Constraints
3 marks	$2 \leq N \leq 50\,000$	For each i , $a_i \leq 26$.
4 marks	$2 \leq N \leq 5\,000$	No additional constraints.
5 marks	$2 \leq N \leq 500\,000$	If i is odd, then $a_i = 1$.
6 marks	$2 \leq N \leq 500\,000$	Any number appears at most twice in the array.
7 marks	$2 \leq N \leq 500\,000$	No additional constraints.

Output Specification

The number of ways to partition the array into good contiguous subarrays, modulo 1 000 003.

Sample Input 1

```
5
1 2 3 2 3
```

Output for Sample Input 1

```
4
```

Explanation of Output for Sample Input 1

There are four valid partitions of $[1, 2, 3, 2, 3]$:

- [1], [2], [3], [2], [3]
- [1], [2, 3, 2], [3]
- [1], [2], [3, 2, 3]
- [1, 2, 3, 2], [3]

Sample Input 2

5

1 2 1 3 1

Output for Sample Input 2

6