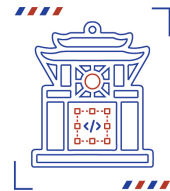




# THE 2024 ICPC ASIA PACIFIC CHAMPIONSHIP

VNU UNIVERSITY OF ENGINEERING AND TECHNOLOGY

2ND MARCH 2024



## Problem L XOR Operations Time limit: 2 seconds

You are given  $n$  integers  $a_1, a_2, \dots, a_n$ . You have a sequence of  $n$  integers  $B = (b_1, b_2, \dots, b_n)$  which initially are all zeroes.

In one operation, you choose two different indices  $i$  and  $j$ , then simultaneously

- replace  $b_i$  with  $b_i \oplus a_i \oplus a_j$ , and
- replace  $b_j$  with  $b_j \oplus a_i \oplus a_j$ .

Note that  $\oplus$  represents the bitwise XOR operation, which returns an integer whose binary representation has a 1 in each bit position for which the corresponding bits of either but not both operands are 1. For example,  $3 \oplus 10 = 9$  because  $(0011)_2 \oplus (1010)_2 = (1001)_2$ .

You want to compute the number of different possible sequences  $B$  you can obtain after performing zero or more operations. Since this number might be huge, calculate this number modulo 998 244 353.

Two sequences of length  $n$  are considered different if and only if there exists an index  $i$  ( $1 \leq i \leq n$ ) such that the  $i$ -th element of one sequence differs from the  $i$ -th element of the other sequence.

### Input

The first line of input contains one integer  $n$  ( $2 \leq n \leq 200\,000$ ). The second line contains  $n$  integers  $a_1, a_2, \dots, a_n$  ( $0 \leq a_i < 2^{30}$  for all  $i$ ).

### Output

Output an integer representing the number of different possible sequences  $B$  you can obtain after performing zero or more operations modulo 998 244 353.

#### Sample Input #1

```
3
1 2 1
```

#### Sample Output #1

```
4
```

#### Explanation for the sample input/output #1

Starting from  $B = (0, 0, 0)$ , we can obtain the following two sequences  $B$ :

- Perform the operation with  $i = 1$  and  $j = 2$ . We will have  $B = (3, 3, 0)$ .
- After that, perform the operation with  $i = 2$  and  $j = 3$ . We will have  $B = (3, 0, 3)$ .

Starting from  $B = (0, 0, 0)$ , we can also obtain the following sequence  $B$ :

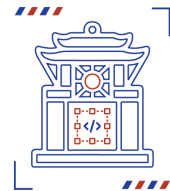
- Perform the operation with  $i = 2$  and  $j = 3$ . We will have  $B = (0, 3, 3)$ .



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It can be shown that  $(0, 0, 0)$ ,  $(3, 3, 0)$ ,  $(3, 0, 3)$ , and  $(0, 3, 3)$  are the only possible sequences  $B$  you can obtain. Therefore, the answer is 4.

## Sample Input #2

## Sample Output #2

4 852415 852415 852415 852415	1
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