Twos

Time limit: 1.0s **Memory limit:** 1G

You are given an array of N positive integers, $a_1, a_2, \ldots a_N$. Let the value of a collection of at least two numbers be the bitwise xor of its **second** minimum and **second** maximum. Determine the sum of the values of all **subsequences** of a which contain at least two elements. Since this value may be huge, output it modulo $10^9 + 7$.

Constraints

$1 \leq N \leq 2 \times 10^5$
$0 \leq a_i < 2^{30}$

Subtask 1 [20%]

$1 \leq N \leq 2\,000$

Subtask 2 [80%]

No additional constraints.

Input Specification

The first line contains one integer, N, the length of the array.

The next line contains N space-separated integers, $a_1, a_2, \ldots, a_N$, the array of positive integers.

Output Specification

Output one line containing one integer, the sum of the values of all subsequences which contain at least two elements, modulo $10^9 + 7$.

Sample Input 1

```
5
3 1 4 1 5
```

Sample Output 1

```
64
```

Explanation for Sample 1

The following are the values of every subsequence containing at least two elements:

Format:
$s_{\geq 2} \to \min_2(s) \oplus \max_2(s) = v$

Where $s_{\geq 2}$ represents a subsequence of a containing at least two elements, $\min_2$ is the second minimum, $\oplus$ is the bitwise xor operator, $\max_2$ is the second maximum, and v is the resulting value of $s_{\geq 2}$.

$[3, 1] \to 3 \oplus 1 = 2$
$[3, 4] \to 4 \oplus 3 = 7$
$[3, 1] \to 3 \oplus 1 = 2$
$[3, 5] \to 5 \oplus 3 = 6$

$[1, 4] \to 4 \oplus 1 = 5$
$[1, 1] \to 1 \oplus 1 = 0$
$[1, 5] \to 5 \oplus 1 = 4$

$[4, 1] \to 4 \oplus 1 = 5$
$[4, 5] \to 5 \oplus 4 = 1$

$[1, 5] \to 5 \oplus 1 = 4$

Subsequences with 3 elements are omitted since they all have a value of 0.

$[3, 1, 4, 1] \to 1 \oplus 3 = 2$
$[3, 1, 4, 5] \to 3 \oplus 4 = 7$
$[3, 1, 1, 5] \to 1 \oplus 3 = 2$
$[3, 4, 1, 5] \to 3 \oplus 4 = 7$
$[1, 4, 1, 5] \to 1 \oplus 4 = 5$

$[3, 1, 4, 1, 5] \to 1 \oplus 4 = 5$

Total value of all subsequences with at least two elements:
$2 + 7 + 2 + 6 + 5 + 0 + 4 + 5 + 1 + 4 + 2 + 7 + 2 + 7 + 5 + 5 = \boxed{64}$

Sample Input 2

```
10
5 1 29 8 7 10 48 15 33 59
```

Sample Output 2

```
30210
```

Sample Input 3

```
50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
35 36 37 38 39 40 41 42 43 44 45 46 47 48 1000000000 1000000000
```

Sample Output 3

```
119486481
```

Explanation for Sample 3

Remember to output the answer modulo $10^9 + 7$.