G - Sum of Min of XOR

Editorial (/contests/abc425/tasks/abc425_g/editorial)

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Time Limit: 2.5 sec / Memory Limit: 1024 MiB

Score : 575 points

Problem Statement

You are given positive integers N, M and a sequence of non-negative integers $A = (A_1, A_2, \ldots, A_N)$ of length N.

Find $\displaystyle\sum_{x=0}^{M-1} \min_{1 \leq i \leq N} (x \oplus A_i)$.

Here, $x \oplus A_i$ represents the bitwise XOR of x and A_i.

▶ What is bitwise XOR operation?

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $1 \leq M \leq 10^9$
- $0 \leq A_i \leq 10^9$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N M
A_1 A_2 $\ldots$ A_N

Output

Output the answer.

Sample Input 1 Copy

```
2 4
1 2
```

Sample Output 1 Copy

```
2
```

- When $x = 0$: $x \oplus A_1 = 1, x \oplus A_2 = 2$, so $\min_{1 \le i \le N} (x \oplus A_i) = 1$.
- When $x = 1$: $x \oplus A_1 = 0, x \oplus A_2 = 3$, so $\min_{1 \le i \le N} (x \oplus A_i) = 0$.
- When $x = 2$: $x \oplus A_1 = 3, x \oplus A_2 = 0$, so $\min_{1 \le i \le N} (x \oplus A_i) = 0$.
- When $x = 3$: $x \oplus A_1 = 2, x \oplus A_2 = 1$, so $\min_{1 \le i \le N} (x \oplus A_i) = 1$.

Therefore, output $1 + 0 + 0 + 1 = 2$.

Sample Input 2 Copy

```
6 5
0 1 2 3 4 5
```

Sample Output 2 Copy

```
0
```

Sample Input 3 Copy

```
10 8762
347 883 264 816 533 306 190 880 624 279
```

Sample Output 3 Copy

```
34912221
```
Copy

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