Due to the frantical usage of the racket to kill flies, Marin has sustained a serious bodily injury known to the medical community as *epicondylitis lateralis humeri*. His grandma has advised smearing rakija over it, the doctor has prescribed a strong painkiller, but Marin has ignored every single advice and decided to look for the answer in integer sequences.

He has discovered a previously undiscovered sequence of integers and called it the *xorbonacci* sequence. The n^{th} element in the sequence is denoted with x_n. The sequence is defined recursively in the following way:

$$\begin{aligned} x_1 &= a_1, \\ x_2 &= a_2, \\ &\ldots \\ x_k &= a_k, \\ x_n &= x_{n-1} \oplus x_{n-2} \oplus \ldots \oplus x_{n-k},\ n > k \end{aligned}$$

Because of a reason only known to Marin, he determined that all his sorrows will go away if you answer his Q queries defined with numbers l and r. The answer to the query is represented with the value

$$x_l \oplus x_{l+1} \oplus \ldots \oplus x_{r-1} \oplus x_r$$

Help Marin and answer his queries.

Please note: The operation $\oplus$ is the operation of binary **XOR**.

INPUT

The first line of input contains the integer K ($1 \leqslant K \leqslant 100\,000$) from the task.
The following line contains K integers that represent the first K elements in the xorbonacci sequence. All numbers are smaller than 10^{18}.
The following line contains the integer Q ($1 \leqslant Q \leqslant 10^6$) from the task.
The i^{th} of the following Q lines contains two integers l_i and r_i ($1 \leqslant l_i \leqslant r_i \leqslant 10^{18}$) that represent Marin's i^{th} query.

OUTPUT

Each of the following Q lines of output must contain the answers to Marin's queries, the order being the same as the input.

SAMPLE TESTS

input

```
4
1 3 5 7
3
2 2
2 5
1 5
```

output

```
3
1
0
```

input

```
5
3 3 4 3 2
4
1 2
1 3
5 6
7 9
```

output

```
0
4
7
4
```