

MAXOR

You are given a sequence $A[1], A[2], \dots, A[N]$. ($0 \leq A[i] < 2^{31}$, $1 \leq N \leq 12000$).

A query is defined as follows:

- $\text{Query}(x,y) = \text{Max} \{ a[i] \text{ xor } a[i+1] \text{ xor } \dots \text{ xor } a[j] ; l \leq i \leq j \leq r \}$.
- $l = \min (((x+\text{lastans}) \bmod N)+1 , ((y+\text{lastans}) \bmod N)+1)$.
- $r = \max (((x+\text{lastans}) \bmod N)+1 , ((y+\text{lastans}) \bmod N)+1)$.
- $\text{lastans}[1] = 0$, $\text{lastans}[i] = \text{Query}[i-1]$.

Given M queries, your program must output the results of these queries. ($0 \leq M \leq 6000$).

IMPORTANT : PROBLEM ENHANCED. (I'M SO SORRY..)

Input

- The first line of the input file contains 2 numbers : N M .
- In the second line, N numbers follow.
- M lines follow, where line i contains 2 numbers x_i and y_i .

Output

Your program should output the results of the M queries, one query per line.

Example

Input:

```
3 3
1 4 3
0 1
0 1
4 3
```

Output:

```
5
7
7
```