F. Xors on Segments

time limit per test: 10 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

You are given an array with n integers a_i and m queries. Each query is described by two integers (l_j, r_j).

Let's define the function $f(u, v) = u \oplus (u+1) \oplus \ldots \oplus v$. The function is defined for only $u \le v$.

For each query print the maximal value of the function $f(a_x, a_y)$ over all $l_j \le x, y \le r_j,\ a_x \le a_y$.

Input

The first line contains two integers n, m $(1 \le n \le 5 \cdot 10^4,\ 1 \le m \le 5 \cdot 10^3)$ — the size of the array and the number of the queries.

The second line contains n integers a_i $(1 \le a_i \le 10^6)$ — the elements of the array a.

Each of the next m lines contains two integers l_j, r_j $(1 \le l_j \le r_j \le n)$ – the parameters of the j-th query.

Output

For each query print the value a_j on a separate line — the maximal value of the function $f(a_x, a_y)$ over all $l_j \le x, y \le r_j,\ a_x \le a_y$.

Examples

input

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

output

```
7
7
7
```

input

```
1 1
1
1 1
```

output

```
1
```

input

```
6 20
10 21312 2314 214 1 322
1 1
1 2
1 3
1 4
```

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

output

```
10
21313
21313
21313
21313
21313
21312
21313
21313
21313
21313
2314
2315
2315
214
215
323
1
323
322
```