B. XOR-pyramid

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

For an array b of length m we define the function f as

$$f(b) = \begin{cases} b[1] & \text{if } m = 1 \\ f(b[1] \oplus b[2], b[2] \oplus b[3], \ldots, b[m-1] \oplus b[m]) & \text{otherwise,} \end{cases}$$

where $\oplus$ is bitwise exclusive OR.

For example, $f(1, 2, 4, 8) = f(1 \oplus 2, 2 \oplus 4, 4 \oplus 8) = f(3, 6, 12) = f(3 \oplus 6, 6 \oplus 12) = f(5, 10) = f(5 \oplus 10) = f(15) = 15$

You are given an array a and a few queries. Each query is represented as two integers l and r. The answer is the maximum value of f on all continuous subsegments of the array $a_l, a_{l+1}, \ldots, a_r$.

Input

The first line contains a single integer n ($1 \le n \le 5000$) — the length of a.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i \le 2^{30} - 1$) — the elements of the array.

The third line contains a single integer q ($1 \le q \le 100000$) — the number of queries.

Each of the next q lines contains a query represented as two integers l, r ($1 \le l \le r \le n$).

Output

Print q lines — the answers for the queries.

Examples

input
3 8 4 1 2 2 3 1 2

output
5 12

input
6 1 2 4 8 16 32 4 1 6 2 5 3 4 1 2

output
60 30 12 3

Note

In first sample in both queries the maximum value of the function is reached on the subsegment that is equal to the whole segment.

In second sample, optimal segment for first query are [3, 6], for second query — [2, 5], for third — [3, 4], for fourth — [1, 2].