

D. Xenia and Bit Operations

time limit per test: 2 seconds
memory limit per test: 256 megabytes

Xenia the beginner programmer has a sequence a , consisting of 2^n non-negative integers: a_1, a_2, \dots, a_{2^n} . Xenia is currently studying bit operations. To better understand how they work, Xenia decided to calculate some value v for a .

Namely, it takes several iterations to calculate value v . At the first iteration, Xenia writes a new sequence $a_1 \text{ or } a_2, a_3 \text{ or } a_4, \dots, a_{2^{n-1}} \text{ or } a_{2^n}$, consisting of 2^{n-1} elements. In other words, she writes down the bit-wise OR of adjacent elements of sequence a . At the second iteration, Xenia writes the bitwise **exclusive** OR of adjacent elements of the sequence obtained after the first iteration. At the third iteration Xenia writes the bitwise OR of the adjacent elements of the sequence obtained after the second iteration. And so on; the operations of bitwise exclusive OR and bitwise OR alternate. In the end, she obtains a sequence consisting of one element, and that element is v .

Let's consider an example. Suppose that sequence $a = (1, 2, 3, 4)$. Then let's write down all the transformations $(1, 2, 3, 4) \rightarrow (1 \text{ or } 2 = 3, 3 \text{ or } 4 = 7) \rightarrow (3 \text{ xor } 7 = 4)$. The result is $v = 4$.

You are given Xenia's initial sequence. But to calculate value v for a given sequence would be too easy, so you are given additional m queries. Each query is a pair of integers p, b . Query p, b means that you need to perform the assignment $a_p = b$. After each query, you need to print the new value v for the new sequence a .

Input

The first line contains two integers n and m ($1 \leq n \leq 17, 1 \leq m \leq 10^5$). The next line contains 2^n integers a_1, a_2, \dots, a_{2^n} ($0 \leq a_i < 2^{30}$). Each of the next m lines contains queries. The i -th line contains integers p_i, b_i ($1 \leq p_i \leq 2^n, 0 \leq b_i < 2^{30}$) — the i -th query.

Output

Print m integers — the i -th integer denotes value v for sequence a after the i -th query.

Examples

| input | Copy |
|--|------|
| 2 4 1 6 3 5 1 4 3 4 1 2 1 2 | |
| output | Copy |
| 1 3 3 3 | |

Note

For more information on the bit operations, you can follow this link:
http://en.wikipedia.org/wiki/Bitwise_operation

→ Attention

The package for this problem was not updated by the problem writer or Codeforces administration after we've upgraded the judging servers. To adjust the time limit constraint, a solution execution time will be multiplied by 2. For example, if your solution works for 400 ms on judging servers, then the value 800 ms will be displayed and used to determine the verdict.

Codeforces Round 197 (Div. 2)

Finished

Practice

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data structures trees *1700

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→ Contest materials

Codeforces Round #197

Tutorial