

Problem A

We have n companies, worth a_1, a_2, \dots, a_n teradollars. Merging two companies worth a and b teradollars costs $a \text{ xor } b$ dollars and results in a company worth $a + b$ teradollars. We say that the resulting company *contains* both companies a and b , and if a and b were created by merging some further companies, it also contains all companies contained in a and b .

You want to merge all the companies into a single one, but you are not sure what is the cheapest way to do it, and no real idea how to find out. Hence, you would like to run some simulations.

Input and output

The first line contains two integers $n, m \leq 100\,000$, the number of companies and the number of steps of the simulation. The second line contains the integers a_1, \dots, a_n ($0 \leq a_i \leq 10^9$), the worths of the companies. The following m lines give commands to be performed in the simulation. On the t -th of these lines, there are three integers s, i, j ($0 \leq s \leq t - 1, 1 \leq i, j \leq n$). This instructs you to take the situation after the s -th command was performed (or the initial state if $s = 0$), merge the companies that contain the i -th and the j -th of the original n companies, and write the cost of merging them. In case the i -th and the j -th company are already contained in the same company in the considered situation, write out -1 instead.

Example

Input:

```
5 6
1 2 3 4 5
0 1 2
0 1 3
1 1 3
2 2 3
3 2 3
3 4 5
```

Output:

```
3
2
0
6
-1
1
```