May We Answer Your Questions Right?

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	1024 mebibytes

Working in the *Right Place to Ask* city information desk is no easy task! As an employee, you constantly receive questions that are hardly answerable instantly.

Vasya also doesn't like answering questions. However, he likes it when computer programs do. Right now, he has an array a of n integers $a_1, a_2, \ldots, a_n$, and he wants to write a program that can respond to the following queries:

- `1` i val: assign the value val to the element a_i;
- `2` l r: calculate *Vasya's sum* for the numbers $a_l, a_{l+1}, \ldots, a_r$.

Vasya does not consider all numbers equally good. He prefers numbers that are to the right of other numbers, and exactly twice as much! Therefore, he defines *Vasya's sum* for the numbers $x_1, x_2, \ldots, x_k$ as the value

$$\sum_{i=1}^{k} 2^{i-1} \cdot x_i = x_1 + 2x_2 + 4x_3 + \ldots + 2^{k-1}x_k.$$

Even if Vasya cannot write such a program, it's no problem: where, if not in the *Right Place to Ask*, can they help you calculate something in favor of the numbers on the right? So, now the burden of solving this has fallen on you! To facilitate the calculations, you only need to determine whether each *Vasya's sum* is positive, negative, or zero.

Input

The first line of input contains a single integer t ($1 \le t \le 5 \cdot 10^5$): the number of test cases. The following t descriptions of test cases are in the format described below.

The first line of a test case contains two integers n and q ($1 \le n, q \le 5 \cdot 10^5$): the number of integers in Vasya's array and the number of queries, respectively.

The next line contains n integers $a_1, a_2, \ldots, a_n$ ($-10^9 \le a_i \le 10^9$): the elements of Vasya's array in left-to-right order.

Each of the following q lines describes a query either in the format `1` i val or in the format `2` L R ($1 \le i \le n$, $-10^9 \le val \le 10^9$, $1 \le L \le R \le n$). A query of the first type means that the value of the element a_i must be changed to val. A query of the second type means that you need to find the sign of *Vasya's sum* for the numbers $a_L, a_{L+1}, \ldots, a_R$ (exactly in that order, of course). All numbers in the queries are integers.

It is guaranteed that the sums of each of the values n and q across all test cases do not exceed $5 \cdot 10^5$, and that there is at least one query of the second type in each test case.

Output

For each test case, output one integer for each query of type `2`. If *Vasya's sum* in the given query is positive, output `1`; if negative, output `-1`; otherwise, output `0`.

Example

standard input	standard output
2 4 7 9 -4 2 -1 2 1 4 2 2 3 2 2 4 1 1 8 2 1 4 1 2 -5 2 1 4 7 1 2026 2 5 -14 59 59 -75 2 1 7	1 0 -1 0 -1 -1

Note

In the first test case, *Vasya's sums* are 1, 0, -4, 0, -2, respectively.

In the second test case, *Vasya's sum* is -30.

Note that in this problem, the input and output data can be quite large. It is recommended to use means of speeding up operations with input and output data that are available in your programming language.