

# Index and Maximum Value

Input file:            standard input  
Output file:           standard output  
Time limit:            1 second  
Memory limit:         256 megabytes

After receiving yet another integer array  $a_1, a_2, \dots, a_n$  at her birthday party, Index decides to perform some operations on it.

Formally, there are  $m$  operations that she is going to perform in order. Each of them belongs to one of the two types:

- **+ l r**. Given two integers  $l$  and  $r$ , for all  $1 \leq i \leq n$  such that  $l \leq a_i \leq r$ , set  $a_i := a_i + 1$ .
- **- l r**. Given two integers  $l$  and  $r$ , for all  $1 \leq i \leq n$  such that  $l \leq a_i \leq r$ , set  $a_i := a_i - 1$ .

For example, if the initial array  $a = [7, 1, 3, 4, 3]$ , after performing the operation **+24**, the array  $a = [7, 1, 4, 5, 4]$ . Then, after performing the operation **-110**, the array  $a = [6, 0, 3, 4, 3]$ .

Index is curious about the maximum value in the array  $a$ . Please help her find it after each of the  $m$  operations.

## Input

Each test consists of multiple test cases. The first line contains a single integer  $t$  ( $1 \leq t \leq 2 \cdot 10^4$ ) — the number of test cases. The description of the test cases follows.

The first line of each test case contains two integers  $n$  and  $m$  ( $1 \leq n \leq 10^5$ ,  $1 \leq m \leq 10^5$ ) — the length of the array and the number of operations.

The second line of each test case contains  $n$  integers  $a_1, a_2, \dots, a_n$  ( $1 \leq a_i \leq 10^9$ ) — the initial array  $a$ .

Then  $m$  lines follow, each line corresponds to the operation, in the following format: **c l r** ( $c \in \{+, -\}$ ,  $l$  and  $r$  are integers,  $1 \leq l \leq r \leq 10^9$ ) — the description of the operation.

Note that the elements  $a_i$  **may not satisfy**  $1 \leq a_i \leq 10^9$  after some operations, as it is shown in the example.

It is guaranteed that the sum of  $n$  over all test cases does not exceed  $10^5$ , and the sum of  $m$  over all test cases does not exceed  $10^5$ .

## Output

For each test case, output one single line containing  $m$  integers, with the  $i$ -th of them describing the maximum value of the array after the  $i$ -th operation.

## Example

| standard input          | standard output |
|-------------------------|-----------------|
| 5                       | 4 4 4 5 5       |
| 5 5                     | 5 5 4 4 3       |
| 1 2 3 2 1               | 1 1 2 1 2       |
| + 1 3                   | 0               |
| - 2 3                   | 1000000001      |
| + 1 2                   |                 |
| + 2 4                   |                 |
| - 6 8                   |                 |
| 5 5                     |                 |
| 1 3 3 4 5               |                 |
| + 1 4                   |                 |
| + 2 3                   |                 |
| - 4 5                   |                 |
| - 3 3                   |                 |
| - 2 6                   |                 |
| 5 5                     |                 |
| 1 1 1 1 1               |                 |
| + 2 3                   |                 |
| - 4 5                   |                 |
| + 1 6                   |                 |
| - 2 5                   |                 |
| + 1 8                   |                 |
| 1 1                     |                 |
| 1                       |                 |
| - 1 1                   |                 |
| 1 1                     |                 |
| 1000000000              |                 |
| + 1000000000 1000000000 |                 |

## Note

In the first test case, the process of the operations is listed below:

- After the first operation, the array becomes equal  $[2, 3, 4, 3, 2]$ . The maximum value is 4.
- After the second operation, the array becomes equal  $[1, 2, 4, 2, 1]$ . The maximum value is 4.
- After the third operation, the array becomes equal  $[2, 3, 4, 3, 2]$ . The maximum value is 4.
- After the fourth operation, the array becomes equal  $[3, 4, 5, 4, 3]$ . The maximum value is 5.
- After the fifth operation, the array becomes equal  $[3, 4, 5, 4, 3]$ . The maximum value is 5.

In the second test case, the process of the operations is listed below:

- After the first operation, the array becomes equal  $[2, 4, 4, 5, 5]$ . The maximum value is 5.
- After the second operation, the array becomes equal  $[3, 4, 4, 5, 5]$ . The maximum value is 5.
- After the third operation, the array becomes equal  $[3, 3, 3, 4, 4]$ . The maximum value is 4.
- After the fourth operation, the array becomes equal  $[2, 2, 2, 4, 4]$ . The maximum value is 4.
- After the fifth operation, the array becomes equal  $[1, 1, 1, 3, 3]$ . The maximum value is 3.