

Multiset Queries

Time: 1 sec / Memory: 256 MB

Problem Statement

You are given a multiset S consisting of $\{1, 2, 3, \dots, n\}$.

Initially, there are C_i copies of i in S .

For example, if $(C_1, C_2, C_3) = (2, 3, 1)$, $S = \{1, 1, 2, 2, 2, 3\}$.

There are 3 types of queries:

Insert x y Insert y copies of x to S

Delete x y Delete y copies of x from S . It is guaranteed that there are at least y copies of x in S at this point.

Ask x k You should answer the following question: If we sort all elements $\geq x$ in S , in non-decreasing order, what will the k -th element be? If no such element exists (less than k elements $\geq x$), output -1 instead.

Hint 1: We could answer each query in $O(\log N)$ time instead of $O(\log^2 N)$, if we correctly determine which children to travel on the segment tree.

Hint 2: Since the input is large, you may need to optimize input/output for this problem. For example, in C++, it is enough to use the following lines at the start of the `main()` function:

```
int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(NULL); cout.tie(NULL);
}
```

Input

The first line contains two integers N and Q .

The second line contains N integers C_1, C_2, \dots, C_n .

The 3-rd to $(Q + 3)$ -th line contains a string and two integers, each belongs to one of the following format:

Insert $x\ y$

Delete $x\ y$

Ask $x\ k$

Output

For each queries of 3-rd type, output the corresponding answer in a line.

If no such number exists (less than k elements $\geq x$), output -1 instead.

Constraints

$$3 \leq N, Q \leq 10^5$$

$$0 \leq C_i \leq 10^9$$

For each Insert $x\ y$: $1 \leq x \leq N, 0 \leq y \leq 10^9$

For each Delete $x\ y$: $1 \leq x \leq N, 0 \leq y \leq \text{count}(x)$

For each Ask $x\ k$: $1 \leq x \leq N, 1 \leq k \leq 10^{18}$

Example

Input1:

```
5 6
7 10 2 8 3
Ask 2 11
Delete 2 4
Ask 2 11
Insert 1 5
Ask 1 18
Ask 5 4
```

Output1:

```
3
4
2
-1
```