Observation Tower

There are N observation towers installed in order from tower 0 to tower $N-1$. For $0 \le i \le N-1$, the height of tower i is $H[i]$. Each tower also has an observation score $S[i]$, and initially all observation scores are 0.

For $0 \le i < j \le N-1$, we say that tower j is observable from tower i if for all $i \le k \le j-1$, $H[k] < H[j]$. Note that towers with $j \le i$ are not observable from tower i.

When an observation is performed from a certain tower, the observation scores of all towers observable from that tower increase by 1.

Now Q events occur. Each event is one of the following three types:

- Observation: For I satisfying $0 \le I \le N-2$, perform an observation from tower I.
- Measurement: For L and R satisfying $0 \le L \le R \le N-1$, compute the sum of observation scores from tower L to tower R. That is, compute $S[L] + \cdots + S[R]$.
- Tectonic Shift: For L, R, and a value V satisfying $0 \le L \le R \le N-1$, add V to the height of each tower from L to R, That is, add V to each of $H[L], \ldots, H[R]$.

Observation events can be represented by array $[I]$, measurement events by array $[L, R]$, and land movement events by array $[L, R, V]$. Note that since the size of the array is different for each event type, the type of event can be determined based on the size of the array.

The events occur in order from event 0 to event $Q-1$, and event i is $E[i]$.

Let the total number of measurement events be K, and label them in the order they occur as measurement event 0 through measurement event $K-1$. You must find all results of the measurement events, that is, the results of measurement events from 0 to $K-1$.

Function List and Definitions

You must implement the following function.

```
vector<long long> tower_events(vector<int> H, vector<vector<int>> E)
```

- H: An integer array of size N.
- E: An array of arrays of size Q. Each value is an array representing an event.
- This function should return an integer array X of size K. $X[i]$ should be the result of the i-th measurement event. ($0 \le i \le K-1$)
- This function is called exactly once.

Constraints

- $5 \leq N \leq 1\,000\,000$
- $1 \leq Q \leq 250\,000$
- $1 \leq H[i] \leq 10^9$ $(0 \leq i \leq N-1)$
- For each observation event, $0 \leq I \leq N-2$
- For each measurement event, $0 \leq L \leq R \leq N-1$
- For each tectonic shift event, $0 \leq L \leq R \leq N-1$
- For each tectonic shift event, $-10^9 \leq V \leq 10^9$
- After each tectonic shift event, the height of all towers is at least 1. That is, $1 \leq H[i]$. $(0 \leq i \leq N-1)$
- Measurement events occur at least once.

Subtasks

Number	Points	Constraints
1	17	$N, Q \leq 150\,000$. In all measurement events, $L = 0, R = N-1$.
2	6	$N, Q \leq 150\,000$. Tectonic shift events do not occur.
3	12	$N, Q \leq 150\,000$.
4	19	In all observation events, $I = 0$. In all tectonic shift events, $L = R$. Tectonic shift events occur at most $30\,000$ times.
5	21	In all measurement events, $L = R$. In all tectonic shift events, $L = R$ and $V \geq 0$.
6	25	No additional constraints.

Examples

Example 1

Consider the following call:

```
tower_events([1, 2, 3, 4, 5], [[0], [1, 3], [1, 2, 1], [1], [0, 4]])
```

- After the first event, $H = [1, 2, 3, 4, 5]$, $S = [0, 1, 1, 1, 1]$.
- The result of the second event, which is measurement event 0, is $S[1] + S[2] + S[3] = 3$.
- After the third event, $H = [1, 3, 4, 4, 5]$, $S = [0, 1, 1, 1, 1]$.
- After the fourth event, $H = [1, 3, 4, 4, 5]$, $S = [0, 1, 2, 1, 2]$.
- The result of the last event, which is measurement event 1, is $S[0] + \cdots + S[4] = 6$.

Therefore, the function should return $[3, 6]$.

Example 2

Consider the following call:

```
tower_events([7, 7, 9, 5, 8, 10, 2, 9, 2, 2], [[1], [6, 8, 6], [1], [1, 9],
[3], [8], [2, 4], [5], [1, 1, 7], [1], [0, 9]])
```

The function should return $[5, 3, 10]$.

Sample Grader

The input format for the sample grader is as follows:

- line 1: $N\ Q$
- line 2: $H[0]\ H[1] \ldots H[N-1]$
- For all $0 \leq i \leq Q-1$:
  - line $3+i$: $|E[i]|\ E[i][0] \ldots E[i][|E[i]|-1]$

The sample grader outputs the answer in the following format:

- For all $0 \leq i \leq K-1$:
  - line $1+i$: $X[i]$