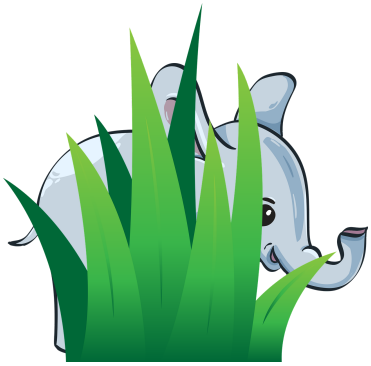
S2-C. Elephant Grass

Time limit	1 s
Memory limit	256 MB

Description

Mr. Ganesh has a field that is being used to cultivate the elephant grass (*Pennisetum purpureum*).



This field consists of N patches, each of which has been planted with elephant grass, lined up from left to right consecutively. Initially, the height of the grass in each patch is 0 mm, and it will grow by 1 mm every day.

Elephant grass has a maximum height of H mm. If the elephant grass has grown to its maximum height, it will stop growing until it is trimmed to the height of less than H.

To ensure that his elephant grass is always in a healthy condition, Mr. Ganesh will fertilize them once in a while. A patch that contains elephant grass of height T mm will require T kg of fertilizer. Correspondingly, the total amount of fertilizer that Mr. Ganesh needs is the sum of fertilizer required from each patch.

Sometimes Mr. Ganesh wants to harvest his grass. There are 3 ways for Mr. Ganesh to harvest them. First, he can trim down the leftmost X patches to height 0 mm. Secondly, he can trim down the rightmost X patches to height 0 mm. Finally, he can trim down all grasses that are taller than height X mm to height X mm.

Mr. Ganesh would like to plan a strategy to manage his grasses for the next few years. In more detail, he wants you to simulate M events, each of which is one of the following:

1. `'N' X`, which implies that X days have passed and all grasses will grow accordingly. Note that the elephant grass has a maximum height.
2. `'L' X`, which implies that Mr. Ganesh trims down the leftmost X patches to height 0 mm. Note that these grasses would still be able to grow the next day.
3. `'D' X`, which implies that Mr. Ganesh trims down the rightmost X patches to height 0 mm. Note that these grasses would still be able to grow the next day.
4. `'S' X`, which implies that Mr. Ganesh trims down all grasses that are taller than height X mm to height X mm
5. `'Z'`, which implies that Mr. Ganesh fertilizes all his grasses and wants to know how much fertilizer that he needs in kg.

Please help Mr. Ganesh in simulating these events.

Task

You must implement the following function.

```
std::vector<long long> simulate(int N, int H, int M, std::vector<char> events, std::vector<int> X
```

- `N`: An integer that represents the number of patches in Mr. Ganesh's field.
- `H`: An integer that represents the maximum height of elephant grass.

- `M`: An integer that represents the number of events that Mr. Ganesh wants you to simulate.
- `events`: A vector of char of size M that represents the type of events that Mr. Ganesh wants you to simulate.
- `X`: A vector of integer where X_i represents the integer corresponding to $events_i$. You may ignore X_i if $events_i$ is `'Z'`.
- This function must return a vector of long long represents the number of fertilizers needed for each `'Z'` event in order.

Example

Given N = 10, H = 8, M = 12, $events$ = $['N', 'Z', 'L', 'Z', 'N', 'Z', 'D', 'Z', 'N', 'Z', 'S', 'Z']$, X = $[3, 0, 5, 0, 3, 0, 3, 0, 3, 0, 5, 0]$, `simulate(N, H, M, events, X)` must return $[30, 15, 45, 27, 55, 44]$

Subtasks

For all subtasks:

- $1 \le H \le 10^6$
- If $events_i$ = `'N'` or `'S'`, then $1 \le X_i \le H$
- If $events_i$ = `'L'` or `'D'`, then $1 \le X_i \le N$

Subtask 1 (10 points)

- $1 \le N \le 1000$
- $1 \le M \le 1000$

Subtask 2 (10 points)

- $1 \le N \le 10^9$
- $1 \le M \le 1000$

Subtask 3 (10 points)

- $1 \le N \le 10^5$
- $1 \le M \le 10^5$
- No `'S'` events
- It is guaranteed that no grasses will ever grow beyond H mm within the simulation.

Subtask 4 (20 points)

- $1 \le N \le 10^9$
- $1 \le M \le 10^5$
- No `'S'` events
- It is guaranteed that no grasses will ever grow beyond H mm within the simulation.

Subtask 5 (10 points)

- $1 \le N \le 10^5$
- $1 \le M \le 10^6$
- No `'D'` events

Subtask 6 (20 points)

- $1 \le N \le 10^9$
- $1 \le M \le 10^6$
- No `'D'` events

Subtask 7 (20 points)

- $1 \le N \le 10^9$
- $1 \le M \le 10^6$

Sample Grader

The provided sample grader read input with the following format:

- A single line consists of 3 integers N, H, and M.
- The next M lines describe each event in one of the following format:
  - `'N' X`
  - `'L' X`
  - `'D' X`
  - `'S' X`
  - `'Z'`

The provided sample grader output with the following format:

- One line for every value in the vector returned by the function `simulate`