Singularity Cup P4 - Staircase Sum

Time limit: 3.5s **Memory limit:** 256M

Given an $N \times M$ grid of integers G, you will be asked to perform Q operations on it. Each operation is one of the following:

1. Update the integer at some (r, c) to v.
2. Query the "staircase sum" at some (r, c) with height h.

A "staircase sum" is defined as follows: starting at (r, c), get the sum of every column from (r, c) to $(r, c + h - 1)$ with the first column going from (r, c) to $(r - h + 1, c)$ and then descending by 1 unit of height for each subsequent column.

More formally, the "staircase sum" at some (r, c, h) is equivalent to $\sum_{x=1}^{h} \sum_{y=1}^{h-x+1} G_{(r-y+1)(c+x-1)}$.

You will be asked to answer Q of the operations described above. For each operation of type 2, output the desired result.

Constraints

$1 \leq N, M \leq 2000$

$1 \leq Q \leq 10^6$

$-10^6 \leq G_{ij} \leq 10^6$

$1 \leq r \leq N$

$1 \leq c \leq M$

Operation 1

$-10^6 \leq v \leq 10^6$

Operation 2

$h \geq 1$

$r - h + 1 \geq 1$

$c + h - 1 \leq M$

Subtask 1 [30%]

$Q \leq 10^5$

Subtask 2 [70%]

No additional constraints.

Input Specification

The first line of input contains integers N, M, and Q.

The next N lines of input each contain M space-separated integers representing G.

The next Q lines of input each contain 4 space-separated integers in the format `1 r c v` or `2 r c h`.

Output Specification

For each type 2 operation, output the "staircase sum" of the grid after applying any previous type 1 operations.

Sample Input

```
4 4 3
6 1 0 2
1 1 1 1
2 2 2 2
3 0 3 -3
1 4 2 7
2 1 1 1
2 4 2 3
```

Sample Output

```
6
12
```

Explanation for Sample

The result of the final operation is obtained by adding the numbers highlighted below:

6	1	0	2
1	1	1	1
2	2	2	2
3	7	3	-3