Freshly Minted

December 2022
C++ — 2 SEC — 512 MB

Susie's Sweetest Sweet Shop has just brought out a new range of lip-smacking, tongue-burning, eye-watering mints. On its release day, keen customers queued for hours for a chance to contort their cheeks as they sucked on the lethal lozenges.

That night, just as her shop closed, Susie's minting machine entered an error state. The minty might of the mighty mints may have messed meaningfully with the minting mechanism. She needs to fix the machine before opening the following day.

In the warehouse, the mints are packed in an **n** by **n** grid of boxes. The minting machine has 2 commands:

ADD x y v Add *v* mints to the box at position *x y* (indexed from 0).

QUERY x1 y1 x2 y2 Count the number of mints in a rectangular selection of boxes from position *x1 y1* to position *x2 y2* (inclusive).

To aid Susie's debugging (and in exchange for many mints), you need to implement the minting machine's functionality.

INPUT You will be given 2 integers, **n** and **q**, denoting the size of the grid and the number of commands, respectively. This will be followed by **q** commands on separate lines.

$3 \leq \mathbf{n} \leq 3000$
$1 \leq \mathbf{q} \leq 500{,}000$
$1 \leq v \leq 2^{20}$

OUTPUT For each *QUERY* command, output the number of mints contained in the given selection of boxes.

SAMPLE For example, suppose the boxes are arranged in a 3x3 grid, and the minting machine receives the following commands:

```
ADD 1 1 3
ADD 2 2 2
ADD 1 0 4
QUERY 0 0 2 2
QUERY 1 1 2 1
```

```
0 4 0
0 3 0
0 0 2
```

The arrangement of the mints in the boxes is shown on the right. From this, it can be seen that the first query returns 9 and the second returns 3.

INPUT

```
4 15
ADD 1 1 5
ADD 2 1 6
ADD 1 2 2
QUERY 1 1 3 3
```

OUTPUT

```
13
```

```
QUERY 0 0 3 1                    11
ADD 1 3 1
ADD 3 2 3
ADD 3 3 2
QUERY 1 1 3 3                    19
QUERY 0 0 3 1                    11
ADD 1 2 2
ADD 0 0 1
QUERY 0 0 2 2                    16
ADD 3 0 5
QUERY 2 0 3 2                    14
```