Task: TEL
Transceivers

Olimpiada Informatyczna

XXV OI, Stage II, Day two. Source file `tel.*` Available memory: 256 MB. *15.02.2018*

Being a progressive king, Byteasar wants to roll out mobile telephony in the kingdom of Byteotia. All towns and villages lay along a straight line road, which we will identify with the number line.

The newly appointed royal telecommunications advisor needs a program to test the locations of base stations equipped with transceivers. A transceiver is characterized by a pair of numbers s and a, with the following meaning. The *signal strength* at point x, where the base station is located, is s. The signal strength decreases linearly as one moves away from the base station, and equals $\max(0, s - a \cdot d)$ at distance d from the station, i.e., at the point(s) $x \pm d$.

We assume (optimistically) that the *effective signal strength* in a given point is the sum of the signal strengths from all the base stations.

The program should allow the operations of erecting and removing a base station as well as a query for the average effective signal strength over all integer points in a given interval.

Input

In the first line of the standard input, there are two integers n and m ($n \geq 2$, $m \geq 1$), separated by a single space, which specify the length of the road and the number of operations to be performed.

Then m lines follow, specifying those operations. Each such line begins with a single character encoding the type of the operation, followed by one up to three integers:

- "`P` x s a" stands for erecting a base station at point x with a transceiver characterized by s, a ($1 \leq x \leq n$, $1 \leq s, a \leq 100\,000$),
- „`U` x" stands for removing a base station from the point x ($1 \leq x \leq n$),
- „`Z` x_1 x_2" stands for a query for the average effective signal strengths over all integer points x that satisfy $x_1 \leq x \leq x_2$ ($1 \leq x_1 \leq x_2 \leq n$).

The symbols and numbers in each line are separated by single spaces. You may assume that upon erection (`P`), there is no base station at x, and that upon removal (`U`) there is a base station at x.

Output

Exactly as many lines as there were queries (`Z`) on input should be printed to the standard output; each such line should contain a single integer: the answer to the corresponding query *rounded down*.

Example

For the input data:

```
11 7
P 5 30 10
Z 6 7
P 10 22 5
Z 6 7
Z 6 6
U 5
Z 6 6
```

the correct result is:

```
15
19
22
2
```

Explanation for the example is provided in the table on the next page.

operation	result	explanation
`P 5 30 10`	–	We erect a base station at $x = 5$ characterized by $s = 30$, $a = 10$.
`Z 6 7`	`15`	At point 6 the effective signal strength is $30 - 10 = 20$, at point 7 it is $30 - 2 \cdot 10 = 10$, hence the average effective signal strength at integer points in $[6, 7]$ is 15.
`P 10 22 5`	–	We erect a base station at $x = 10$ characterized by $s = 22$, $a = 5$.
`Z 6 7`	`19`	With two base stations, the effective signal strength at point 6 is $20+2 = 22$, whereas at point 7 it is $10+7 = 17$, hence the average effective signal strength at integer points in $[6, 7]$ is $19\frac{1}{2}$.
`Z 6 6`	`22`	see above
`U 5`	–	We remove the base station from $x = 5$.
`Z 6 6`	`2`	At point 6 the effective signal strength is 2.

Sample grading tests:

`1ocen:` $n = 101$, $m = 500$, base stations erected at the beginning, end, and middle of the road, followed by random queries;

`2ocen:` $n = 300\,000$, a single base station at point 1 characterized by $s = 100\,000$ and $a = 100$, average effective signal strength queries for all prefixes $[1, i]$, for $1 \leq i \leq 300\,000$.

`3ocen:` $n = 300\,000$, $m = 500\,000$, a base station characterized by $s = 1000$ and $a = 1$ at every integer point, all average effective signal strength queries are for the whole span of the road.

Grading

The set of tests consists of the following subsets. Within each subset, there may be several unit tests.

Subset	Property	Score
1	$n, m \leq 2000$	8
2	$n \leq 300\,000$, $m \leq 500\,000$, `Z` operations appear after all `P` and `U` operations	24
3	$n \leq 300\,000$, $m \leq 500\,000$, the number of erected base stations never exceeds 50	16
4	$n \leq 300\,000$, $m \leq 500\,000$, all `Z` operations have $x_1 = x_2$	15
5	$n, m \leq 100\,000$	15
6	$n \leq 300\,000$, $m \leq 500\,000$, all `P` operations have $a = 1$	12
7	$n \leq 300\,000$, $m \leq 500\,000$	10