



## USACO 2022 JANUARY CONTEST, GOLD PROBLEM 2. FARM UPDATES

[Return to Problem List](#)

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English (en) ▾

Farmer John operates a collection of  $N$  farms ( $1 \leq N \leq 10^5$ ), conveniently numbered  $1 \dots N$ . Initially, there are no roads connecting these farms to each-other, and each farm is actively producing milk.

Due to the dynamic nature of the economy, Farmer John needs to make changes to his farms according to a series of  $Q$  update operations ( $0 \leq Q \leq 2 \cdot 10^5$ ). Update operations come in three possible forms:

- (D  $x$ ) Deactivate an active farm  $x$ , so it no longer produces milk.
- (A  $x$   $y$ ) Add a road between two active farms  $x$  and  $y$ .
- (R  $e$ ) Remove the  $e$ th road that was previously added ( $e = 1$  is the first road that was added).

A farm  $x$  that is actively producing milk, or that can reach another active farm via a series of roads, is called a "relevant" farm. For each farm  $x$ , please calculate the maximum  $i$  ( $0 \leq i \leq Q$ ) such that  $x$  is relevant after the  $i$ -th update.

### INPUT FORMAT (input arrives from the terminal / stdin):

The first line of input contains  $N$  and  $Q$ . The next  $Q$  lines each contain an update of one of the following forms:

```
D x
A x y
R e
```

It is guaranteed that for updates of type R,  $e$  is at most the number of roads that have been added so far, and no two updates of type R have the same value of  $e$ .

### OUTPUT FORMAT (print output to the terminal / stdout):

Please output  $N$  lines, each containing an integer in the range  $0 \dots Q$ .

### SAMPLE INPUT:

```
5 9
A 1 2
A 2 3
D 1
D 3
A 2 4
D 2
R 2
R 1
R 3
```

### SAMPLE OUTPUT:

```
7
8
6
```

```
9
9
```

In this example, roads are removed in the order (2, 3), (1, 2), (2, 4).

- Farm 1 is relevant just before (1, 2) is removed.
- Farm 2 is relevant just before (2, 4) is removed.

- Farm 2 is relevant just before (2, 4) is removed.
- Farm 3 is relevant just before (2, 3) is removed.
- Farms 4 and 5 are still active after all queries. Therefore they both stay relevant, and the output for both should be  $Q$ .

**SCORING:**

- Tests 2 through 5 satisfy  $N \leq 10^3$ ,  $Q \leq 2 \cdot 10^3$
- Test cases 6 through 20 satisfy no additional constraints.

Problem credits: Benjamin Qi

Contest has ended. No further submissions allowed.

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