

DMPG '17 G4 - Timeline

Harold is, like the rest of his coworkers, working hard to ensure all records are "accurate". To do this they must change some labels here and there, but more importantly, change the time that certain events occurred... in the database.

Unfortunately for you, many students are looking up "information" for their projects at the same time, and all the queries are grouped together. You wouldn't want to keep them waiting.

The timeline begins with N events, each occurring at a distinct time t_i and having a label l_i . Initially the search filter allows all events to pass. There will be Q queries, which will be one of the following:

- `T a b` - find the event which occurred at time a and change it so it occurred at time b .
- `L a b` - find the event which occurred at time a and change its label to b .
- `F s v` - change the filter. If `s` is `<`, allow only events with labels below v to pass, if `s` is `>`, allow only events with labels above v to pass, and if `s` is `.`, reset the filter to none and ignore v .
- `S v` - find the event which occurred at time closest to v and passing the filter. If there is a tie, choose the later one. Output this event's time.

Constraints

For all subtasks:

$$|t_i| \leq 10^8, |l_i| \leq 10^9$$

Subtask 1 (30%) **Subtask 2 (70%)**

$$1 \leq N, Q \leq 10^3 \quad 1 \leq N, Q \leq 10^5$$

Input Specification

The first line will contain N .

The next N lines will each contain t_i and l_i separated by a space.

The following line will contain Q .

The next Q lines will each contain a query in the form described above.

Output Specification

The result of each query, one per line.

Sample Input

```
5
-2 1
0 4
3 -1
4 3
7 4
13
S -1
F > 3
S -4
S 4
T 7 9
S 4
F < -2
L 9 -3
S -3
F . 0
S 2
T 3 -3
S -3
```

Sample Output

```
0
0
7
0
9
3
-3
```

Explanation

The closest event to -1 is 0 .

The filter is set to $l > 3$.

The closest event to -4 is -2 , but 1 is not greater than 3 , and for the next closest, 0 , its label 4 is greater than 3 .

The closest event to 4 is 4, but 3 is not greater than 3, and for the next closest, 7, its label 4 is greater than 3.

The time of event 7 is changed to 9.

The closest event to 4 with label greater than 3 is now 0.

The filter is set to $l < -2$. No events pass, but that is okay.

The label of event 9 is changed to -3 . Now it passes the filter.

The closest event to -3 which passes the filter is 9.

The filter is cleared.

The closest event to 2 is 3.

The time of event 3 is changed to -3 .

The closest event to -3 is -3 .