Amplitude Hackathon '23 Problem 2 - Gigatron Lag

Time limit: 5.0s **Memory limit:** 1G

Kurt has built a cool new service called Gigatron. He's not sure how well it's performing relative to its predecessor, Megatron. Your job is to help him determine how much Gigatron is lagging.

Here's a simplified model of how Gigatron works. Gigatron has 1024 partitions, numbered 1 through 1024. Each partition corresponds to a queue of events that need to be processed. We define the "lag" of a partition to be the number of active events in its corresponding queue.

There are six types of actions that can happen:

1. Events can be added to a single partition.
2. Events can be added to all partitions.
3. Gigatron can process events on a single partition.
4. Gigatron can process events on all partitions.
5. Kurt wants to know the lag of a specific partition.
6. Kurt wants to know the maximum lag over all partitions.

When Gigatron is initialized, all partitions have zero lag. Help Kurt analyze Gigatron's performance!

Constraints

$1 \leq N \leq 10^4$

$1 \leq p \leq 1024$

$1 \leq x \leq 10^5$

There is at least one event of the form `LAG p` or `MAXLAG`.

Input Specification

The first line of input contains a single integer, N. The number of actions is N.

Each of the next N lines contains a line either of the form `ADD p x`, `ADDALL x`, or `PROCESS p x`, `PROCESSALL x`, `LAG p`, or `MAXLAG`.

If the line is of the form `ADD p x`, partition p has x additional events to process.

If the line is of the form `ADDALL x`, all partitions have x additional events to process.

If the line is of the form `PROCESS p x`, Gigatron processes x events from partition p. If x is greater than the number of events in partition p's queue, all events are processed.

If the line is of the form `PROCESSALL x`, Gigatron processes x events from every partition. If x is greater than the number of events in some partition's queue, all events are processed from that queue.

If the line is of the form `LAG p`, print the lag of partition p.

If the line is of the form `MAXLAG`, print the maximum lag over all partitions.

Output Specification

For every `LAG` line, print Gigatron's lag at the time of the request. For every `MAXLAG` line, print the maximum lag over all partitions.

Print each lag amount on a separate line.

Sample Input

```
15
LAG 39
MAXLAG
ADDALL 17
LAG 42
MAXLAG
PROCESS 1 2
LAG 1
MAXLAG
PROCESSALL 1
LAG 39
MAXLAG
PROCESSALL 100
MAXLAG
ADD 17 1
MAXLAG
```

Sample Output

```
0
0
17
17
15
17
16
16
0
1
```

Sample Explanation

Gigatron starts out with no lag over all partitions. The third event causes all partitions to have a lag of 17. After processing 2 events from partition 1, partition 1 has a lag of 15. After processing 1 event from all partitions, the maximum lag is 16 and all partitions except for partition 1 have a lag of 16. After attempting to process 100 events from all partitions, the maximum lag is 0. After adding one event to partition 17, Gigatron ends with a maximum lag of 1.