Sequential Prefix Function

The *prefix function* of a sequence of integers, $s = s_0, \ldots s_{n-1}$, is defined as follows:

1. 0 if s is empty (i.e., $n = 0$).
2. The maximal $0 \leq k < n$ such that $(s_0, s_1, \ldots s_{k-1}) = (s_{n-k}, \ldots s_{n-1})$ if $n \geq 1$.

You have a sequence of integers that's initially empty. You have two types of queries:

1. `+ x`: Append integer x to the end of the sequence.
2. `-`: Remove the last integer from the sequence.

After each query, print the value of the prefix function of the whole string on a new line.

Input Format

The first line contains a single integer, n, denoting the number of queries.
Each line i of the n subsequent lines contains one query each, and each query is in the format `+ x` or `-`.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x \leq 10^6$

Output Format

After each query, print a single integer denoting the value of the prefix function.

Sample Input

```
9
+ 1
+ 1
+ 2
-
+ 1
-
-
-
+ 3
```

Sample Output

```
0
1
0
1
2
1
0
0
0
```

Explanation

The list of sequences (in order) is:

1. Append `1` to the sequence, resulting in (1).
2. Append `1` to the sequence, resulting in $(1, 1)$.
3. Append `2` to the sequence, resulting in $(1, 1, 2)$.
4. Remove the last value from the sequence, resulting in $(1, 1)$.
5. Append `1` to the sequence, resulting in $(1, 1, 1)$.
6. Remove the last value from the sequence, resulting in $(1, 1)$.
7. Remove the last value from the sequence, resulting in (1).
8. Remove the last value from the sequence, resulting in $()$.
9. Append `3` to the sequence, resulting in (3).

At each step, we print the value of the prefix function on a new line.