# Grid Paper

Description

You have a $R \times C$ grid paper. Initially the thickness of each grid is 1. Then K operations/queries will be given:

- (c w), where c can be character ^,v,>, or <. These four characters represent the direction up, down, right and left, respectively. It means that you fold the paper in such direction with width w. You may want to check the sample input for more precise details.
- (? r c) is a query. If you meet the query, you have to output the thickness of the grid located at (r, c). The current top-left grid is indexed as $(0, 0)$.
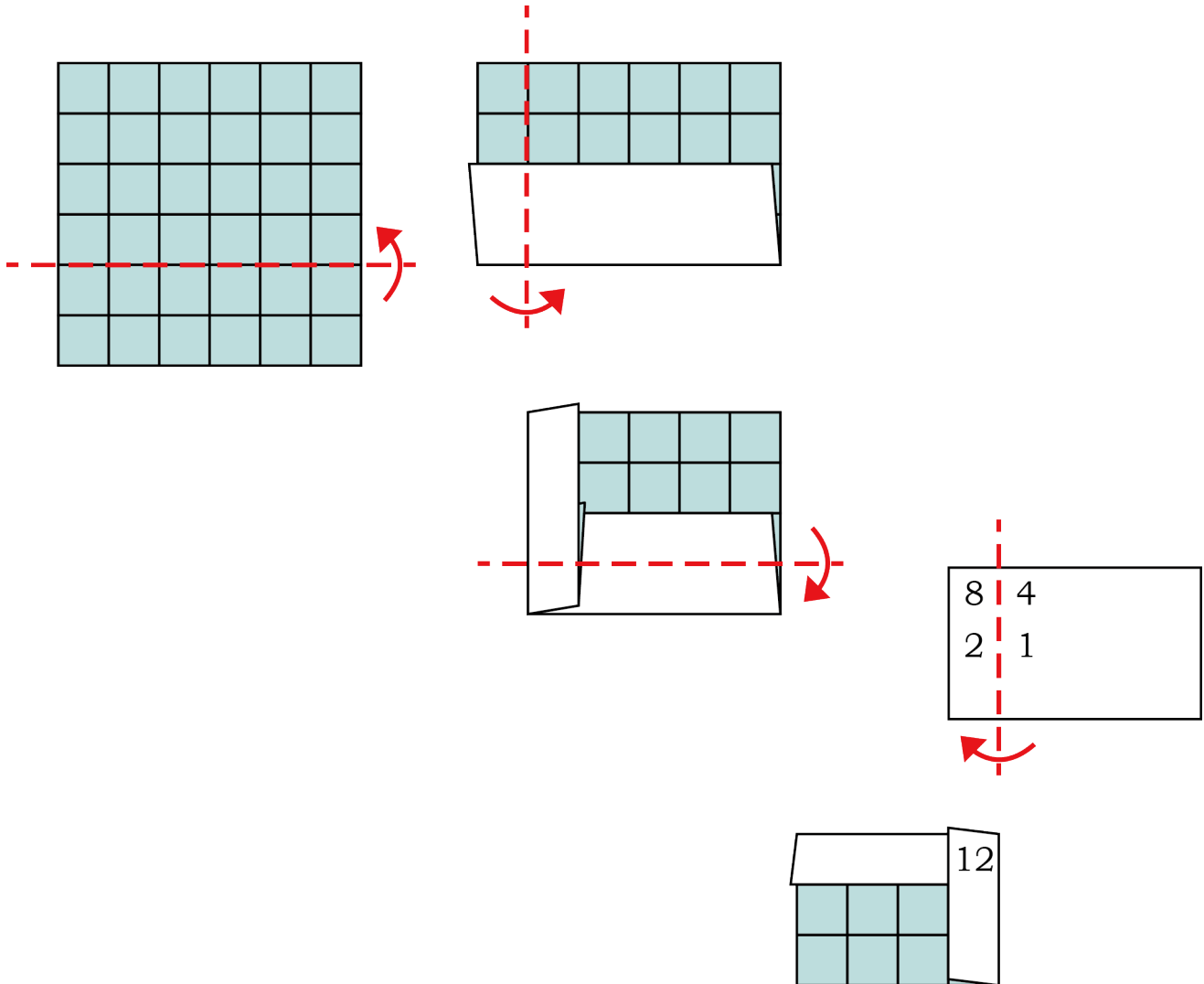
Input

The first line contains a integer T indicating the total number of test cases. Each test case starts with three integers R, C, K. Each of the following K lines describes an operation or a query. If it is an operation, the line will contain a character `c` and an integer `w`. On the other hand, if it is a query, the line will contain a character `?` and two integers `r` and `c`.

- $1 \le T \le 20$
- $1 \le R, C \le 3,000$
- $1 \le K \le 4,000$
- Every value in operations/queries is reasonable. That is, denote R' and C' as the current height (number of row) and current width (number of column) of the paper. We ensure $1 \le w < R'$ for operation (`^` `w`) and (`v` `w`), $1 \le w < C'$ for operation (`>` `w`) and (`<` `w`), and $0 \le r < R', 0 \le c < C'$ for query (`?` `r` `c`).

Output

Output the answer in a line for each query.

Sample Input

```
2
6 6 10
^ 2
> 1
v 3
? 0 0
? 1 0
? 1 1
? 0 1
< 4
? 0 0
? 0 3

6 6 1
? 0 0
```

Sample Output

```
8
2
1
4
4
12
1
```