Problem Treasure Hunting

Input	`stdin`
Output	`stdout`

After he beat Tanaka in last year's cook-off contest (yes, the most important contest in all of INFO(1)CUP KINGDOM), Lulu decided to quit cooking and go *treasure hunting.* But since Tanaka is a very ambitious person, he wants to get his revenge and beat Lulu this time. The hunt takes place inside of a maze which can be represented as a matrix of size $n \times m$. Each cell (x, y) can be either a wall (represented by the character `#`) or a treasure cell (represented by the character `$`). Each treasure cell can contain at most one treasure. Initially, all treasure cells contain a treasure.

We say that the cell (x', y') is reachable from (x, y) if one can get from (x, y) to (x', y') by moving only *down* or to the *right* through treasure cells. Note that a treasure cell is reachable from itself.

The maze has a very interesting property. The cell (n, m) is reachable from any treasure cell and any treasure cell is reachable from $(1, 1)$. Let $F(x, y)$ be the number of treasure cells which contain a treasure and can be reached from (x, y). We define $F(x, y) = 0$ if (x, y) is a wall. Tanaka thinks that he could get ahead of his opponent by finding S, the sum of $F(x, y)$ for all $1 \le x \le n$ and $1 \le y \le m$, i.e.

$$S = \sum_{x=1}^{n} \sum_{y=1}^{m} F(x, y)$$

But then the real treasure hunt begins! At each moment, one of two things can happen:

1. The cell (x, y) gets an update. If the cell previously had a treasure in it, then the treasure disappears. Otherwise, a treasure appears in the cell (x, y).
2. Tanaka wants to know $F(x, y)$ for a given cell (x, y).

Tanaka doesn't have enough time to do all this on his own, so he needs your programming skills. Help Tanaka beat Lulu by writing a program which calculates the value S, then answers all of his queries right.

Input data

The first line of input contains the integers n, m and Q, the number of rows and columns in the matrix and the number of operations you need to process. The next n lines contain m characters, representing the maze. Each of the next Q lines contains an operation, which will be represented as follows:

- ! x y, which means the cell (x, y) gets an update.
- ? x y, which means you have to output the value $F(x, y)$.

It is guaranteed that (x, y) is a treasure cell in both cases.

Output data

The first line of output must contain the value S, the sum of $F(x, y)$ for all cells (x, y) in the initial state. Each of the next lines must contain the answers to Tanaka's queries, in order.

Restrictions

- $1 \le n, m \le 1\,000$
- $1 \le Q \le 50\,000$
- It is guaranteed that both $(1, 1)$ and (n, m) are treasure cells
- 50% of the points for each subtask are awarded for finding S, and the other 50% for answering the queries. Please note that you still have to output the value S, even if it is not correct, in order to get the points for the queries.

#	Points	Restrictions
1	5	$n = 1$ or $m = 1$
2	7	All cells (x, y) are treasure cells
3	8	The cell (x, y) is a wall for all $2 \leq x \leq n-1$ and $2 \leq y \leq m-1$
4	12	$n, m \leq 50$
5	18	$Q \leq 50$
6	27	$n, m \leq 240$
7	23	No further restrictions

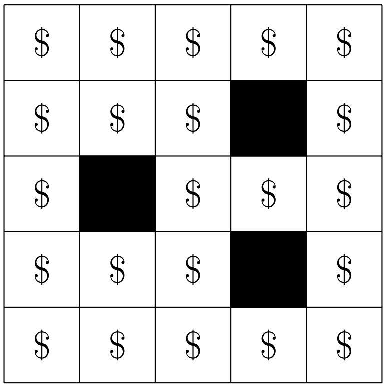
Examples

Input	Output

`5 5 5`
`$$$$$`
`$$$#$`
`$#$$$`
`$$$#$`
`$$$$$`
`! 5 4`
`? 2 2`
`! 4 5`
`? 5 5`
`? 3 4`
	`159`
	`9`
	`1`
	`3`

Explanations

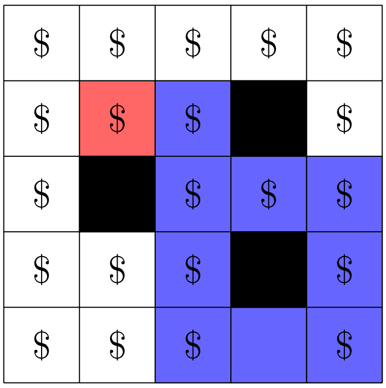
First example In the initial state, the maze looks like this:



The values $F(x, y)$ for the whole maze are:

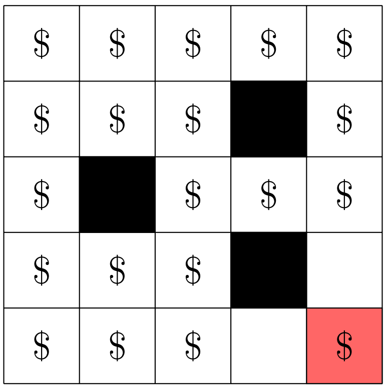
22	15	13	6	5
16	10	9		4
9		8	4	3
8	6	4		2
5	4	3	2	1

For the first query, the maze looks like this:



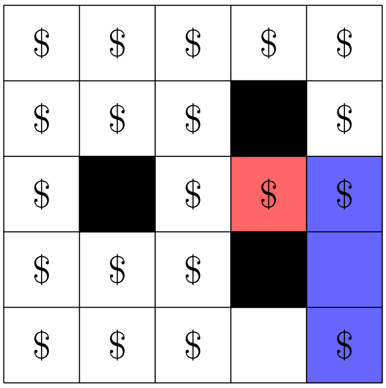
The red cell is the starting cell and the blue cells are those reachable from it. Cells that contain a treasure are marked with a \$ sign, and cells without are empty. The number of such cells which contain a treasure is 9.

For the second query, the maze looks like this:



The only cell reachable from $(5, 5)$ is $(5, 5)$.

For the third query, the maze looks like this:



The red cell is the starting cell and the blue cells are those reachable from it. The number of such cells which contain a treasure is 3.