Problem B - Pintar o Chão

Check our instructions page for detailed information on the qualification and the format of this problem.

In order to prepare the room for the Final of the National Olympiads in Informatics, the organizers decided to paint the floor in blue and red.

Formally, the floor consists of a grid of squares, with M columns and N rows, initially colorless.

However, the organizers can only perform two types of operations:

- paint an entire column red.
- paint an entire row blue.

Due to the nature of the inks, when a square is painted more than once, it keeps the color of the last used ink.

Part I

On this first Part, the organizers want to test some sequences of operations, and they need your help to predict how the floor is going to look like.

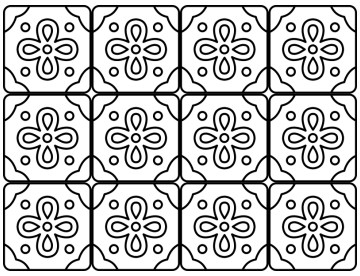
Given a grid of squares, with M columns and N rows, initially colorless, and a sequence of K operations of painting either a row or a column, help the organizers figuring out the final grid (See the Input Format section for more information on how these values will be provided).

Example

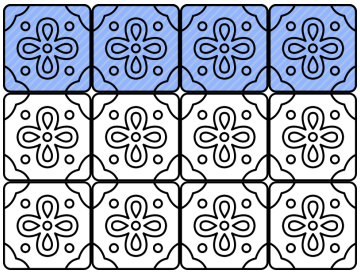
Let $N = 3$, $M = 4$, $K = 3$, and assume the three operations are:

- O_1 = "L" and $I_1 = 1$, which consists in painting the first row blue.
- O_2 = "C" and $I_2 = 4$, which consists in painting the forth column red.
- O_3 = "L" and $I_3 = 3$, which consists in painting the third row blue.

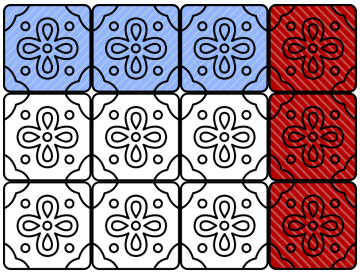
Initially, the grid is colorless:



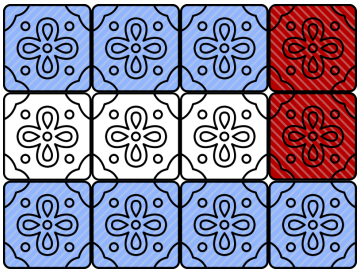
After the first operation, the first row is blue:



Then, after the second operation, the forth column is red. Since the square in the position $(1, 4)$ was painted twice, it kept the last color it was painted with, i.e., red:



Finally, the third row is painted blue. Thus, the final grid is:



Constraints

The following limits are guaranteed for all test cases of this Part that will be given to the program:

$1 \leq \boldsymbol{M} \leq 100$	Number of columns of the grid
$1 \leq \boldsymbol{N} \leq 100$	Number of rows of the grid
$1 \leq \boldsymbol{K} \leq 100$	Number of operations
$1 \leq \boldsymbol{I_i} \leq \boldsymbol{N}$ if $\boldsymbol{O_i}$ = "L"	Index of the rows to be painted in the i-th operation
$1 \leq \boldsymbol{I_i} \leq \boldsymbol{M}$ if $\boldsymbol{O_i}$ = "C"	Index of the column to be painted in the i-th operation

The test cases of this Part of the problem are organized into one group:

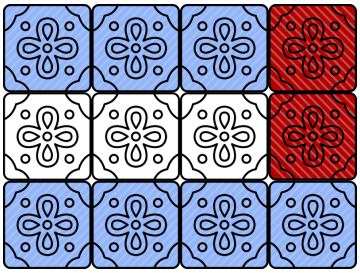
Subtask	Points	Additional Constraints
1	20	No further constraints

Part II

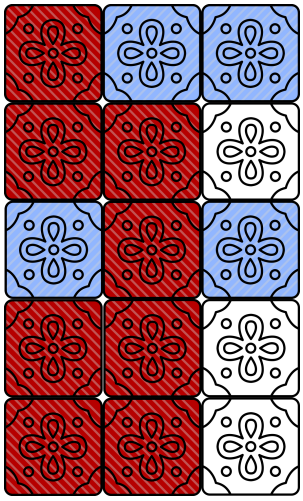
On the second Part of the problem, the organizers receive $\boldsymbol{T}$ final grids. For each one of the grids, the organizers want your help to find if there exists at least one sequence of operations that results in the given grid, starting with a colorless grid.

Example

As seen in Part I, the following grid can be obtained through a sequence of operations:



However, for $\boldsymbol{N} = 5$ and $\boldsymbol{M} = 3$, the following grid cannot be obtained through any sequence of operations:



Constraints

The following limits are guaranteed for all test cases of this Part that will be given to the program:

$1 \leq \boldsymbol{T} \leq 10$	Number of grids to be considered
$1 \leq \boldsymbol{M_i} \leq 500$	Number of columns of the ith grid
$1 \leq \boldsymbol{N_i} \leq 500$	Number of rows of the ith grid

The test cases of this Part of the problem are organized into three groups with different additional constraints:

Subtask	Points	Additional Constraints
2	20	$\boldsymbol{N_i}, \boldsymbol{M_i} \leq 100$
3	30	The grids have at most one color
4	30	No further constraints

Notice: Subtask 3 has a constraint that simplifies the problem significantly. If you are not sure about how to solve the whole problem, it's a good idea to think about this simplification of the problem.

Summary of Subtasks

The test cases for the problem are organized into four groups with different additional constraints:

Subtask	Points	Part	Additional Constraints
1	20	Part I	No further constraints
2	20	Part II	$\boldsymbol{N_i}, \boldsymbol{M_i} \leq 100$
3	30	Part II	The grids have at most one color
4	30	Part II	No further constraints

Input Format

The first line contains an integer $\boldsymbol{P}$, which represents the Part that the test case represents. If it is 1, then the test case refers to Part I, if it is 2 then it refers to Part II.

Part I

In Part I, this is followed by one line with three integers $\boldsymbol{N}$, $\boldsymbol{M}$ and $\boldsymbol{K}$, representing the number of rows, columns and operations, respectively.

Then, there are $\boldsymbol{K}$ rows, which state the $\boldsymbol{K}$ operations. Each row has a pair $\boldsymbol{O_i}$, $\boldsymbol{I_i}$.

Each $\boldsymbol{O_i}$ is either "L", showing that a row was painted, or "C", showing that a columns was painted.

Each $\boldsymbol{I_i}$ corresponds to the index of the row/column.

The input respects the following format:

1
$\boldsymbol{N}$ $\boldsymbol{M}$ $\boldsymbol{K}$
$\boldsymbol{O_1}$ $\boldsymbol{I_1}$
...
$\boldsymbol{O_k}$ $\boldsymbol{I_k}$

It's guaranteed that the index $\boldsymbol{I_i}$ is an integer between 1 and $\boldsymbol{N}$, if it corresponds to a row, or between 1 and $\boldsymbol{M}$, if it corresponds to a column.

Part II

In Part II, this is followed by one line with an integer $\boldsymbol{T}$, representing the number of grids to analyse.

Then, there are $\boldsymbol{T}$ sets, which consist of one line with integers $\boldsymbol{N_i}$ and $\boldsymbol{M_i}$ (the dimensions of the grid), and then $\boldsymbol{N_i}$ lines with $\boldsymbol{M_i}$ characters each, which can be "`S`" (colorless), "`V`" (red) or "`A`" (blue). Each set respects the following format:

$\boldsymbol{N_i}$ $\boldsymbol{M_i}$
$CC\cdots C$
...
$CC\cdots C$

Where the "`C`" represent colors, with no spaces between each color.

Output Format

Parte I

The output of Part I should contain $\boldsymbol{N}$ lines with $\boldsymbol{M}$ characters each, which can be "`S`" (colorless), "`V`" (red) or "`A`" (blue), without any quotation marks or accents.

This should be the final coloration of the grid after the $\boldsymbol{K}$ operations.

Notice: there should be no space between the characters in each line, and there should be no space at the end of each line.

Parte II

The output should contain $\boldsymbol{T}$ lines, each with "SIM" or "NAO" (without quotation marks), depending on whether the grid can be obtained after a sequence of operations or not, respectively.

Example 1 Input

```
1
3 4 3
L 1
C 4
L 3
```

Example 1 Output

```
AAAV
SSSV
AAAA
```

Example 1 Description

This example corresponds to the example mentioned in Part I of the problem statement.

Example 2 Input

```
2
2
3 4
AAAV
SSSV
AAAA
5 3
VAA
VVS
AVA
VVS
VVS
```

Example 2 Output

```
SIM
NAO
```

Example 2 Description

This example corresponds to the example mentioned in Part II of the problem statement.

Organizers