7245 Chessboard

Ruirui and Doc are playing an interesting game on a chessboard with n rows and m columns. The rows are numbered from 1 to n from top to bottom, and the columns are numbered from 1 to m from left to right. There are some broken grids on the chessboards, which a chess cannot move in. Firstly, Doc gives Ruirui a sequence of commands, each command is of one of four following forms:

- **Move Up**: moving from grid (x, y) to grid $(x-1, y)$;
- **Move Down**: moving from grid (x, y) to grid $(x+1, y)$;
- **Move Left**: moving from grid (x, y) to grid $(x, y-1)$;
- **Move Right**: moving from grid (x, y) to grid $(x, y+1)$.

Then Ruirui puts a single chess on a grid of the chessboard

Ruirui will move the chess by Doc's commands in sequence. If the chess will be out of boarder or in a broken grid after a move, she omits this command and **go on** to consider the next one until the last command. Now Ruirui wants to find the grid which the chess will be in the end.

Input

The first line contains a single integer T $(1 \leq T \leq 10)$, which indicates the number of test cases. Then T test cases follow.

For each test case, the first line contains 4 integers n, m, o and l $(1 \leq n, m, o, l \leq 1000)$ representing the number of rows, the number of columns, the number of broken grids and the length of Doc's command sequence.

Next o lines, each line contains two integers i and j describing the position of broken grid.

The last line contains Doc's command sequence, it's a string of length l with each character being one of {`U`,`D`,`L`,`R`} denoting Move Up, Move Down, Move Left and Move Right respectively.

Output

For each test case, for each unbroken grid (i, j), assume a chess started at (i, j) would stop at $(x(i,j), y(i,j))$, output the sum of $(i - x(i,j))^2 + (j - y(i,j))^2$ (over all unbroken (i, j)).

Sample Input

```
2
5 5 5 5
2 3
5 1
5 5
4 4
3 5
RRRLR
10 10 10 10
2 6
3 8
7 2
```

```
5 3
4 3
3 2
7 9
6 8
9 10
10 6
DLLDRRURLR
```

Sample Output

```
Case #1: 49
Case #2: 241
```