Fire

"Fire! Fire!" The "red flower" blooms in the peaceful thousand-acre wood. Animals started to panic and began running for their lives. Winnie, a bear living in the woods, began saving his honey pots (of course, they are empty – he has eaten all the honey) and ran for his life. With his friends Piglet the piglet and Tigger the tiger, he wants to devise a safe strategy to get out of the woods.

Lucky for him, Tigger is known to be a great bouncer. Using his tail, Tigger can bounce from trees to trees with ease. In order to escape the burning woods, they need to bounce from a safe tree to another in order to avoid the fire, with Tigger having to carry Winnie and Piglet on his back. Since the three of them are busy with their own stuffs and their own safety, you, as the guardian of the woods, need to tell them which trees are safe for how long.

Winnie, Piglet, and Tigger will give you some questions about the fire and the trees. You need to inform them whether the tree is safe or not, and for how long. As the guardian of the woods, you also need to inform them how many trees will be burnt after a certain period of time. This period of time will be informed to you so that you can focus on helping the animals flee the woods safely.

Before you start, you want to remind yourself of how the woods look like. The woods is represented by a rectangular grid of size R x C in which each cell has a tree growing on it. Each tree can be on fire from the first minute or it is still safe. Fire will spread to adjacent trees in one minute. A tree is adjacent to another tree if you can reach it by going vertically or horizontally from that tree.

Input

The first line contains two integers, **M**, the number of rows and **N** (1 <= **M, N** <= 20), the number of columns, in the woods, separated by a single space. The next M lines will contain N characters, separated by a single space, denoting the status of the tree in that particular cell. An "S" means that the tree is currently not on fire, while "F" means otherwise. The next line contains an integer **T**. After **T** minutes have passed, you need to report how many trees are burnt.

The next line contains a single integer **Q** (1 <= Q <= 100), denoting the number of queries that you are asked. **Q** lines follow, each asking whether a tree at a certain position is safe for how many minutes. Note that the top-left-hand corner of the grid is cell (1,1) for this problem.

Output

In the first line of output, print the number of burnt trees after T minutes using the following format: **"Number of burnt trees: x."**. A tree is defined to be burnt if it is on fire. For each query, print, in a single line, the longest period (in minutes) such that the tree is safe from fire, with the following format: **"Tree at (x,y) is safe for t minutes."**

Sample Input 1

```
3 3
S S S
S F S
S S S
1
3
1 1
1 2
2 2
```

Sample Output 1

```
Number of burnt trees: 5.
Tree at (1,1) is safe for 2 minutes.
Tree at (1,2) is safe for 1 minutes.
Tree at (2,2) is safe for 0 minutes.
```

Sample Input 2

```
5 5
S S S S S
S S F S S
S S S S F
S S S S S
S S S S S
2
2
2 1
2 2
```

Sample Output 2

```
Number of burnt trees: 17.
Tree at (2,1) is safe for 2 minutes.
Tree at (2,2) is safe for 1 minutes.
```

Explanation

For sample input 1, after 1 minute, the woods will look like this:

```
S F S
F F F
S F S
```

Hence, 5 trees are burnt.

For the queries, tree at (1,1) is safe for 2 minutes. Tree at (1,2) is safe for 1 minute while the tree at (2,2) is safe for 0 minute (i.e. it is burnt from the beginning).

For sample input 2, the woods will look like this after 2 minutes:

```
S F F F F
F F F F F
S F F F F
S S F F F
S S S S F
```