

H P C O D E W A R S X V I I

You hop over a low barricade to discover an archeological dig at the side of the arena. Among the artifacts on display, there is a curious note:

problem **18**
Sapphire Search
13 points

I buried my sapphire then started walking. I always walked in a straight line following a compass direction (N, S, E, W). When I stopped, I made a 90 degree turn and continued walking. I might have crossed my path, but I don't remember. Below are the number of meters I travelled in each direction. I'm now lost and must abandon this record while I search for a way out. I'm placing this note under a rock at my final location. Perhaps some lucky adventurer will decode my note and retrace my steps to earn the treasure.

Unfortunately, there is no record of where in the ruins the note was found. Instead, you must write a program to find the treasure.

Input

The first line contains two integers X Y, representing the number of rows and columns in the ruins. Maximum of 20 rows and 50 columns. The next X lines show a grid map of the space. A period "." is an empty square. A hash "#" is a large boulder, marking a square that cannot be entered. The next line has an integer N, the count of the straight paths walked. Maximum of 20 paths. The last line contains N integers separated by spaces, showing the successive path-lengths..

```
5 10
#####
#.....#
#.#...##.#
#...#....#
#####
8
2 4 2 2 2 5 2 1
```

Output

Your program must print the same map, with the location of both the Sapphire (S) and the final location of the message (F) marked. Also, label every turning point with successive lowercase letters (if the same point is used more than once, print the letter for the later turn.) There is only one route which follows the path-lengths in the list.

```
#####
#b.e.a..f#
#.#...##.#
#c.d#S.Fg#
#####
```