Problem 6: Going Home

A little region of the world is divided into equal-sized rectangular areas. In this little region there are *n* little men and *n* little houses. Every little man can move horizontally or vertically but not diagonally to an adjacent area, being paid a $1.00 travel fee for every move he makes between adjacent areas until he enters a little house. Your task is to compute the minimum travel fees required to get these *n* little men into those *n* little houses. The task is complicated by the restriction that each little house can accommodate only one little man.

The input is a map of the region, and has one of the characters '.', 'H', or 'm' in each area. A '.' identifies an empty area, an 'H' identifies an area containing a little house, and an 'm' identifies an area containing a little man.

Each area is quite large; it can hold up to *n* little men and a little house at the same time. A little man can also enter an area containing a little house without necessarily entering the little house. Initially, however, each area will hold at most one little man or one little house.

Input

The input will contain multiple cases. Each case starts with a line having two integers *N* and *M*; *N* is the number of rows (of areas) in the grid map, and *M* is the number of columns (of areas). The remainder of the input for the case will be *N* lines giving the map, one line for each row of areas. *N* and *M* are each between 2 and 100, inclusive. There may be one or more trailing whitespace (blank or tab) characters on a line. The number of 'H's on the map will equal the number of 'm's on the map, and there will be at most 100 houses. The last case will be followed by a line containing two integer zeroes.

Output

For each case, display the case number (they start with 1 and increase sequentially) and the minimum number of dollars required for travel fees. The output format should resemble that shown in the sample output.

Sample Input

```
2 2
.m
H.
5 5
HH..m
.....
.....
.....
mm..H
7 8
...H....
...H....
...H....
mmmHmmmm
...H....
...H....
...H....
0 0
```

Output for the Sample Input

```
Case 1: $2
Case 2: $10
Case 3: $28
```