Overworld

You're playing an RPG. Your hero, mouse Stofl, is currently on the overworld map and you would like to go to different towns to do some quests. Time is running out (you have to safe the world after all), so you want to reach the town as soon as possible. In one second, Stofl can either move one tile up, down, left or right. Stofl can't cross mountain tiles, but he can walk on grassland and in towns just fine.

Input

The first line of the Input contains 2 integers n and m (separated by spaces). n is the height of the map and m is the width. Then there follows the map as ASCII image.

`#`	Mountain
`.`	Grassland
`s`	Stofl
`t`	Town

There is exactly one Stofl.

Output

For each town, print the minimal number of seconds you need to reach it from Stofls current position. If you can't reach the town, print -1 instead.

You should print these numbers in the order in which the towns appear in the input.

Limits

The tests consist out of 4 test groups, each worth 25 points.

- In test group 1 we have $n \leq 10$.
- In test group 2 we have $n \leq 50$.
- In test group 3 we have $n \leq 100$.
- In test group 4 we have $n \leq 300$.

Examples

Input	Output

`5 7`
`s.....`
`#######`
`##t##..`
`#####..`
`##..#..`
	`-1`

Stofl can't reach the town.

Input	Output
8 9 ....#####.. ..#.t.#.. ..#...... ..####### .... ###...s.. t........	24 7

Note that Stofl can't walk diagonally.