

Problem C. Chill Zone Fun

Program: doors.(cpp|java)
Input: doors.in
Balloon Color: Orange

IBM Chill Zone is known to be one of the World Finalists favorite place to hang out, have fun, and play some interesting games. As most of you know, the World Finals 2015 was held in Marrakesh, Morocco, and there was one of the games in IBM Chill Zone in Hotel Du Golf that was everyone's favorite, in this game you are given a grid that we will represent in the following form:

'.' empty cell, can pass.
'*' wall, can't pass.
'K' door, moves you from any door to any other door with 0 cost. Also, can be treated as an empty cell.
'S' represents the start.
'T' represents the target.

Game rules:

- You are allowed to use the door feature at most once in the whole game.
- With a cost of 1, you can pass from a cell to any of the four adjacent cells (up, down, left, right) if and only if it's an empty cell or a door cell.

Can you figure out the minimum cost required to get from the start to the target?

Input

The first line of the input contains an integer T ($1 \leq T \leq 1024$), the number of test cases.

The first line of each test case contains two integers r and c ($1 \leq r, c \leq 100$) and $r \times c \geq 2$. Then r lines follow, each line contains c characters and each character will be one of { '.', '*', 'K', 'S', 'T' }.

It's guaranteed that each grid will contain exactly one start S and exactly one target T .

Output

For each test case if it's possible to reach T from S print a single integer, the minimum cost required to get from S to T , otherwise print -1.

Examples

doors.in	Standard Output
3 2 15 ..*.*.....S** ..*T.....*.* 2 15 ..*K*...K*..S** ..*T.....*.* 2 15 ..*.*.....K.S** ..*T.....K*..*	10 7 -1