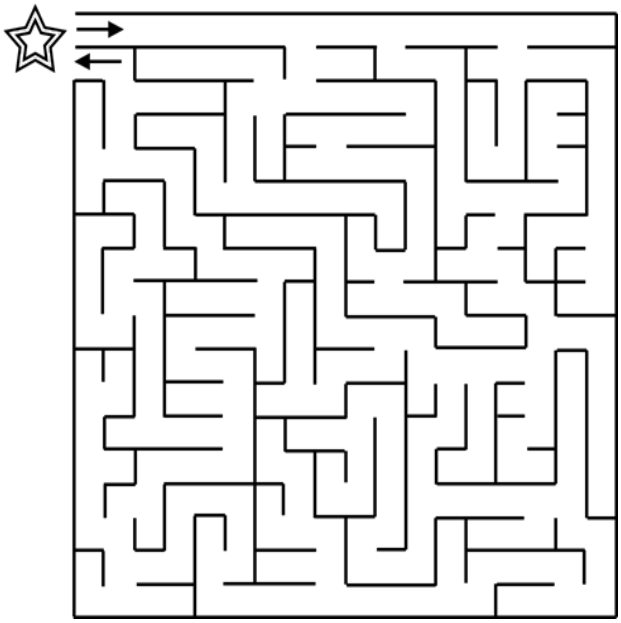
VALIDATE THE MAZE

There are many algorithms to generate maze. (http://en.wikipedia.org/wiki/Maze_generation_algorithm). After generating the maze we've to validate whether it's a valid maze or not. A valid maze has exactly one entry point and exactly one exit point (exactly 2 openings in the edges) and there must be at least one path from the entry point to exit point.



Given a maze, just find whether the maze is "valid" or "invalid".

Input

The first line consists of an integer t, the number of test cases. Then for each test case, the first line consists of two integers m and n, the number of rows and columns in the maze. Then contains the description of the matrix M of order mxn. M[i][j]=# represents a wall and M[i][j]='.' represents a space.

Output

For each test case find whether the maze is "valid" or "invalid".

Constraints

1<=t<=10000

1<=m<=20

1<=n<=20

Example

Input:
6
4 4

####
#...
#.##
#.##
5 5
#.###
#..##
##..#
#.#.#
###.#
1 1
.
5 1
#
#
.
.
#
2 2
#.
.#
3 4
#..#
#.##
#.##

Output:
valid
valid
invalid
valid
invalid
invalid