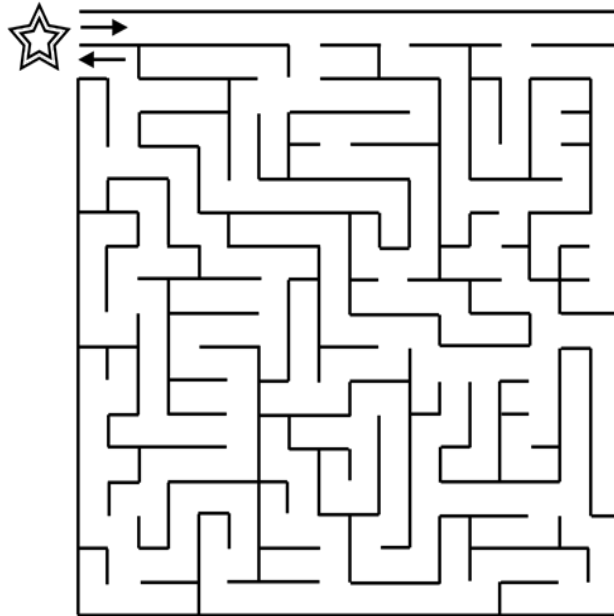


VALIDATE THE MAZE

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 $m \times n$. $M[i][j]=\#$ represents a wall and $M[i][j]='.'$ represents a space.

Output

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

Constraints

$$1 \leq t \leq 10000$$

$$1 \leq m \leq 20$$

$$1 \leq n \leq 20$$

Example

Input:

6

4 4

#...
#.#
#.#
5 5

#.#
##.#
#.#
###.#
1 1
.
5 1

.
.

2 2
#.
.#
3 4
#.#

###

Output:

valid
valid
invalid
valid
invalid
invalid