Problem E

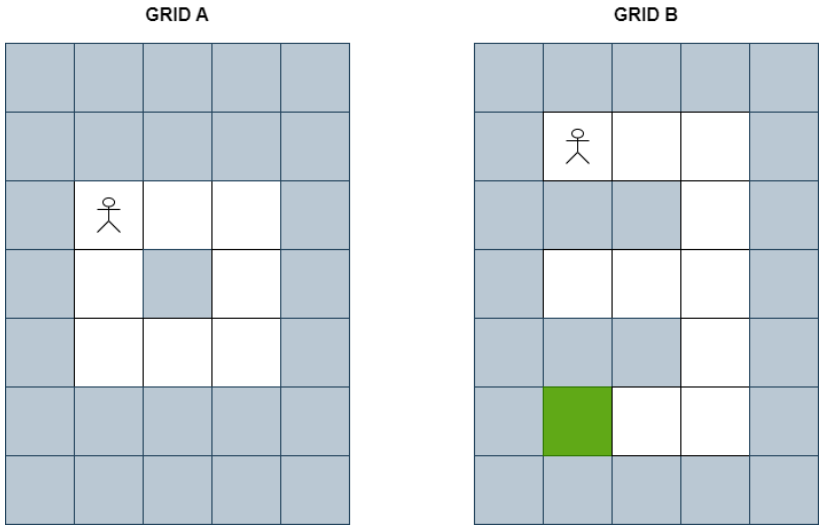
Long Distance Examination

Hero A (obviously an alias) is one of the applicants to the Super Resonant Psychic Hub (SRPH), the pre-eminent association of mentally-powered superheroes. After having passed the first round of exams, he is now currently on vacation in Vienna, Austria.

However, this vacation would soon be interrupted when he realizes that he misread the schedule for the final exam. It won't be taking place after he comes back from vacation... it's taking place *right now*!

Not wanting to spend the rest of his vacation reflecting on being rejected from his dream, he uses the full extent of his abilities to remotely conjure a clone of himself to take the exam, which he will control telepathically.

The exam requires applicants to utilize their psychic powers to navigate a maze, represented by an $r \times c$ grid (r rows and c columns) that we shall call Grid B. Hero A finds a room in Austria with the same $r \times c$ grid shape, and takes the examination from here; let's call this Grid A.



Hero A creates a clone (whom we'll call Clone B) that appears somewhere in Grid B. Whenever Hero A moves, Clone B attempts to mimic that motion as well (e.g. if Hero A takes a step to the right, Clone B will try to step to the right as well). The goal is to have Clone B navigate through the maze set up in Grid B and reach a marked destination.

Unfortunately, the setup isn't perfect. Although it is guaranteed that Grid A and Grid B have the same $r \times c$ dimensions, it's possible that Hero A and Clone B don't start at the same position in the grids. Also, both Grid A and Grid B have obstacles, but these obstacles could be placed in different locations!

Precisely, Clone B is controlled via the following manner.

- Hero A can only move horizontally and vertically, one step at a time.
- Neither Hero A nor Clone B can walk into obstacles, nor step out of the grid.
- When Hero A moves one step in a given direction, Clone B will *try* to move one step in the same direction.
    - In the case where Clone B's move is blocked, Clone B will not move.
    - This will not prevent Hero A from moving.

- If Hero A tries to take a step in a direction blocked by an obstacle or by a wall, neither he **nor Clone B** will move.

Additionally, Hero A needs to finish the exam as quickly as possible before the examiner realizes (they won't notice, right?) he was never there to begin with! Find the fewest number of steps Hero A needs to make in order for Clone B to reach the destination.

Input Format

The first line of input contains a single integer T, the number of test cases. The descriptions of the T test cases follow.

The first line of each test case contains the two space-separated positive integers r and c—the number of rows and columns for Grids A and B.

Then, r lines follow, each containing a string of length c. This encodes the state of Grid A.

Then, another r lines follow, each containing a string of length c. This encodes the state of Grid B.

The possible characters that may appear in each grid are as follows:

- "`.`": Empty space
- "`X`": Obstacle
- "`S`": Starting point (of Hero A in Grid A, or of Clone B in Grid B)
- "`D`": Destination/Goal of the clone (only appears in Grid B)

Output Format

For each test case, output an integer corresponding to the fewest number of moves needed to reach the destination. If the destination is unreachable, output -1 instead.

Constraints

Constraints
$1 \leq T \leq 10$ $1 \leq r, c \leq 100$ $2 \leq r \times c \leq 1000$ "`S`" appears exactly once in Grids A and B. "`D`" appears exactly once in Grid B.

Sample I/O

Input	Output
2 5 5 S.... ....S ....D 7 5 XXXXX XXXXX XS..X X.X.X X...X XXXXX XXXXX XXXXX XS..X XXX.X X...X XXX.X XD..X XXXXX	4 14

Explanation

In the first test case, though Hero A and Clone B have different starting points, Hero A only needs to move downward for Clone B to reach the destination.

In the second test case, Hero A can have Clone B reach the destination in the optimal number of steps by walking "clockwise" in his grid, twice.