

Problem 160: Race to the Finish!

Difficulty: Hard

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Problem Background

We're putting you in the driver's seat! You need to drive your car around the track as quickly as possible, without crashing into any walls. Success will depend on skillfully controlling your car's speed and direction.

Problem Description

The racecourse will be represented by a grid, which will indicate your starting position and a 3x3 region representing the finish line. Your position and velocity at any point can be represented by a pair of numbers; for your position, your location along the X and Y axes (X, Y); and for your velocity, your current speed along each axis (V_x, V_y). At the beginning of the race, your velocity will be $(0, 0)$. Your velocity may never exceed an absolute value of 3 along either axis.

Your car will move along the racecourse in a series of steps. At each step, your car will move according to its current velocity. For example, if your velocity is $(1, -2)$, your car will move one space upward and two spaces leftward. Following this movement, you will have the option to increase or decrease your car's speed by one along each axis. For example, you could change your car's velocity to $(0, -2)$ (reducing your X speed), $(2, -3)$ (increasing both your upward and leftward speed), or leave it at $(1, -2)$ unchanged.

If at any point your car's position is outside the bounds of the provided racetrack, or your car's position is occupied by a wall, you will have crashed. If your car's position is within the 3x3 finish area, you have completed the course. Your goal is to determine the fewest number of steps required to bring your car from its starting position to a position within the finish area.

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include:

- A line containing two positive integers separated by spaces, Y and X , representing the number of rows and columns in the racecourse, respectively.
- Y lines containing the layout of the racecourse. Each line will contain X characters, consisting of the following characters:
 - # (representing walls)
 - Spaces (representing open track)

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- A single uppercase letter C (representing your starting position)
 - Nine \$ symbols in a 3x3 area (representing the finish area)

Sample Output

For each test case, your program must print an integer representing the least number of steps required to reach the finish area.

5
17