AI Lab

Mid-Term Break Homework (Assignment 3): *ADVERSARIAL SEARCH*

Note:

1. Any code that you write will be helpful in the examinations. Please protect your codes and do not share your codes. The TAs/portal do a random check on plagiarism. If any part of the code is copied, even if it the standard code of a search, the TA will regard it as copied. We are not following the policy of the last year where copying the base codes was allowed. For the same reasons it may be risky to take codes from online repository or your seniors' repository.
2. Please maintain a local copy of your own codes. Please also maintain backup copies of your codes on secured email/drives/backup software.
3. Any form of copying will be attract negative marks and penalties
4. You can code inside lab as well as outside lab after the normal working hours, however the code should be your own
5. Any magnitude of verbal discussion outside lab is allowed. No codes must be exchanged
6. Please protect your own codes. Copying will more severely affect the person whose codes are taken.
7. The TAs/portal itself will check for plagiarism.
8. If your performance is very good during the semester and poor in the mid-sem and end-sem, it would be assumed that you have copied and all marks would be zeroed.
9. In the exams you will be allowed to carry your own codes, written apriori, but not of anybody else.

Consider a generalized tic-tac-toe game. The game is played on a game board of size $n \times n$. The players play one after the other. The first player to mark all columns of a row, all rows of a column, entire forward diagonal, or entire backward diagonal wins.

Input specification

The first line of input is the number of test cases (t). Then there are exactly t lines each line is a test case. Each test has the first number as n, the size of the tic-tac-toe game. Then there is a string of length n^2, presenting the current picture of the board in a row major format. Player 1 is marked as '1', player '2' is marked '2', while a black is marked by '*'. Note that the initial state may not be valid as per the game logic.

Sample Input

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2
3 12**1***2
3 12*******
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Question 1: Suppose that there are two players. However both players are bored and want to finish the game as early as possible. Being mature people, they do not care who wins or who loses the

game. Their only intention is to complete it as a boring assignment. Print the minimum number of moves it takes to complete the game.

Question 2: Suppose that there are two players who are experts of the game and are playing against each other. The game state is when the 1st player is to make a move. Print 1 if player 1 is guaranteed a win irrespective of how the 2nd player plans, -1 if player 1 is guaranteed to lose if the 2nd player plays optimally, and 0 if no such guarantee exists.

Question 3: Suppose that there are two players. Player 2 has no idea about the game and is playing randomly. The game state is when the 1st player is to make a move. Print the expected score of the game for Player 1, if the winner gets +1 and the loser gets -1. Print upto 1 place of decimal only. 1 is printed as 1.0, 1.65 is printed as 1.7.

Question 4: Suppose that there are three players. The first two players (1 and 2) are experts, but the 3rd player is only playing the game to kill time. The player does not care about winning and losing. The 3rd player always searches the board in a row major format, and fills in the first unoccupied cell. The order of play is: Player 1, Player 2, and then Player 3. The game state is when the 1st player is to make a move. Print 1 if player 1 is guaranteed a win irrespective of how the 2nd player plans, -1 if player 1 is guaranteed to lose if the 2nd player plays optimally, and 0 if no such guarantee exists.

Question 5: Suppose that there are three players. Players 2 and 3 are friends and are playing collectively so that player 1 loses. Winning of player 2 and player 3 does not matter to them. The game state is when the 1st player is to make a move. Print 1 if player 1 is guaranteed a win irrespective of how the other players play, -1 if player 1 is guaranteed to lose if the other players play optimally, and 0 if no such guarantee exists.

Question 6: Suppose that there are three players. Each player attempts to win without forming any alliances. The game state is when the 1st player is to make a move. Print 1 if player 1 is guaranteed a win, print 2 if player 2 is guaranteed a win, print 3 if player 3 is guaranteed a win, 0 otherwise.