

## 6693 Flow Game

Flow game is a popular game now on smart phone due to the invention of multi-touch screen. The rule of the game is easy. Given a board with  $N \times N$  grids and given a set of paired color dots, please find a way to connect paired color dots without crossing the paths of others as in Fig. 1.

Fortunately, the flow games you need to solve only have two pairs of color dots and the color dots only appear on the locations of boundary cells. For example, Fig. 2 shows the boundary cells in a  $5 \times 5$  grids.

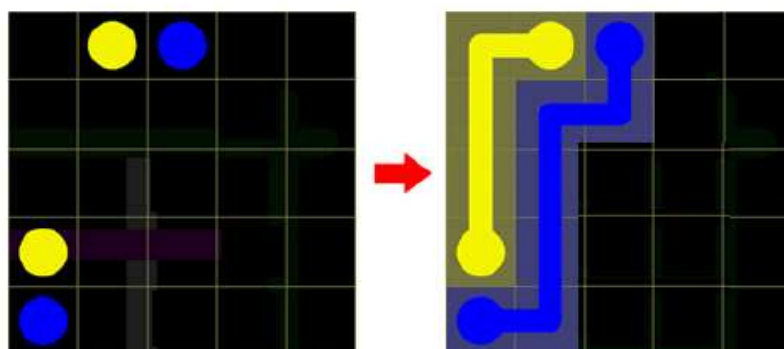


Figure 1: The screen shot of a flow game.

Once you connect two pairs of color dots, there is a cost for your solution. The cost of your solution is the number of painted cells (including two end dots). For example, in Fig. 1, blue line paints 7 cells and yellow line paints 5 cells. So, the total cost is 12 which is minimum in this game. Given an  $N \times N$  grids, please output the minimum cost to connect the color dots.

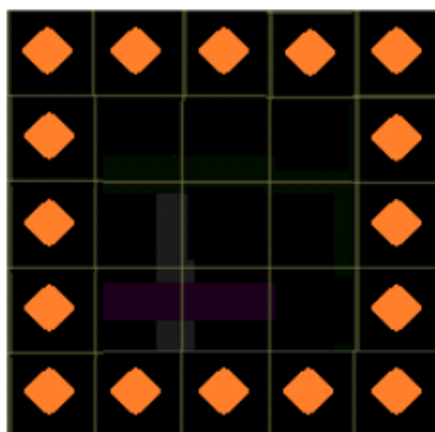


Figure 2: The boundary cells.

### Input

The test data begins with a positive integer  $T$ , which is the number of test cases. Each test case begins with a positive integer  $N$  ( $N < 10$ ), which is the size of the board. Following is  $N \times N$  cells of board data. An empty cell is represented by a '.'. Color dots are described by '1', '2'.

## Output

Please output the minimum cost to connect the two pairs of dots. If there is no solution to a given game, please output '-1' in a new line.

## Sample Input

```
2
5
.12..
.....
.....
1....
2....
5
.21..
.....
1....
2....
.....
```

## Sample Output

```
12
-1
```