UVa Online Judge

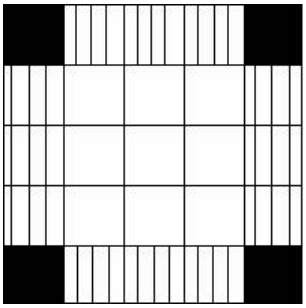
11606 Atoms

Atoms is a two player game consisting of an $N * N$ grid. The top-left cell has a coordinate of $(0, 0)$ and the bottom-right has a coordinate of $(N - 1, N - 1)$. Each player has an infinite number of *atoms* with them. Every *atom* of player one has the same color. The *atoms* of player two also have same color but they are different from those of player one. The two players take turns to place *atoms* on the grid. On each turn, a player selects a *stable* cell to place one *atom* from his collection. The rule for *stability* is simple; the cell must either be empty or it must already contain an *atom* of that players color. There is however an upper limit to the number of *atoms* a cell may contain and they are described below:

i) The four corner cells can contain at most 1 *atom*.

ii) The other outer cells can contain at most 2 *atoms*.

iii) The remaining cells can contain at most 3 *atoms*.



As an example, the figure above shows a grid of 5×5. The filled cells can contain at most 1 *atom* each. The stripped ones can contain at most 2 *atoms* each and the blank ones can contain at most 3 *atoms* each.

When selecting a *stable* cell, the two players follow rather simple rules:

i) First, player one places an *atom* on a randomly selected cell.

ii) Player two looks for a cell whose minimum distance from any cell occupied by *atoms* of player one is maximized. Here distances between cells are measured as Manhattan distance. The Manhattan distance between two cells is the sum of the absolute row difference and column difference. For example, the Manhattan distance between (1, 5) and (4, 2) is equal to (4-1) + (5-2) = 3 + 3 = 6.

iii) In case of multiple cells fulfilling the criteria of rule (ii), the cell with lowest row number is selected. If there is still a tie, then the cell with lowest column number is selected.

iv) Player one then follows a similar strategy to that described in (ii) to place another *atom* and the game continues likewise.

If a player is unable to make any valid move, then he is considered the loser and the game stops there.

Your task in this problem is simple. Given a state of the grid, you are to determine if this state is achievable if the players follow the rules mentioned earlier.

Input

The first line of input will start with a positive integer $T < 50$, where T denotes the number of test cases. Each case will begin with a number N ($3 \leq N \leq 7$) which denotes the size of the grid for that case. N lines will follow with N integers on each line. The absolute value of these integers will be less than 10^7. A positive integer means player one has placed *atoms* in the corresponding cell and negative integer means player two placed *atoms* in the cell. The number of *atoms* in a cell is denoted by the absolute value of the cell.

Output

For each case, output the case number first. If the given configuration is valid output '`valid`', otherwise output '`invalid`'. Look at the sample in/out for exact format.

Sample Input

```
2
3
1 0 0
0 0 0
0 0 -1
3
2 0 0
0 0 0
0 0 0
```

Sample Input

```
Case 1: valid
Case 2: invalid
```