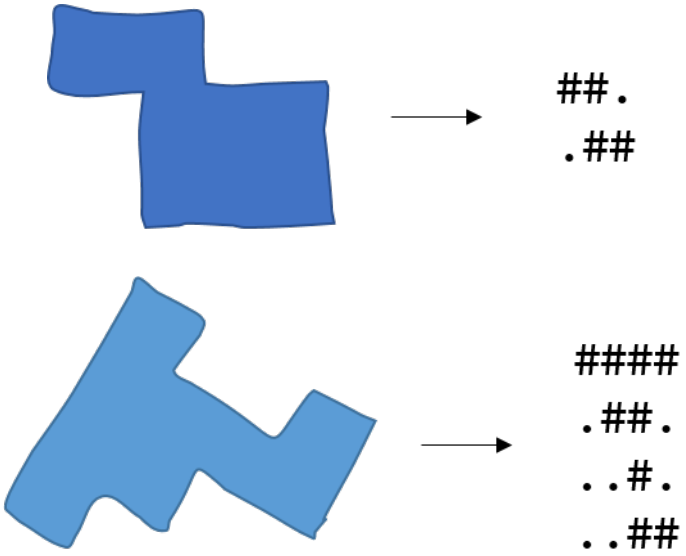
Bacteria

Description

You have some bacteria, they want to play tetris. In order to play tetris, they have malformed into some polygon with each angle a right angle. Now you have recorded the polygon that bacteria formed, and try to figure out what shape it represents.

To fully understand your bacteria, you need to use grid representation to draw it down. However, it does not required to be exactly. The only thing you need is to preserve the relative positions inside each part of the bacteria. There may have several way to describe this grid, you need to find the smallest one in size (i.e. number of characters you need to output). If there are still a tie, output the lexicographically smallest one if you concatenate every row into a single string.

Note that you can only rotate your bacteria, but not flip it.



Input

There is an integer in the first line, indicating the number of test cases. The first line of each test case contains an integer n. Each of the next n lines contains a pair of integers x_i, y_i representing the coordinates of each corner of the bacteria, clockwise or counter-clockwise. You may assume that all input data is correct and the bacteria is not self-intersecting.

- $1 \leq T \leq 100$.
- $1 \leq n \leq 100$.
- $0 \leq |x_i|, |y_i| \leq 10000$.

Output

For each test case, please output the number of rows and columns first, then the desired grid representation of this bacteria. Please see sample output for more information.

Sample Input

```
2
8
0 5
3 5
3 3
9 3
9 0
1 0
1 3
0 3
12
0 2
4 6
5 5
4 4
6 2
7 3
8 2
6 0
4 2
3 1
2 2
1 1
```

Sample Output

```
2 3
##.
.##
4 4
####
.##.
..#.
..##
```