Problem A - Battle for Piltover

Description

Another day rises in the prosperous city of Piltover. You, a student of ancient artifacts and the mysterious knowledge of the arcane, make your way to your laboratory for another day of exhausting research. As you enter the campus, you hear a loud, disturbing sound roaring through the entire city. It's the emergency alarm! Suddenly, you see your professor, Dr. Heimerdinger, running across the halls, with a very preoccupied look on his face.

Figure 1 - Piltover cinematic.

"Professor, what's the matter?!"
"Noxus! Noxus is the matter! I predicted they would eventually try to expand their power over to Piltover, but I did not anticipate that it would happen so soon! I still haven't finished planning our new defence system!"

An idea sparks in your head. «If I can help Professor Heimerdinger defend our city, maybe he will finally promote me from the Bronze laboratory to the prestige Challenger class!»

"Let me help you professor! What do you need?"
"Follow me!"

You rush across the campus to Professor Heimerdinger's office. As you arrive, you notice a grid overlay of the city drawn on the board.

Figure 2 - Grid representation of the city, with 1 wall and 3 outposts.

The professor begins to explain:

"I am very close to perfecting my new H-28 G Evolution **turrets**! They can fire in all directions and are perfect to defend our many **outposts** across Piltover. In fact, each outpost has already requested a specific number of my new turrets. However, the turrets still lack a critical safety feature: if one turret is in the line of sight of another turret, they will destroy each other! Oh, I fear I do not have the time to calculate the optimal disposition of turrets across the city without having them blasting themselves to bits! Do you think you can help me?"

"Certainly, Professor!"

Turrets (*T*) fire in orthogonal directions (left, up, right and down). A turret can cover all cells in each of these directions, including the cell where it has been placed, unless blocked by a **wall** or an outpost. Cells can be covered my more than one turret at the same time.

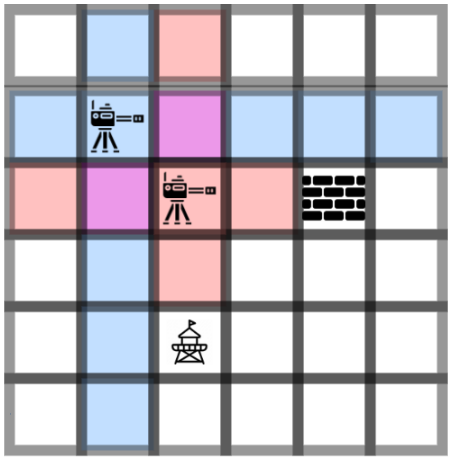

Figure 2 - The leftmost turret covers all cells in blue. The second turret covers all cells in red.

Each outpost (*O*) has an associated number of **required turrets**, ranging from 0 to 4, that need to be placed directly adjacent to the outpost, in orthogonal directions. No outpost can have more or less than its required turrets surrounding it.

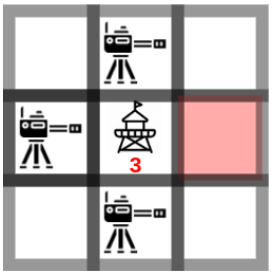

Figure 3 - This outpost requires 3 turrets. Required turrets can be placed either on the left, up, right or down of the outpost. No turret can be placed in the red empty cell, as it would exceed this outpost's required turrets constraint.

Your mission is simple. Given a grid of the city of Piltover, where each cell is either empty, a wall or an outpost, find the **minimum** number of turrets you need to place on the grid so that: all empty cells are covered by at least one turret; all outposts are defended by exactly the number of turrets they requested; no two turrets are in each other's line of sight.

Input

The input starts with one line containing one integer *T* that corresponds to the number of test cases. Then, *T* input blocks follow.

Each input block starts with a line containing the number of rows *R* and columns *C* of the grid *G* separated by whitespace. Then, *R* lines follow, each representing a row of the city grid, containing *C* characters. Each character can either be: a ' . ', representing an empty cell; a '#', representing a wall; an integer between 0 and 4 representing an outpost.

Output

For each test case, you should print the **minimum number of turrets** *S* required to defend the city in the format "*S*\n". If no solution is found, you should output "noxus will rise!\n".

Constraints

1 <= T <= 100
1 <= R,C <= 15
0 <= O_i <= 4

Example

Input:

```
2
7 7
1.2..1#
#......
......0
.......
0......
......#
#1..#.#
3 5
.3...
....2
.....
```

Output:

```
7
noxus will rise!
```

Explanation

There are 2 test cases. In the first test case, there are 6 walls and 6 outposts: two outposts require 0 turrets, three outposts require 1 turret and one outpost requires 2 turrets. A solution with the minimum number of turrets placed is: ("x" marks turrets)

```
1x2x-1#
#----x-
x-----0
-------
0-----x
----x-#
#1x-#-#
```

In the second test case, there is no valid solution.