Problem J: Stars and Lasers

Filename: `j`

Time Limit: `2 seconds`

Galactic superstar Nota Bair has observed a decrease in morale among her fans. She suspects that it probably has to do with her touring hiatus and nothing to do with the ongoing war between the cats and dogs. Regardless, Nota has decided to host a dance-off! Nota asked many of her superstar friends to join her in the highly publicized dance-off.

On the day of the event, almost everything has been set up. However, the background lighting still needs to be prepared. Nota has asked you for help. The chosen venue has an unusual backdrop display that the Company set up beforehand. The display is made up of individual stars arranged into rows and columns, where each star can be lit or unlit. Using a set of giant lasers, the Company is able to light up some of the stars, but not every combination is possible. Each row and column of stars have a laser. If a row laser is turned on, then every star in that row is turned on; the same goes for the column. However, if both the row and column laser are turned on, the star that sits at the intersection of the lasers will be off.

Nota has provided you with images she would like displayed on the light board, but doesn't know if it's possible. The Company also wants you to activate the fewest lasers possible, because each activation costs the Company millions of dollars. Help her determine if the image is possible to create, and if so, which lasers to activate.

Problem

Given the desired state of the star grid, determine the activation states of row and column lasers such that the requested image is completed using the fewest possible activations.

Input

The first line will contain a single integer **d**, the number of display plans to check. Then, **d** display ideas will follow. The first line of each display contains two integers, **r** and **c**, the rows and columns of lightbulbs, respectively. Then, **r** lines will follow, each containing **c** characters, 0 if the star should be off, and 1 if the star should be on.

Output

For each case, print "`impossible`" if the state is not possible, otherwise print the state of the row lasers on one line and the state of the column lasers on the next. If there are multiple possible activation arrangements, output the lexicographically smallest. Namely, if the state of the row laser activations were read as a single binary number (100 for the first sample), this binary number should be minimized. If two solutions exist with the same minimal row setting, then the binary representation of the column number should be minimized.

Input Bounds and Corresponding Credit

- $1 \le \mathbf{d} \le 15$
- $1 \le \mathbf{r}, \mathbf{c} \le 1000$

Samples

Input	Output
3 3 3 101 010 010 2 4 1111 0000 2 4 1100 0101	1 0 0 0 1 0 1 0 0 0 0 0 impossible