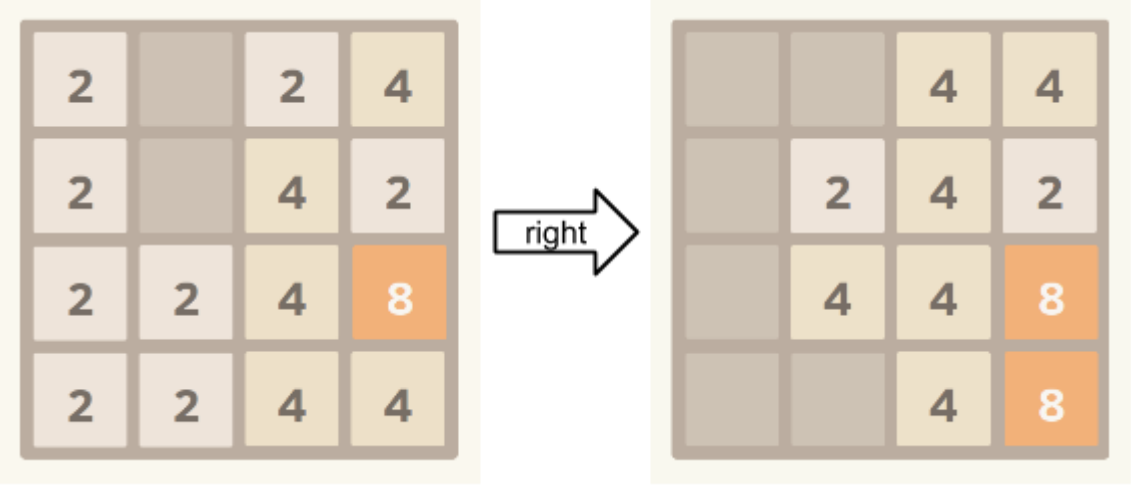
Kick Start 2014 - Round A

Super 2048

Problem

2048 is a famous single-player game in which the objective is to slide tiles on a grid to combine them and create a tile with the number 2048.

2048 is played on a simple 4 x 4 grid with tiles that slide smoothly when a player moves them. For each movement, the player can choose to move all tiles in 4 directions, left, right, up, and down, as far as possible at the same time. If two tiles of the same number collide while moving, they will merge into a tile with the total value of the two tiles that collided. **In one movement, one newly created tile can not be merged again and always is merged with the tile next to it along the moving direction first.** E.g. if the three "2" are in a row "2 2 2" and the player choose to move left, it will become "4 2 0", the most left 2 "2" are merged.



The above figure shows how 4 x 4 grid varies when player moves all tiles 'right'.

Alice and Bob accidentally find this game and love the feel when two tiles are merged. After a few round, they start to be bored about the size of the board and decide to extend the size of board to **N** x **N**, which they called the game "Super 2048".

The big board then makes them dazzled (no zuo no die -_-|). They ask you to write a program to help them figure out what the board will be looked like after all tiles move to one specific direction on a given board.

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow. The first line of each test case gives the side length of the board, **N**, and the direction the tiles will move to, **DIR**. **N** and **DIR** are separated by a single space. **DIR** will be one of four strings: "left", "right", "up", or "down".

The next **N** lines each contain **N** space-separated integers describing the original state of the board. Each line represents a row of the board (from top to bottom); each integer represents the value of a tile (or 0 if there is no number at that position).

Output

For each test case, output one line containing "Case #x:", where x is the test case number (starting from 1). Then output **N** more lines, each containing **N** space-separated integers which describe the board after the move in the same format as the input.

Limits

Time limit: 30 seconds per test set.
Memory limit: 1GB.
Each number in the grid is either 0 or a power of two between 2 and 1024, inclusive.

Small dataset (Test set 1 - Visible)

1 ≤ **T** ≤ 20
1 ≤ **N** ≤ 4

Large dataset (Test set 2 - Hidden)

1 ≤ **T** ≤ 100
1 ≤ **N** ≤ 20

Sample

Sample Input

```
3
4 right
2 0 2 4
2 0 4 2
2 2 4 8
2 2 4 4
10 up
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
2 0 0 0 0 0 0 0 0 0
3 right
2 2 2
4 4 4
8 8 8
```

Sample Output

```
Case #1:
0 0 4 4
0 2 4 2
0 4 4 8
0 0 4 8
Case #2:
4 0 0 0 0 0 0 0 0 0
4 0 0 0 0 0 0 0 0 0
4 0 0 0 0 0 0 0 0 0
4 0 0 0 0 0 0 0 0 0
4 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0
Case #3:
0 2 4
0 4 8
0 8 16
```