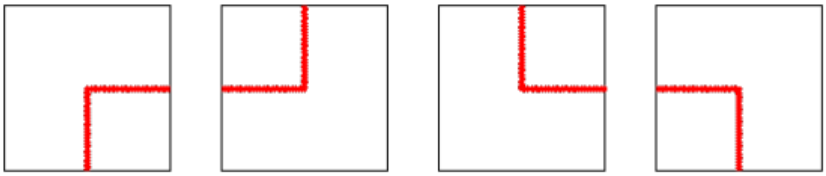
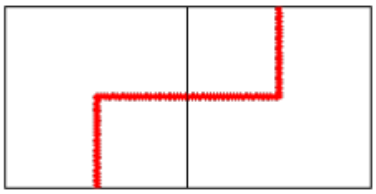
7906 Mr.Panda and TubeMaster

Mr.Panda loves playing games. Recently he falls in love with a game named TubeMaster.

In TubeMaster, players can build tubes in cells in a $N \times M$ table. Each cell can be either left empty or put in exact one of the following four kinds of tubes.



When two adjacent cells sharing a same edge are connected by tubes (e.g. the picture on the right), the player will gain some score (the score will be described in the Input section).



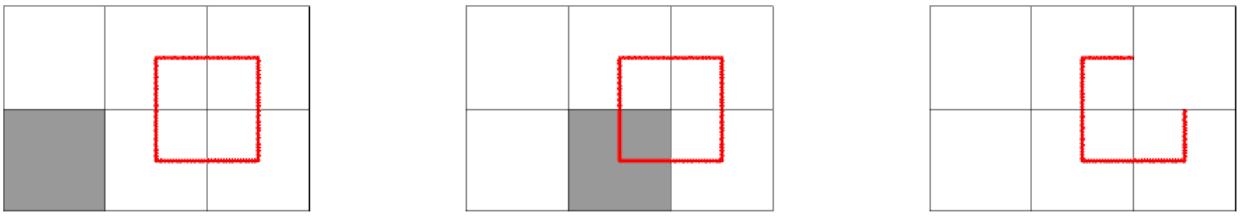
Some of the cells are considered as essential cells, which means each of such cells is required to contain a tube, otherwise the player loses the game.

Before the end of the game, the table needs to be a valid configuration, otherwise the player loses the game.

A valid configuration has to meet the following conditions:

- Each cell needs to contain either no tube or a tube which is in a tube cycle.
- Each of the essential cells needs to contain a tube.

Note that multiple tube cycles might appear in a valid configuration simultaneously and an empty table can also be a valid configuration when there are no essential cells.



In the tables above, the left one is a valid configuration while the middle one and the right one are not. (grey cells are essential cells)

Mr. Panda wants to win the game with a maximum accumulation of scores. Could you please help him calculate the value?

Input

The first line of the input gives the number of test cases, T.

T test cases follow. Each test case starts with a line containing two numbers separated by a space, N and M indicating the number of rows and the number of columns of the table.

Then N lines follow, each line contains $M - 1$ numbers separated by spaces where $ScoreC_{i,j}$ (i.e. the j-th number in the i-th line) indicates the score of connecting the cell (i, j) and cell $(i, j + 1)$ with tubes.

Then $N-1$ lines follow, each line contains M numbers separated by spaces where $ScoreR_{i,j}$ (i.e. the j-th number in the i-th line) indicates the score of connecting the cell (i,j) and cell $(i+1,j)$ with tubes.

Then there will be a line containing a number, E the number of essential cells.

Finally E lines follow, each line contains two number separated by a space, R_i and C_i indicating that the cell (R_i, C_i) is an essential cell.

Output

For each test case, output one line containing '`Case #`x`:` y', where x is the test case number (starting from 1) and y is the maximum accumulation of scores if Mr. Panda wins the game. If Mr. Panda cannot win the game, output '`Impossible`' for y.

Limits:

- $1 \leq T \leq 100$.
- $1 \leq N, M \leq 30$.
- $-500 \leq ScoreC_{i,j}, ScoreR_{i,j} \leq 500$.
- $0 \leq E \leq 100$.
- $1 \leq R_i \leq N$.
- $1 \leq C_i \leq M$.
- For 40% of the test cases, $N, M \leq 10$ holds.

Sample Input

```
2
4 4
0 0 -1
0 1 0
0 -1 -1
0 1 0
1 0 1 0
-1 -1 0 0
1 1 -1 -1
1
3 3
2 3
0 0
0 0
0 0 0
2
1 1
2 3
```

Sample Output

```
Case #1: 2
Case #2: Impossible
```