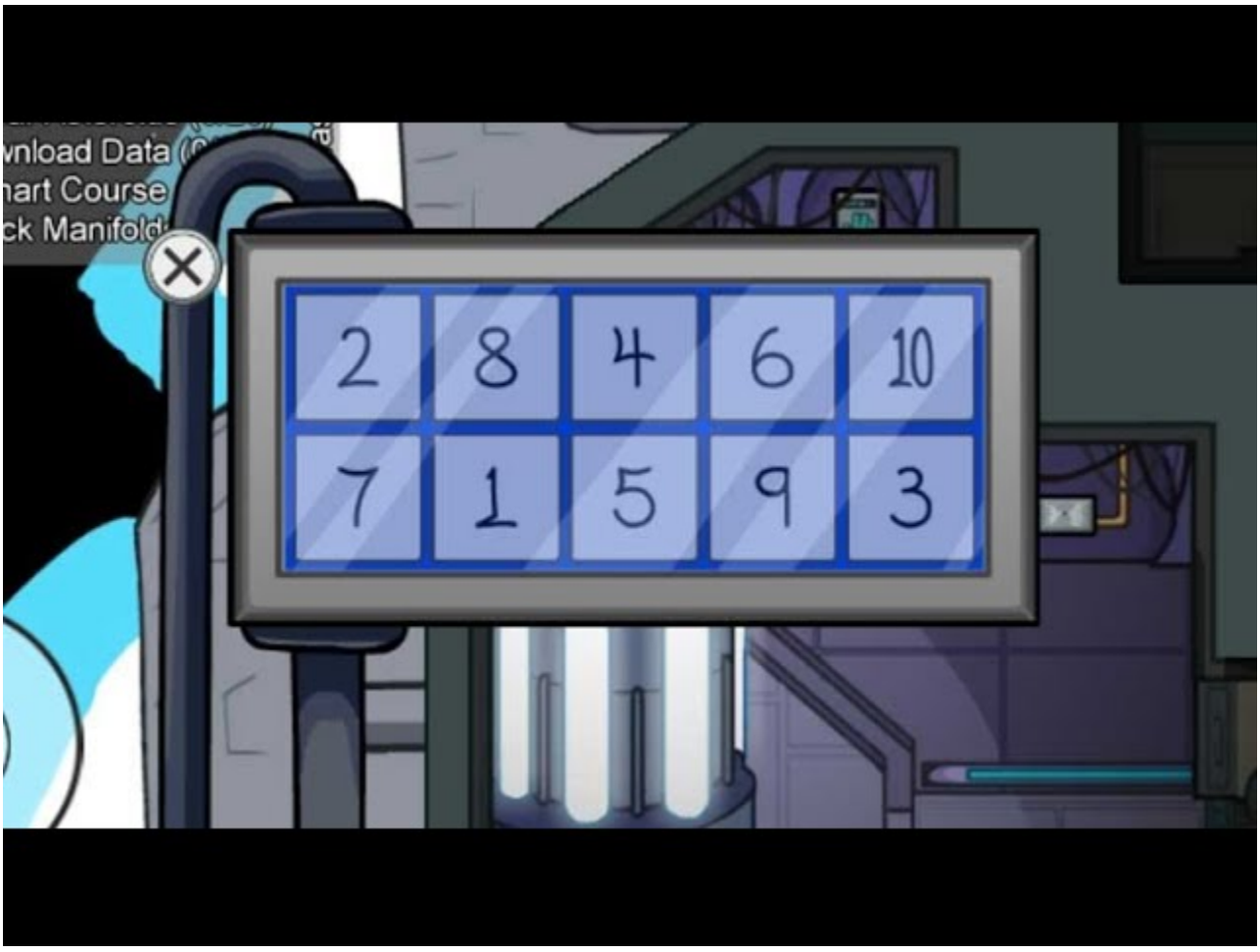
Problem 4: Sussy Smooth Brain Tasking
6 Points

Problem ID: `unlockmanifolds`
Rank: `2`

Introduction

After being invited by your friend still stuck in the pandemic to play Among Us five years later, you are sick of doing tasks. Being the imposter is sus, but being a crewmate has become bovine. In a flash of inspiration, you decide to make a robot to complete tasks for you. Your first goal, unlocking the manifolds before red vents into reactor.



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Problem Statement

You are given a grid $\mathbf{G}$ of integers with $\mathbf{N}$ rows and $\mathbf{M}$ columns. Each tile on the grid represents a button that is labeled with an integer from 1 to $\mathbf{N} \times \mathbf{M}$. Starting with your cursor at the top left of the grid $\mathbf{G}$[0][0], your goal is to count the minimum number of actions needed to visit every button in order from 1 to $\mathbf{N} \times \mathbf{M}$.

An action is defined as one of the following:

- Move the cursor to an adjacent button: up, down, left, right
- Do nothing (take an action to do nothing!)

The cursor also wraps around the screen. So if the cursor moves such that it exits the top of the screen, it will appear at the bottom of the same column.

Find the minimum number of actions required to visit each button in ascending order.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains 2 spaced integers $\mathbf{N}$ $\mathbf{M}$ denoting the rows and columns of the board, respectively.
- The next $\mathbf{N}$ lines each contain $\mathbf{M}$ space-separated integers, representing a row of the grid.

Output Format

For each test case, output a single integer denoting the minimum number of actions required to visit each button in ascending order.

Constraints

Time Limit: **1 Second**
Memory Limit: **1024 MB**

$1 \leq \mathbf{T} \leq 10$
$1 \leq \mathbf{N}, \mathbf{M} \leq 200$

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Sample Test Cases

Sample Input Download

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

Sample Output Download

```
10
6
7
7
0
```

Sample Explanations

For test case #1, 10 actions are enough to visit every button in ascending order. Note this optimal use of moves takes advantage of wrapping around the screen.

For test case #2, 6 actions are enough to visit every button in ascending order. This is achieved with the following sequence of actions:

1. Move right, ending up on button 3.
2. Move down, ending up on **button 1**.
3. Move left, ending up on **button 2**.
4. Move up, ending up on button 4.
5. Move right, ending up on **button 3**.
6. Move left, ending up on **button 4**.

For test case #3, 7 actions are enough to visit every button in ascending order. This is achieved with the actions:

Note that we start having already visited **button 1**.

1. Move right, ending up on **button 2**.
2. Move right, ending up on **button 3**.

   ⋮

7. Move right, ending up on **button 8**.

For test case #4, 7 actions are enough to visit every button in ascending order. This is achieved the same way as in sample test case #3, except we repeatedly move left instead of right.

For test case #5, 0 actions is enough to visit every button in ascending order since we start having already visited **button 1**.