130. Surrounded Regions

Given a 2D board containing `'X'` and `'O'` (**the letter O**), capture all regions surrounded by `'X'`.

A region is captured by flipping all `'O'`s into `'X'`s in that surrounded region.

Example:

```
X X X X
X O O X
X X O X
X O X X
```

After running your function, the board should be:

```
X X X X
X X X X
X X X X
X O X X
```

Explanation:

Surrounded regions shouldn't be on the border, which means that any `'O'` on the border of the board are not flipped to `'X'`. Any `'O'` that is not on the border and it is not connected to an `'O'` on the border will be flipped to `'X'`. Two cells are connected if they are adjacent cells connected horizontally or vertically.

找到被包围的区域

DFS, Graph

1. DFS mark the target and its connected areas located in four boarders
2. iterate the 2D array with specific targets
3. **只遍历Graph边界**

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200. Number of Islands

Given an `m x n` 2d `grid` map of `'1'`s (land) and `'0'`s (water), return *the number of islands*.

An **island** is surrounded by water and is formed by connecting adjacent lands horizontally or vertically. You may assume all four edges of the grid are all surrounded by water.

Example 1:

```
Input: grid = [
  ["1","1","1","1","0"],
  ["1","1","0","1","0"],
  ["1","1","0","0","0"],
  ["0","0","0","0","0"]
]
Output: 1
```

Example 2:

```
Input: grid = [
  ["1","1","0","0","0"],
  ["1","1","0","0","0"],
  ["0","0","1","0","0"],
  ["0","0","0","1","1"]
]
Output: 3
```

Constraints:

- `m == grid.length`
- `n == grid[i].length`
- `1 <= m, n <= 300`
- `grid[i][j]` is `'0'` or `'1'`.

小岛个数

DFS, Graph

二维数组找group of 1的个数

1. two loops to iterate the graph
2. if current position is 1, island count++, DFS this position
3. border cases to end DFS, mark currrent position as visited, DFS four directions

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417. Pacific Atlantic Water Flow

Given an `m x n` matrix of non-negative integers representing the height of each unit cell in a continent, the "Pacific ocean" touches the left and top edges of the matrix and the "Atlantic ocean" touches the right and bottom edges.

Water can only flow in four directions (up, down, left, or right) from a cell to another one with height equal or lower.

Find the list of grid coordinates where water can flow to both the Pacific and Atlantic ocean.

Note:

1. The order of returned grid coordinates does not matter.
2. Both *m* and *n* are less than 150.

Example:

```
Given the following 5x5 matrix:

  Pacific ~   ~   ~   ~   ~
       ~  1   2   2   3  (5) *
       ~  3   2   3  (4) (4) *
       ~  2   4  (5)  3   1  *
       ~ (6) (7)  1   4   5  *
       ~ (5)  1   1   2   4  *
          *   *   *   *   * Atlantic

Return:

[[0, 4], [1, 3], [1, 4], [2, 2], [3, 0], [3, 1], [4, 0]] (positions with parentheses in
```

太平洋大西洋水流

DFS, Graph

1. two boolean[][] to determine whether current position is true
2. DFS search four boarders
3. DFS four directions, if the position is visited or previous height is greater to end the DFS

547. Number of Provinces

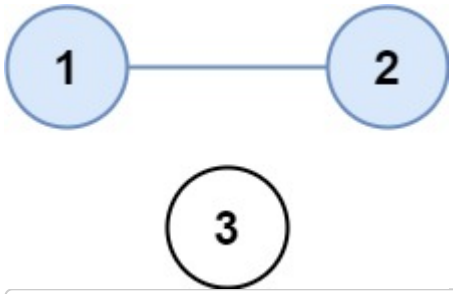
There are `n` cities. Some of them are connected, while some are not. If city `a` is connected directly with city `b`, and city `b` is connected directly with city `c`, then city `a` is connected indirectly with city `c`.

A **province** is a group of directly or indirectly connected cities and no other cities outside of the group.

You are given an `n x n` matrix `isConnected` where `isConnected[i][j] = 1` if the i^{th} city and the j^{th} city are directly connected, and `isConnected[i][j] = 0` otherwise.

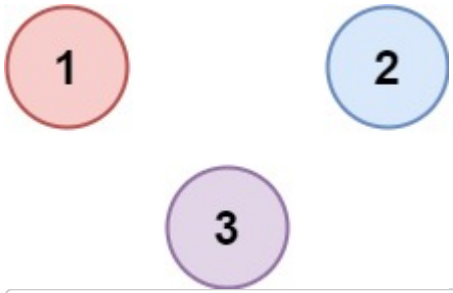
Return *the total number of* ***provinces***.

Example 1:




```
Input: isConnected = [[1,1,0],[1,1,0],[0,0,1]]
Output: 2
```

Example 2:




```
Input: isConnected = [[1,0,0],[0,1,0],[0,0,1]]
Output: 3
```

Constraints:

- `1 <= n <= 200`
- `n == isConnected.length`
- `n == isConnected[i].length`
- `isConnected[i][j]` is `1` or `0`.
- `isConnected[i][i] == 1`
- `isConnected[i][j] == isConnected[j][i]`

找出多少个forest

DFS, Graph, connected components

each row represents each node, and each col represents the connectivity with other nodes

1. boolean visited array to store visited node
2. DFS non-visited node, and its neighbors until all nodes are connected
3. increment the count after finishing DFS the node.

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695. Max Area of Island

Given a non-empty 2D array `grid` of 0's and 1's, an **island** is a group of `1`'s (representing land) connected 4-directionally (horizontal or vertical.) You may assume all four edges of the grid are surrounded by water.

Find the maximum area of an island in the given 2D array. (If there is no island, the maximum area is 0.)

Example 1:

```
[[0,0,1,0,0,0,0,1,0,0,0,0,0],
 [0,0,0,0,0,0,0,1,1,1,0,0,0],
 [0,1,1,0,1,0,0,0,0,0,0,0,0],
 [0,1,0,0,1,1,0,0,1,0,1,0,0],
 [0,1,0,0,1,1,0,0,1,1,1,0,0],
 [0,0,0,0,0,0,0,0,0,0,1,0,0],
 [0,0,0,0,0,0,0,1,1,1,0,0,0],
 [0,0,0,0,0,0,0,1,1,0,0,0,0]]
```

Given the above grid, return `6`. Note the answer is not 11, because the island must be connected 4-directionally.

Example 2:

```
[[0,0,0,0,0,0,0,0]]
```

Given the above grid, return `0`.

Note: The length of each dimension in the given `grid` does not exceed 50.

找最大面积的岛屿

DFS, Graph

找面积最大的group of 1

1. same approach as **200**
2. 主函数返回最大岛屿数量，DFS返回对当前点四个方向进行DFS找到1的个数
3. return max(res, dfs result)
