2023-07-08 - Handout – UnionFind

Q1. Redundant Connection

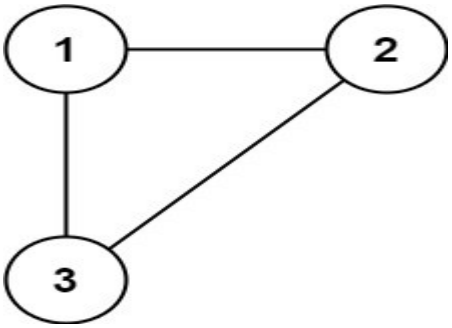
Link: https://leetcode.com/problems/redundant-connection/

In this problem, a tree is an undirected graph that is connected and has no cycles.

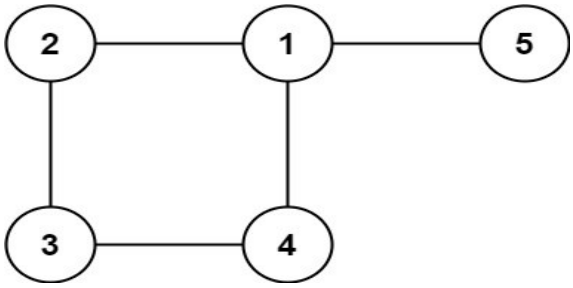
You are given a graph that started as a tree with n nodes labeled from 1 to n, with one additional edge added. The added edge has two different vertices chosen from 1 to n, and was not an edge that already existed. The graph is represented as an array edges of length n where edges[i] = [ai, bi] indicates that there is an edge between nodes ai and bi in the graph.

Return an edge that can be removed so that the resulting graph is a tree of n nodes. If there are multiple answers, return the answer that occurs last in the input.

```
Example 1:
Input: edges = [[1,2],[1,3],[2,3]]
Output: [2,3]
```




```
Example 2:
Input: edges =
[[1,2],[2,3],[3,4],[1,4],[1,5]]
Output: [1,4]
```



Q2. Number of Islands

Link: https://leetcode.com/problems/number-of-islands/

Given an m x n 2D binary grid grid which represents a 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
```

Q3. Most Stones Removed with Same Row or Column

Link: https://leetcode.com/problems/most-stones-removed-with-same-row-or-column/

On a 2D plane, we place n stones at some integer coordinate points. Each coordinate point may have at most one stone.

A stone can be removed if it shares either **the same row or the same column** as another stone that has not been removed.

Given an array stones of length n where stones[i] = [xi, yi] represents the location of the ith stone, return the largest possible number of stones that can be removed.

```
Example 1:
Input: stones =
[[0,0],[0,1],[1,0],[1,2],[2,1],[2,2]]
Output: 5
```

```
Example 2:
Input: stones =
[[0,0],[0,2],[1,1],[2,0],[2,2]]
Output: 3
```

Q4. Accounts Merge

Link: https://leetcode.com/problems/accounts-merge/

Given a list of accounts where each element accounts[i] is a list of strings, where the first element accounts[i][0] is a name, and the rest of the elements are **emails** representing emails of the account.

Now, we would like to merge these accounts. Two accounts definitely belong to the same person if there is some common email to both accounts. Note that even if two accounts have the same name, they may belong to different people as people could have the same name. A person can have any number of accounts initially, but all of their accounts definitely have the same name.

After merging the accounts, return the accounts in the following format: the first element of each account is the name, and the rest of the elements are emails **in sorted order**. The accounts themselves can be returned in **any order**.

```
Example 1:
Input:
accounts = [
["John","johnsmith@mail.com", "john_newyork@mail.com"],
["John","johnsmith@mail.com", "john00@mail.com"],
["Mary","mary@mail.com"],
["John","johnnybravo@mail.com"]]
Output:
[["John","john00@mail.com","john_newyork@mail.com", "johnsmith@mail.com"],
 ["Mary","mary@mail.com"],
 ["John","johnnybravo@mail.com"]]
```