2023-12-09 - Handout – Graphs Part 3

Q1. Time Needed to Inform All Employees

A company has n employees with a unique ID for each employee from 0 to n - 1. The head of the company is the one with headID.

Each employee has one direct manager given in the manager array where manager[i] is the direct manager of the i-th employee, manager[headID] = -1. Also, it is guaranteed that the subordination relationships have a tree structure.

The head of the company wants to inform all the company employees of an urgent piece of news. He will inform his direct subordinates, and they will inform their subordinates, and so on until all employees know about the urgent news.

The i-th employee needs informTime[i] minutes to inform all of his direct subordinates (i.e., After informTime[i] minutes, all his direct subordinates can start spreading the news).

Return the number of minutes needed to inform all the employees about the urgent news.

Example 1:

Input: n = 1, headID = 0, manager = [-1], informTime = [0]

Output: 0

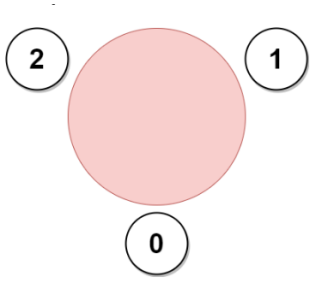
Explanation: The head of the company is the only employee in the company.

Q2. Maximum Employees Invited to Meeting

A company is organizing a meeting and has a list of n employees, waiting to be invited. They have arranged for a large circular table, capable of seating any number of employees.

The employees are numbered from 0 to n - 1. Each employee has a favorite person and they will attend the meeting only if they can sit next to their favorite person at the table. The favorite person of an employee is not themself.

Given a 0-indexed integer array favorite, where favorite[i] denotes the favorite person of the i-th employee, return the maximum number of employees that can be invited to the meeting.



Example 1:

Input: favorite = [2,2,1,2], Output: 3

Explanation:

The above figure shows how the company can invite employees 0, 1, and 2, and seat them at the round table.

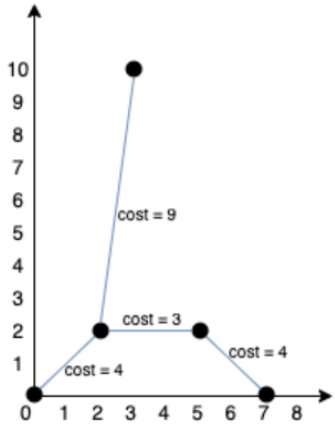
All employees cannot be invited because employee 2 cannot sit beside employees 0, 1, and 3, simultaneously. Note that the company can also invite employees 1, 2, and 3, and give them their desired seats. The maximum number of employees that can be invited to the meeting is 3.

Q3. Min Cost to Connect All Points

You are given an array point representing integer coordinates of some points on a 2D-plane, where points[i] = [x_i, y_i].

The cost of connecting two points [x_i, y_i] and [x_j, y_j] is the manhattan distance between them: $|x_i - x_j| + |y_i - y_j|$, where |val| denotes the absolute value of val.

Return the minimum cost to make all points connected. All points are connected if there is exactly one simple path between any two points.



Example 1:

Input: points = [[0,0],[2,2],[3,10],[5,2],[7,0]]

Output: 20

Explanation:

We can connect the points as shown above to get the minimum cost of 20. Notice that there is a unique path between every pair of points.