

Submission will be according to the Faculty Rules & Timetable

Student/s may be discussed online after submission according to the announced timetable

Part 1

1. Overview

LinkedIn is a professional networking site, people are connected with other people. The whole system appears as a giant connected graph, and when you open any user profile you can see if this user is a connection from 1st, 2nd, or 3rd connection. 1st means I'm directly connected with this user, 2nd means I'm not directly connected with this user, but I'm connected with someone who is connected with this user. 3rd means I'm not directly connected with this user, but I'm connected with someone who is connected with someone that is connected with this user. And so on.

2. Problem

It's required to get the total number of people connected at k th vertices away from each other.

3. Input

Input will be number of people which will be represented using vertices and connections between them which will be represented as edges of the graph, then the starting vertex and value k .

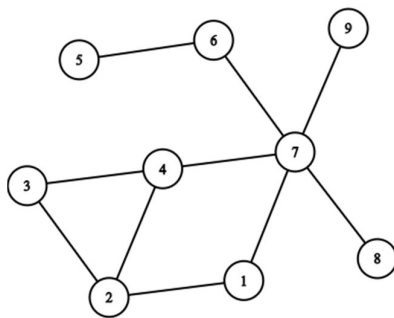
4. Output

Number of people that are k vertices away from starting vertex.

5. Input and Output Format

Input	Output
please enter number of vertices: 9 please enter number of edges: 10 please enter edges in the form (u v): 1 2 2 3 1 7 2 4 4 7 7 8 3 4 7 6 5 6 9 7 please enter starting vertex: 4 please enter value k : 2	There are 4 people with 2 connections away starting from 4

According to the input we have the following graph



We need to find number of nodes from starting vertex 4 with distance $k=2$

$1(4 \rightarrow 2 \rightarrow 1), 8(4 \rightarrow 7 \rightarrow 8), 9(4 \rightarrow 7 \rightarrow 9), 6(4 \rightarrow 7 \rightarrow 6) = 4$

So the solution is 4

Part 2

1. Overview

A runner wants to escape out of a maze.

The maze consists of ($N \times N$) cells.

Some of cells contained blocks, so, runner will avoid those cells to escape. Runner needs to know the path to follow which he can take to escape the maze.

Notes

- Initially the runner is in cell (0, 0) and the exit is cell (N-1, N-1).
- He can move in all four directions if there are no blocks
If his current location is (X, Y), he can move to either (X+1, Y), (X-1, Y), (X, Y+1), (X, Y-1).
- If the first cell (0, 0) and the last cell (N-1, N-1) contain blocks, then he can't escape out of the maze.
- Value 1 represents a cell containing block and 0 for cells he can move through it.

2. Problem

It's required to get the path that runner can follow to escape out of maze.

3. Input

The first line of input contains an integer " N ", (i.e. the size of the ($N \times N$) matrix). The next n lines each line contains N space-separated values either 0 or 1.

4. Output

Print the path that runner can follow to escape out of maze.

In case no possible path found print **"no path found"**.

5. Input & Output format

Input	Output
please enter N: 4 please enter values for maze: 0 1 1 0 0 0 1 0 0 0 0 0 0 1 1 0	Solution : (0,0),(1,0),(1,1),(2,1),(2,2).(2,3),(3,3)

Part 3

1. Overview

There are some cities and some routes connecting specific cities (not all cities are connected).

For each route between two cities there is a flight with specific time and cost (same for any direction).

An Employee wants to travel from city **X** to city **Y** and he needs to minimize the cost that will be paid.

Every hour that the employee spends during traveling or waiting in the airport for another flight connection, he has to pay **M Dollars**

Assume that layover time between connecting flights is always one hour.

2. Problem

It's required to get the path with the minimum cost for the employee during his journey.

3. Input

- Amount M that he will lose per hour.
- Number of cities.
- Number of existing routes.
- Cost and time for each flight between two cities.
- Source and destination Cities.

4. Output

The route with the minimum cost with total time and cost.

5. Input & Output format

Input	Output
please enter amount M: 100 please enter number of cities: 4 please enter number of routes: 5 please enter source , destination time and cost for each route: 1 2 1 250 1 3 1 300 1 4 2 700 2 4 1 300 3 4 1 200 please enter source city: 1 please enter destination city: 4	The route with minimum cost is 1→3→4 Total time 3 hours Total cost = 800\$

Deliverables

- **Source code**
- **Report**
 - Detailed description of each program
 - Sample Runs for each program
 - Role of each team member

Policies

- You should work in groups from **3 to 5 members**.
- Plagiarism is not allowed.
- You should develop the assignment using **any programming language**.

Evaluation Plan

- 50% for development of running code.
 - 20% for passing provided test cases.
 - 30% for the report (discussion).
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