Data Structures HW4

Logistics

Due date: **6/4 (Fri) 23:59**

Submission

- Via LMS (no email submission)

- **Three files** (please make sure to upload three files)

1. Report (No template. You can write a report in English or in Korean.)

2. output.txt (answer file)

3. Zip file of your program (**Compress it** to make a single file.)

Note: No restrictions on programming languages and platforms.

Evaluation Policy (10 pts in total)

Score (10pts) = Report (5pts) + Accuracy (3pts) + Implementation (2pts)

Report: **relative evaluation**

        Top 30%: 5 pts

        <= 50%: 4 pts

        <= 70%: 3pts

        <= 90%: 2pts

        <= 100%: 1pt

Accuracy: Full Mark x # right answers / # total cases

Penalties

    1. Unable to build code → Accuracy = 0

    2. Plagiarism → Score = -5 (will affect your overall grade)

    3. Late Submission → Report -= 2

    4. **Wrong output format** and missing files (in case you forget to submit output.txt, or…)
   → Accuracy /= 2

Problem Description: Detecting a cycle

Write a program that checks whether there exists a cycle in a given graph. A cycle is defined as a path on which the nodes are connected with a connected chain. An "input.txt" file in the following format is provided:

2

4

0 1 0 0

0 0 0 0

0 0 0 0

1 0 0 0

7

0 0 0 0 0 0 0

0 0 0 0 0 0 1

0 0 0 0 0 0 0

0 0 0 0 0 0 0

0 1 0 0 0 0 1

0 0 0 0 0 0 0

0 0 0 0 1 1 0

The number in the first line (i.e., 2) shows the number of test cases to be processed. From the second line, test cases are given, where the first number shows the number of nodes (denoted by N) in the graph, and the corresponding adjacent matrix is provided over the next N lines in a form of N by N matrix (denoted by M). M[i][j] of one indicates that there exists a link from node i to node j. Note however that it does not imply that a link from node j to node i exists. That is, all given graphs are directed graphs.

For the first case, the number of nodes in the graph is four, and we can depict the corresponding graph as the following:
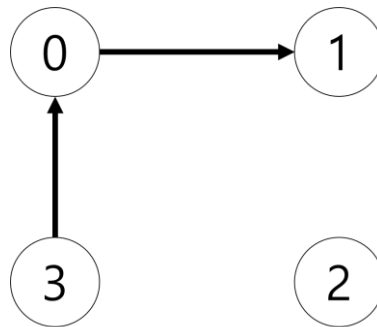
In the graph above, there is no cycle, and thus the answer is 0.

Below illustrates the graph for the next case:
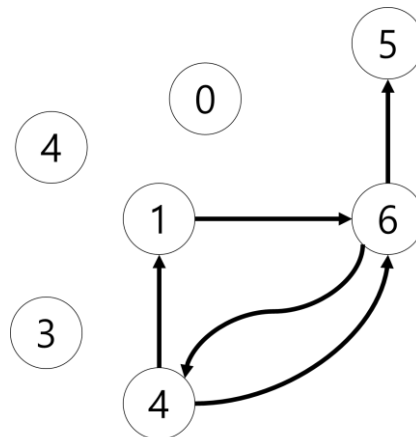
In this case, we can find the following two cycles: 1) 4 → 1 → 6, and 2) 4 → 6, and the result will be 1.

For the above example, your "output.txt" should be as follows:

0

1

Please be sure to follow the output format, and you can use the following additional information:

1. The maximum number of nodes in each graph is limited to 50.

2. There are no self-loops, where a node is connected to itself. In other words, M[i][i] = 0 is guaranteed.

3. DFS is a good option for this task.