

Computer Science 320S2C (2022)

Test (Graph Algorithms)

Due date Sept 13, 2022

Introduction

This programming part of the test will test your ability to write a simple graph algorithm. You need to submit a program for the following task to <https://www.automarker.cs.auckland.ac.nz/>. Most common programming languages will be available to do the test. As in past assignments, the input is from keyboard/stdin and output is to console/stdout.

The automarker will start at 6.30pm and due time for full credit is 7.30pm. Each hour over (up to 5 hours until 1.30am) incurs an additional late penalty of 10% per hour.

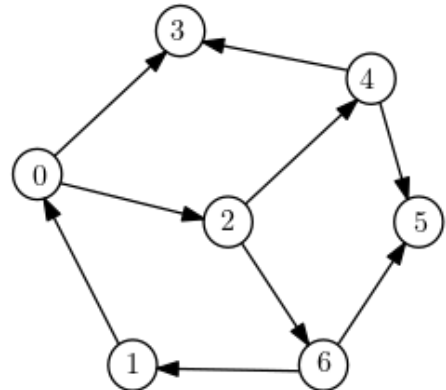
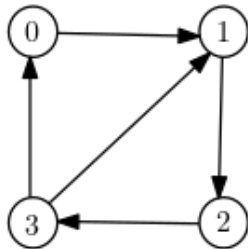
Task: Compute Arborescence Roots

For this warm-up task you are to implement any efficient algorithm that takes a sequence of digraphs and determines how many of the nodes can be the root of an arborescence.

Input Format

Input for this problem consist of a sequence of one or more directed graphs taken from the keyboard. Each digraph is represented by an adjacency list. The first line is an integer n indicating the order of the graph. This is followed by n white space separated lists of adjacencies for nodes labeled 0 to $n - 1$. The input will be terminated by a line consisting of one zero (0). This line should not be processed. Two sample input graphs are listed below.

```
4
1
2
3
0 1
7
2 3
0
4 6
5
1 5
0
```



The easy (harder) test cases on the automarker are digraphs of order at most 20 (2000). These are worth 3 and 2 marks, respectively.

Output Format

Output will be just one integer per test case. For the above input, we would output the following two integers denoting the number of potential roots of the two digraphs given.

```
4
4
```