CSCI 3005 – Programming Assignment 3 – Spring 2020

In the midst of a global pandemic, you are part of a team of computer scientists charged with developing an application to aid in the process of *Contact Tracing* needed to track and -hopefully- contain the spread of the disease. The process of contact tracing involves identifying people confirmed as being infected with the virus as well as identifying persons suspected to have had contact with infected individuals, since they are at high risk of having been infected themselves.

Since you have a solid background in the study of algorithms, you know that breadth-first search can be used for finding shortest paths in an unweighted, undirected graph. To facilitate your task, you have been provided a java Graph class to be used in your solution (see below). Data for your program will be obtained from text files in which each line contains the names of several individuals who have had contact with one another, as described below.

Your solution, to be implemented as a class named `ContactTracer`, should contain the following public methods:

- `ContactTracer(String filename)`: a constructor to read in data from a text file which contains a series of lines. Each line has the names of any number of individuals who have been in contact with one another, separated by / symbols, in the format `LastName, Name(s).`
- `String infectionConfirmed(String person)`: returns a string containing the number and names of individuals who have been in immediate contact with the person given as argument, who has been confirmed as being infected.
- `int infectionPathLength(String target)`: returns the number of edges in the shortest path from the target argument to an individual confirmed as infected. It should return -1 if no such path exists.
- `String infectionPath(String target)`: returns the names of individuals in the shortest path from the target to an individual confirmed as infected, using the format:

  [infected | name | name | … | target]

  It should return **No known infection path to <target>** if no such path exists.
- `String infectionRisk(String target, int distance)`: returns a string representing the infection risk for an individual, as measured by the number and names of infected individuals separated no more than 'distance' edges from the target.

The *ContactTracerTest.java* program and sample text files are available for partial testing. Submit your *ContactTracer.java* (and any other .java files developed as part of your solution) to Mimir for testing. Your solution should include neither Graph.java nor any data files nor any .class files).

Sample method calls using the Graph class to construct the undirected graph below.

```
Graph beatles = new Graph();
beatles.addVertex("John");
beatles.addVertex("Paul");
beatles.addVertex("George");
beatles.addVertex("Ringo");
beatles.addEdge("John", "Paul");
beatles.addEdge("Paul", "George");
System.out.println(beatles);
```