DESCRIPTION

----------Contact tracing database of 100 residents of Greater Toronto Area (GTA)----

Person's ID	# of direct contacts	IDs of people contacted directly
1	4	5 80 89 71
2	2	73 77
3	1	16
4	2	32 81
5	1	61
6	0	
7	4	58 91 39 82
8	3	43 19 71
9	5	62 20 82 91 34
10	2	64 3

Figure 1 Sample of Contact Tracing Table

This assignment builds an application to randomly generate and display contact trace of the select population of GTA or one of its regions. It then monitors Covid-19 spread by analyzing the contact trace database. It is based on Dijkstra's algorithm and requires its thorough understanding and exploration. The original Dijkstra's algorithm project as demonstrated in the class must be used as the starting point for the solution.
Figure 1 above shows a sample of the contact tracing table, showing person's ID, number of people the person got in touch with and their list.

DESIGN AND IMPLEMENTATION

It is strongly recommended that you use structure definitions and function prototypes given in the header file randomGraph.h included in the assign4Help folder.
You main task is to use random generator to populate edges and vertices structures and use these to provide data to buildGraph function of Dijkstra code that actually gets data from file. If you find it simple and convenient you can use random generator and write the information to a text file in a format identical to what Dijkstra code expects and once the information is saved into the graph, use it to display the contact history of the people as shown in Figure 1 above and then run the query of contact tracing between two persons as demonstrated in the screenshots below and in the screencast shared.
Note the following:

1- Weight of the edge must be set to 1.
2- Use random generator to generate the data in integers; however, wherever Dijkstra expects the data to be of string type, for example a node ID, convert the integer ID to string just before passing it to the graph using appropriate string functions.
3- As a first attempt, you may save the randomly generated data to the text file that Dijkstra code reads in a format identical to the one it expects; however, it will be much more efficient if you carefully read Dijkstra's buildGraph function and directly provide it all the information in the format it needs.

Its user interface is illustrated below with screenshots.

USER INTERACTION

The application starts with the following startup menu:

```
C:\Data\CollegeSheridan\2021AWinter\prog20799\assignments\assign4DijkstraContactTracing\cmake-build-debug\assign4GraphBasedSoln.exe
------------------------This application helps in contact tracing to monitor Covid-19 spread.------------------------
-----It displays contact database of the population and determines if any two persons have been in contact.-----
Select the population dataset
Enter 1 for Durham region
Enter 2 for Peel region
Enter 3 for York region
Enter 4 or higher integer for Greater Toronto Area
1
Enter total number of people to be traced/tracked (it must be an integer between 2 to 1000) or enter '0' to end
```

Once the region and number of records are entered, it displays everyone's contact history and prompts the user for a pair of persons to establish their contact as shown below:

```
Enter total number of people to be traced/tracked (it must be an integer between 2 to 1000) or enter '0' to end
35
----------Contact tracing database of 35 residents of Greater Toronto Area (GTA)-----------------
Person's        # of direct     IDs of people
ID              contacts        contacted directly
1               2               8  33
2               3               7  1  32
3               3               15  10  16
4               1               8
5               0
6               5               14  23  15  20  5
7               4               3  20  28  24
8               3               34  2  16
9               5               29  21  24  19  23
10              0
11              1               27
12              3               5  11  2
13              2               17  15
14              1               4
15              0
16              4               20  22  14  38
17              5               5  27  34  16  33
18              0
19              5               21  29  17  11  6
20              2               18  32
21              1               20
22              2               3  34
23              0
24              1               31
25              1               1
ID      # of contacts           IDs of contacts
26              2               9  16
27              3               23  8  1
28              5               32  21  29  16  3
29              3               21  26  34
30              0
31              3               1  30  24
32              5               10  28  11  30  2
33              3               15  11  29
34              0
35              3               15  17  12
----------Query for contact tracing between two individuals:----------
Enter source person's ID (1 to 35)
```

Once the pair of IDs entered, it displays relevant information as shown below and asks for next action. You must ensure that your application runs iteratively till such time that the user opts to quit as shown below:
Iterative user interaction:

```
---------Query for contact tracing between two individuals:---------
Enter source person's ID (1 to 100)
55
Enter target person's ID (1 to 100 excluding 55) or 0 to change the population data set
34
Contact trace from person ID 55 to person ID 34
55  -> 65  -> 57  -> 27  -> 1  -> 10  -> 24  -> 34
Next query:
Enter 1 to check for another pair of persons or 2 to change the population data set or 0 to exit
1
---------Query for contact tracing between two individuals:---------
Enter source person's ID (1 to 100)
32
Enter target person's ID (1 to 100 excluding 32) or 0 to change the population data set
76
Contact trace from person ID 32 to person ID 76
32  -> 21  -> 38  -> 16  -> 76
Next query:
Enter 1 to check for another pair of persons or 2 to change the population data set or 0 to exit
2
Select the population dataset
Enter 1 for Durham region
Enter 2 for Peel region
Enter 3 for York region
Enter 4 or higher integer for Greater Toronto Area
1
Enter total number of people to be traced/tracked (it must be an integer between 2 to 1000) or enter '0' to end
0

Thanks
```

Functionality: Program functions as specified: Program must generate valid random data. It must prompt the user and obtain information in an intuitive, convenient and logical manner implementing **data validation** techniques.	40
All menu options are correctly implemented especially valid random data generation and display of correct contact tracing between two persons. (30) Code is divided into source and header files.(10)	40
Code comments: Code should be heavily commented using header and inline comments in every source/header file to prove full understanding of the code	10
Style and format: Variable, function, enumerated data type names should follow naming standards and code should be correctly formatted.	10