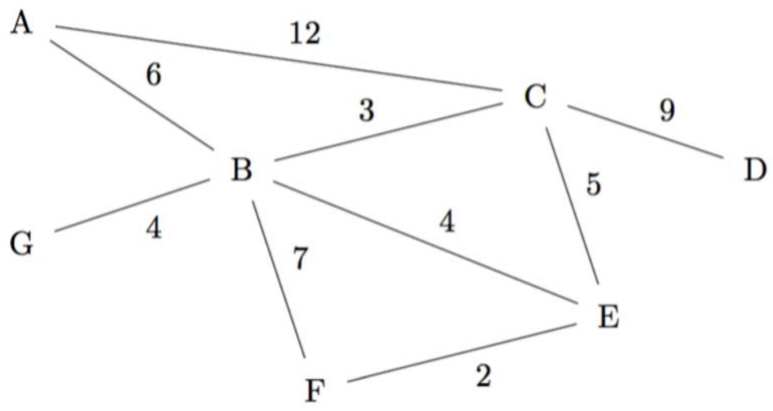
CSC 226
Summer 2018
Lab 7

You are given the following graph.



1. On a paper draw MST edges using Prim's algorithm (starting from A). List the edges in the order they are added to the tree.
2. On a paper draw SPT (Shortest Path Tree) edges using Dijkstra's algorithm from the source vertex A. List the edges in the order they are added to the tree.
3. Are the two trees the same? If yes, are the orders in which the edges were added to the trees the same?

For the following questions you need to complete the function `primAndDijkstra` defined in Line 50 of Lab7.java. This function runs both Prim's MST and Dijkstra's algorithm on the graph given above. In addition, this function will draw the edges of the graph in which they are added to the trees. It is already partially coded for you. All you have to do is complete Lines 86 to 94. These lines form the core of Dijkstra's algorithm.

Implementation hint: Observe how the corresponding part of Prim's algorithm is coded in Lines 64 to 71. Lines 66-71 and Lines 88-94 will essentially be the same. However, Lines 86-87 will explain how Dijkstra's algorithm is different from Prim's algorithm (see Lines 64-65). Use `dijkstraDistTo`, `dijkstraEdgeTo`, and `dijkstraPQ` variables in Lines 86-94. These variables are already declared and initialized for you.

Compiling and Running:

1) Use Eclipse, or
2) On Windows terminal: **javac -cp .;algs4.jar Lab7.java**
   java -cp .;algs4.jar Lab7
3) On Linux and Mac terminal: **javac -cp .:algs4.jar Lab7.java**
   java -cp .:algs4.jar Lab7

***Don't forget** to place algs4.jar file in the same folder as your Lab7.java file.

More questions: Try to answer these questions first by looking at the graph given above and then run the program to verify your answer.

4. Are there any Dijkstra's SPT different from Prim's MST? What will the SPT look like if we run Dijkstra's algorithm from Vertex C? To see the sequence of edges that will be added to both the trees, change the value for source from 0 to 2 in Line 118 of Lab7.java.
5. Are there any other Dijkstra's SPT that is exactly the same as Prim's MST?
6. What do the Dijkstra's SPTs look like if Vertices B and G are used as sources? Don't forget to change the value for source in Line 118 of Lab7.java.