Introduction to Algorithms

Module 10.5: Practice Day 01

(Practice Questions)

Topics:

1. Dijkstra Algorithm
2. 2D Grid Graph Traversal

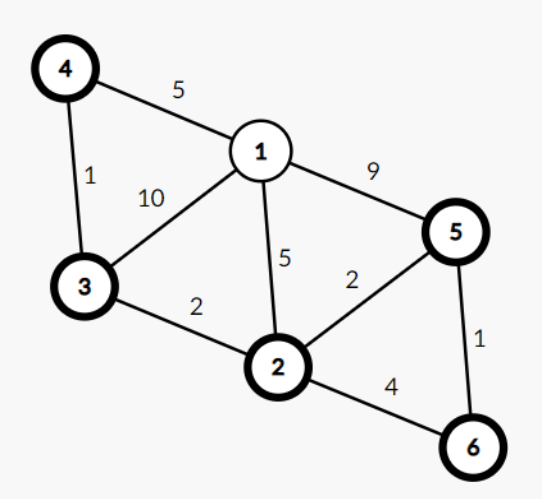
Practice Problem 1

Question: You will be given an **undirected weighted** graph. At first you will be given N, the number of nodes then you will be given M, the number of edges. The value of nodes are from 1 to N. Next M lines will contain A, B and W which means there is an edge from A to B where the cost is W. There will be no negative weight in the graph.

Also, you will be given a source and a destination. You need to tell the shortest distance between source and destination.

Sample Input	Sample Output
6 9 1 2 5 2 3 2 1 3 10 3 4 1 4 1 5 1 5 9 5 6 1 2 6 4 2 5 2 4 6	6

The shortest path is 4-> 3-> 2-> 5-> 6, so the shortest distance is 6.



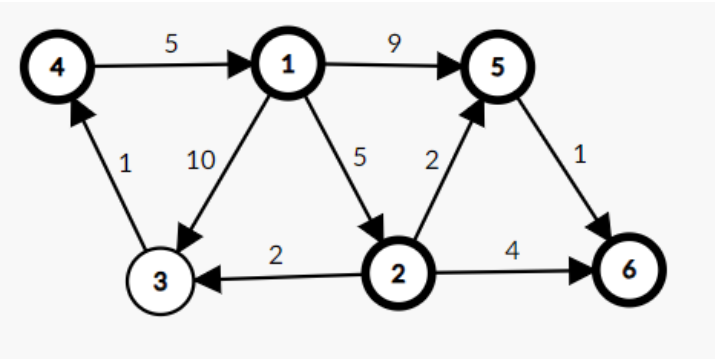
Practice Problem 2

Question: You will be given a **directed weighted** graph. At first you will be given N, the number of nodes then you will be given M, the number of edges. The value of nodes are from 1 to N. Next M lines will contain A, B and W which means there is an edge from A to B where the cost is W. There will be no negative weight in the graph.

Also, you will be given a source and a destination. You need to tell the shortest distance between source and destination.

Sample Input	Sample Output
6 9 1 2 5 2 3 2 1 3 10 3 4 1 4 1 5 1 5 9 5 6 1 2 6 4 2 5 2 4 6	13

The shortest path is 4-> 1-> 2-> 5-> 6, so the shortest distance is 13.



Practice Problem 3

Question: You are given a 2D grid which will contain only the characters **'s'**, **'.'**, **'x'** and **'e'**. The size of the grid is N*M squares, where 's' means where you should start, '.' means there is a path, 'x' means there is no path and 'e' means where you should stop. You can walk left, right, up, and down through the cell of squares. You need to say **"YES"** if you can go from 'S' to 'E'. Otherwise print **"NO"**. There will be exactly one **'s'** and one **'e'**. If there is no path, print **-1**.

Note: Try to solve this using both BFS and DFS as you don't need the shortest distance.

Sample Input	Sample Output
6 5 .s.x. ...x. ..x.. ..x.. ..xex	YES
5 5 .s.x. ...x. ..x.. ..x.. ..xex	NO
5 5 .... .x..e s.x.. x	YES

Practice Problem 4

Question: You are given a 2D grid which will contain only the characters **'s'**, **'.'**, **'x'** and **'e'**. The size of the grid is N*M squares, where 's' means where you should start, '.' means there is a path, 'x' means there is no path and 'e' means where you should stop. You can walk left, right, up, and down through the cell of squares. You need to tell the minimum number of steps you need to go from 'S' to 'E'. There will be exactly one **'s'** and one **'e'**. If there is no path, print **-1**.

Sample Input	Sample Output
6 5 .s.x. ...x. ..x.. ..x.. ..xex	8
5 5 .s.x. ...x. ..x.. ..x.. ..xex	-1
5 5 .... .x..e s.x.. x	7

Practice Problem 5

Question: You are given a 2D grid which will contain only the characters **'s'**, **'.'**, **'x'** and **'e'**. The size of the grid is N*M squares, where 's' means where you should start, '.' means there is a path, 'x' means there is no path and 'e' means where you should stop. You can walk left, right, up, and down through the cell of squares. You need to tell the minimum number of steps you need to go from 'S' to 'E' and also you need to print the path in the form of **R(Right), L(Left), U(Up)** and **D(Down)** from source to destination. There will be exactly one **'s'** and one **'e'**. If there is no path, print **-1**.

Sample Input	Sample Output
6 5 .s.x. ...x. ..x.. ..x.. ..xex	8 DDDDDRRU
5 5 .s.x. ...x. ..x.. ..x.. ..xex	-1
5 5 .... .x..e s.x.. x	7 UURRRRD