A CSE221: Algorithms (Lab)

Semester: **Fall 2023** Examination: **Lab Final**

Duration: **60 minutes** Full marks: **20**

QUESTION 1:

"BRACU Foods" is a cloud kitchen. They deliver food to different parts of the city. For this they hired you so that you can find the quickest way to deliver their food. You are given the map of the city. Now it's your job to make sure that the delivery man reaches each place in the quickest possible time from their headquarters.

Part 1:

You have to show the shortest time taken from their headquarters to each place.

Part 2:

If a road is blocked due to heavy traffic, you have to show which places cannot be reached today in the quickest possible time.

Marks Distribution:

1) Taking input from file ==========> 2
2) Display Adjacency List ==========> 2
3) Implement Part 1 ==========> 2.5
4) Implement Part 2 ==========> 1.5
5) Output to file ==========> 2

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Total 10

Input

The first line of the input contains two integers, N and M (1 <= N <= 1000, 1 <= M <= 100000) denoting the number of cities and roads in the map, respectively.

The next M lines each contain three integers, u, v (1 <= u, v <= N), and w (1 <= w <= 100) denoting a road from point u to point v with weight w.

The second last line of the input contains an integer S (1 <= S <= N) denoting the headquarters.

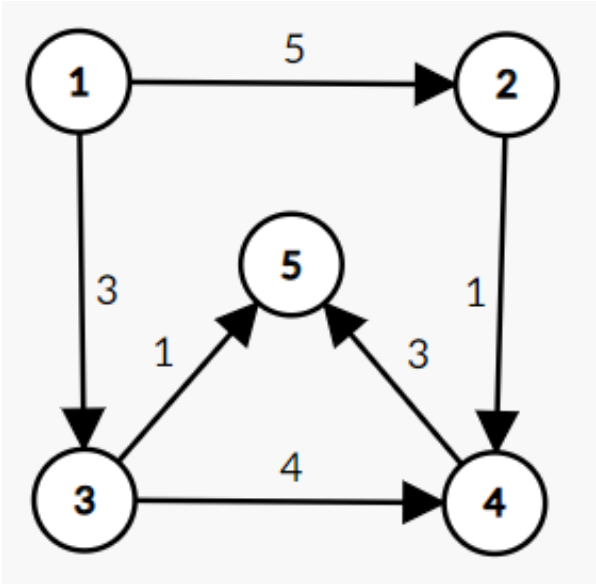
The last line contains two integers u1 and v1 for the second part of the problem, where there is traffic on that road. So the road from point u1 to v1 is blocked.

Output

Part 1
Output N space-separated integers, where the i-th integer represents the shortest distance from the source node to node i.
If a node is not reachable from the source node, output -1 instead.

Part 2
Output N space-separated integers, where "1" means the blocked road has no effect on the shortest time taken that we calculated in Part 1 for each place. "0" means that place cannot be reached in the shortest time.

Both the output for part 1 and part 2 should be in the same output file.

Sample Input:	**Sample Output:**	
5 6 1 2 5 1 3 3 2 4 1 3 4 4 3 5 1 4 5 3 1 2 4	Adjacency List: 1 : (2, 5) (3, 3) 2 : (4, 1) 3 : (4, 4) (5, 1) 4 : (5, 3) 5 : Part 1: 0 5 3 6 4 Part 2: 1 1 1 0 1	

Output Explanation:
Part 1: Shortest distance of 1 from 1 is 0, 2 from 1 is 5, 3 from 1 is 3, 4 from 1 is 6 and 5 from 1 is 4

Part 2: Shortest path to 1: 1->1 {so 1}
Shortest path to 2: 1->2 {so 1}
Shortest path to 3: 1->3 {so 1}
Shortest path to 4: 1->2->4 {so 0 as 2->4 is blocked}
Shortest path to 5: 1->3->5 {so 1}

QUESTION 2:

You are given a weighted, directed graph with N nodes and M edges. Each edge is represented as a triple (u, v, w), where u and v are the nodes connected by the edge and w is the weight of the edge.

Your task is to find the shortest path from a source node S to all other nodes in the graph using Dijkstra's algorithm. You should output the shortest distance from the source node to each of the other nodes in the graph. If a node is unreachable from the source node, its distance should be represented as -1.

Input

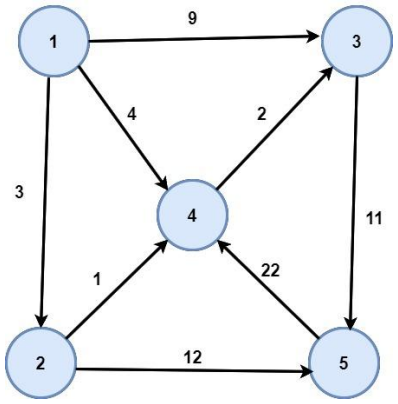
The first line of the input contains two integers, N and M ($1 <= N <= 1000$, $1 <= M <= 100000$) denoting the number of nodes and edges in the graph, respectively.

The next M lines each contain three integers, u, v ($1 <= u, v <= N$), and w ($1 <= w <= 100$) denoting an edge from node u to node v with weight w.

The last line of the input contains an integer S ($1 <= S <= N$) denoting the source node.

Output

Output N space-separated integers, where the i-th integer represents the shortest distance from the source node to node i.
If a node is not reachable from the source node, output -1 instead.

Sample Input 1	Sample Output 1	Sample Graph 1
5 8 1 2 3 1 3 9 1 4 4 2 4 1 2 5 12 3 5 11 4 3 2 5 4 22 1	0 3 6 4 15	
Sample Input 2	Sample Output 2	Sample Graph 2
6 8 1 2 2 1 3 12 3 4 1 4 5 9 5 2 11 5 1 3 6 2 4 6 3 22 3	13 15 0 1 10 -1