

BFS: Shortest Reach



Consider an undirected graph consisting of n nodes where each node is labeled from 1 to n and the edge between any two nodes is always of length 6 . We define node s to be the starting position for a BFS.

Given q queries in the form of a graph and some starting node, s , perform each query by calculating the shortest distance from starting node s to all the other nodes in the graph. Then print a single line of $n - 1$ space-separated integers listing node s 's shortest distance to each of the $n - 1$ other nodes (ordered sequentially by node number); if s is disconnected from a node, print -1 as the distance to that node.

Input Format

The first line contains an integer, q , denoting the number of queries. The subsequent lines describe each query in the following format:

- The first line contains two space-separated integers describing the respective values of n (the number of nodes) and m (the number of edges) in the graph.
- Each line i of the m subsequent lines contains two space-separated integers, u and v , describing an edge connecting node u to node v .
- The last line contains a single integer, s , denoting the index of the starting node.

Constraints

- $1 \leq q \leq 10$
- $2 \leq n \leq 1000$
- $1 \leq m \leq \frac{n \cdot (n-1)}{2}$
- $1 \leq u, v, s \leq n$

Output Format

For each of the q queries, print a single line of $n - 1$ space-separated integers denoting the shortest distances to each of the $n - 1$ other nodes from starting position s . These distances should be listed sequentially by node number (i.e., $1, 2, \dots, n$), but *should not* include node s . If some node is unreachable from s , print -1 as the distance to that node.

Sample Input

```
2
4 2
1 2
1 3
1
3 1
2 3
2
```

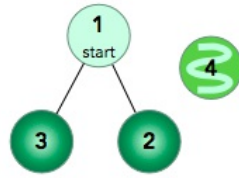
Sample Output

```
6 6 -1
-1 6
```

Explanation

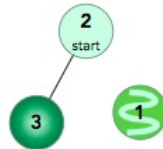
We perform the following two queries:

1. The given graph can be represented as:



where our *start* node, *s*, is node **1**. The shortest distances from *s* to the other nodes are one edge to node **2**, one edge to node **3**, and an infinite distance to node **4** (which it's not connected to). We then print node **1**'s distance to nodes **2**, **3**, and **4** (respectively) as a single line of space-separated integers: **6, 6, -1**.

2. The given graph can be represented as:



where our *start* node, *s*, is node **2**. There is only one edge here, so node **1** is unreachable from node **2** and node **3** has one edge connecting it to node **2**. We then print node **2**'s distance to nodes **1** and **3** (respectively) as a single line of space-separated integers: **-1 6**.

Note: Recall that the actual length of each edge is **6**, and we print **-1** as the distance to any node that's unreachable from *s*.