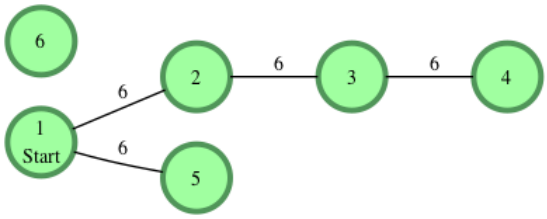
# BFS: Shortest Reach in a Graph

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 a graph, determine the distances from the start node to each of its descendants and return the list in node number order, ascending. If a node is disconnected, it's distance should be $-1$.

For example, there are $n = 6$ nodes in the graph with a starting node $s = 1$. The list of $edges = [[1, 2], [2, 3], [3, 4], [1, 5]]$, and each has a weight of $6$.




Starting from node $1$ and creating a list of distances, for nodes $2$ through $6$ we have $distances = [6, 12, 18, 6, -1]$.

**Function Description**

Define a Graph class with the required methods to return a list of distances.

**Input Format**

The first line contains an integer, $q$, the number of queries.

Each of the following $q$ sets of lines is as follows:

- The first line contains two space-separated integers, $n$ and $m$, the number of nodes and the number of edges.
- Each of the next $m$ 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, $s$, 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., $1, 2, \ldots, n$), 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
```

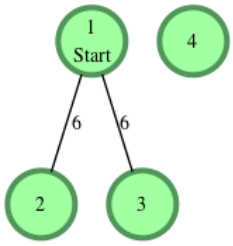
**Sample Output**

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

**Explanation**

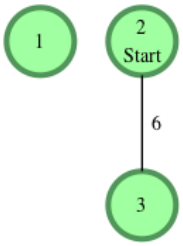
We perform the following two queries:

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 there is no connection to node $4$.

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 $s$.