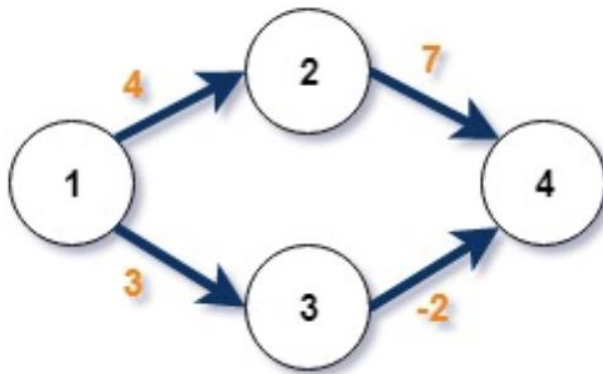


# Find Distance from Source using Bellman Ford Algorithm GFG

Given a weighted, graph of  $V$  vertices and  $E$  edges, Find the shortest distance of all the vertex's from the source vertex  $S$ . If a vertices can't be reach from the  $S$  then mark the distance as  $10^8$ . Note: If the Graph contains a negative cycle then return an array consisting of only -1.

Example:



Source: 1

Output: {0, 4, 3, 1}

## Approach 1: Function to find the shortest path using Bellman-Ford algorithm

- **Explanation:**
  - The algorithm initializes distances to all vertices as infinity, setting the distance of the source vertex to itself as 0.
  - It relaxes edges repeatedly to find the shortest paths.
  - The process is repeated for **vertices - 1** iterations.
  - The algorithm also checks for negative cycles by performing an additional iteration.
  - If a shorter path is found in this additional iteration, the graph contains a negative cycle.
- **Time Complexity:**
  - The algorithm performs **vertices - 1** iterations, each involving checking all edges.
  - Overall time complexity:  $O(V * E)$ , where  $V$  is the number of vertices and  $E$  is the number of edges.

- **Space Complexity:**
  - **Additional space for the distance array:  $O(V)$**
  - **Overall space complexity:  $O(V)$**