

# Distance to the Vertex #2 (BFS)

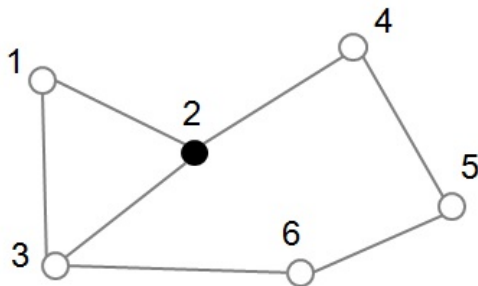
Time limit: 1 second / Memory Limit: 256 MB

## Problem Description

You are given a graph  $G = (V, E)$  with  $|V| = n$  vertices and  $|E| = m$  edges, where the vertices are numbered using integers from 1 to  $n$ .

Your task in this problem is to compute for each vertex of this graph, the shortest distance to the vertex numbered 2. ( Hint: You should use Breadth-first search (BFS) technique to solve this problem. See the in-class document for more detail. )

Consider the following graph with 6 vertices and 7 edges as an example. The shortest distance between vertex No. 5 and vertex No. 2 is 2, while the shortest distance between vertex No. 4 and No.2 is 1.



## Technical Specification

- $2 \leq n \leq 10^5$ ,  $1 \leq m \leq 2 \cdot 10^5$ .
- The vertices are numbered using integers from 1 to  $n$ .

## Input

The first line contains two integers  $n$  and  $m$ , the number of vertices and the number of edges in the tree  $G$ .

Each of the next  $m$  lines contains two integers  $u_i$  and  $v_i$ , which means that there is an edge connecting vertex  $u_i$  and vertex  $v_i$  in the tree.

## Output

Output  $n$  integers in a line, separated by a space, where the  $i^{th}$  integer denotes the shortest distance between vertex numbered  $i$  and the vertex numbered 2.

Use "-1" to denote that no valid path exists for a vertex.

Sample Input	Sample Output
9 8 1 2 1 3 2 4 2 3 3 6 6 5 5 4 7 6	1 0 1 1 2 2 3 -1 -1