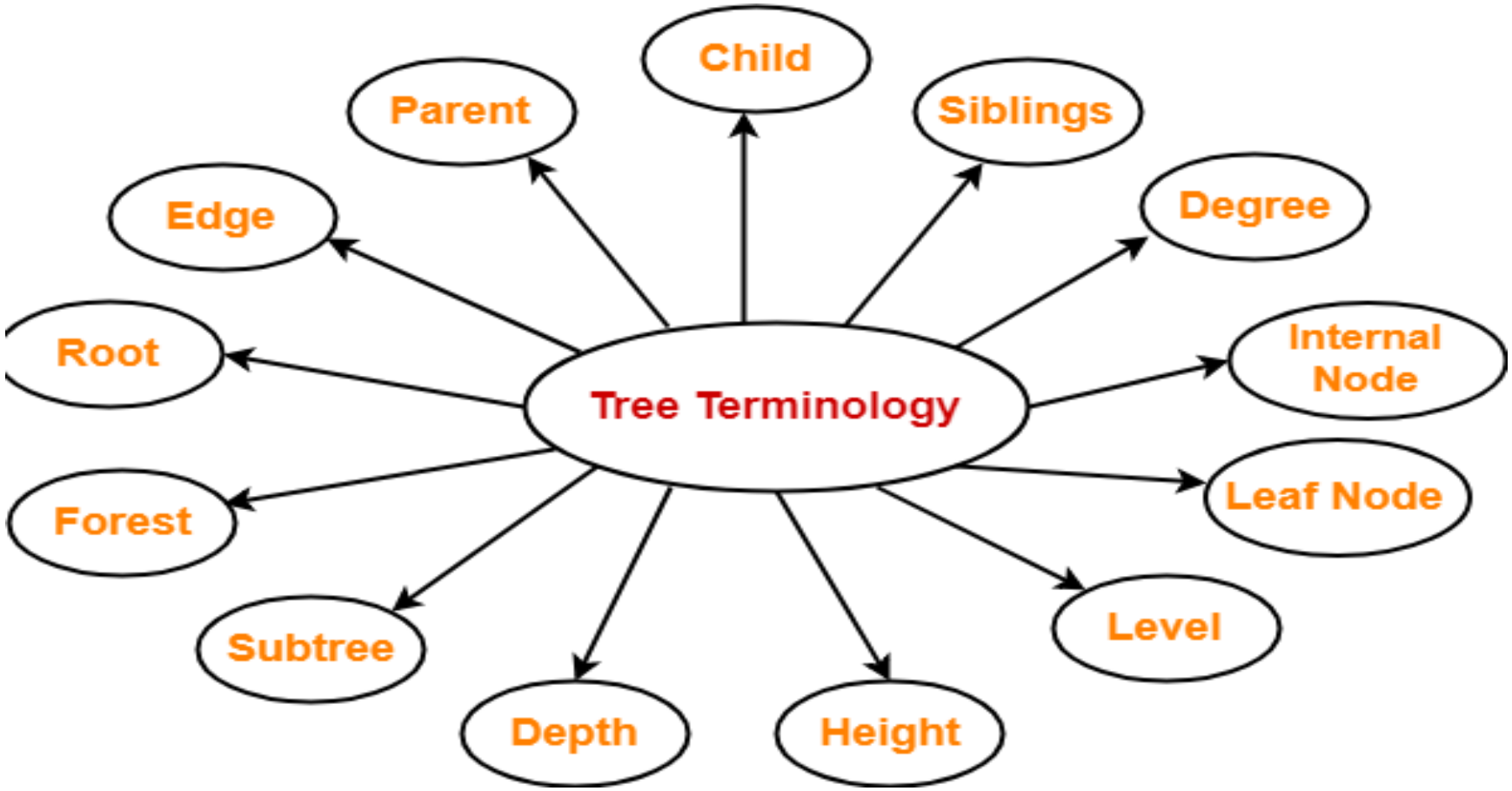
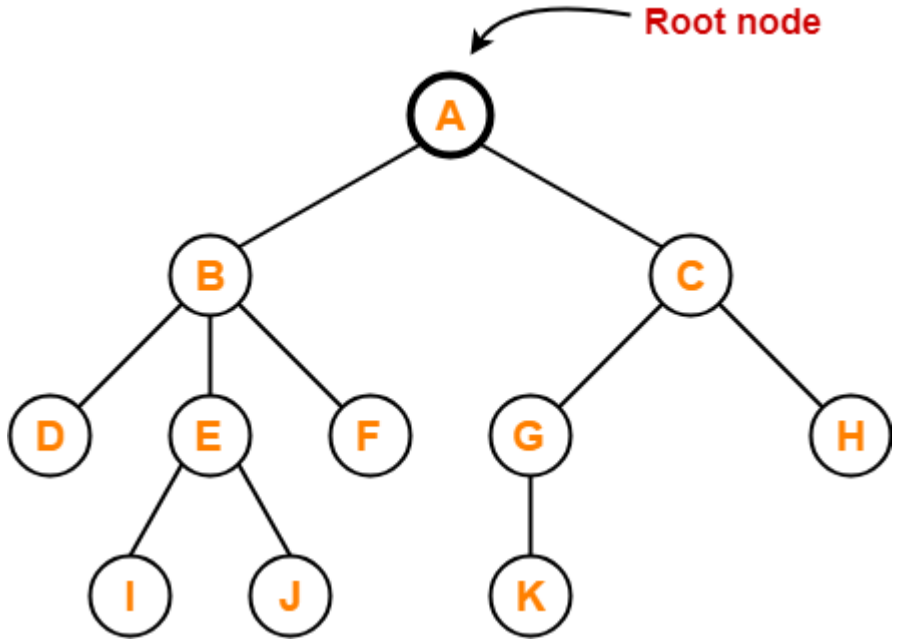
# TREE

# Tree Terminology



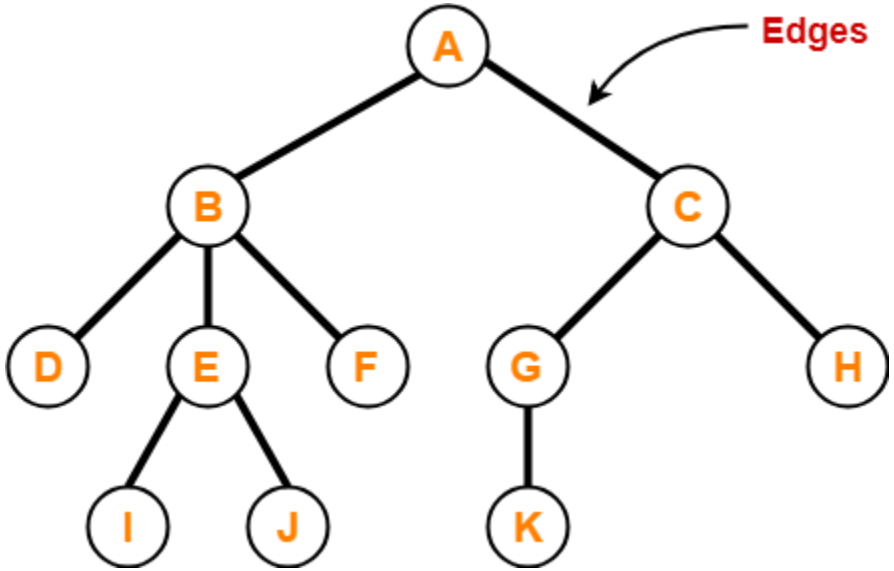
# Root

- The first node from where the tree originates is called as a **root node**.
- In any tree, there must be only one root node.
- We can never have multiple root nodes in a tree data structure.



# Edge

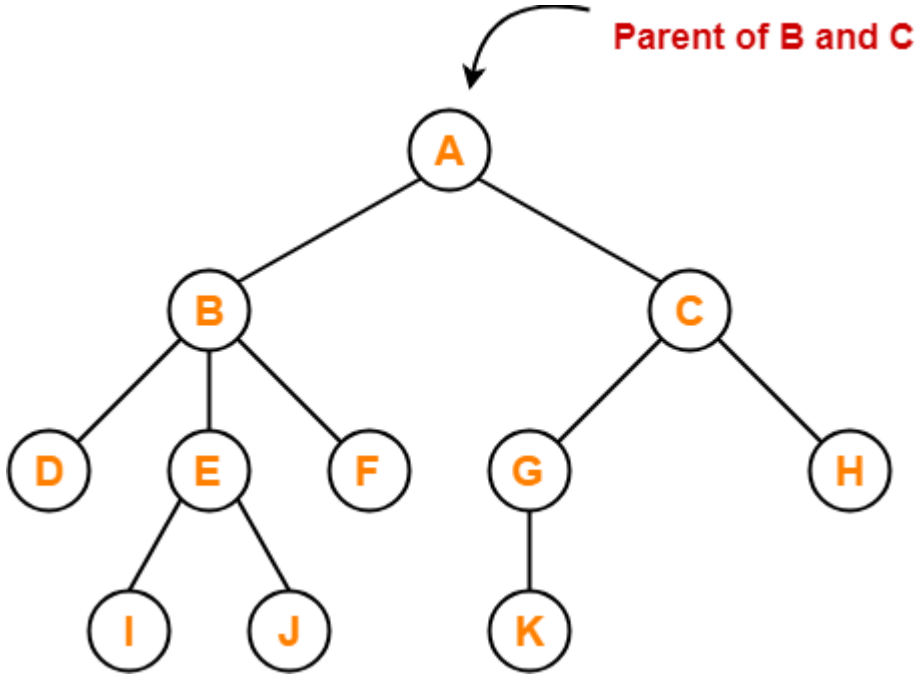
- The connecting link between any two nodes is called as an **edge**.
- In a tree with n number of nodes, there are exactly (n-1) number of edges.



# Parent Node

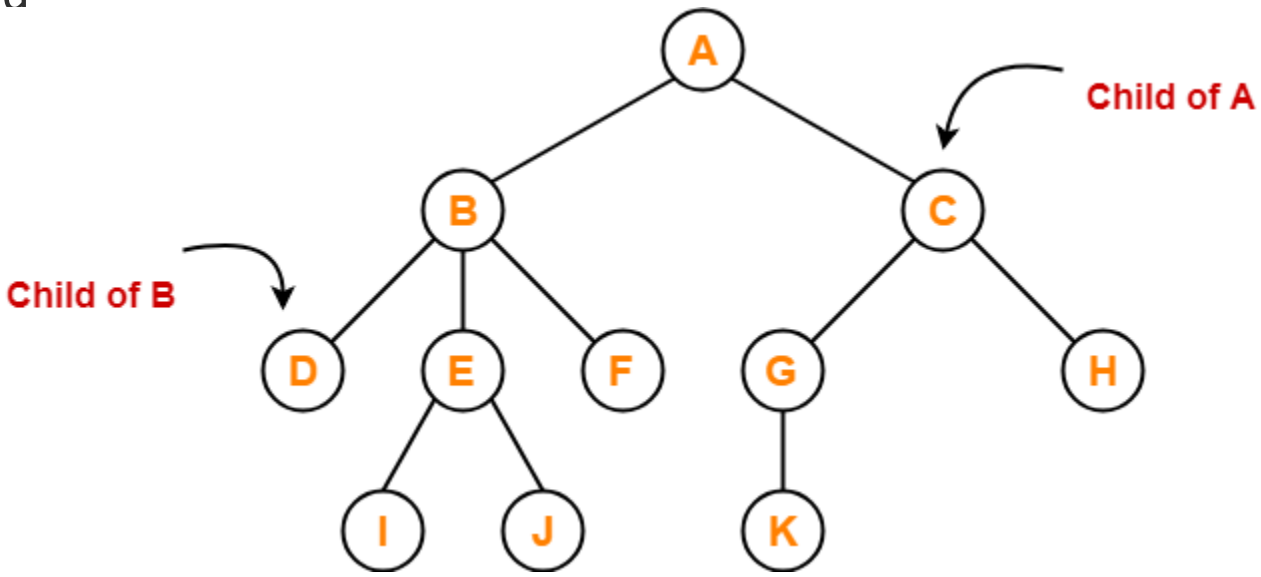
•The node which has a branch from it to any other node is called as a **parent node**.
•In other words, the node which has one or more children is called as a parent node.
•In a tree, a parent node can have any number of child nodes.

Here,
•Node A is the parent of nodes B and C
•Node B is the parent of nodes D, E and F
•Node C is the parent of nodes G and H
•Node E is the parent of nodes I and J
•Node G is the parent of node K



# Child

•The node which is a descendant of some node is called as a **child node**.
•All the nodes except root node are child nodes.

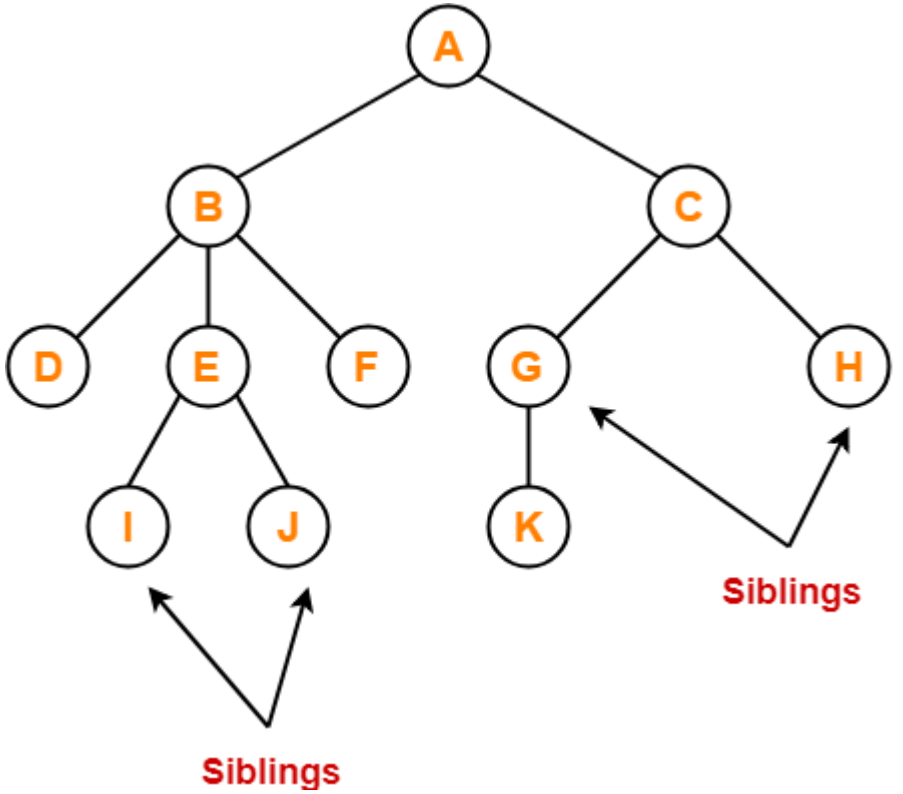



Here,
•Nodes B and C are the children of node A
•Nodes D, E and F are the children of node B
•Nodes G and H are the children of node C
•Nodes I and J are the children of node E
•Node K is the child of node G

# Siblings

•Nodes which belong to the same parent are called as **siblings**.
•In other words, nodes with the same parent are sibling nodes.

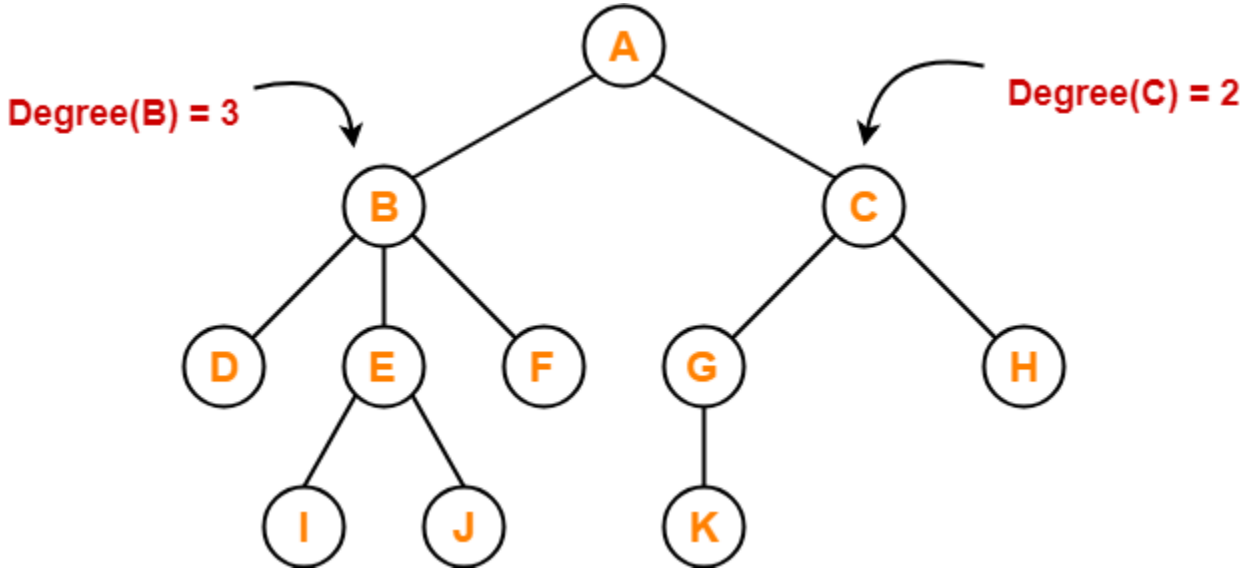
Here,
•Nodes B and C are siblings
•Nodes D, E and F are siblings
•Nodes G and H are siblings
•Nodes I and J are siblings



# Degree

•**Degree of a node** is the total number of children of that node.
•**Degree of a tree** is the highest degree of a node among all the nodes in the tree.

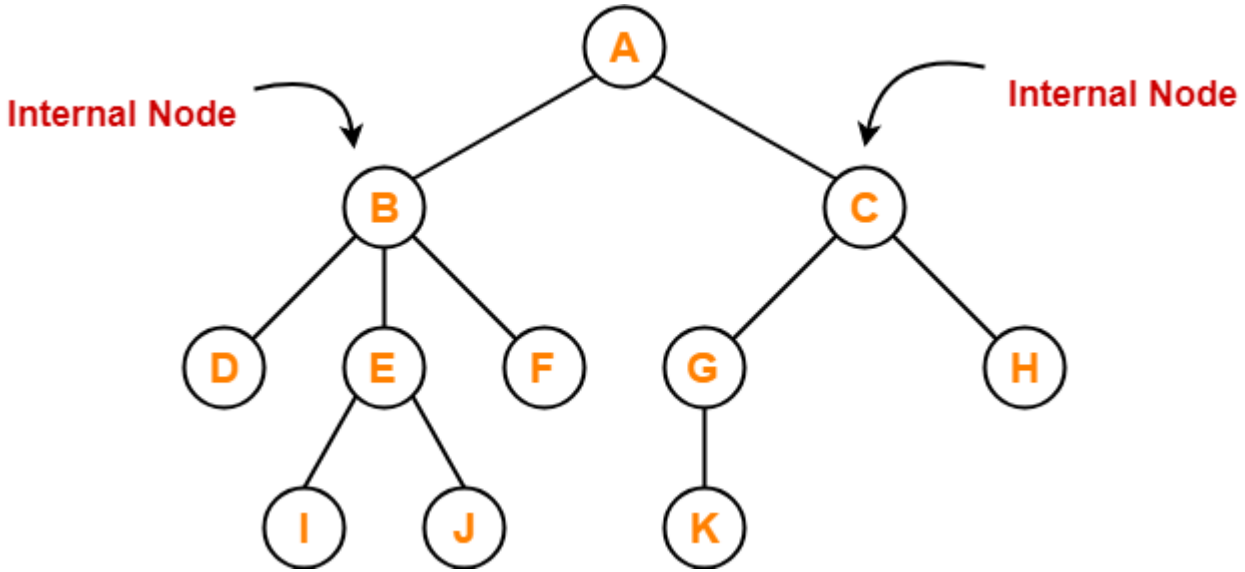
Here,
•Degree of node A = 2
•Degree of node B = 3
•Degree of node C = 2
•Degree of node D = 0
•Degree of node E = 2
•Degree of node F = 0
•Degree of node G = 1
•Degree of node H = 0
•Degree of node I = 0
•Degree of node J = 0
•Degree of node K = 0



# Internal Node

•The node which has at least one child is called as an **internal node**.
•Internal nodes are also called as **non-terminal nodes**.
•Every non-leaf node is an internal node.

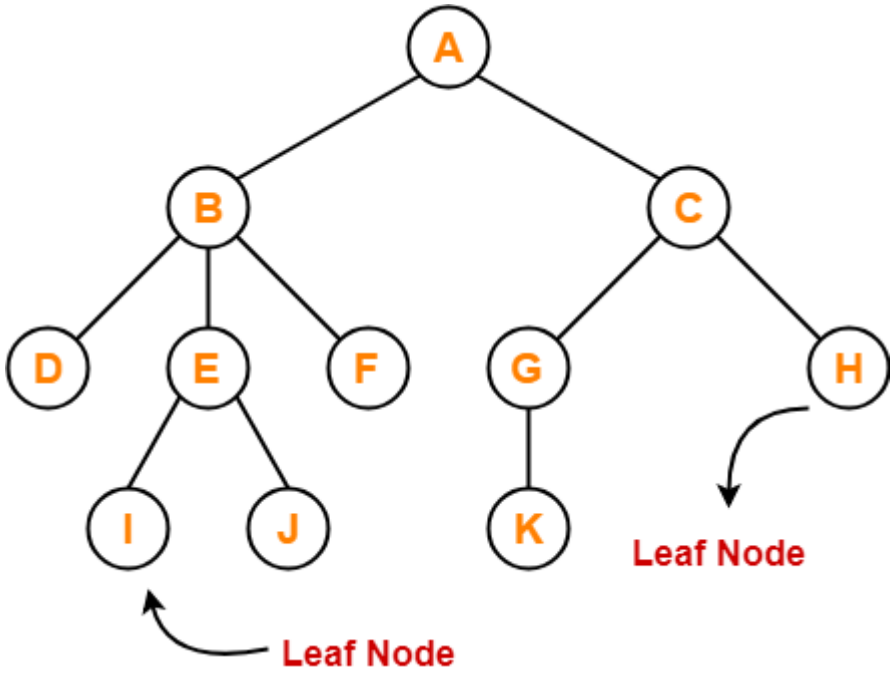
Here, nodes A, B, C, E and G are internal nodes.



# Leaf Node

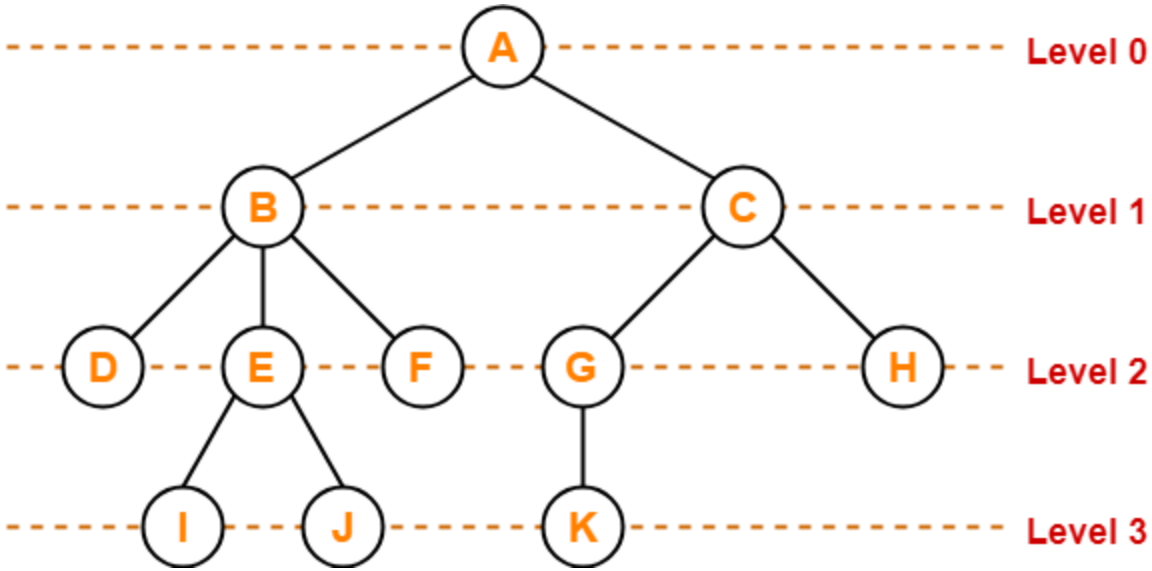
•The node which does not have any child is called as a **leaf node**.
•Leaf nodes are also called as **external nodes** or **terminal nodes**.

Here, nodes D, I, J, F, K and H are leaf nodes.



# Level

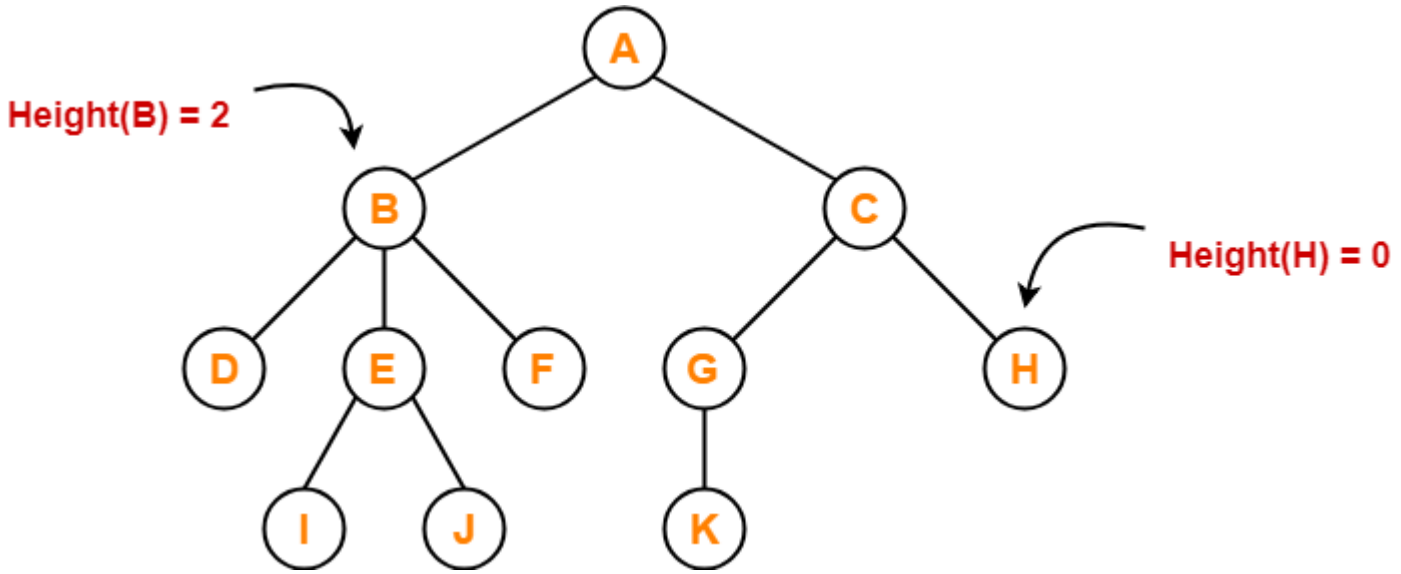
- In a tree, each step from top to bottom is called as **level of a tree**.
- The level count starts with 0 and increments by 1 at each level or step.



# Height

•Total number of edges that lies on the longest path from any leaf node to a particular node is called as **height of that node**.
•**Height of a tree** is the height of root node.
•Height of all leaf nodes = 0

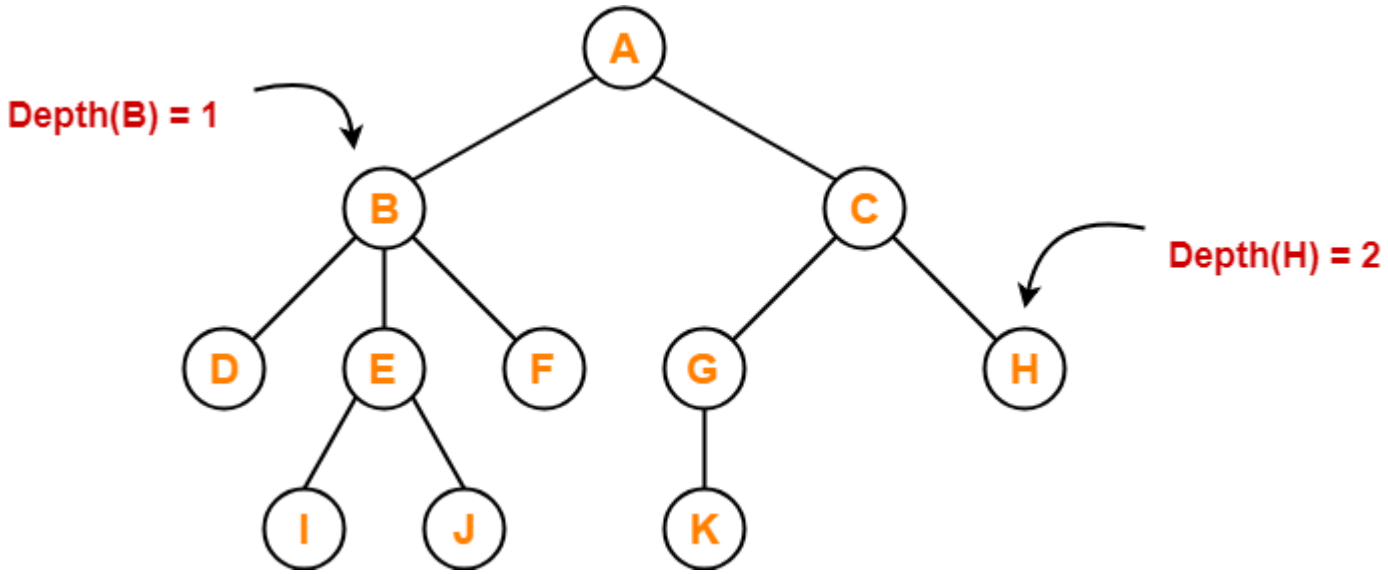
Here,
•Height of node A = 3
•Height of node B = 2
•Height of node C = 2
•Height of node D = 0
•Height of node E = 1
•Height of node F = 0
•Height of node G = 1
•Height of node H = 0
•Height of node I = 0
•Height of node J = 0
•Height of node K = 0



# Depth

•Total number of edges from root node to a particular node is called as **depth of that node**.
•**Depth of a tree** is the total number of edges from root node to a leaf node in the longest path.
•Depth of the root node = 0
•The terms “level” and “depth” are used interchangeably.

Here,
•Depth of node A = 0
•Depth of node B = 1
•Depth of node C = 1
•Depth of node D = 2
•Depth of node E = 2
•Depth of node F = 2
•Depth of node G = 2
•Depth of node H = 2
•Depth of node I = 3
•Depth of node J = 3
•Depth of node K = 3



# Subtree

- In a tree, each child from a node forms a **subtree** recursively.
- Every child node forms a subtree on its parent node.