Week 9 – Fatima Khan

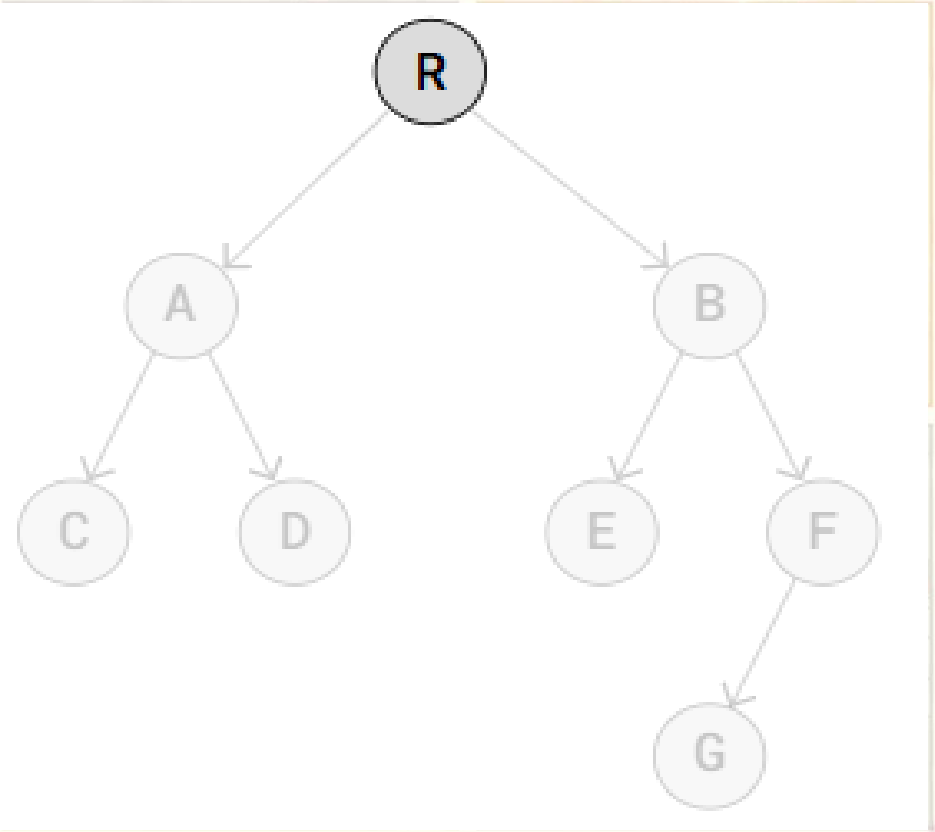
Binary Trees

A Binary Tree is a type of tree data structure where each node can have a maximum of two child nodes, a left child node and a right child node.

Definition

A parent node, or internal node, in a Binary Tree is a node with one or two child nodes.

Parent Node

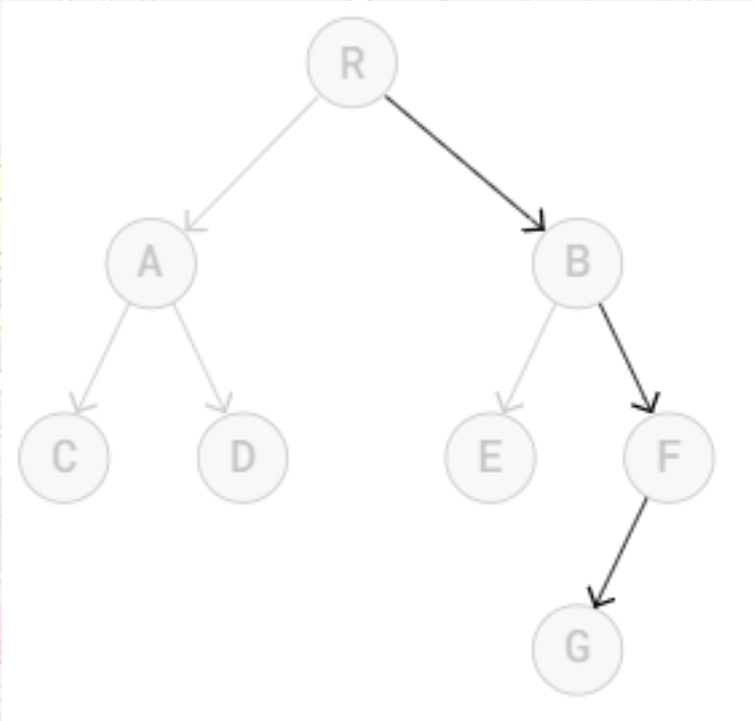


Left & Right Nodes

The left child node is the child node to the left.
The right child node is the child node to the right.

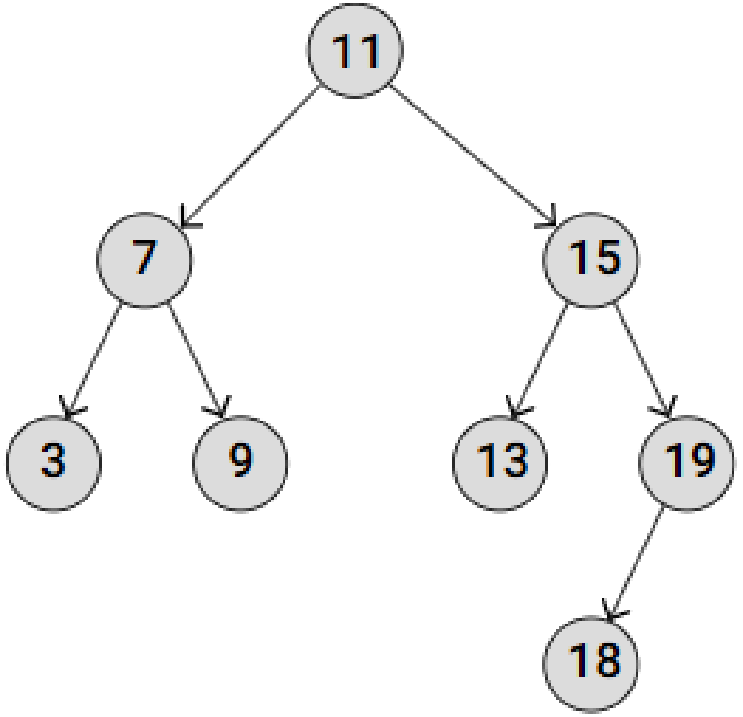
The tree height is the maximum number of edges from the root node to a leaf node.

Tree Height



Types Of Binary Trees

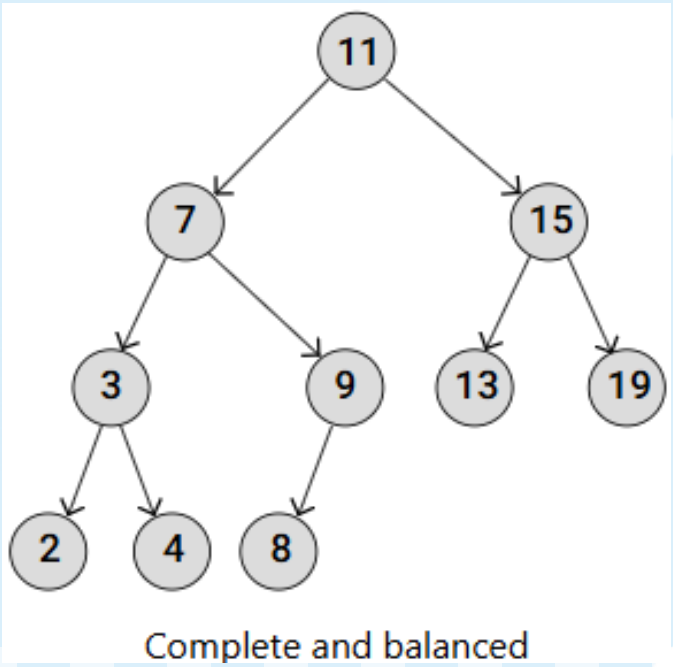
A **balanced** Binary Tree has at most 1 in difference between its left and right subtree heights, for each node in the tree.



Balanced

Complete Binary Tree

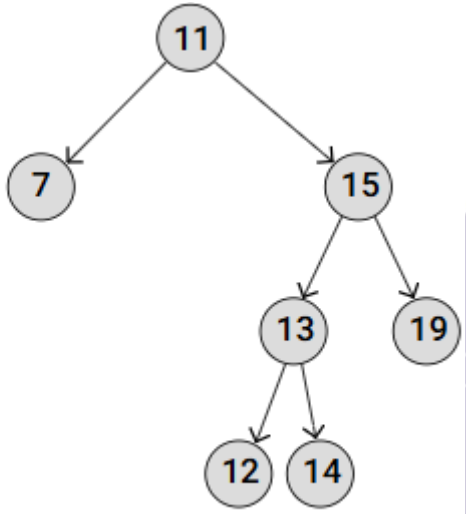
A **complete** Binary Tree has all levels full of nodes, except the last level, which is can also be full, or filled from left to right.



Complete and balanced

Full Binary Tree

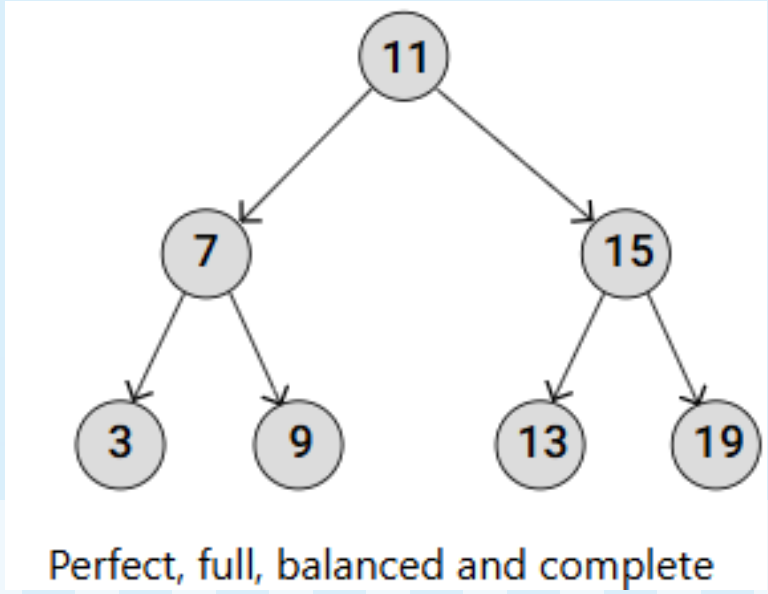
A full Binary Tree is a kind of tree where each node has either 0 or 2 child nodes.



Full

Perfect Binary Tree

A perfect Binary Tree has all leaf nodes on the same level, which means that all levels are full of nodes, and all internal nodes have two child nodes.The properties of a perfect Binary Tree means it is also full, balanced, and complete.



Perfect, full, balanced and complete

Properties

A binary tree of height h can have at most $2^{h+1} - 1$ nodes.

Max Nodes

The minimum possible height for N nodes is ⌊log2N⌋.

Min Height

Total Edges

In any non-empty binary tree with n nodes, the total number of edges is n - 1.

Thank You

Any Questions?