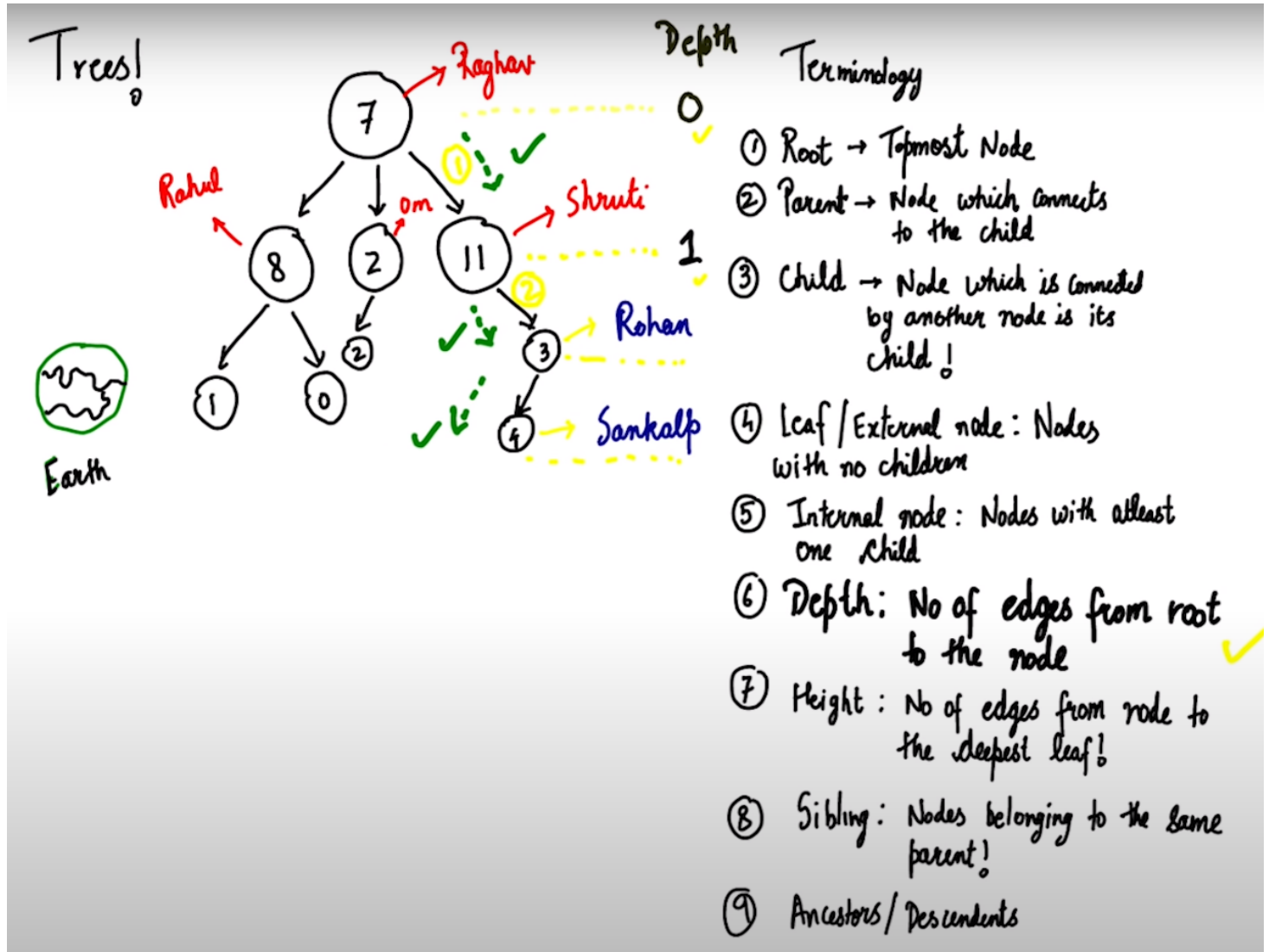


Trees

Terminologies for trees



Binary Tree

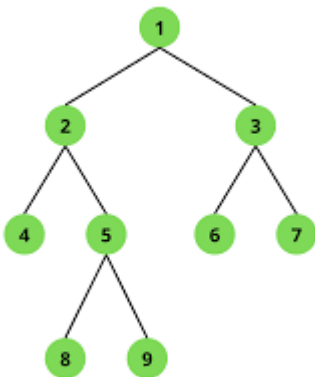
A binary tree is a type of tree which contains at most two node as child

- ① Tree is made up of nodes & edges!
- ② n nodes $\Rightarrow n-1$ edges
- ③ Degree \Rightarrow no of direct children (for a node)
- ④ Degree of a tree is the highest degree of a node among all the nodes present in the tree.
- ⑤ Binary tree = Tree of degree ≤ 2
Nodes can have 0, 1 or 2 children
Ham do Hamare Do! 🤪

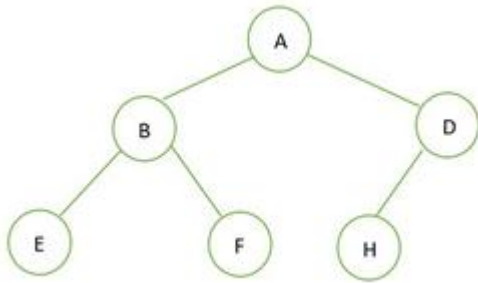
There are two types of Binary tree

Full or strict binary tree

Each node have either 0 or 2 child

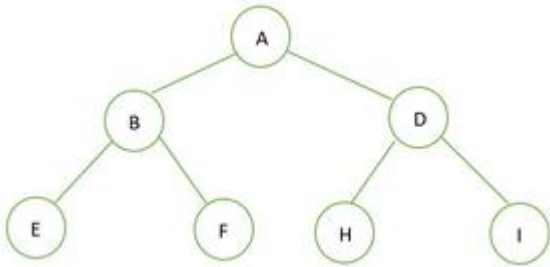


Non full binary tree

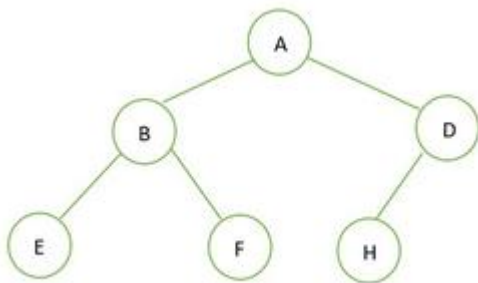


Perfect binary tree

All internal node have exactly two children and all leaf nodes are on same level

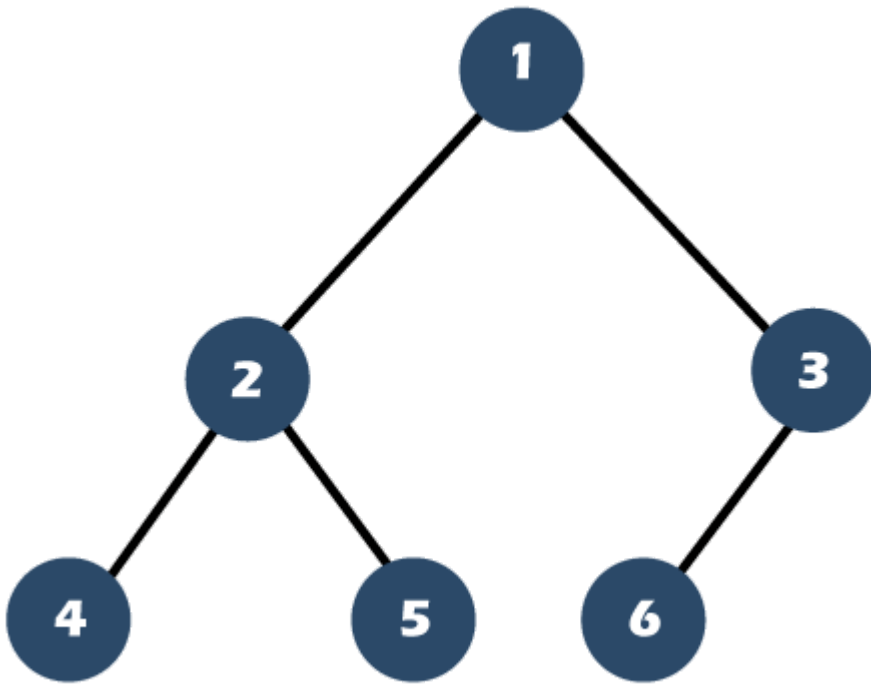


Non perfect binary tree



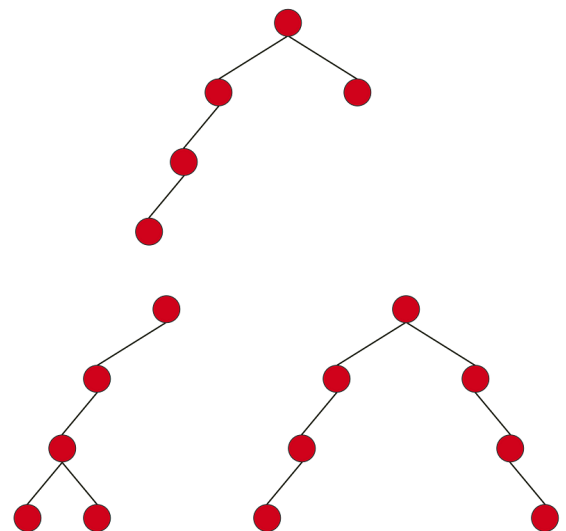
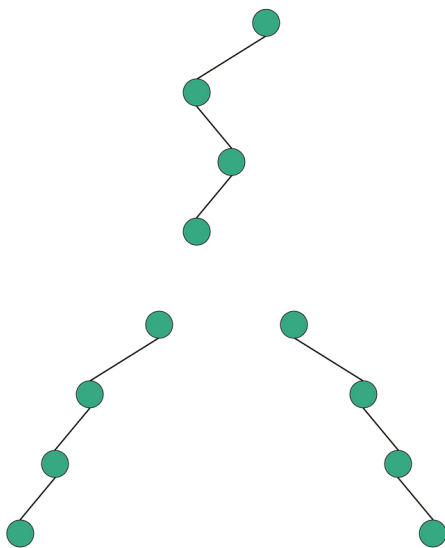
Complete binary tree

- All levels are completely filled except possibly last level
- Last level if not filled then it must be left aligned nodes



Degenerate tree

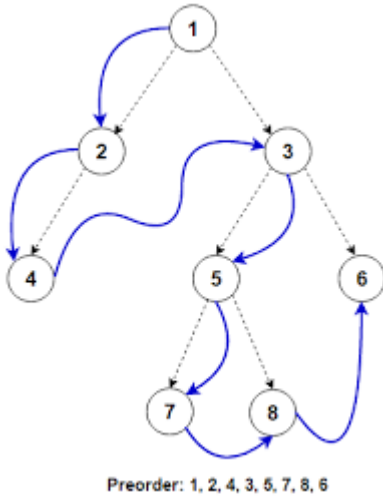
- Every Parent node has exactly one child
- it contains two sub type trees which are left skews and right skews
- left skews trees move on left side which shown in figure below the left side bottom green tree
- right skews trees move on right side which shown in figure below the right side bottom green tree



Traversal in binary tree

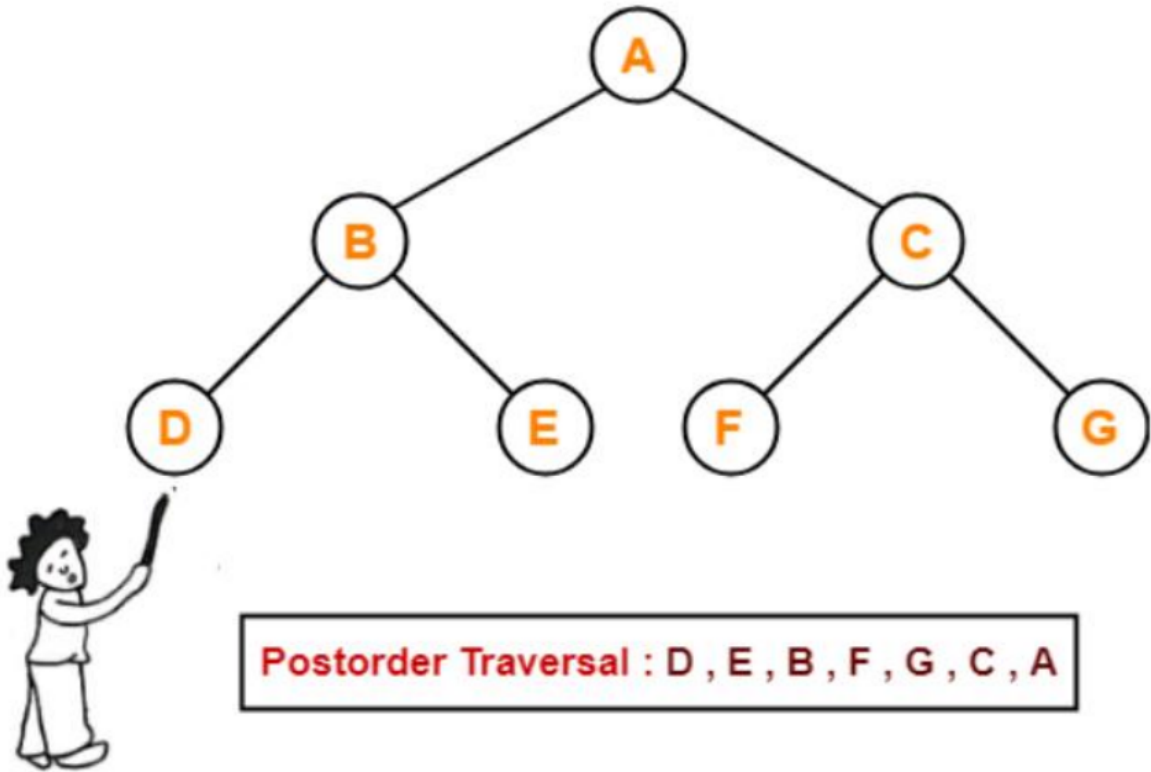
1. PreOrder (**root** -> leftSubTree -> rightSubTree)
2. PostOrder (leftSubTree -> rightSubTree -> **Root**)
3. InOrder (leftSubTree -> **root** -> rightSubTree)

PreOrder Traversal



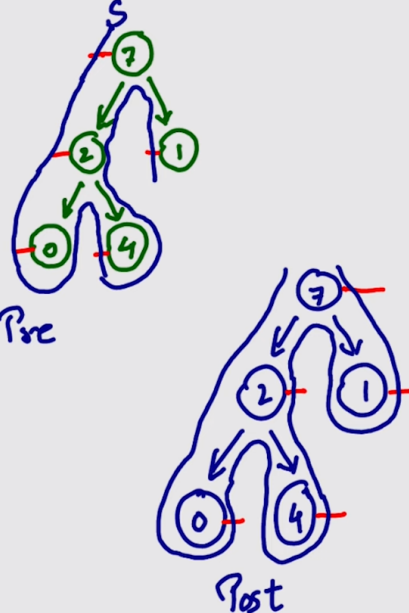
PostOrder Traversal

Pluck all the leftmost leaf nodes one by one.



Tips to find preOrder, postOrder and inOrder

Trick to find Inorder, Preorder & Postorder Traversal



7 2 0 4 1 → Preorder Traversal
0 4 2 1 7 → Postorder Traversal
0 2 4 7 1 → Inorder Traversal

Pre

Post

Inorder

Binary search tree

It is a type of binary tree

Properties of BST

- All nodes of left sub tree are less than root node
- All nodes of right sub tree are greater than root node
- Left and right sub trees are also binary search trees
- There are no duplicate nodes