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**Introduction:**

Tree is a collection of nodes and among those nodes,one node is

taken as root node.Rest of the nodes are taken as disjoint subsets.

Each subsets is a tree again or a subtree again.

**Root** -> The first node of the tree.

**Parent** -> A node is a parent to it's very next descendants.

**children** -> descendants which are connected by a single edge with a node.

**Siblings** -> Children of same parents.

**Descendants** -> they are the sets of nodes which can be reached from

a particular node downwards.

**Ancestors** -> Between the path of two particular nodes,all other nodes

along the path are called ancestors.

**Degree of a node** -> Number of direct children of a particular node.

**Leaf Nodes** -> Nodes with degree 0 are leaf nodes./External nodes./Terminal nodes

**Non-Leaf Nodes** -> Nodes with degrees > 0 are non-leaf nodes/internal nodes/non-terminal nodes.

**Levels** -> starts from 1 and Horizontally measured .

**Height** -> Root is of height 0,So height of a tree starts from 0 onwards till the last reachable node.

**Forest** -> A collection of tree is a forest.

**Binary tree** -> Every node can have max true children min 0 children.

**Shapes of binary tree** -> For n nodes , 2nCn/n+1 binary trees can be formed.

**Binary trees of max height** -> For n nodes, 2n-1 binary trees of max height are possible.

**Binary trees of max height(labeled nodes)** -> For n label nodes,(2nCn/n+1)\*n! binary trees of max height are possible.

**Minimum Nodes of a binary tree** -> n=h+1 (h=height)

**Maximum Nodes of a binary tree** -> n= 2h+1 - 1 ; (h=height)

**Minimum Height of a binary tree** -> log2 (n+1)-1;

**Maximum Height of a binary tree** -> h=n-1; (n=node)

**In Binary tree** ,the number of deg(2) = the number of deg(0) + 1

**Strict Binary Tree** -> The binary tree which can have either 0 child or 2 children.

**For Strict Binary Tree** ->

Minimum Nodes -> (2\*h)+1 (h=height)

Maximum Nodes -> 2h+1 - 1

Minimum Height -> log2(n+1)-1 (n=nodes)

Maximum Height -> (n-1)/2 (n=nodes)

External Nodes(Leaf Nodes)=Internal Nodes(Non-leaf nodes)+1

1. **ary Trees** -> the degree of the tree is M,so in M-ary trees,every nodes of the tree can have from 0 to at most M children.Not more than that.

**Strict M-ary Trees** -> Every nodes of the tree can have either 0 children or M children.

**For M-ary Trees->**

**Minimum Nodes ->** Mh + 1 (M=degree,h=height)

**Maximum Nodes ->** (M(h+1)-1)/M-1) (M=degree,h=height)

**Minimum Height ->** h= (n-1)/M (M=degree,h=height,n=nodes)

**Maximum Height ->** logM[n(M-1)+1]-1

(M=degree,h=height,n=nodes)

External Nodes(Leaf Nodes)

=(M-1)\*(Internal Nodes(Non-leaf nodes))+1