

# Trees

- A Tree is a Non-Linear Data Structure.
- A Tree is a Finite Non-Empty set of elements in which one is called Root.
- Tree is a Non-Linear Data Structure which can represent hierarchal relationship of one element of one element with more than one element.
- Since, in shape it looks like a real inverted tree, so it is given the name “Tree”, e.g. A family’s Trace-back record can be represented by a Tree.

## Tree Terminologies

1. Nodes: The elements of a Tree e.g.
2. Parent Node: A node associated downwards with one or more nodes.  
E.g.
3. Child Node: A node associated upward with a single node is called a Child node e.g.
4. Root: A parent node that can never be a Child Node for the given Tree **OR** A node which is not associated upward with any node is Root Node e.g.
5. Terminal / Leaf: A child node that can never be a parent node for the given Tree Insertion Sort Algorithm **OR** a node which is not associated downward with any node e.g.
6. Level Number: Root is assigned a Level Number 0. Each node is given a level number which is One plus the level number of its parent node.

7. Height / Depth: It is the highest level number plus one in a Tree. Height / Depth show the total number of levels in a Tree.
8. Brother Nodes: Children Nodes of the same Parent Nodes e.g.
9. Oldest Brother: The Left-Most Child Node of a Parent Node e.g.
10. Youngest Brother: The Right-Most Child Node of a Parent Node e.g.
11. Edge: The graphical line drawn between two nodes connecting each other is called an Edge.
12. Path: Sequence of connecting Edges between nodes forms a Path.
13. Branch: A Path ending on a Leaf or Terminal Node is called a Branch.
14. Generation: Nodes belonging to the same Level Numbers are said to be of the same generation e.g.
15. Similar Trees: Two or more Trees having same structures are called Similar Trees. Node contents are different e.g.
16. Copy Trees: Two or more Trees having same structures as well as the same node contents are called Copy Trees e.g.
17. Ordered Tree: A Tree in which nodes are in proper order i.e. the Left-Most is Oldest Brother Node and the Right-Most is the Youngest Brother Node.

18.Forest: An Ordered Set of Ordered Trees.

## Tree Traversal

- Visiting each and every node of a Tree is called Tree Traversal.
- There are three Tree Traversal Techniques

### 1. Level-by-Level Traversal

- 1.1. Visit Level 0
- 1.2. Visit each further Level from Oldest to Youngest Brother Node.

### 2. Pre-Order Traversal

- 2.1. Process Parent Node.
- 2.2. Visit children nodes from left to right of a corresponding Parent Node

### 3. Post-Order Traversal

- 3.1. Visit children nodes from left to right of a corresponding Parent Node
- 3.2. Process Parent Node