1. **Binary Tree :** The Tree in which each and every node must have 0,1 or 2 children. Normally the node which are left of its parent known as left subtree and nodes which are right its parent known as right subtree.

*o – children*

Root node / Parent node

*1 – children*

Root node / Parent node

Child node

*2 – children*

Root node / Parent node Child node

Right Subtree Left Subtree

**\* Properties of Binary Tree**

**1. The node which share common parent is known as sibilings (brother and sister)**

**Sibiling (** They have common parent which is root node **)**

**2. Each node in a binary tree has a level which is begins with 0 for the root node and increase by 1 as we step down to it. Level 0**

**Level 1**

**Level 2**

**Q. How to find maximum number of nodes at highest level**

**No. of nodes at particular level =**

**=** ‘L’ stants for highest level

Ex-

Here highest level is = 2

So,  **=>**

Here at level 2 there has 4 nodes

**3. The nodes which are having a no children known as leaf node.**

**Leaf Nodes**

**4. The nodes which are having atleast one child node are known as non – leaf nodes.**

**5. Height and depth of a binary tree ‘T’**

**Level 0**

**Level 1**

**Height/depth of binary tree ‘T’ = Largest Level + 1**

**Height/depth of ‘T’ = 1+1 =2**

**Qns. Find the depth/height of tree ‘T’.**

**Level 0**

**Level 1 Level 2 Level 3**

**Ans. Largest level is = 3**

**Height and depth of Binary Tree ‘T’ = 3+1 = 4**

**Heigth of last node is = L + 1**

**= 0+1 = 1 (when we want to calculate height of particular node , me have to count level down to up )**

**Depth of last node is = L + 1 = 3+1 = 4 (when we want to calculate depth of particular node , me have to count level up to down )**

**\* Internal Memory Representation of Binary Tree**

There are two ways of a binary tree representation :-

1. **Sequential Representation {using Array}**
2. **Linked Repreentation {using linked list}**

**a). Sequential Representation {using Array}**

**1 2 3 4 5 6 7**

Let, k=1 (root)

Left node = 2k =2 X 1 = **2**

|  |
| --- |
| **1** |
| **2** |
| **3** |
| **4** |
| **5** |
| **6** |
| **7** |

Right node = 2k+1 =2 X 1 + 1 = **3**

**Sequential block representation**

**b). Linked Representation**

**A**

**B C**

**D E F G**

**Representation of this diagram by linked list : -**

**Suppose any node to be root node**

**S.no Node Left Right**

**1 B 7 3**

**Root Node 2 F NULL NULL**

**3 E NULL NULL**

**4 G NULL NULL**

**5 C 2 4**

**6 A 6 1**

**7 D NULL NULL**