

➤ **Extended Binary Tree: -**

- Extended binary tree consists of replacing every null subtree of the original tree with special nodes.
- Empty circle represents internal node and square represents external node.
- The nodes from the original tree are internal nodes and the special nodes are external nodes.
- Every internal node in the extended binary tree has exactly two children and every external node is a leaf. It displays the result which is a complete binary tree.

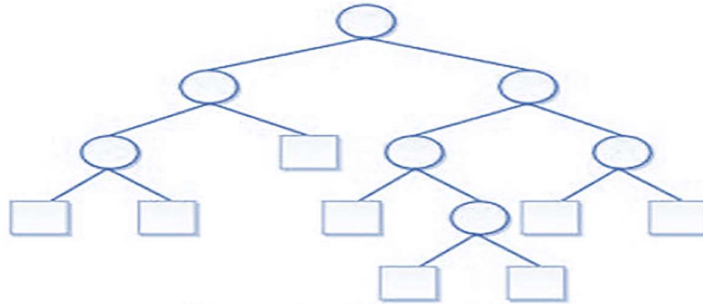


Fig. Extended Binary Tree

Properties of External binary tree

1. The nodes from the original tree are internal nodes and the special nodes are external nodes.
2. All external nodes are leaf nodes and the internal nodes are non-leaf nodes.
3. Every internal node has exactly two children and every external node is a leaf. It displays the result which is a complete binary tree

➤ **Complete Binary Tree: -**

A binary tree is said to be a complete binary tree in data structure if it meets the following conditions

- All the levels except possibly the last level have the maximum number of possible nodes.
- All the nodes in the last level appear as far left as possible. That is, at the last level, there should not be any right successor of a parent not without a left successor

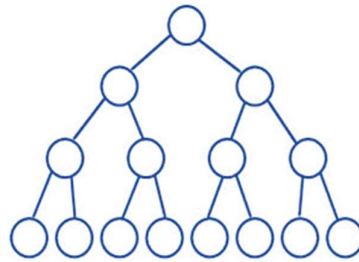
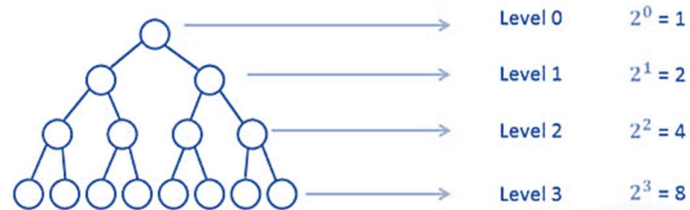


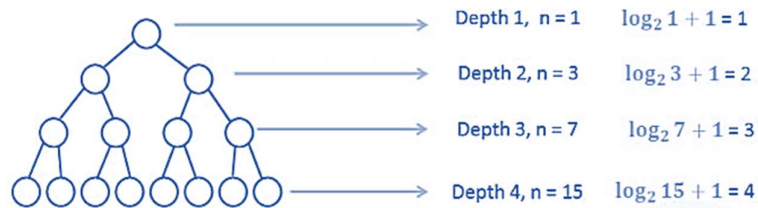
Figure: Complete Binary tree

Nodes at level r



A tree can have atmost 2^r nodes at level r

Depth or height



The depth of the complete tree with n nodes is given by

$$\text{Depth} = \text{Height} = \log_2 n + 1$$