Properties of Binary Tree

1) The maximum no.of nodes in **level (l)** of a binary tree is **2l**

1. The maximum no.of nodes in a binary tree of **height (h)** is **2h-1**
2. In a binary tree with **(N) nodes** the **minimum possible height** or **minimum no.of levels** is **log2 (N+1)**

4) A binary tree with **L leaves** has **at least | log2 L | + 1 levels**

### 5) **In a non-empty binary tree, if **n** is the **total number of nodes** and **e** is the **total number of edges**, then **e = n-1****

Properties of Full Binary Tree

1. No.of internal nodes = **i**, then no.of leaf nodes is **(i + 1)**
2. Total no.of nodes = **2i + 1**
3. No.of internal nodes = **(n-1)/2**
4. No.of leaf nodes(L) = **(n+1)/2**
5. Total no.of nodes = **2L - 1**
6. Total no.of internal nodes = **L - 1**

Properties of Complete Binary Tree

1. A complete binary tree with **n nodes**, **height** of tree is **log(n + 1)**

Properties of Perfect Binary Tree

1. Degree of all internal nodes is 2
2. Degree of all leaf nodes is 0
3. Height of a perfect binary tree is **h**, then no.of leaf nodes will be **2h**
4. Total no.of nodes = **2h+1-1**
5. Height of a perfect binary tree = **log(n +1) - 1**

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| --- | --- | --- | --- |
| **ALGORITHMS** | **BEST CASE** | **AVERAGE CASE** | **WORST CASE** |
| Linear Search | O(1) | O(n) | O(n) |
| Binary Search | O(1) | O(log n) | O(log n) |
| Selection Sort | O(n2) | O(n2) | O(n2) |
| Bubble Sort | O(n) | O(n2) | O(n2) |
| Insertion Sort | O(n) | O(n2) | O(n2) |
| Radix Sort | O(nk) | O(nk) | O(nk) |
| Heap Sort | O(n log n) | O(n log n) | O(n log n) |

