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CPEN 65

Exercises on Trees

1. Name the three properties of a tree.
   - Edges, Nodes, and Recursive
2. Is a tree a forest?
   - Yes
3. What do you call the special designated node in a tree?
   - Root
4. What is the minimum number of nodes in a tree?
   - One
5. Can a tree have no subtrees at all?
   - Yes
6. Children of node 16.
   - 13, 6, & 60
7. Parent of node 1.
   - 7
8. Siblings of 23.
   - None
9. Ancestors of 9.
   - 22, 7,12, & 4
10. Descendants of 16.
    - 13, 23, 6, 60, & 21
11. Leaves.
    - 23, 6, 21, 20, 9, & 1
12. Non-leaves.
    - 22, 16, 13, 60, 7, 12, & 4
13. Depth of node 4.
    - 3
14. Degree of the tree.
    - 3
15. Height of the tree.
    - 5
16. Weight of the tree.
    - 10
17. Is the tree a binary tree?
    - No.
18. Removing 6, is the tree a full binary tree?
    - Yes
19. Removing 6, is the tree a complete binary tree?
    - No
20. Is a full binary tree complete?
    - Yes, as full binary trees are complete binary trees.
21. Is a complete binary tree full?
    - No, not all complete binary trees are full binary trees.
22. How many leaves does a complete n-ary tree of height h have?
    - Equal to n^h

23. What is the height of a complete n-ary tree with m leaves?
    - $\log_n m$
24. What is the number of internal nodes of a complete n-ary tree of height h?
    - $\frac{n^h-1}{n-1}$
25. What is the total number of nodes a complete n-ary tree of height h have?
    - $n^h - 1$