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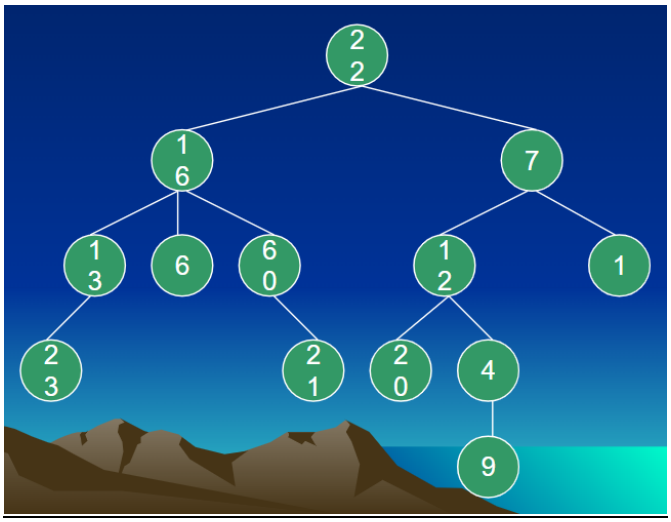
BS CPE 2-1

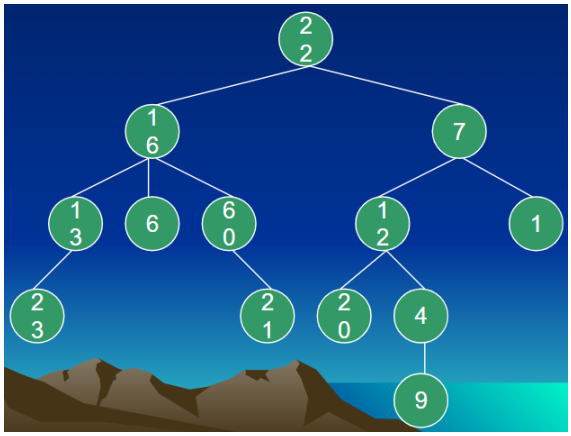
Exercises on trees

1. **Name the three properties of a tree.**
   Answer: connected, acyclic and undirected graph.
2. **Is a tree a forest?**
   Answer: Yes, however a forest cannot be a tree because it's not connected.
3. **What do you call the special designated node in a tree?**
   Answer: Root
4. **What is the minimum number of nodes in a tree?**
   Answer: At least 1 node (the root node).
5. **Can a tree have no subtrees at all?**
   Answer: Yes, a tree can have no subtrees at all.



Given the tree to the right, identify the ff.:

6. **Children of node 16.**
   Answer: 13,6,60
7. **Parent of node 1.**
   Answer: 7
8. **Siblings of 23.**
   Answer: None
9. **Ancestors of 9.**
   Answer: 22,7,12,4
10. **Descendants of 16.**
    Answer: 13,6,60,23,21
11. **Leaves.**
    Answer: 23,6,21,20,9,1
12. **Non-leaves.**
    Answer: 22,16,7,13,60,12,4



Given the tree to the right, identify the ff.:

13. **Depth of node 4.**

    Answer: Node 4 has depth 3

14. **Degree of the tree.**

    Answer: 3

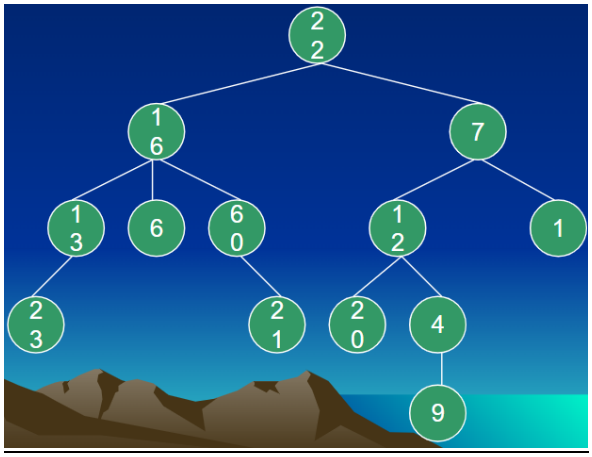
15. **Height of the tree.**

    Answer: 4

16. **Weight of the tree.**

    Answer: 6

17. **Is the tree a binary tree?**
    Answer: Yes



Given the tree to the right, identify the ff.:

18. **Removing 6, is the tree a full binary tree?**

    Answer: No

19. **Removing 6, is the tree a complete binary tree?**

    Answer: No

20. Is a full binary tree complete?

Answer: No

21. Is a complete binary tree full?

Answer: Yes

22. How many leaves does a complete *n*-ary tree of height *h* have?

Answer: n^h

23. What is the height of a complete *n*-ary tree with *m* leaves?

Answer: $log_n m$

24. What is the number of internal nodes of a complete *n*-ary tree of height *h*?

Answer: $\sum_{i=0}^{h-1} n^i = \frac{n^h - 1}{n-1}$

25. What is the total number of nodes a complete *n*-ary tree of height *h* have?

Answer: $n^h - 1$