Republic of the Philippines
CAVITE STATE UNIVERSITY
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DATA STRUCTURES AND ALGORITHM

Short Quiz in

TREES

Score

Submitted by:
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Monday-Thursday/10:00-1:00 / BSCPE 2-2

Date Submitted
16-01-2023

Submitted to:

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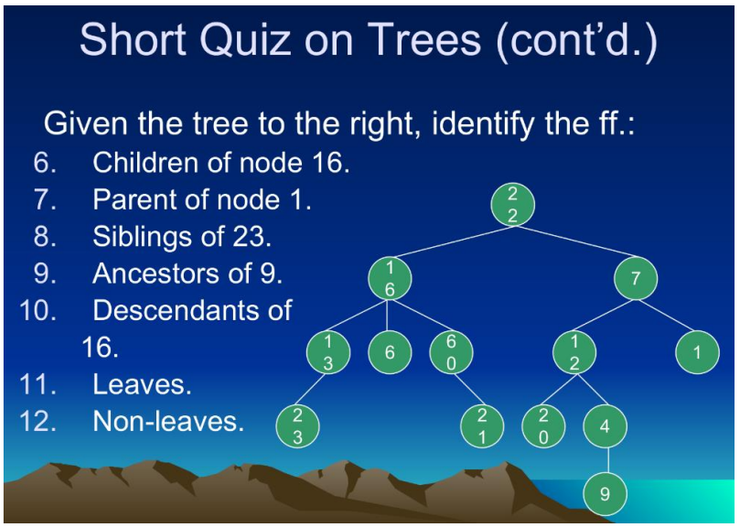


ANSWER:

6. Children of node 16 are nodes **13**, **6**, and **60**.

7. Parent of node 1 is **node 7**.

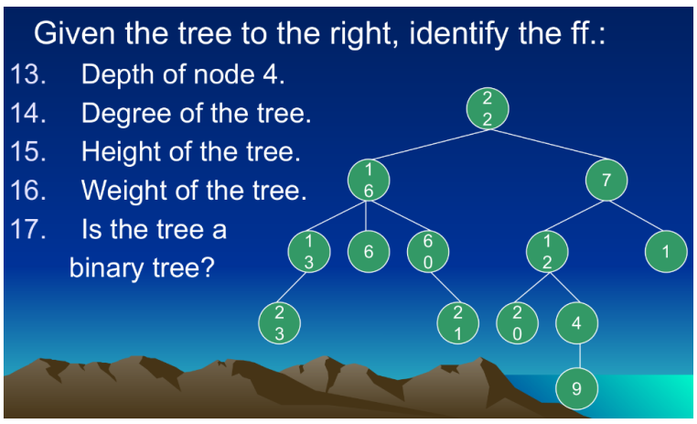
8. Node 23 has **no siblings**.

9. Ancestors of 9 are nodes **22**, **7**, **12**, **1**, **20**, **4**, and **9.**

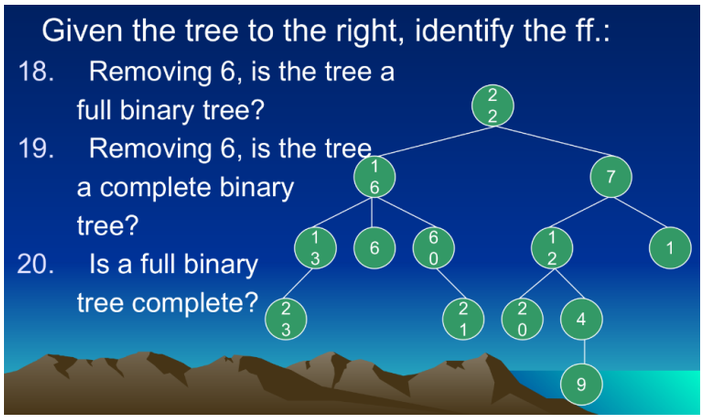
10. Descendants of 16 are nodes **13, 6, 60, 23,** and **12.**

11. Leaves in the given tree are nodes **23, 6, 21, 20, 9,** and **1.**

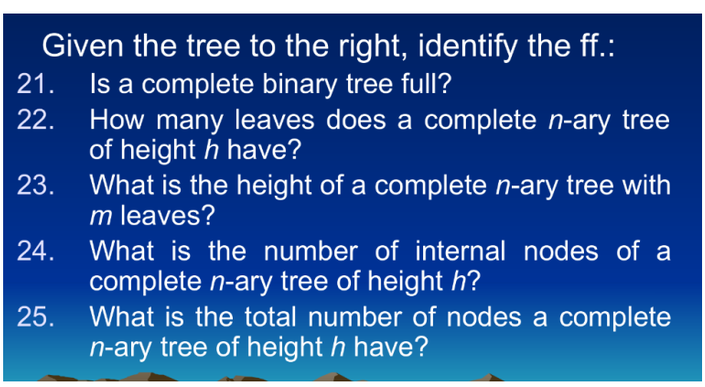
12. Non-leaves in the given tree are nodes **22, 16, 7, 13, 60, 12,** and **4.**



13. Depth of node 4 is **Depth 3.**
14. Degree of the tree is **3.**
15. Height of the tree is **4.**
16. Weight of the tree is **6.**
17. The tree is not a binary tree since node 16 has 3 children nodes. By definition, a binary tree is an ordered tree with a degree of 2 in which each node has at most 2 children.



18. Removing node 6, the tree is still **not a full binary tree** since nodes 13, 60 and 4 has only 1 degree otherwise each node in a full binary tree is either a leaf or has a degree of 2.
19. Removing node 6, the tree is still **not a complete binary tree** since all the leaves have different depths and other internal nodes is either a leaf or have only a degree of 1.
20. A full binary tree is **not complete** since a complete binary tree is where all leaves have the same depth and all internal nodes must have a degree of 2, while in a full binary tree is where each node is either a leaf or has a degree of 2. Hence a full binary tree cannot be a complete binary tree, but a complete binary tree can be a full binary tree.



21. A complete binary tree is full since each node in a full binary tree is either a leaf or has a degree of 2, whereas all internal nodes in a complete binary tree has a degree of 2 given that all leaves are on the same depth therefore a complete binary tree can be a full binary tree as well.
22. The number of leaves does a complete n-ary tree of height h have is $\mathbf{n^h}$.
23. The height of a complete n-ary tree with m leaves is $\mathbf{\log_n m}$.
24. The number of internal nodes of a complete n-ary tree of height h is:

$$\mathbf{1 + n + n^2 + \cdots + n^{h-1} = \sum_{i=0}^{h-1} n^i = \frac{n^h - 1}{n - 1}}$$

25. To get the total number of nodes of a complete n-ary tree of height h , simply add the number of leaves and the number of internal nodes of the tree.
    Let T = total number of nodes in a complete n-ary tree

$$\boldsymbol{T = n^h + \frac{n^h - 1}{n - 1}}$$