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## Data Structures & Algorithms 2

### Tutorial 4

#### Trees

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##### OBJECTIVES

- Understand the basics for different types of Trees (Binary, BST, AVL.)
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##### Exercise 1

- Show the result of inserting 3, 1, 4, 6, 9, 2, 5, 7 into an initially empty binary search tree.
- Show the result of displaying the BST elements in :
  - a) in order traversal
  - b) preorder traversal
  - c) postorder traversal
- Show the result of deleting the root.

##### Exercise 2

Show that the maximum number of nodes in a binary tree of height  $h$  is  $2^{h+1} - 1$

##### Exercise 3

Two binary trees are similar if they are both empty or both nonempty and have similar left and right subtrees. Write a function to decide whether two binary trees are similar. What is the running time of your function?

##### Exercise 4

Show the result of inserting 2, 1, 4, 5, 9, 3, 6, 7 into an initially empty AVL tree.

##### Exercise 5

Suppose we want to add the operation findKth to our repertoire. The operation findKth( $k$ ) returns the  $k$ th smallest item in the tree. Assume all items are distinct. Explain how to modify the binary search tree to support this operation in  $O(\log N)$  average time, without sacrificing the time bounds of any other operation.