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SENG 201 Data and Game Structures

Lab Assignment 6

In this exercise you will implement a Binary Search Tree assuming you have the basic understanding of tree data structures and binary search trees.

PART 1: Implementing Binary Search Tree

1. Create a **generic** "Node" class for the binary search tree holding **Comparable** items. Each node should have a value, a left child, and a right child.
2. Create a **generic** "`BinarySearchTree`" class to represent the binary search tree holding **Comparable** items. Include methods for inserting a node (insert) and searching for a value (search).

PART 2: Implement Insert Operation

Implement the **iterative** "`insert`" method in the "`BinarySearchTree`" class that takes a generic value and inserts a new node with the value into the tree while maintaining the binary search tree properties. If the value already exists in the tree, you don't have to do anything.

In your main method, create a binary search tree object for **Integers** and test your **`insert`** method by inserting the following into the tree:

```
10 5 15 3 7 12 18
```

PART 3: Implement Search Operation

Implement the **recursive** "`search`" method in the "`BinarySearchTree`" class that searches for a value in the tree. Return True if the value is found, otherwise return False. You can create an additional private helper method.

Test your **`search`** method by searching some integers on the tree and check if the method is working correctly.

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PART 4: Implement Count Nodes

Implement the "`int countNodes`" method for the "`BinarySearchTree`", which returns the total number of nodes on the tree. You can add an additional private helper method.

PART 5: Implement Check If Binary Tree

Implement the "`boolean checkBST`" method for the "`BinarySearchTree`", which takes a Binary Search Tree and returns true if the tree satisfies the Binary Search Tree properties, false otherwise.

You should submit one zip file name as **"YourNameSurname_Lab6.zip"** and it should contain the java files you created (Node.java, BinarySearchTree.java and Main.java for the tests)