Course Name: A Level (2nd Sem) **Subject:** Data Structure using C++
Topic: Binary Tree is BST or Not **Date:** 05-05-2020

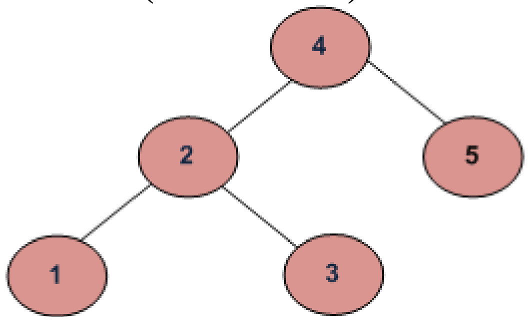
Check if a Binary Tree is BST : Simple and Efficient Approach

Given a Binary Tree, the task is to check whether the given binary tree is Binary Search Tree or not.
A binary search tree (BST) is a node-based binary tree data structure which has the following properties.

- The left subtree of a node contains only nodes with keys less than the node's key.
- The right subtree of a node contains only nodes with keys greater than the node's key.
- Both the left and right subtrees must also be binary search trees.

From the above properties it naturally follows that:

Each node (item in the tree) has a distinct key.



The idea is to use In order traversal and keep track of the previously visited node's value. Since the in order traversal of a BST generates a sorted array as output, So, the previous element should always be less than or equals to the current element.
While doing In-Order traversal, we can keep track of previously visited Node's value by passing an integer variable using reference to the recursive calls. If the value of the currently visited node is less than the previous value, then the tree is not BST.

```
// C++ program to check if a given tree is BST.
#include <bits/stdc++.h>
using namespace std;

/* A binary tree node has data, pointer to
left child and a pointer to right child */
struct Node {
   int data;
   struct Node *left, *right;

   Node(int data)
   {
      this->data = data;
      left = right = NULL;
   }
};

// Utility function to check if Binary Tree is BST
```

```
bool isBSTUtil(struct Node* root, int& prev)
{
    // traverse the tree in inorder fashion and
    // keep track of prev node
    if (root) {
        if (!isBSTUtil(root->left, prev))
            return false;

        // Allows only distinct valued nodes
        if (root->data <= prev)
            return false;

        // Initialize prev to current
        prev = root->data;

        return isBSTUtil(root->right, prev);
    }

    return true;
}

// Function to check if Binary Tree is BST
bool isBST(Node* root)
{
    int prev = INT_MIN;
    return isBSTUtil(root, prev);
}

/* Driver program to test above functions*/
int main()
{
    struct Node* root = new Node(5);
    root->left = new Node(2);
    root->right = new Node(15);
    root->left->left = new Node(1);
    root->left->right = new Node(4);

    if (isBST(root))
        cout << "Is BST";
    else
        cout << "Not a BST";

    return 0;
}
```

Output:

```
Is BST
```