

Day 9 25/11/2024

BST:

```
#include<bits/stdc++.h>
using namespace std;
struct Node{
    int data;
    Node* left;
    Node* right;
};
Node* createNode(int data){
    Node* newNode = new Node();
    newNode->data = data;
    newNode->left = newNode->right = nullptr;
    return newNode;
}
Node* insertNode(Node* root, int data){
    if(root == nullptr){
        return createNode(data);
    }
    else if(data<root->data){
        root->left = insertNode(root->left,data);
    }
    else{
        root->right = insertNode(root->right,data);
    }
    return root;
}
void inOrder(Node* root,vector<int>& arr){
    if(root!=nullptr){
        inOrder(root->left,arr);
        arr.push_back(root->data);
        inOrder(root->right,arr);
    }
}
void preOrder(Node* root,vector<int>& arr){
    if(root!=nullptr){
        arr.push_back(root->data);
        preOrder(root->left,arr);
        preOrder(root->right,arr);
    }
}
void postOrder(Node* root,vector<int>& arr){
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    if(root!=nullptr){
        postOrder(root->left,arr);
        postOrder(root->right,arr);
        arr.push_back(root->data);
    }
}
Node* searchNode(Node* root, int key){
    if(root == nullptr || root->data == key){
        return root;
    }
    else if(root->data < key){
        return searchNode(root->right,key);
    }
    else{
        return searchNode(root->left,key);
    }
}
Node* minNode(Node* node){
    Node* currNode = node;
    while(currNode && currNode->left != nullptr){
        currNode = currNode->left;
    }
    return currNode;
}
Node* maxNode(Node* node){
    Node* currNode = node;
    while(currNode && currNode->right != nullptr){
        currNode = currNode->right;
    }
    return currNode;
}
Node* deleteNode(Node* root,int data){
    if(root == nullptr){
        return root;
    }
    if(data < root->data){
        root->left = deleteNode(root->left,data);
    }
    else if(data > root->data){
        root->right = deleteNode(root->right,data);
    }
    else{
        if(root->left == nullptr){
            Node* temp = root->right;

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        delete root;
        return temp;
    }
    else if(root->right == nullptr){
        Node* temp = root->left;
        delete root;
        return temp;
    }
    Node* temp = minNode(root->right);
    root->data = temp->data;
    root->right = deleteNode(root->right,temp->data);
}
return root;
}
int main(){
    Node* root = nullptr;
    vector<int> tree = {50,60,10,80,20};
    for(int i:tree){
        root = insertNode(root,i);
    }
    root = deleteNode(root,80);
    cout<<"InOrder:\n";
    vector<int> in;
    inOrder(root,in);
    for(int i:in){
        cout<<i<<" ";
    }
    cout<<"\n";
    cout<<"PreOrder:\n";
    vector<int> pre;
    preOrder(root,pre);
    for(int i:pre){
        cout<<i<<" ";
    }
    cout<<"\n";
    cout<<"PostOrder:\n";
    vector<int> post;
    postOrder(root,post);
    for(int i:post){
        cout<<i<<" ";
    }
    return 0;
}

```

Validate BST:

```
#include<bits/stdc++.h>
using namespace std;
struct Node{
    int data;
    Node* left;
    Node* right;
};
Node* createNode(int data){
    Node* newNode = new Node();
    newNode->data = data;
    newNode->left = newNode->right = nullptr;
    return newNode;
}
Node* insertNode(Node* root, int data){
    if(root == nullptr){
        return createNode(data);
    }
    if(root->left == nullptr){
        root->left = createNode(data);
    }
    else{
        root->right = createNode(data);
    }
    return root;
}
int minValue(Node* node){
    if(node == nullptr){
        return INT_MAX;
    }
    return min({node->data,minValue(node->left),minValue(node->right)});
}
int maxValue(Node* node){
    if(node == nullptr){
        return INT_MIN;
    }
    return max({node->data,maxValue(node->left),maxValue(node->right)});
}
bool isBst(Node* node){
    if(node == nullptr){
        return true;
    }
}
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else if(node->left != nullptr && maxValue(node->left)>=node->data){
    return false;
}
else if(node->right != nullptr && minValue(node->right)<=node->data){
    return false;
}
return isBst(node->left) && isBst(node->right);
}
int main(){
    Node* root = nullptr;
    vector<int> tree = {50,10,60};
    for(int i:tree){
        root = insertNode(root,i);
    }
    bool isTree = isBst(root);
    if(isTree){
        cout<<"BST boi";
    }
    else{
        cout<<"No BST boi";
    }
    return 0;
}

```