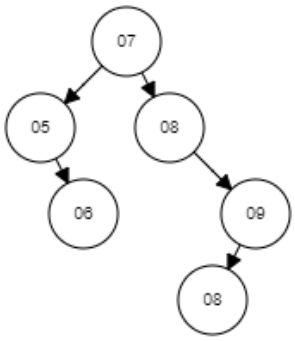
15B17CI371 – Data Structures Lab

ODD 2024
Week 7-LAB B
Practice Lab

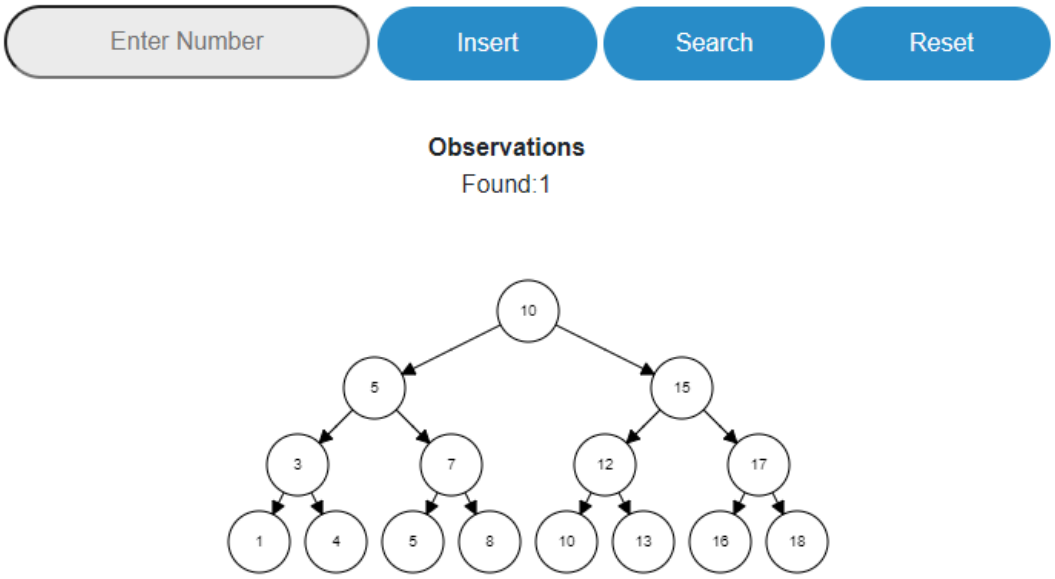
VIRTUAL LAB

INSERT

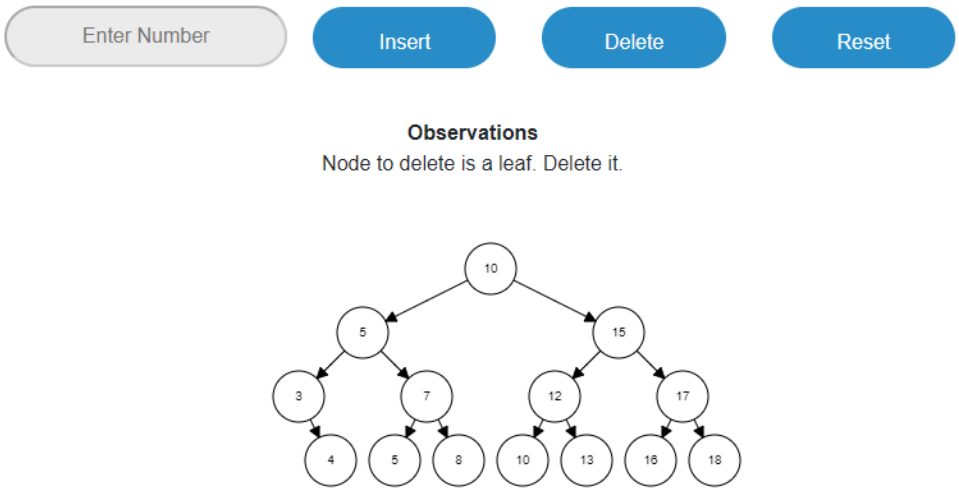
Observations



SEARCH



DELETE



1.

```
#include <iostream>
using namespace std;

class Node {
public:
   int data;
   Node *left, *right;
   Node(int value) {
      data = value;
      left = NULL;
      right = NULL;
   }
};

void printCurrentLevel(Node* root, int level);
int height(Node* node);


void printLevelOrder(Node* root) {
   int h = height(root);
   for (int i = 1; i <= h; i++)
```

```
        printCurrentLevel(root, i);
}

void printCurrentLevel(Node* root, int level) {
    if (root == NULL)
        return;
    if (level == 1)
        cout << root->data << " ";
    else if (level > 1) {
        printCurrentLevel(root->left, level - 1);
        printCurrentLevel(root->right, level - 1);
    }
}


int height(Node* node) {
    if (node == NULL)
        return 0;
    else {
        int lheight = height(node->left);
        int rheight = height(node->right);
        return (lheight > rheight) ? (lheight + 1) :
                                (rheight + 1);
    }
}
```

```
int main() {
    Node* root = new Node(1);
    root->left = new Node(2);
    root->right = new Node(3);
    root->left->left = new Node(4);
    root->left->right = new Node(5);
    printLevelOrder(root);
    return 0;
}
```

```
1 2 3 4 5
Process returned 0 (0x0)   execution time : 0.078 s
Press any key to continue.
```

```
#include <bits/stdc++.h>
using namespace std;
class Node {
public:
    int data;
    Node* left;
    Node* right;
    Node(int v)
    {
        this->data = v;
        this->left = this->right = NULL;
```

```
    }
};

void printInorder(Node* node)
{
    if (node == NULL)
        return;

    printInorder(node->left);
    cout << node->data << " ";
    printInorder(node->right);
}

int main()
{

    Node* root = new Node(100);
    root->left = new Node(20);
    root->right = new Node(200);
    root->left->left = new Node(10);
    root->left->right = new Node(30);
    root->right->left = new Node(150);
    root->right->right = new Node(300);
```

```
    cout << "Inorder Traversal: ";

    printInorder(root);

    return 0;

}
```

```
Inorder Traversal: 10 20 30 100 150 200 300
Process returned 0 (0x0)   execution time : 0.078 s
Press any key to continue.
```

```
#include <bits/stdc++.h>

using namespace std;


class Node {

public:

    int data;

    Node* left;

    Node* right;

    Node(int v)

    {

        this->data = v;

        this->left = this->right = NULL;

    }

};



void printPreOrder(Node* node)

{
```

```
    if (node == NULL)
        return;

    cout << node->data << " ";
    printPreOrder(node->left);
    printPreOrder(node->right);
}

int main()
{
    Node* root = new Node(100);
    root->left = new Node(20);
    root->right = new Node(200);
    root->left->left = new Node(10);
    root->left->right = new Node(30);
    root->right->left = new Node(150);
    root->right->right = new Node(300);
    cout << "Preorder Traversal: ";
    printPreOrder(root);
    return 0;
}
```

```
Preorder Traversal: 100 20 10 30 200 150 300
Process returned 0 (0x0)   execution time : 0.062 s
Press any key to continue.
```

```
#include <bits/stdc++.h>

using namespace std;


class Node {

public:

   int data;

   Node* left;

   Node* right;

   Node(int v)

   {

      this->data = v;

      this->left = this->right = NULL;

   }

};


void printPostOrder(Node* node)

{

   if (node == NULL)

      return;

   printPostOrder(node->left);

   printPostOrder(node->right);


   cout << node->data << " ";

}
```

```
int main()
{
    Node* root = new Node(100);
    root->left = new Node(20);
    root->right = new Node(200);
    root->left->left = new Node(10);
    root->left->right = new Node(30);
    root->right->left = new Node(150);
    root->right->right = new Node(300);
    cout << "PostOrder Traversal: ";
    printPostOrder(root);
    cout << "\n";

    return 0;
}
```

```
PostOrder Traversal: 10 30 20 150 300 200 100

Process returned 0 (0x0)   execution time : 0.031 s
Press any key to continue.
```

2.

```
#include <bits/stdc++.h>
using namespace std;
struct node
```

```
{
	int key;
	struct node *left, *right;
};

struct node *newNode(int item)
{
	struct node *temp = new node;
	temp->key = item;
	temp->left = temp->right = NULL;
	return temp;
}

void preorder(struct node *root)
{
	if (root != NULL)
	{
		cout << root->key << " ";
		preorder(root->left);
		preorder(root->right);
	}
}

vector<struct node *> constructTrees(int start, int end)
{
```

```
vector<struct node *> list;



if (start > end)
{
        list.push_back(NULL);
        return list;
}



for (int i = start; i <= end; i++)
{
        vector<struct node *> leftSubtree = constructTrees(start, i - 1);
        vector<struct node *> rightSubtree = constructTrees(i + 1, end);
        for (int j = 0; j < leftSubtree.size(); j++)
        {
                struct node* left = leftSubtree[j];
                for (int k = 0; k < rightSubtree.size(); k++)
                {
                        struct node * right = rightSubtree[k];
                        struct node * node = newNode(i);
                        node->left = left;
                        node->right = right;
                        list.push_back(node);
                }
```

```
            }
        }
        return list;
}


int main()
{


        vector<struct node *> totalTreesFrom1toN = constructTrees(1, 3);
        cout << "Preorder traversals of all constructed BSTs are \n";
        for (int i = 0; i < totalTreesFrom1toN.size(); i++)
        {
            preorder(totalTreesFrom1toN[i]);
            cout << endl;
        }
        return 0;
}
```

```
Preorder traversals of all constructed BSTs are
1 2 3
1 3 2
2 1 3
3 1 2
3 2 1

Process returned 0 (0x0)   execution time : 0.047 s
Press any key to continue.
```

3.

```
#include <bits/stdc++.h>
using namespace std;

struct Node {
    int key;
    Node *left, *right;
    Node(int k) {
        key = k;
        left = NULL;
        right = NULL;
    }
};

bool findPath(Node* root, vector<int>& path, int k) {
    if (!root)
        return false;
    path.push_back(root->key);

    if (root->key == k)
        return true;
```

```
    if ((root->left && findPath(root->left, path, k)) ||
        (root->right && findPath(root->right, path, k)))
        return true;
    path.pop_back();
    return false;
}



int findLCA(Node* root, int n1, int n2) {

    vector<int> path1, path2;
    if (!findPath(root, path1, n1) ||
        !findPath(root, path2, n2))
        return -1;
    int i;
    for (i = 0; i < path1.size() && i < path2.size(); i++) {
        if (path1[i] != path2[i])
            break;
    }
    return path1[i - 1];
}

int main() {
    Node* root = new Node(1);
```

```
    root->left = new Node(2);

    root->right = new Node(3);

    root->left->left = new Node(4);

    root->left->right = new Node(5);

    root->right->left = new Node(6);

    root->right->right = new Node(7);


    cout << "LCA(4, 5) = " << findLCA(root, 4, 5) << endl;

    cout << "LCA(4, 6) = " << findLCA(root, 4, 6) << endl;

    cout << "LCA(3, 4) = " << findLCA(root, 3, 4) << endl;

    cout << "LCA(2, 4) = " << findLCA(root, 2, 4) << endl;


    return 0;

}
```

```
LCA(4, 5) = 2
LCA(4, 6) = 1
LCA(3, 4) = 1
LCA(2, 4) = 2

Process returned 0 (0x0)   execution time : 0.078 s
Press any key to continue.
```

4.

```
#include <bits/stdc++.h>

using namespace std;

class node
```

```
{
        public:
        int data;
        node* left;
        node* right;
};


int max(int inorder[], int strt, int end);
node* newNode(int data);
node* buildTree (int inorder[], int start, int end)
{
        if (start > end)
                return NULL;
        int i = max (inorder, start, end);
        node *root = newNode(inorder[i]);
        if (start == end)
                return root;
        root->left = buildTree (inorder, start, i - 1);
        root->right = buildTree (inorder, i + 1, end);

        return root;
}
int max (int arr[], int strt, int end)
{
```

```
	int i, max = arr[strt], maxind = strt;
	for(i = strt + 1; i <= end; i++)
	{
		if(arr[i] > max)
		{
			max = arr[i];
			maxind = i;
		}
	}
	return maxind;
}



node* newNode (int data)
{
	node* Node = new node();
	Node->data = data;
	Node->left = NULL;
	Node->right = NULL;

	return Node;
}



void printInorder (node* node)
```

```
{
        if (node == NULL)
                return;
        printInorder (node->left);
        cout<<node->data<<" ";
        printInorder (node->right);
}

int main()
{

        int inorder[] = {5, 10, 40, 30, 28};
        int len = sizeof(inorder)/sizeof(inorder[0]);
        node *root = buildTree(inorder, 0, len - 1);
        cout << "Inorder traversal of the constructed tree is \n";
        printInorder(root);
        return 0;
}
```

```
Inorder traversal of the constructed tree is
5 10 40 30 28
Process returned 0 (0x0)   execution time : 0.047 s
Press any key to continue.
```