204700
Data Structure and Programming Languages

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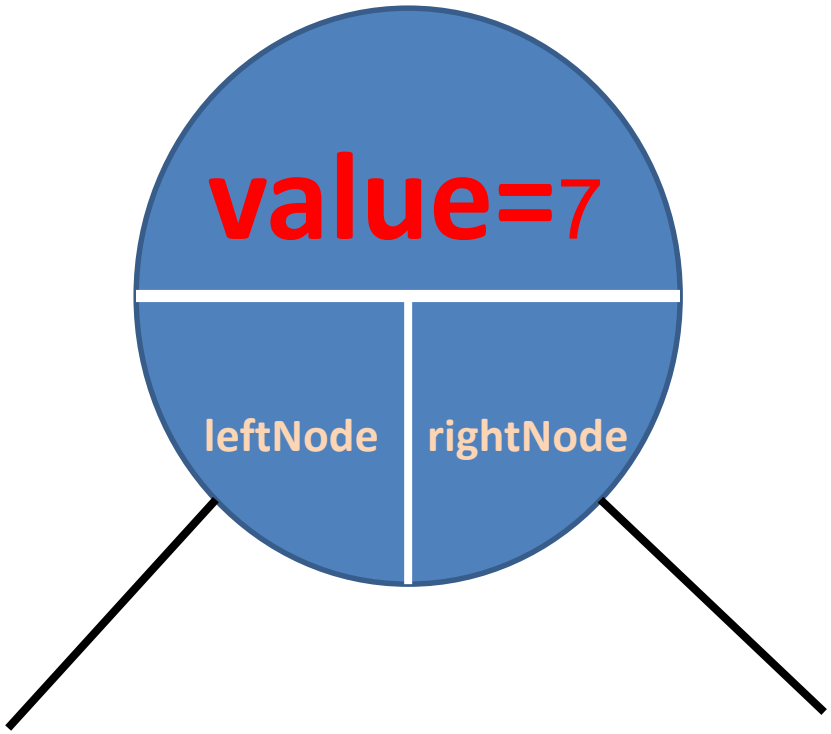
TREES

- Binary tree
  - Create a node
  - Insert a node
  - Find a key
  - Traversal

Node

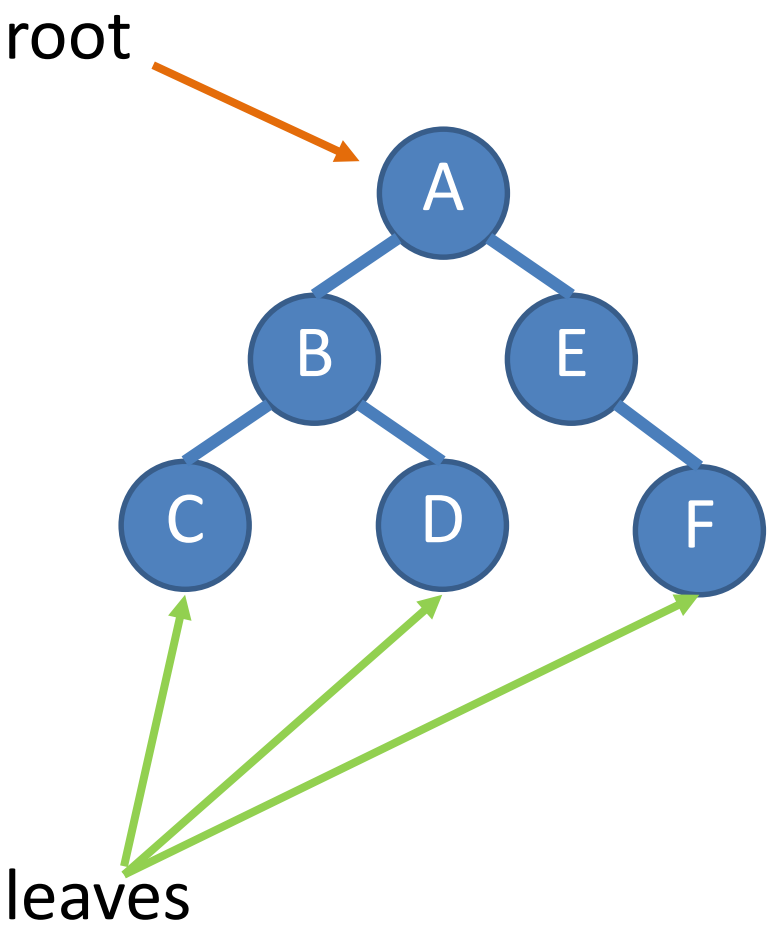



```
public class Node {
    int value;
    Node leftNode;
    Node rightNode;

    Node() {
    }

    Node(int inputValue) {
        value = inputValue;
    }
}
```

Class Tree



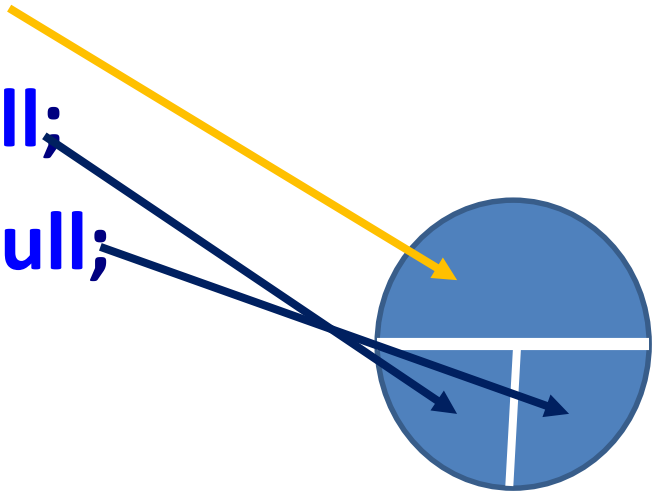

```
public class Tree {
    Node root;
    Node pointer;

    Tree() {
        root=null;
    }

    Tree(int item) {
        root = new Node();
        root.value = item;
    }
//OPERATIONS
```

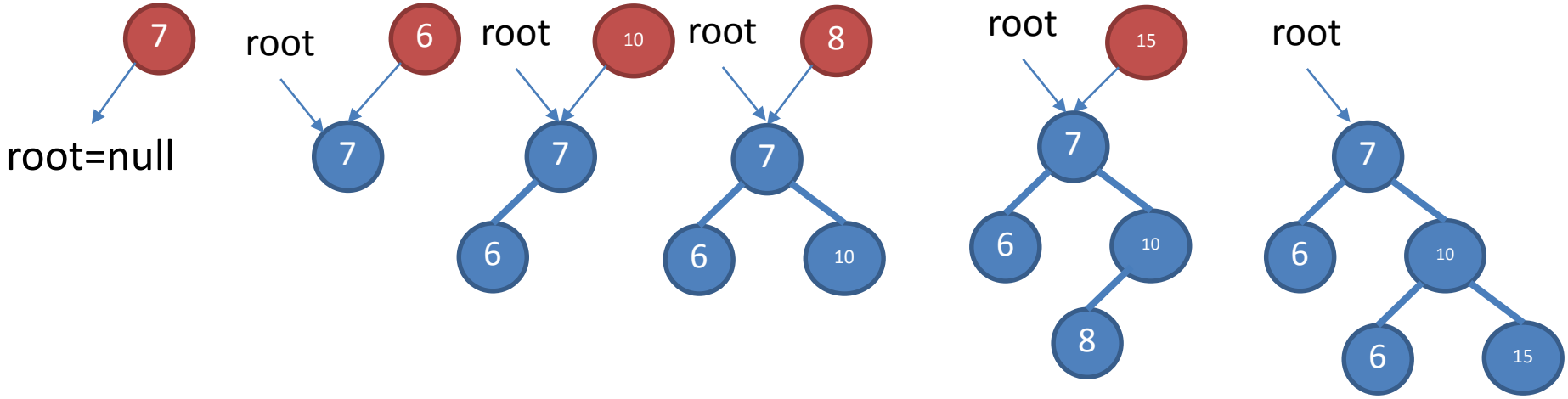
Create a node

```
Node createNode(int item) {
    Node newNode = new Node();
    newNode.value = item;
    newNode.leftNode = null;
    newNode.rightNode = null;
    return newNode;
}
```



รูปตัวอย่างการ insert node

- ลำดับการ insert node: 7, 6, 10, 8, 15



เริ่มต้น root = null

ผลลัพธ์สุดท้าย

```
void insertNewNode(Node newNode) {
    Node previous=null
    pointer=null;

    if (root == null) {
        root = newNode;
    } else {
        pointer=root;
        while(pointer!=null){
            previous = pointer;
            if(pointer.value>newNode.value){
                pointer=pointer.leftNode;
            }else{
                pointer=pointer.rightNode;
            }
        }

        if(previous.value>newNode.value){
            previous.leftNode=newNode;
        }else{
            previous.rightNode=newNode;
        }
    }
}
```

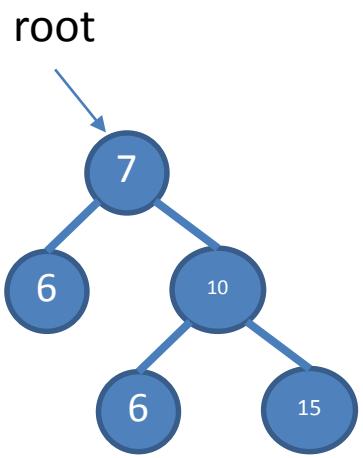
หาโหนดสุดท้ายแล้วเก็บไว้ที่ previous

เลือกตัวชี้ที่จะต้อง link ไปโหนดใหม่

Class Test

```
public static void main(String[] args) {
        // TODO Auto-generated method stub
        Tree t = new Tree(10);
        Node x = new Node(5);
        Node y = new Node(15);
        t.insertNewNode(x);
        t.insertNewNode(y);
        System.out.println(t.root.value);
        System.out.print(t.root.leftNode.value);
        System.out.print(t.root.rightNode.value);
}
```

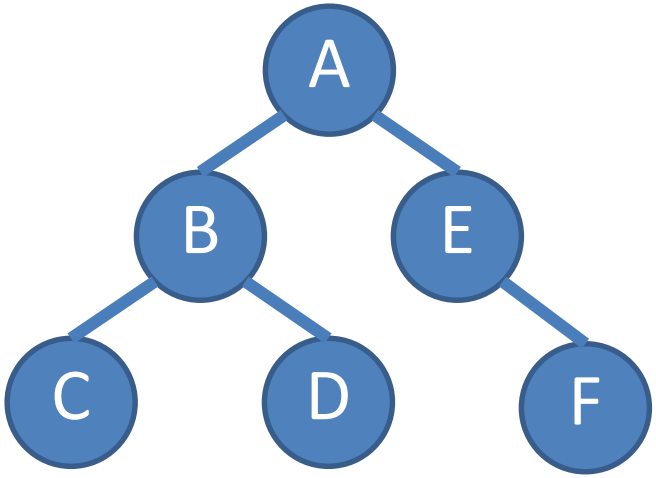
FindKey



FindKey(20)
FindKey(10)

```
void FindKey(int key,Node v){
    if(v==null){
        System.out.println("Not found.");
    }
    if(key<v.value){
        if(v.leftNode==null){
            System.out.println("Not found.");
        }else{
            FindKey(key,v.leftNode);
        }
    }else if(key==v.value){
        System.out.println("Found.");
    }else{
        if(v.rightNode==null){
            System.out.println("Not found.");
        }else{
            FindKey(key,v.rightNode);
        }
    }
}
```

Binary Tree Traversal



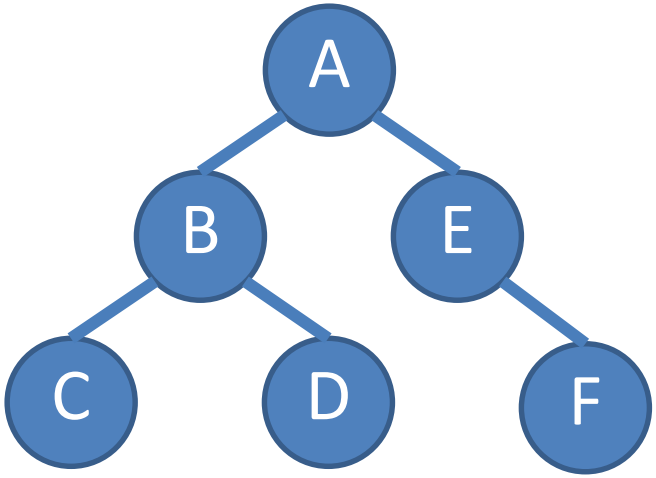
preOrder

```
void preOrder(Node p){
    System.out.println(p.value);
    if(p.leftNode!=null){
        preOrder(p.leftNode);
    }
    if(p.rightNode!=null){
        preOrder(p.rightNode);
    }
}
```

ผลลัพธ์: RT_LT_R

A B C D E F

Binary Tree Traversal



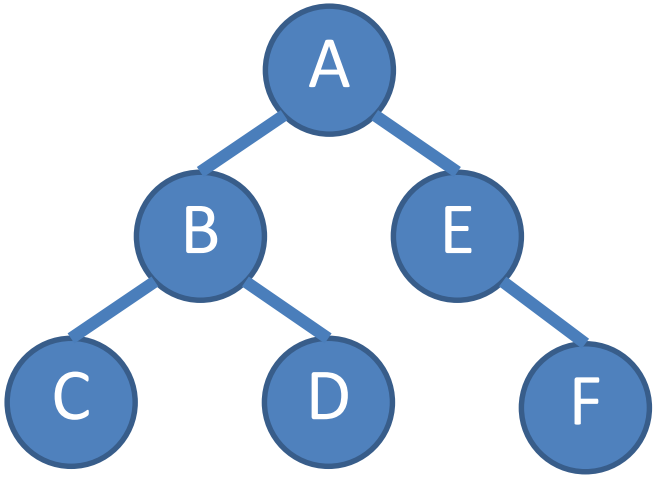
postOrder

```
void postOrder(Node p){
    if(p.leftNode!=null){
        postOrder(p.leftNode);
    }
    if(p.rightNode!=null){
        postOrder(p.rightNode);
    }
    System.out.println(p.value);
}
```

ผลลัพธ์: $T_L T_R R$

C D B F E A

Binary Tree Traversal



inOrder

InOrder ??

ผลลัพธ์: $T_L R T_R$

C B D A E F