

# CSE12 - Lecture 19 - B00

Monday, November 7, 2022 9:00 AM

PA 6 due tomorrow

PA 3 Late / Resubmit due tomorrow

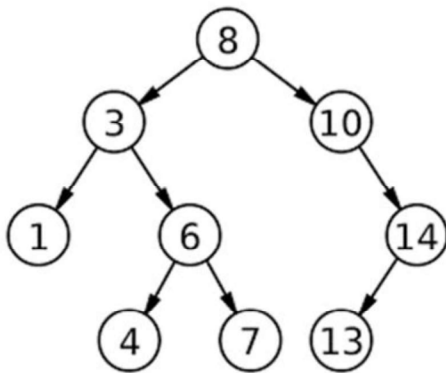
No class on Friday

What order does printAllElement() traverse the tree?

```
void printAllElements(Node<K, N> n) {
    if (n == null) return;
    ① → System.out.println(n.key);
    ② → printAllElements(n.left);
    ③ → printAllElements(n.right);
    ④ → }

void printAllElement() {
    printAllElements(this.root);
}
```

What's the post, pre, in-order traversal of this tree?



Traversal

① pre-order → 8 3 1 6 4 7 10 14 13

② in-order → 1 3 4 6 7 8 10 13 14

↳ sorted

③ post-order → 1 4 7 6 3 13 14 10 8

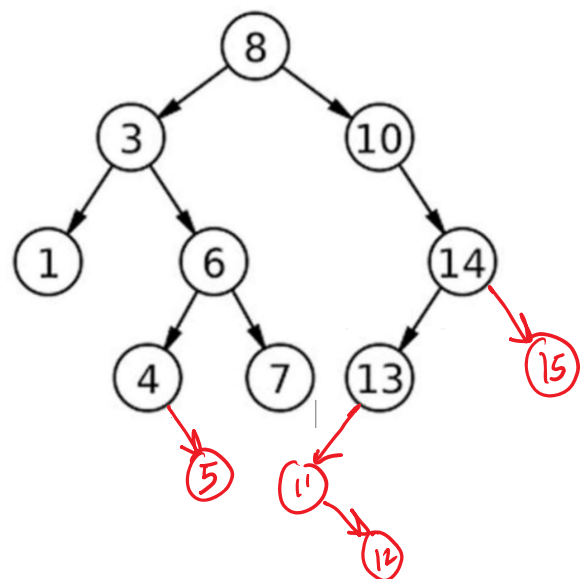
```
class BSTMap<K,V> implements OrderedDefaultMap<K,V>{
    Node<K, V> root;
    int size;
    Comparator<K> comparator;
    ...
    Node<K, V> set(Node<K, V> node, K key, V value) {
        if (node == null) {
            this.size += 1;
            return new Node<K, V>(key, value, null, null);
        }
        int comp = this.comparator.compare(node.key, key);
        if (comp < 0) {
            node.right = this.set(node.right, key, value);
            return node;
        } else if (comp > 0) {
            node.left = this.set(node.left, key, value);
            return node;
        } else {
            node.value = value;
            return node;
        }
    }

    @Override
    public void set(K key, V value) {
        if (key == null) {
            throw new IllegalArgumentException();
        }
        this.root = this.set(this.root, key, value);
    }
}
```

Use the picture on the left and assume the key and value are identical:

```
set("5", 5);
set("11", 11);
set("15", 15);
set("12", 12);
```

What is the picture after calling the above set() methods?



What is the run-time for a Binary Tree

set() / insert Worst Case  $\Theta(N)$

What conditions make up the worst case for set()?

sorted or reverse sorted inputs

Best Case:  $\Theta(\log_2(N))$

What conditions make up the best case for set()?

root nodes are median values

get() / <sup>set</sup>update Worst Case  $\Theta(N)$

What conditions make up the worst case for get()?

sorted  $\rightarrow$  largest element last

Best Case:  $\Theta(1)$

What conditions make up the best case for get()?

root node has the key we are looking for

printAllElements()

Worst Case

Best Case:

$> \Theta(N)$

What conditions make up the best case for set()?

no best or worst case  
print all nodes

