

CSE12 - Lecture 19

Friday, November 17, 2023 8:00 AM

PA7 and PA5 Late/Resubmit - due Wednesday @ 8am

Lecture 19

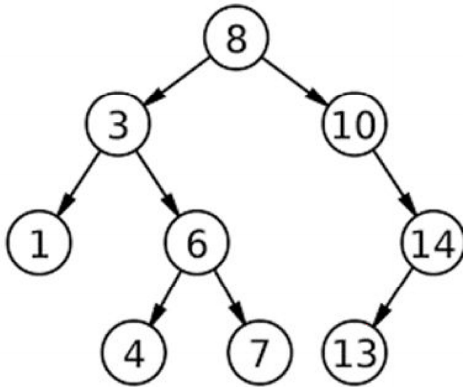
What order does printAllElement() traverse the tree?

pre-order

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

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

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



Traversal

① 8 3 1 6 4 7 10 14 13
 sorted ② 1 3 4 6 7 8 10 13 14
 ③ 1 4 7 6 3 13 14 10 8

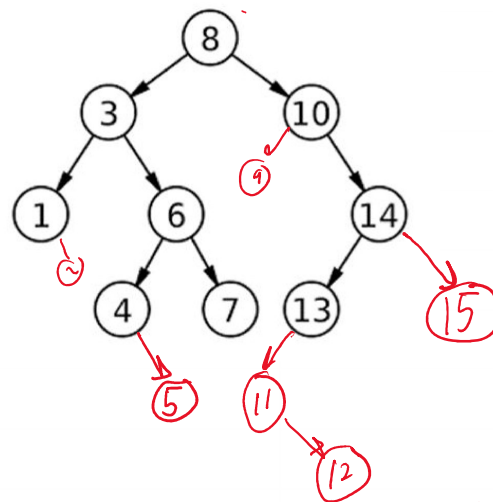
```
class BSTMap<K,V> implements OrderedDefaultMap<K,V>{
    Node<K, V> root;
    int size;
    Comparator<K> comparator;
    ...
    Node<K, V> set(Node<K, V> node, K key, V value) {
        if (node == null) {
            this.size += 1;
            return new Node<K, V>(key, value, null, null);
 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



Name: _____ PID: _____ Code: 1427

What is the run-time for a Binary Tree

set()

Worst Case $\Theta(N)$

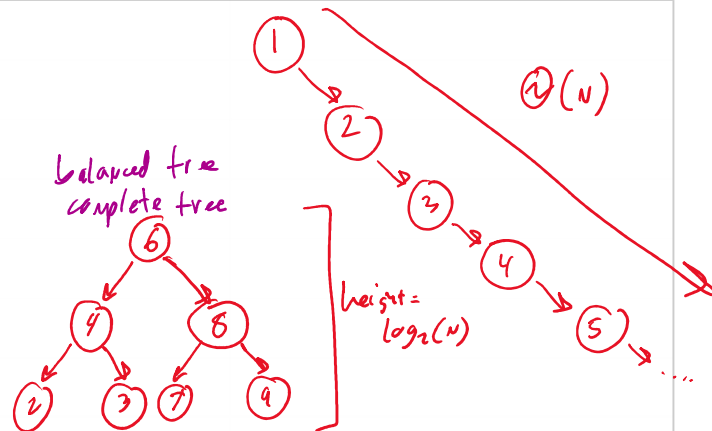
What conditions make up the worst case for set()?

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()

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

worst case
on best tree
 $\rightarrow \log_2(N)$

avg case $\rightarrow \Theta(\log(N))$

printAllElements()

Worst Case $\rightarrow \Theta(N)$

Best Case:

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