

**Traversal vs. Search:**

- **Traversal** visits every node in the tree exactly once.
- **Search** finds one (or more) element(s) in the tree.

**Breadth First Traversal + Search:**

**Depth First Traversal + Search:**

**Runtime Analysis on a Binary Tree:**

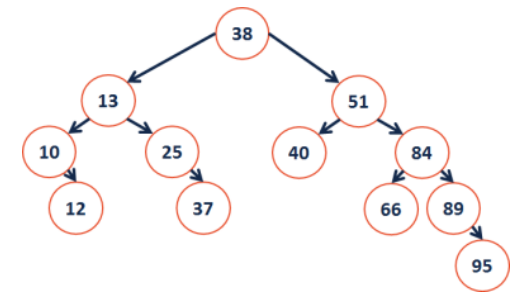
- Find an element:      Best case?              Worst case?
- Insertion of a sorted list of elements?  
                                 Best case?              Worst case?
- Running time bound by?

**Dictionary ADT**

```

Dictionary.h
3
4 class Dictionary {
5     public:
6
7
8
9
10
11
12
13     private:
14
15
16 };
    
```

**A Searchable Binary Tree?**



**Binary Search Tree Property:**

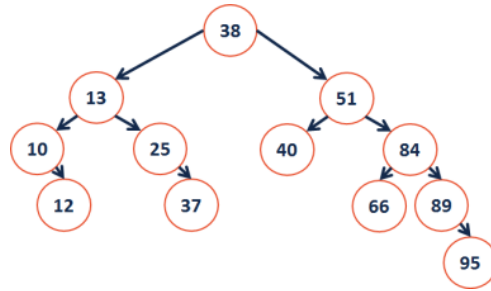
**Finding an element in a BST:**

```

BST.hpp
template <typename K, typename V>
    find(const K & key)
const {
}

template <typename K, typename V>
    _find
    (TreeNode *& root, const K & key) const {
}
    
```

## Inserting an element into a BST:



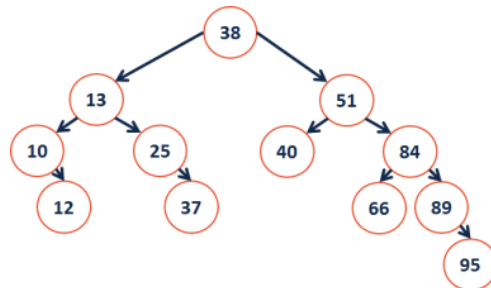
```

BST.hpp
template <typename K, typename V>
void BST<K, V>::_insert(TreeNode *& root, K key, V value)
{
}

```

Running time? \_\_\_\_\_ Bound by? \_\_\_\_\_

What if we did not pass a pointer by reference?

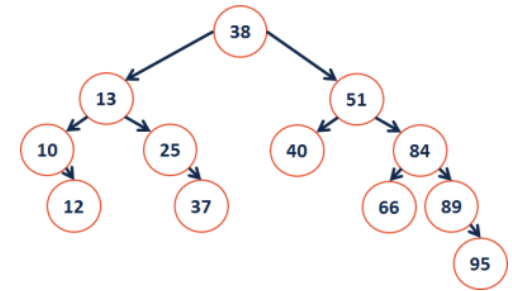


## Removing an element from a BST:

```

_remove(40)
_remove(25)
_remove(10)
_remove(13)

```



One-child Remove	Two-child remove

```

BinaryTree.hpp
template <class K, class V>
void BST<K,V>::_remove(TreeNode *& root, const K & key) {
}

```

Running time? \_\_\_\_\_ Bound by? \_\_\_\_\_

- CS 225 – Things To Be Doing:**
1. Theory Exam 2 Topics List Posted (exam next week)
  2. MP3 extra credit on-going; MP3 due Monday, Oct. 7
  3. Upcoming Lab: lab\_trees
  4. Daily POTDs