

## Chapter 5, Binary search trees:

- ▶ Binary search trees intro; the balanced BST problem (**Today** and Monday, Mar 13)
- ▶ AVL trees (Monday, Mar 13, and Wednesday, Mar 15)
- ▶ Traditional red-black trees (Friday, Mar 17)
- ▶ Left-leaning red-black trees (Monday, Mar 20)
- ▶ “Wrap-up” BST (Wednesday, Mar 22)

## Today:

- ▶ The quest for a better map, motivation for BST
- ▶ BST definition and iterative implementation
- ▶ BST performance and the balanced BST problem
- ▶ Introduction to the code base

## Coming up:

*Catch up on older projects?*

*Do **SSSP** project (suggested by today, Fri, Mar 3)*

*Due **Mon, Mar 13** (end of day)*

*Read Section 5.(1 & 2)*

*Do Exercises 5.(2 & 6)*

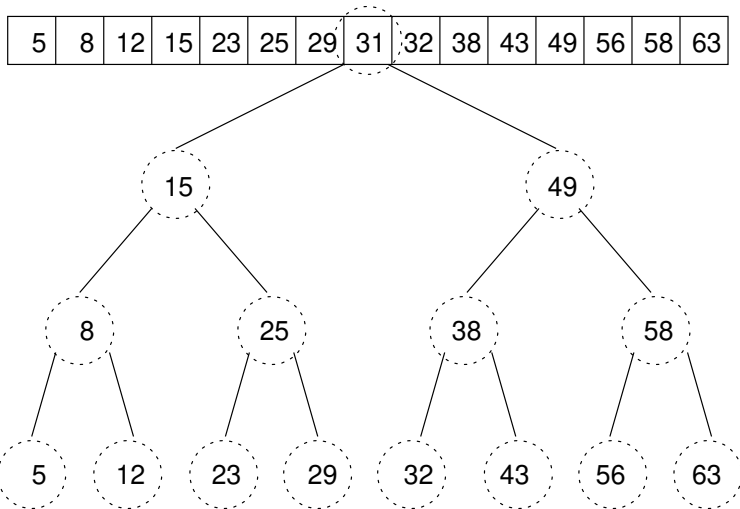
*Take quiz*

*Do **BST rotations** project (suggested by Wed, Mar 15)*

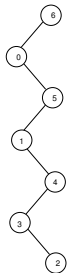
```
public interface Map<K, V> extends Iterable<K> {  
    void put(K key, V val);  
    V get(K key);  
    boolean containsKey(K key);  
    void remove(K key);  
}
```

List	$\Theta(n)$
BST	$\Theta(\lg n)$
Hashtable	$\Theta(1)$

		Unsorted	Sorted
Array	Find	$\Theta(n)$	$\Theta(\lg n)$
	Insert	$\Theta(1)$ expected, $\Theta(n)$ worst	$\Theta(n)$
	Delete	$\Theta(n)$	$\Theta(n)$
Linked structure	Find	$\Theta(n)$	$\Theta(n)$
	Insert	$\Theta(1)$	$\Theta(1)$
	Delete	$\Theta(1)$	$\Theta(1)$

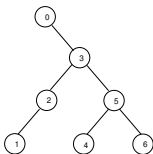


6, 0, 5, 1, 4, 2, 3



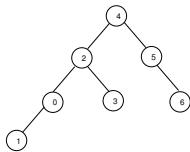
height 7  
total depth 21  
ANI 4

0, 3, 5, 2, 6, 1, 4



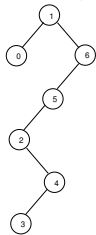
height 4  
total depth 14  
ANI 3

4, 2, 5, 3, 0, 1, 6



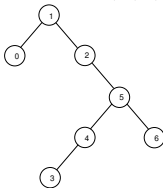
height 4  
total depth 11  
ANI 2.57

1, 6, 5, 2, 4, 3, 0



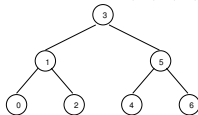
height 6  
total depth 16  
ANI 3.29

1, 2, 5, 4, 3, 0, 6

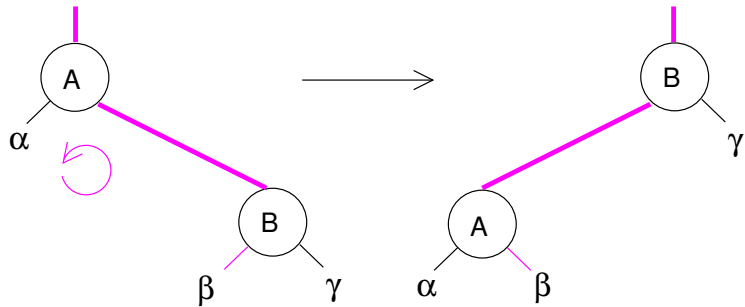


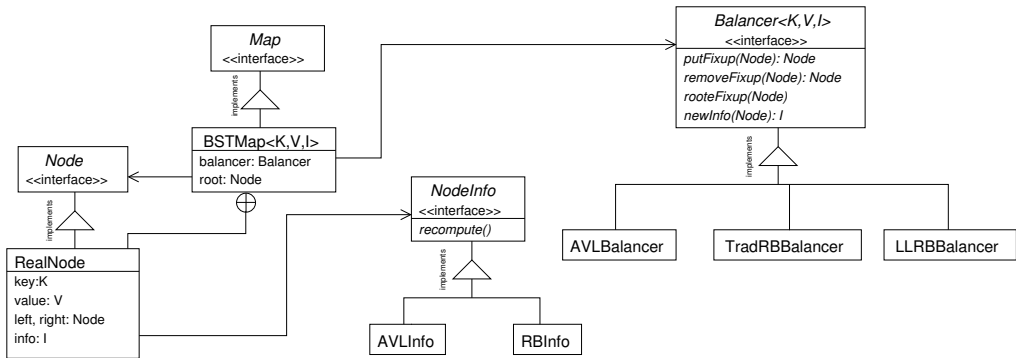
height 5  
total depth 14  
ANI 3

3, 1, 5, 0, 2, 4, 6



height 3  
total depth 10  
ANI 2.43







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*Take quiz*

*Do **BST rotations** project (suggested by Wed, Mar 15)*