CSE12W19-Feb25-W8-M-19-1

```
class Node<K, V> {
  K key;
  V value;
  Node<K, V> left, right;
}

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);
}

}
```

`@A.set("orange", 5)`

`this.root = ...`

@A	BSTMap root = @B size = 4 comparator = String::compare

@B	Node
	key = "blue"
	value = 10
	left = null
	right = @C

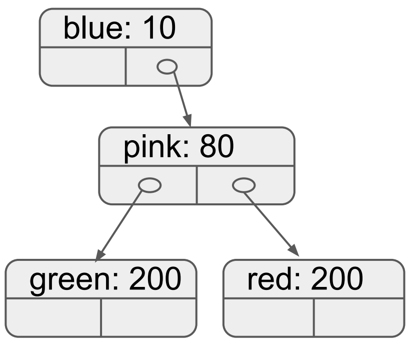
@C	Node
	key = "pink"
	value = 80
	left = @D
	right = @E

@D	Node
	key = "green"
	value = 200
	left = null
	right = null

@E	Node
	key = "red"
	value = 200
	left = null
	right = null

Based on set() above, what order should we add elements to an empty tree to get the below?

A: blue, green, pink, red
B: blue, pink, green, red
C: blue, pink, red, green
D: red, pink, green, blue
E: More than one of these works



Definition: A **binary search tree (BST)** is a tree where at **every** node, all keys to the **left** of that node are **smaller** than that key, and all keys to the **right** are larger.

```
class Node<K, V> {
  K key;
  V value;
  Node<K, V> left, right;
}

class BSTMap<K,V> implements OrderedDefaultMap<K,V>{









int height() {


}

























void printAllElements() {


}









}
```

Definition: the **height** of a tree is the number of nodes on the **longest** path from the root to the bottom (or to a **leaf**).

The example on the front has height **3**. After we add "orange" it has height **4**.

Consider adding "blue", "pink", "orange", "red", "green", "gray", and "yellow" to an empty tree. What is the **smallest** and **largest** height possible? [Which order gives these results?]

A: smallest: 4, largest: 6
B: smallest: 3, largest: 7
C: smallest: 4, largest: 7
D: smallest: 2, largest: 7
E: smallest: 4, largest: 6