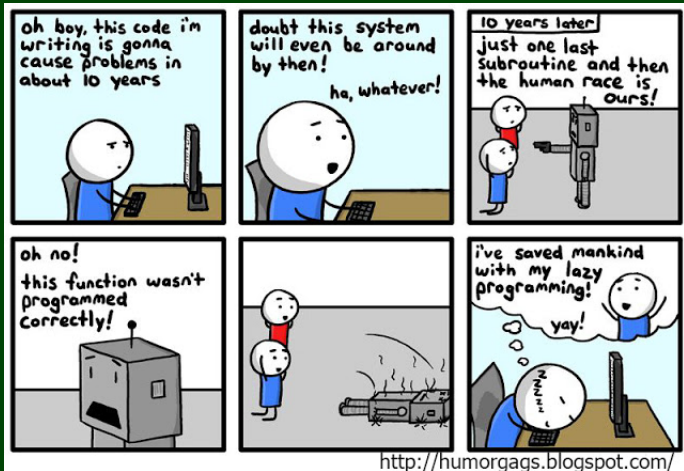


CSE 143

Computer Programming II

More BSTs



- 1 More (BST) Set Operations

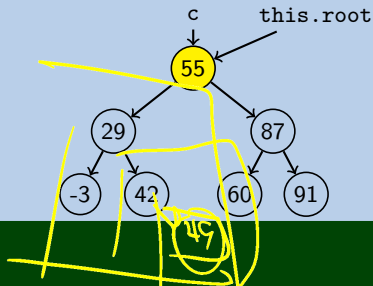
Adding to a BST

Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) { // 55 > 49  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) {  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

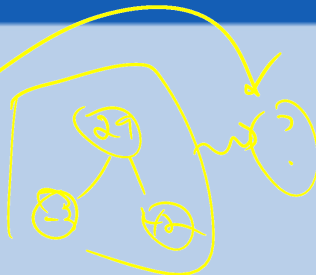
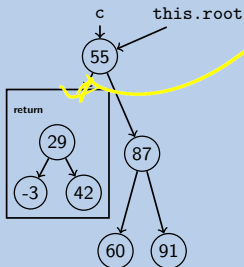


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) {  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

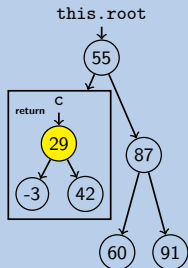


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) { // 29 < 49  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

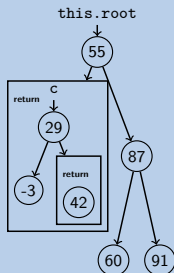


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) { // 29 < 49  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

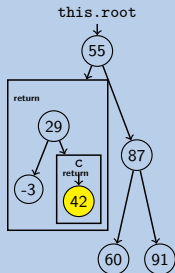


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) { // 42 < 49  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

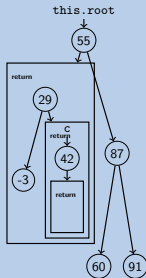


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) { // 42 < 49  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

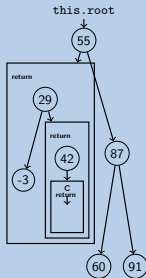


Code

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1 private IntTreeNode add(IntTreeNode c, int value) {  
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10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

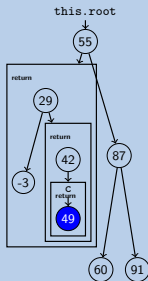


Code

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1 private IntTreeNode add(IntTreeNode c, int value) {  
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10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

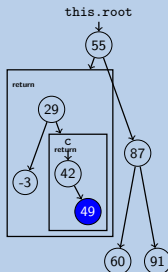


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
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5     else if (c.data > value) {  
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10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

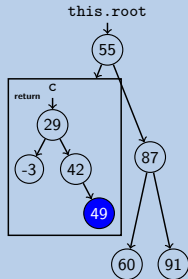


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
6         c.left = add(c.left, value);  
7     }  
8     else if (c.data < value) {  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

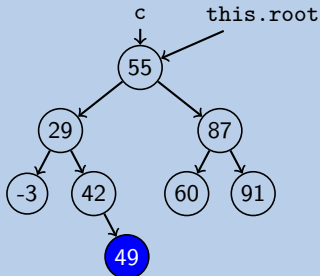


Code

```
1 private IntTreeNode add(IntTreeNode c, int value) {  
2     if (c == null) {  
3         c = new IntTreeNode(value);  
4     }  
5     else if (c.data > value) {  
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7     }  
8     else if (c.data < value) {  
9         c.right = add(c.right, value);  
10    }  
11    return c;  
12 }
```

Example (tree.add(49))

value = 49

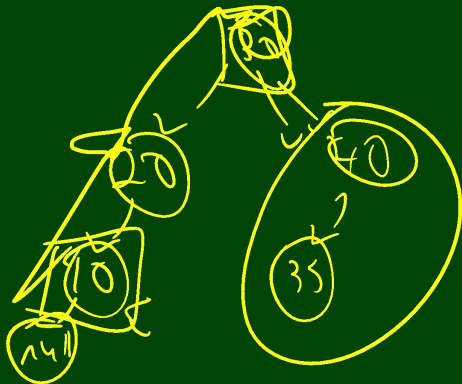


`first`

Write a function `first` in the `BST` class with the following signature:

```
public int first();
```

that returns the smallest value in the tree. If the tree is empty, `first` should throw a `NoSuchElementException`.



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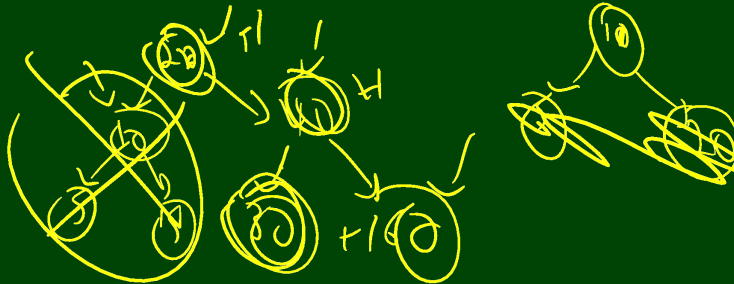
```
1 public int first() {
2     return first(this.root);
3 }
4
5 private int first(IntTreeNode current) {
6     if (current == null) {
7         throw new NoSuchElementException();
8     }
9     /* Keep on going left as far as we can */
10    else if (current.left != null) {
11        return first(current.left);
12    }
13    else {
14        return current.data;
15    }
16 }
```


increment

Write a function `increment` in the `BST` class with the following signature:

```
public void increment(int value);
```

that ~~increments every value~~ visited on a standard "search" for `value`.

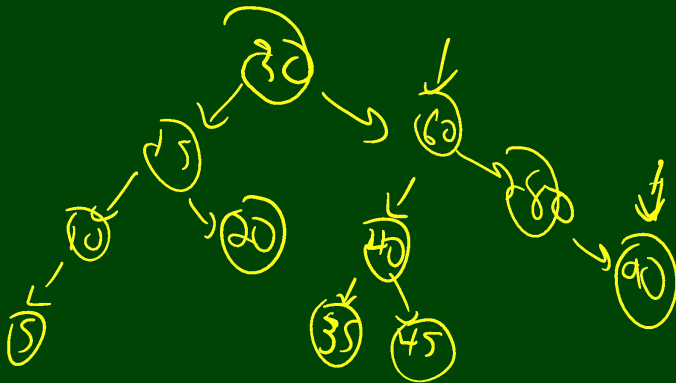


replaceWithSum

Write a function `replaceWithSum` in the `BST` class with the following signature:

```
public void replaceWithSum(int value);
```

that replaces all subtrees "rooted" at `value` with their sum.



copy

Write a function `copy` in the `BST` class with the following signature:

```
public IntTree copy();
```

that returns a new `IntTree` with the same values as `this` one.