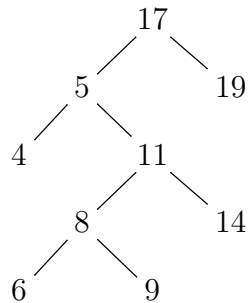# Data Structures
CSCI C343, Fall 2015

Name: _____

This quiz has 3 questions, for a total of 30 points.

1. ⟨13 points⟩ Balance the following binary search tree so that it satisfies the AVL property. Only use tree rotations to change the tree.

```
            17
           /   \
          5     19
         / \
        4   11
           /   \
          8     14
         / \
        6   9
```
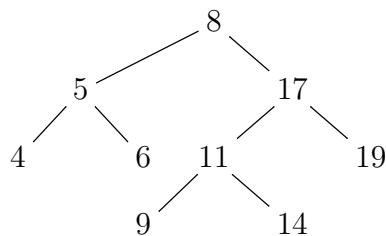

Solution:

5 is the lowest node that does not satisfy the AVL property. It's right node is left heavy, so we rotate right on 11 then rotate left on 5 to get the following tree.
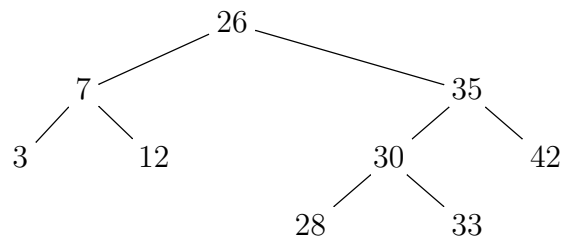
```
              17
             /   \
            8     19
           / \
          5   11
         / \  / \
        4  6 9   14
```
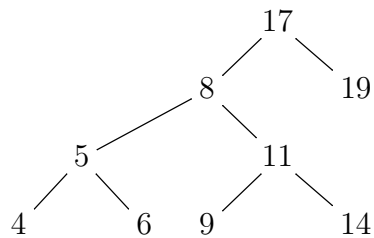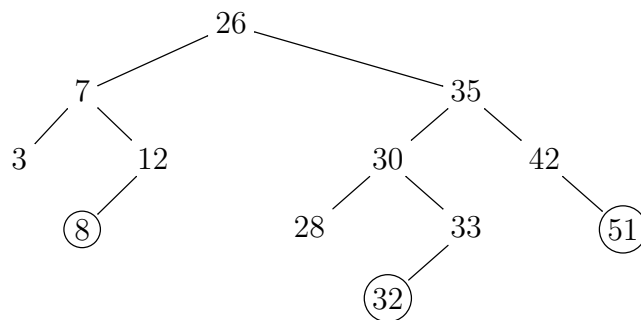
Now 15 is the lowest node that does not satisfy the AVL property. It's left child is balanced, so we rotate right on 15.

```
              8
            /   \
           5     17
          / \   /  \
         4   6 11   19
              / \
             9   14
```
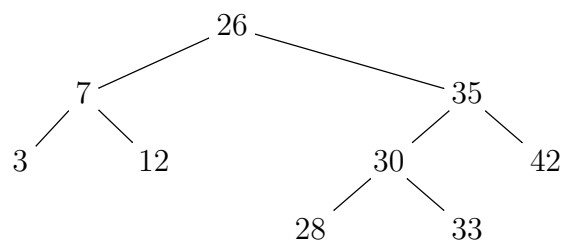
2. 9 points Insert keys 32, 51, and 8 into the following tree.

```
              26
          /        \
        7           35
       / \         /   \
      3   12      30     42
                 /  \
               28    33
```

Solution:

```
                26
            /        \
          7           35
         / \         /   \
        3   12      30     42
             \     /  \      \
             (8) 28    33    (51)
                        \
                       (32)
```

3 points per correct insertion.

3. 8 points Answer the following questions about this binary search tree. The integers at each node of the tree are the keys.

```
              26
          /        \
        7           35
       / \         /   \
      3   12      30     42
                 /  \
               28    33
```

1. What is the successor (the "after") of the node with key 30?
2. What is the successor (the "after") of the node with key 12?
3. What is the predecessor (the "before") of the node with key 30?
4. What is the predecessor (the "before") of the node with key 35?

Solution:

1. 33

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2. 26

3. 28

4. 33

2 points for each correct answer.