

CS 5012: Binary Trees Module 4.3 Exercise

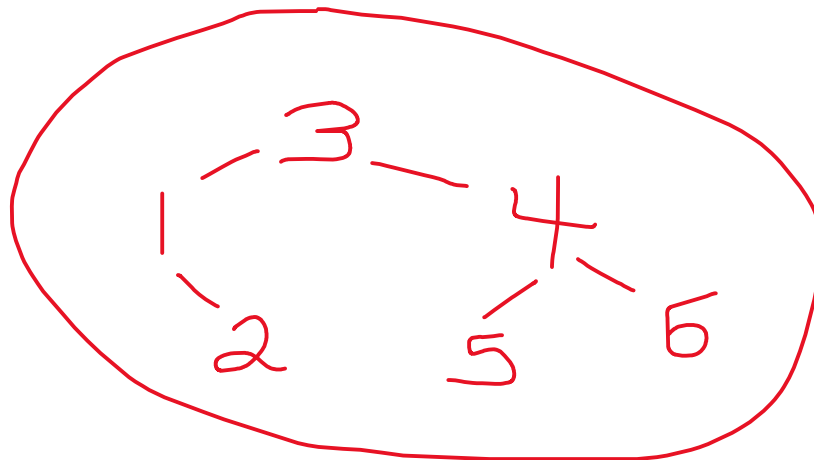
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Question 1:

Assume the implementation of a `BinaryTree` from slide 30 in *Introduction to Trees*. Draw the binary tree that the following code produces (the code was written in *main*).

```
# create a bunch of nodes with integer values
theRoot = BinaryTree.Node(3) # root node with value 3
n1 = BinaryTree.Node(1)
n2 = BinaryTree.Node(2)
n4 = BinaryTree.Node(4)
n5 = BinaryTree.Node(5)
n6 = BinaryTree.Node(6)
# create a binary tree called 'myTree'
myTree = BinaryTree(theRoot) # create a tree 'myTree' with root = 3
# connect the tree
myTree.root.setLeft(n1)
myTree.root.setRight(n4)
n1.setRight(n2)
n4.setRight(n6)
n4.setLeft(n5)
```



Question 2:

Assume the implementation of a `BinaryTree` from slide 30 in *Introduction to Trees*. Build a binary tree by providing the code in Python as would be typed in main (similar to the code in Q1), based on the following drawing.

Answer

```
# create the root node
theRoot = BinaryTree.Node(3)
# create the other nodes
n1 = BinaryTree.Node(1)
n2 = BinaryTree.Node(2)
n11 = BinaryTree.Node(11)
n5 = BinaryTree.Node(5)
n6 = BinaryTree.Node(6)
n9 = BinaryTree.Node(9)

# create the tree object
theTree = BinaryTree(theRoot)

# connect the tree
theTree.root.setLeft(n1)
theTree.root.setRight(n6)

n1.setLeft(n2)
n1.setRight(n11)

n6.setRight(n9)
n6.setLeft(n5)
```

Question 3:

Write a tree-level `getHeight()` method that calculates the height (or depth) of the binary tree (e.g., it would return 3, if called on the tree in Q2).

Note: Think of a way to do this recursively, having each node calculate its height, as if it was the root of its subtree.

Answer

```
def getHeight(self):
    if self.right and self.left:
        rightHeight = getHeight(self.right)
        leftHeight = getHeight(self.left)
        if (leftHeight > rightHeight):
            return (1 + leftHeight)
        else:
            return (1 + rightHeight)
    elif node.left:
        return (1 + getHeight(self.left))
```

```
    elif node.right:
        return (1 + getHeight(self.right))
    else:
        # height is 1 at a leaf, i.e. no children
        return 1

root.getHeight()
```