CS 171 Assignment 6, Due on Oct.30th

1. Implement your binary search tree with methods:
   - *height()* to computes the height of the tree.
   - *size()* to count the number of nodes in the tree.
   - *put(Key key, Value val)* to put the new node into the tree.
   - *delete()* to delete the node with given key (find the maximum node in the left subtree topped by deleted node).
   - *printbstinorder()* to print your tree.

Test case:

```
BinarySearchTree<Character, Integer>  binarySearchTree = new BinarySearchTree<>();
String test = "EASYQUESTION";
System.out.println("Height: " + binarySearchTree.height() + " Size: " +
binarySearchTree.size());
for(int i = 0 ; i < test.length(); i++){
    binarySearchTree.put(test.charAt(i),test.charAt(i) + 0);
    System.out.println("After put: " +test.charAt(i) + " value: " +(test.charAt(i) +
0) +" Height: " + binarySearchTree.height() + " Size: " + binarySearchTree.size());
}

binarySearchTree.printbstinorder();
binarySearchTree.delete('S');
System.out.println("Delete S, Height: " + binarySearchTree.height() + " Size: " +
binarySearchTree.size());
binarySearchTree.printbstinorder();
binarySearchTree.delete('O');
System.out.println("Delete O, Height: " + binarySearchTree.height() + " Size: " +
binarySearchTree.size());
binarySearchTree.printbstinorder();
```

Expected:

Height: -1 Size: 0

After put: E value: 69 Height: 0 Size: 1

After put: A value: 65 Height: 1 Size: 2

After put: S value: 83 Height: 1 Size: 3

After put: Y value: 89 Height: 2 Size: 4

After put: Q value: 81 Height: 2 Size: 5

After put: U value: 85 Height: 3 Size: 6

After put: E value: 69 Height: 3 Size: 6

After put: S value: 83 Height: 3 Size: 6

After put: T value: 84 Height: 4 Size: 7

After put: I value: 73 Height: 4 Size: 8

After put: O value: 79 Height: 4 Size: 9

After put: N value: 78 Height: 5 Size: 10

A E I N O Q S T U Y

Delete S, Height: 5 Size: 9

A E I N O Q T U Y

Delete O, Height: 4 Size: 8

A E I N Q T U Y

2. a. How many ways are there that can produce the worst case when we insert the elements A X C S E R H into an empty BST?

b. How many binary tree shapes of n nodes are there with height n?