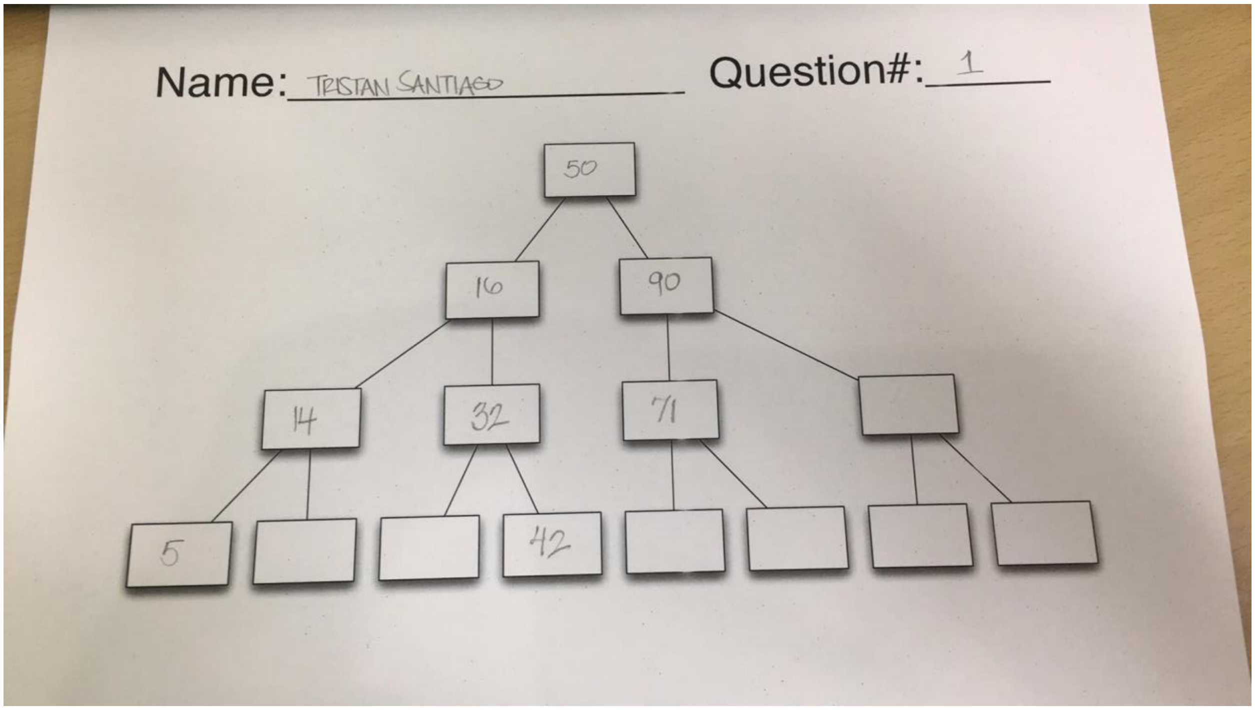
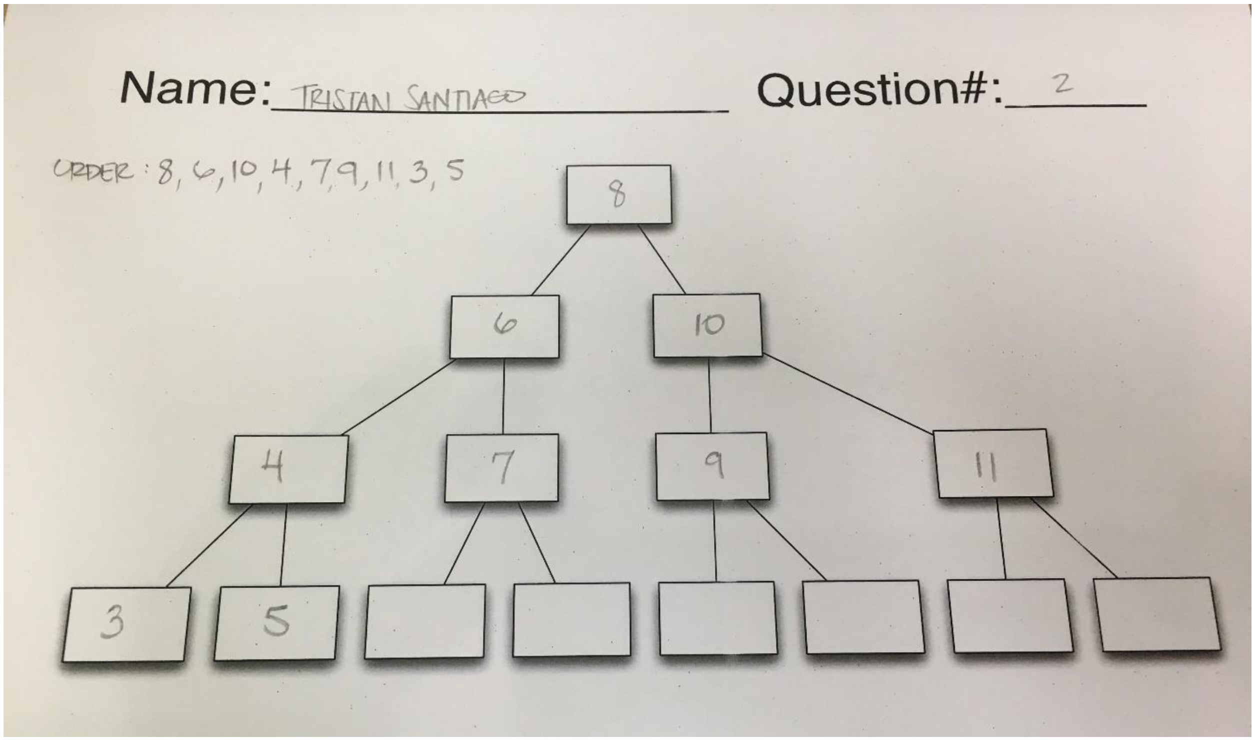
Question 1
Show the binary search tree built by adding numbers in this specific order, assuming the graph is empty to start with: 50, 16, 90, 14, 32, 71, 42, 5. (You may need to add more boxes to the diagram)

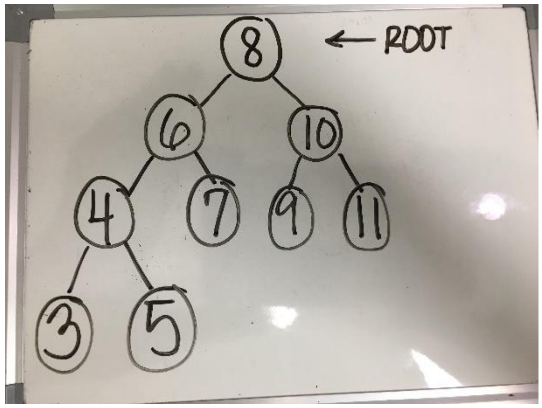


Question 2
The trouble with binary search tress is that they ca become unbalanced depending on the order that you insert values. Give an order for inserting the numbers 4, 5, 6, 7, 8, 9, 10, 11 such that the resulting tree is a complete binary search tree. This problem does not require you to fill in a tree, just write down the order in which you would insert the values. (Hint: it might be helpful to first draw the entire tree to figure out how the values must be arranged, then you can determine the order to add them!)



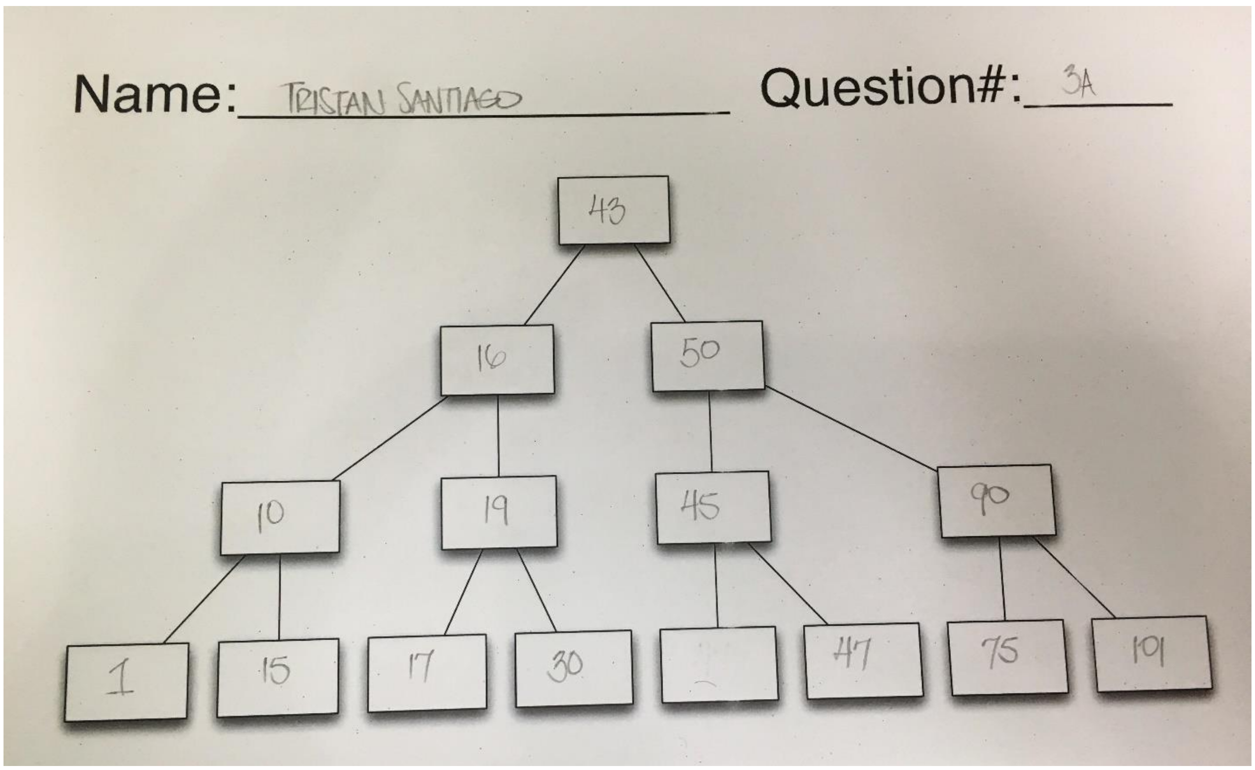
Order: 8, 6, 10, 4, 7, 9, 11, 3, 5

<u>Explanation</u>: We start with 8 as the root. The first value to be inserted (not counting the root, of course) is 6 because it is less than 8 and we want to make sure that we're inserting values from left to right to ensure that we're properly balancing the tree. Next, we insert 10 to balance the first subtree (consisting of 8, 6, and 10). Next, to continue inserting left to right for balance, we want a number that is less than both 8 and 6 to make sure that value gets placed in the leftmost part of our current tree. At this point, our remaining values are 3, 4, 5, 7, 9, and 11. We choose 4 because of the values remaining that are less than 6 (3, 4, and 5) 4 is the only value that would leave a value that is both greater than and less than itself. i.e. 3 is less than 4 (and could be the left child), while 5 is greater than 4 (which could be it's right child), assuming we were to insert those values immediately afterwards. But, we don't want to insert 3 and 5 just yet because we want to now balance the right side of the tree (6). The only value that fits here is 7, so it is inserted immediately after 4. Now that the left child of the root has a subtree, we want to balance the right child of the root. We'd ideally need two values, so we look to our remaining values (3, 5, 9, and 11). We know that 9 is less than 10, so we insert that next. Then we know that 11 is greater than 10, so we then insert 11. Now we balanced the subtrees of the root's children, but we have two values remaining (3 and 5). We simply insert them from least to greatest, since we know they would balance the leftmost part of our tree. This results in the following tree:

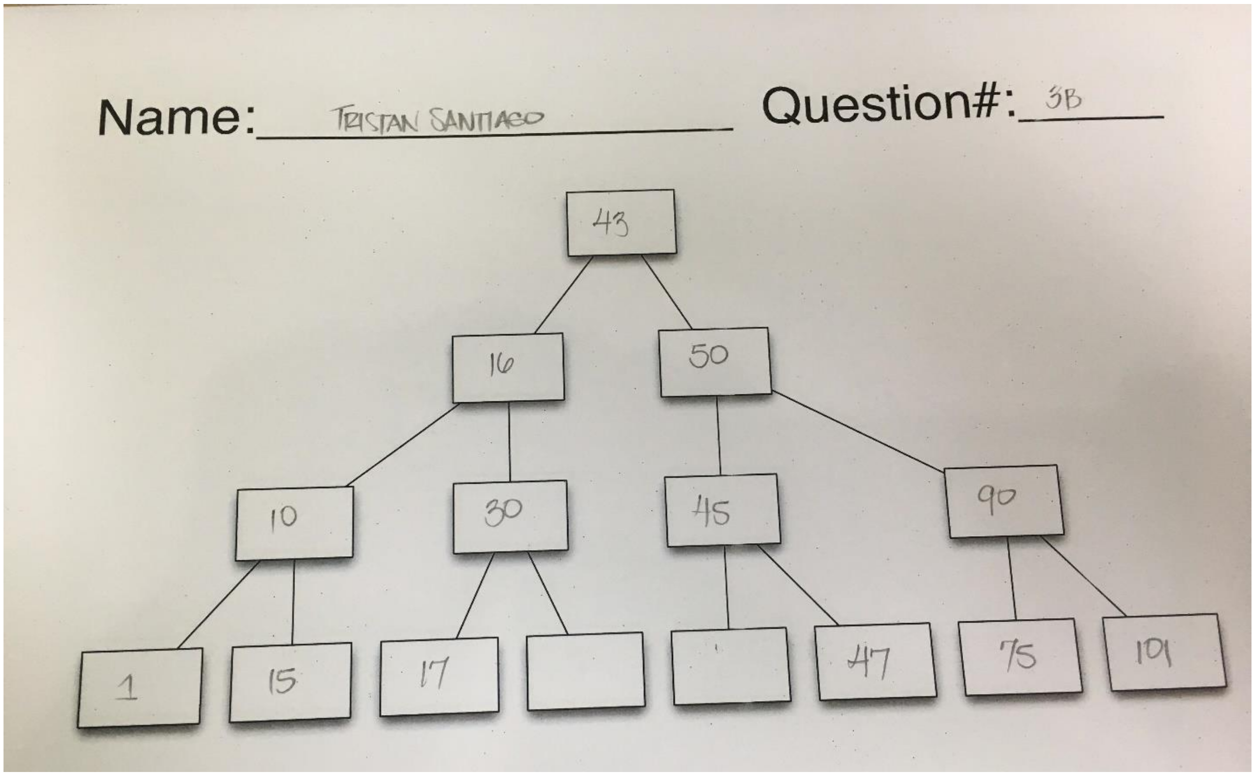


Question 3

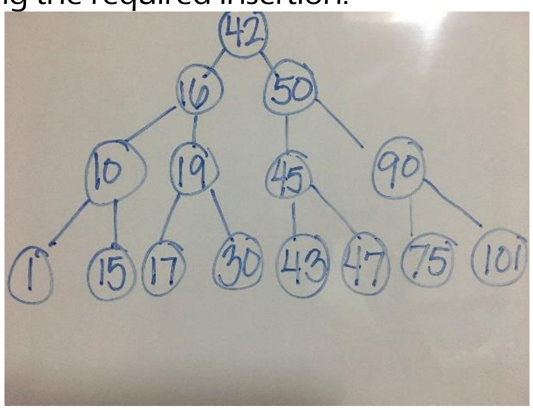
- Part A: Given the following tree, question3.pdf, show the tree after removing the value 42.



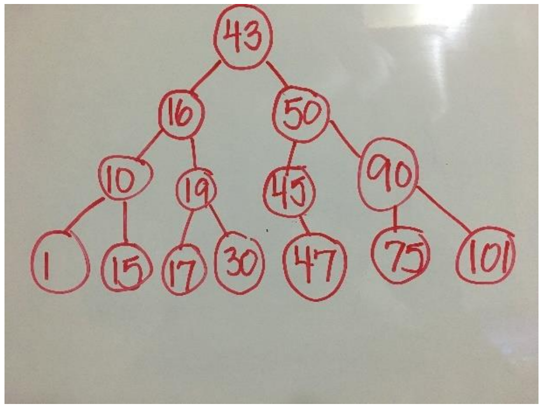
- Part B: Using the tree produced by Part A, show the tree after removing the value 19.



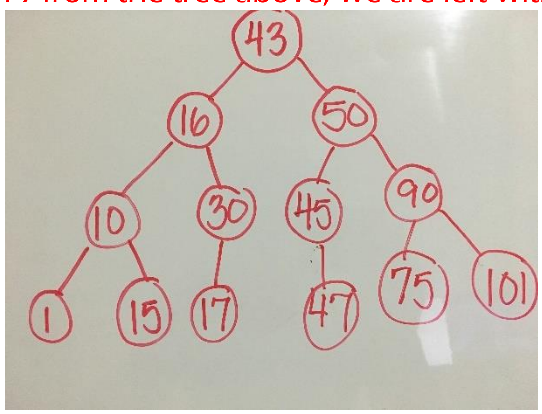
The tree before completing the required insertion:



Part A: Once we remove 42 from the tree, we search for the minimum node in the right subtree of the node we've removed, which in this case happens to be the root. Therefore, we are searching the right subtree of the root. The minimum value is 43, which becomes the new root of the tree, resulting in the following tree:



Part B: Once we remove 19 from the tree above, we are left with the following tree:



Question 4:

The computer has built the following decision tree for the Guess the Animal Game, question4.pdf. The player has an animal in mind and will answer the questions shown in the tree. Each of the players responses is used to determine the next question to ask. For example, if the player is thinking of a sea turtle, she would answer Yes to the first (top) question, "does it live in the water?", which leads to the second question "is it a mammal?", to which she would answer No.

Show the decision tree that the computer should build after adding a Zergling and a question to differentiate it, "Does it eat space marines?",
to the tree. The question and the animal should be added below existing questions in the tree. Note that Zerglings *do* eat space marines , *do not* live in the water, *do not* climb trees, and *are not* mammals (just in case you didn't know :-))

Name: TRISTAN SANTIAGO Question#: 4