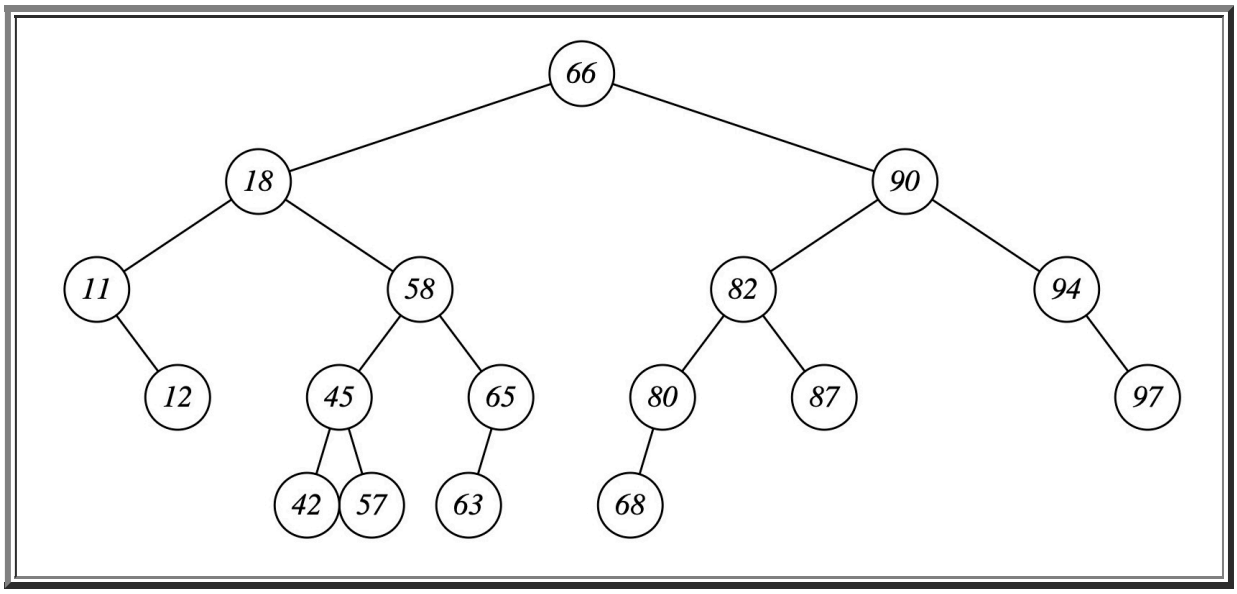
All of the questions below pertain to the tree to the right. For each pair of questions, ignore the previous questions -- in other words, each pair of questions pertains to this tree and not to the results of previous AVL tree operations.



Question 1: If I insert 72 into the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 2: About which node will I perform the rotation(s)?

Question 3: If I insert 99 into the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 4: About which node will I perform the rotation(s)?

Question 5: If I insert 19 into the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 6: About which node will I perform the rotation(s)?

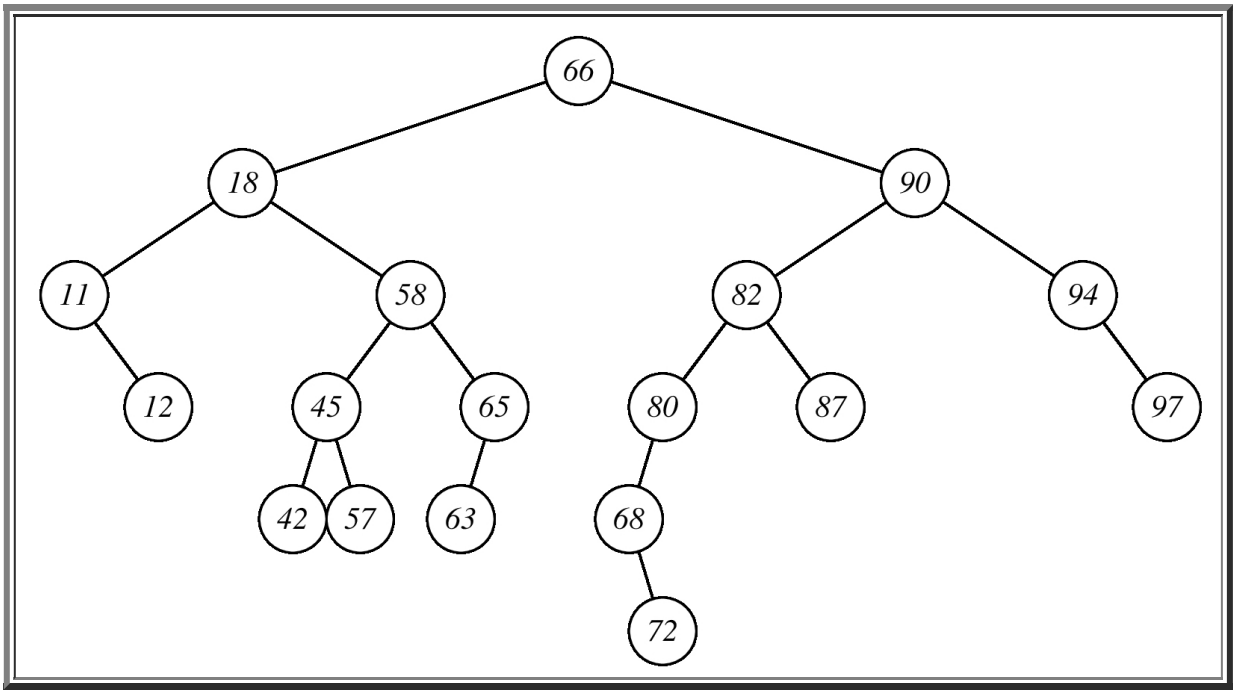
Question 7: If I delete 94 from the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 8: About which node will I perform the rotation(s)?

Question 9: If I delete 87 from the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 10: About which node will I perform the rotation(s)?

Question 11: If I delete 18 from the tree, what type of rebalancing operation will I do (answer "zigzig" or "zigzag")?
Question 12: About which node will I perform the rotation(s)?

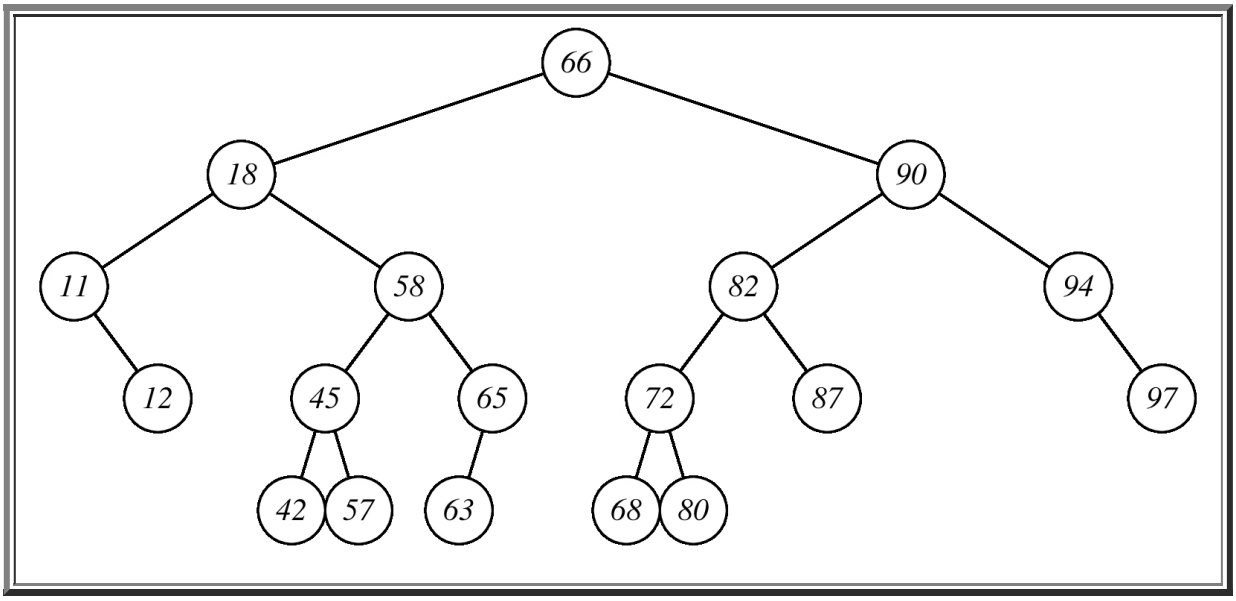
Answers

Question 1: When I insert 72, I get:

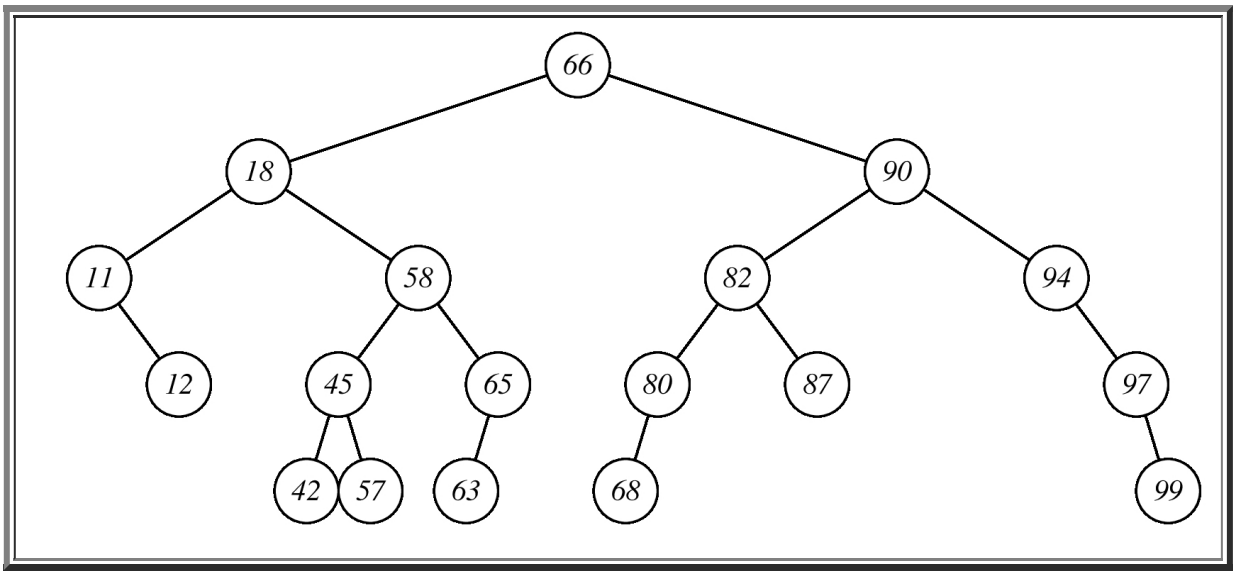


Node 80 is imbalanced, and the imbalance goes left-right. So it's a zigzag.

Question 2: To fix, I rotate twice about the grandchild of the imbalanced node. That's node 72. Here's the result.

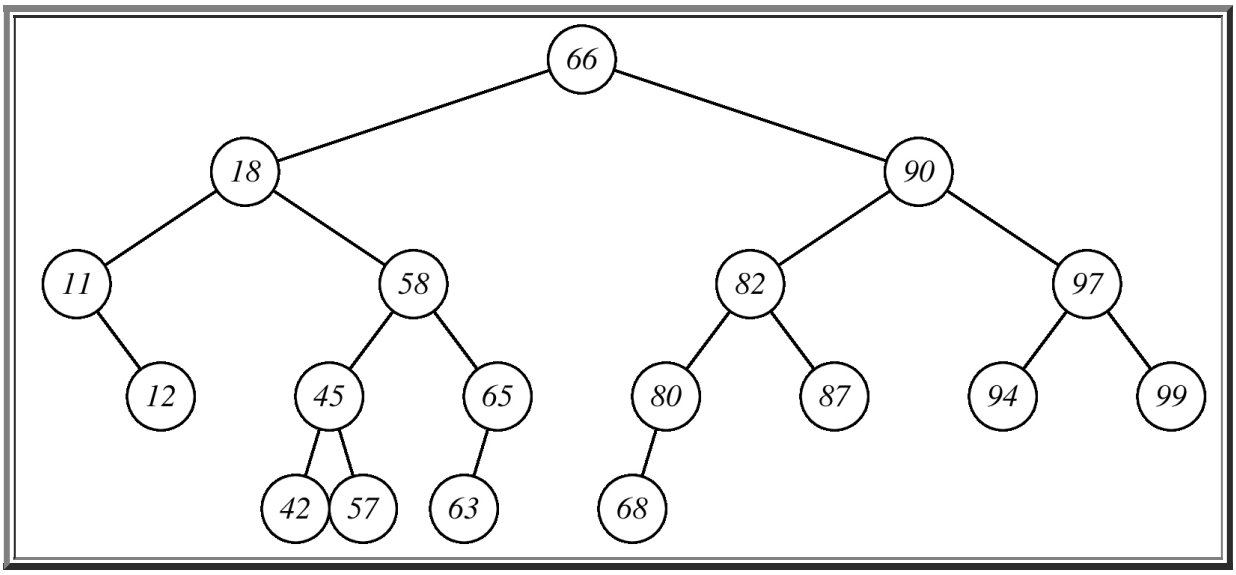


Question 3: When I insert 99, I get:

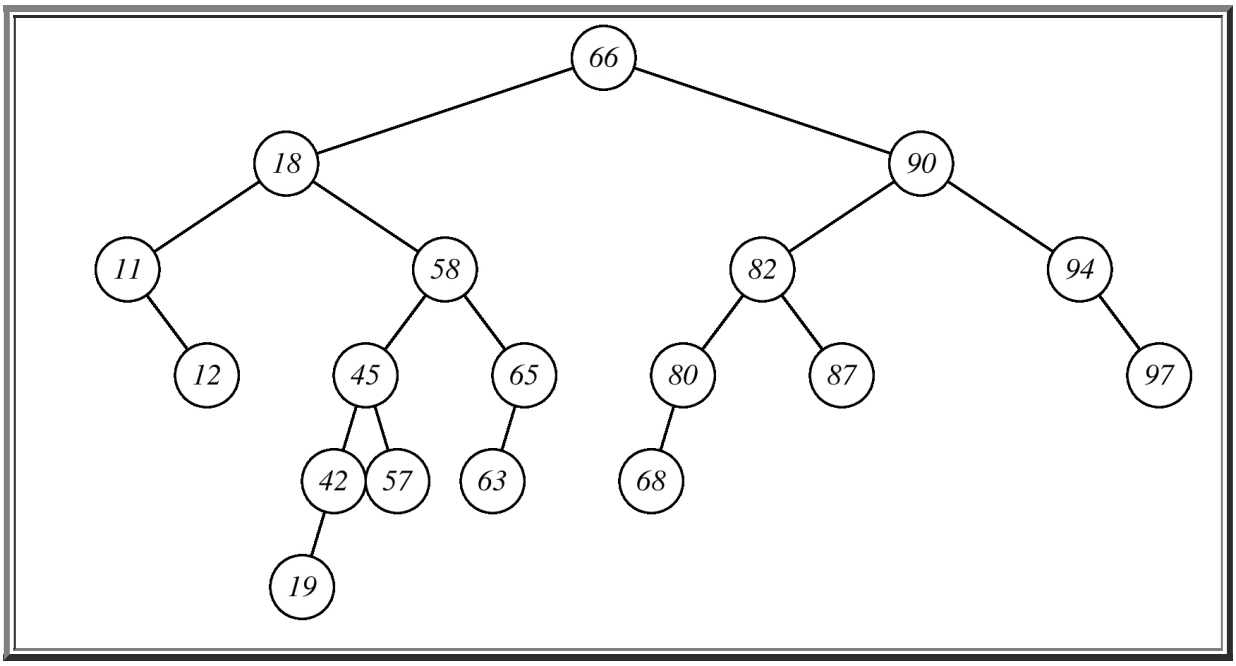


Node 94 is imbalanced, and the imbalance goes right-right. So it's a zigzig.

Question 4: To fix, I rotate once about the child of the the imbalanced node. That's node 97. Here's the result.

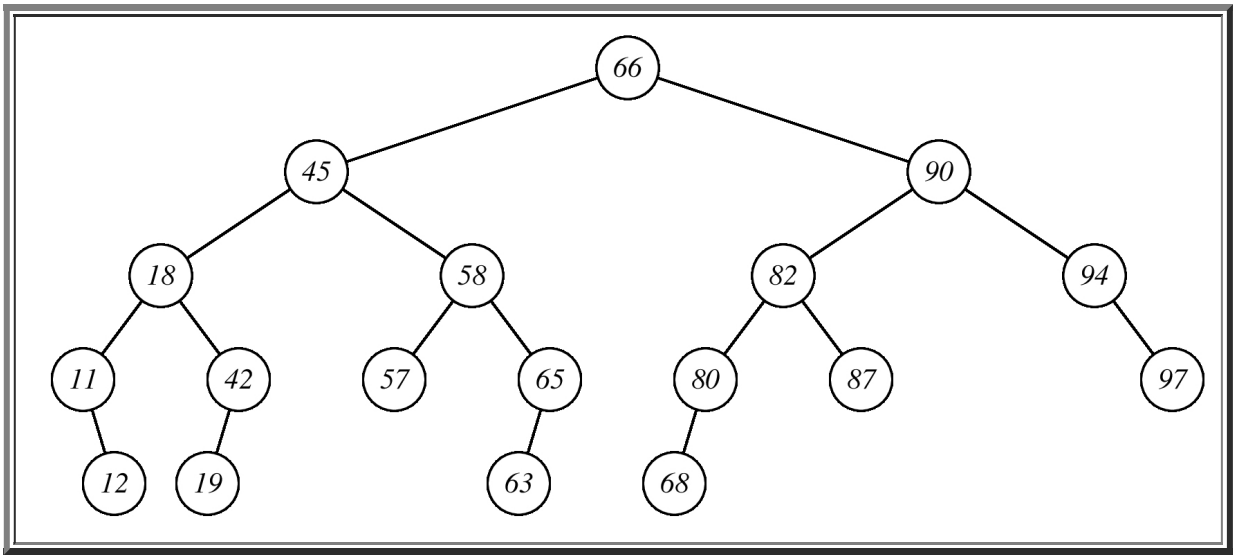


Question 5: When I insert 19, I get:

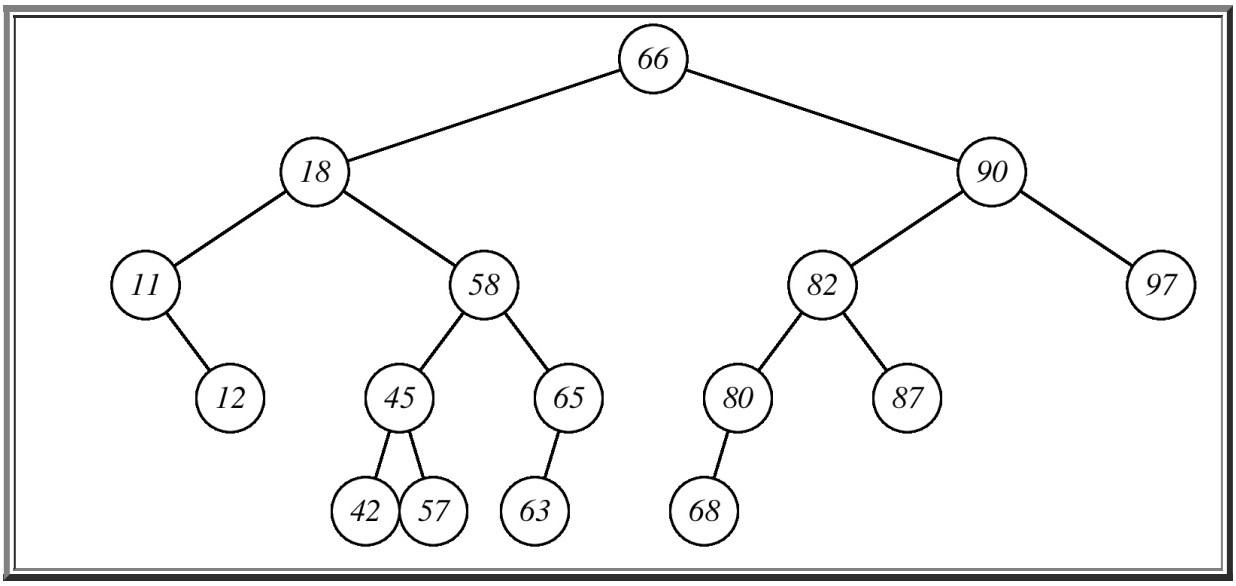


Node 18 is imbalanced, and the imbalance goes right-left. So it's a zigzag.

Question 6: To fix, I rotate twice about the grandchild of the the imbalanced node. That's node 45. Here's the result.

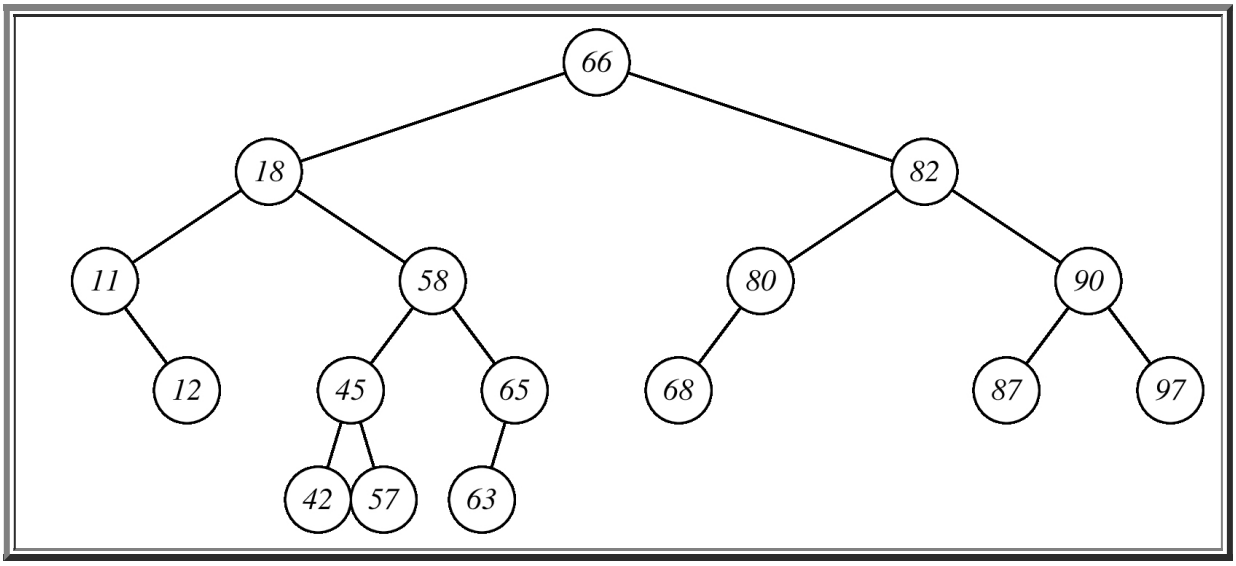


Question 7: When I delete 94, I replace it with node 97. The result is:

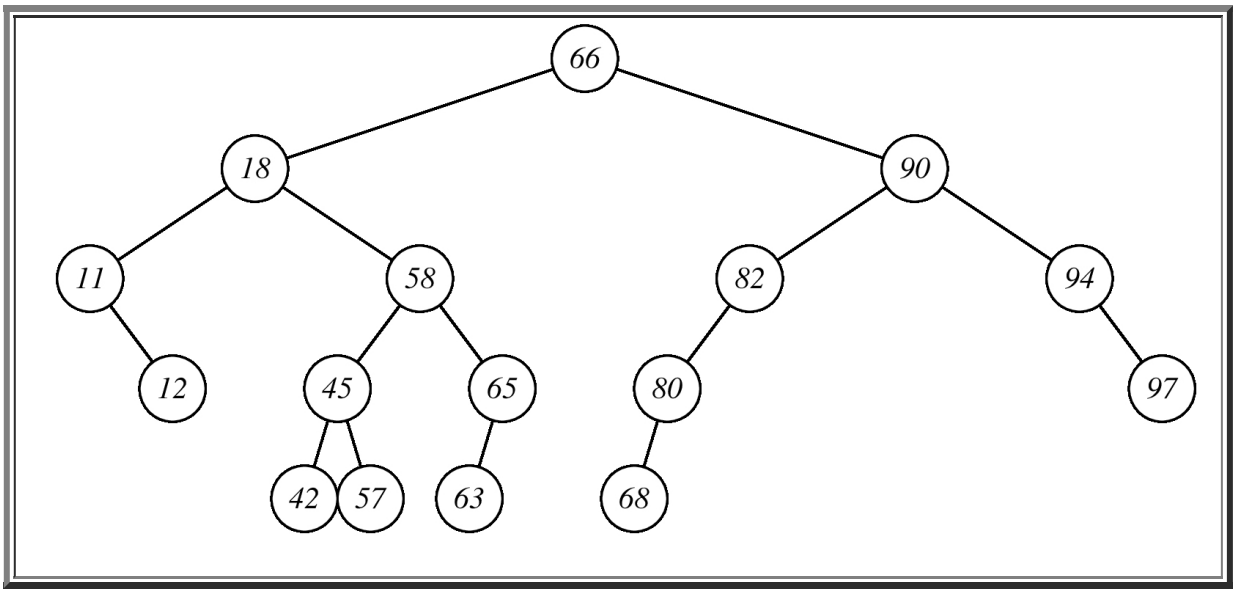


Node 90 is imbalanced, and the imbalance goes left-left. So it's a zigzig.

Question 8: To fix, I rotate once about the child of the the imbalanced node. That's node 82. Here's the result.

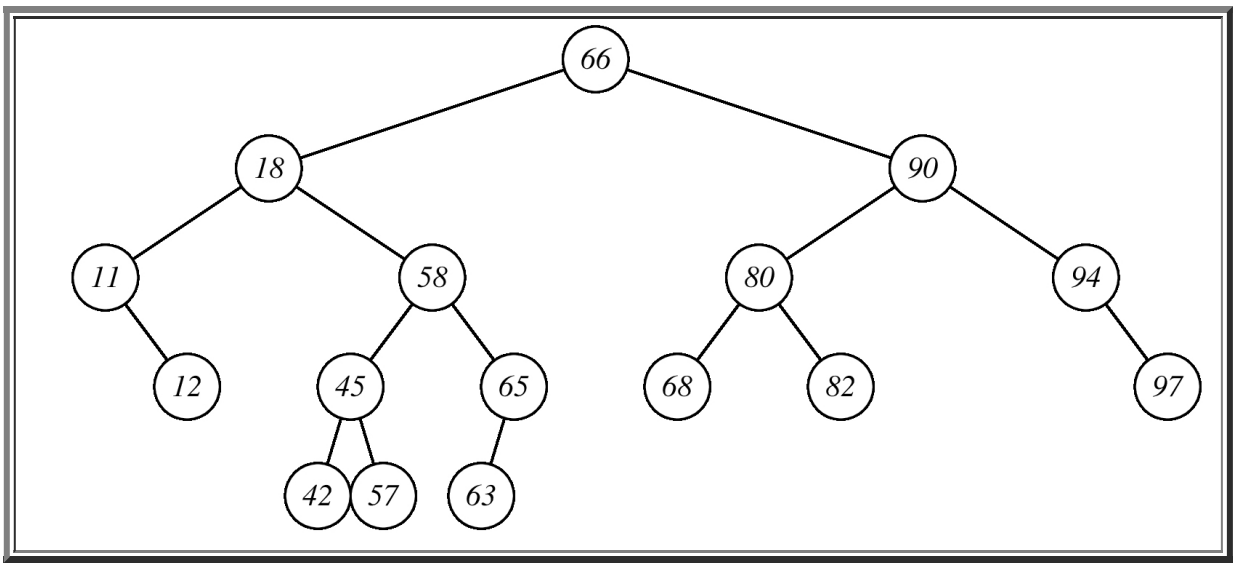


Question 9: When I delete 87, I get:

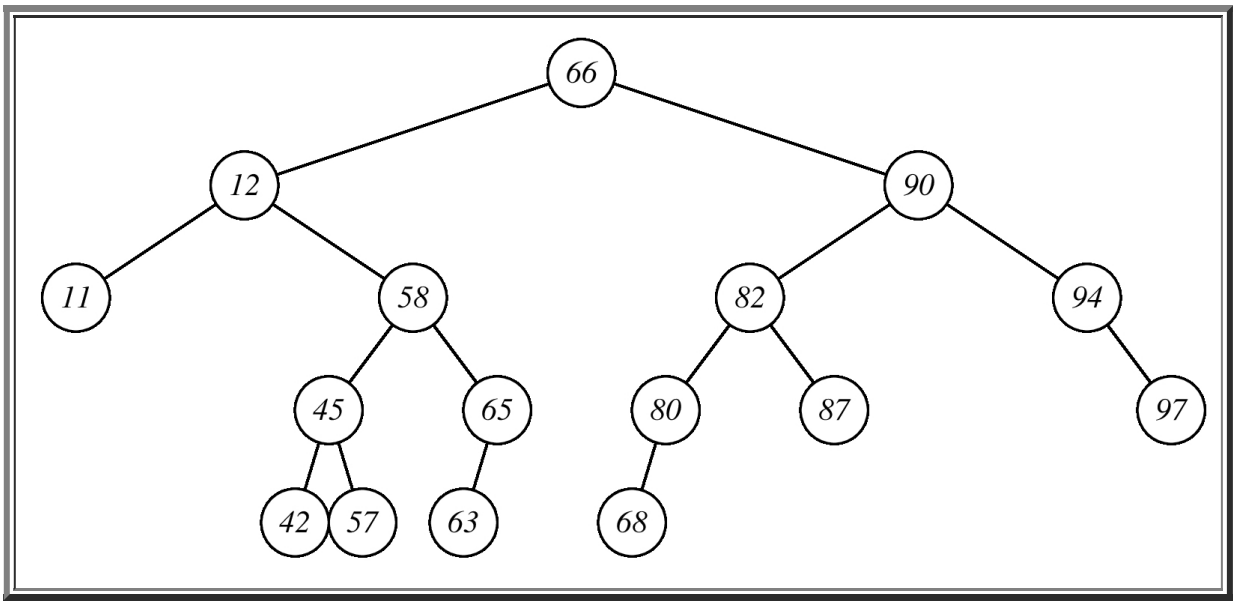


Node 82 is imbalanced, and the imbalance goes left-left. So it's a zigzig.

Question 10: To fix, I rotate once about the child of the the imbalanced node. That's node 80. Here's the result.



Question 11: When I delete 18, I replace it with the largest node in its left subtree -- 12 -- and then delete node 12. Here's the result:



Node 12 is imbalanced, and this is a case where the two subtrees of the child (58) are the same height. You treat this as a zigzig.

Question 12: To fix, I rotate once about the child of the the imbalanced node. That's node 58. Here's the result.