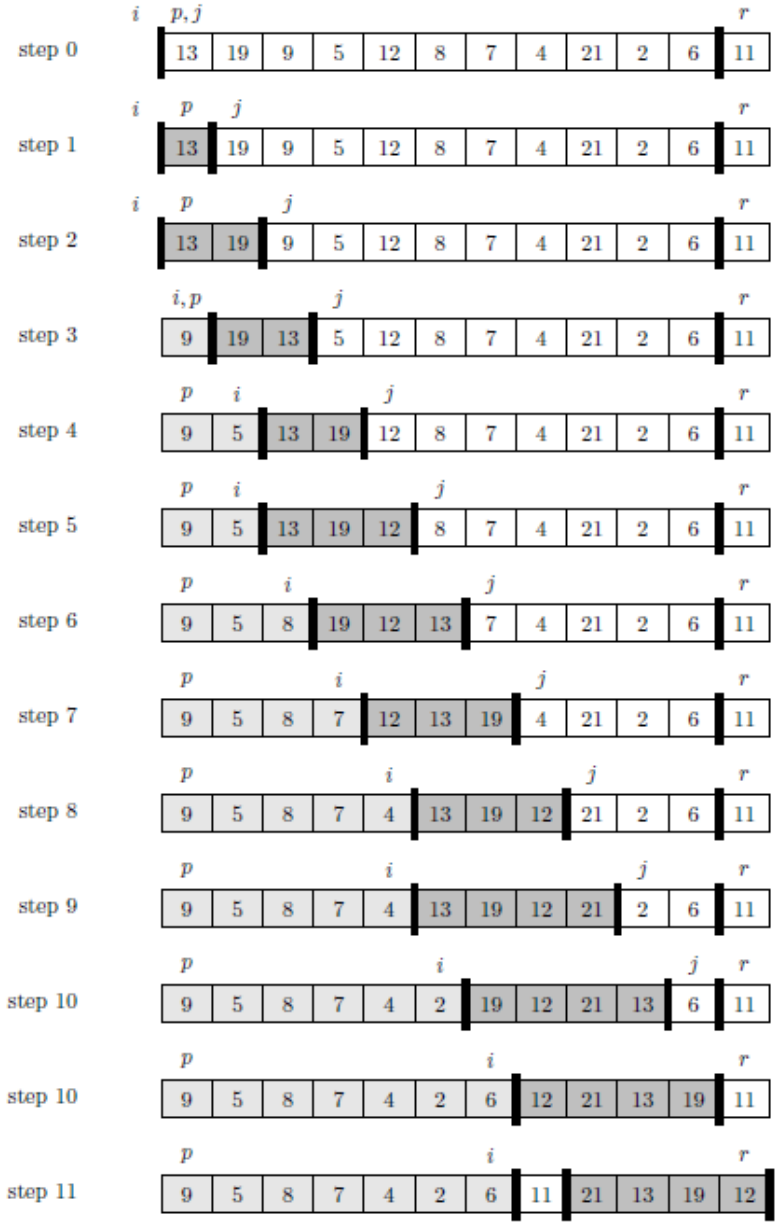
## Training Problems #5 Solutions

**Chapter 7:**

1. Illustrate the operation of PARTITION on the array A = <13, 19, 9, 5, 12, 8, 7, 4, 21, 2, 6, 11>. Show how the array would look like, step by step. You can assume array index starts at 1

**Solution:**

We follow Figure 7.1 with the given array. Step 0 has the array in the given order, and step 11 has the array in the final order.




The procedure returns the index value $i + 1 = p + 7$. ■

2. After running PARTITION on Problem #1, what value does the PARTITION method return? Assume array index starts at 1.

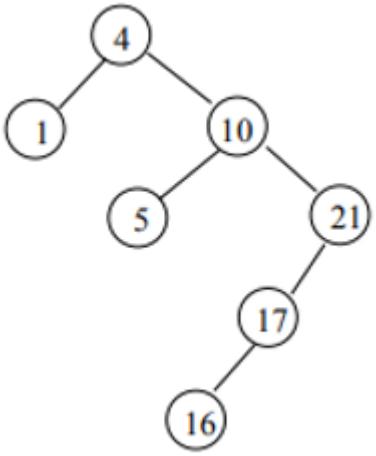
   **Solution:**

   The procedure returns the index value i + 1 = 7 + 1 = 8.

**Chapter 12:**

For questions 3 to 8, provide the resultant tree and explain what you did.

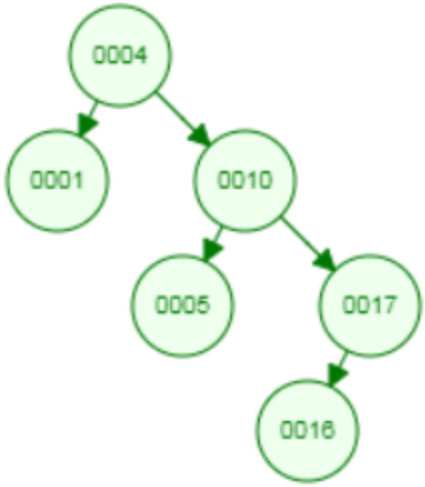
3. Delete node 21 from the below tree:



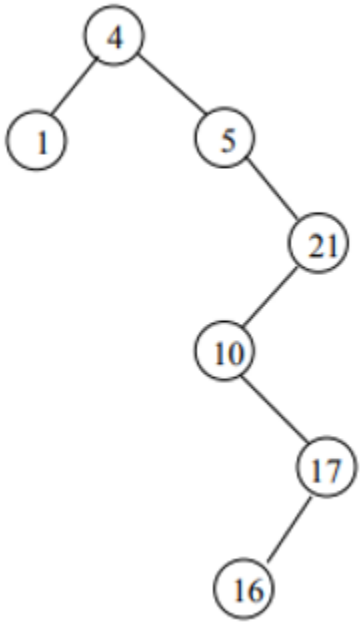

**Solution:**

Node 21 is deleted. Right child of node 10 becomes node 17's parent.

Resulting tree:

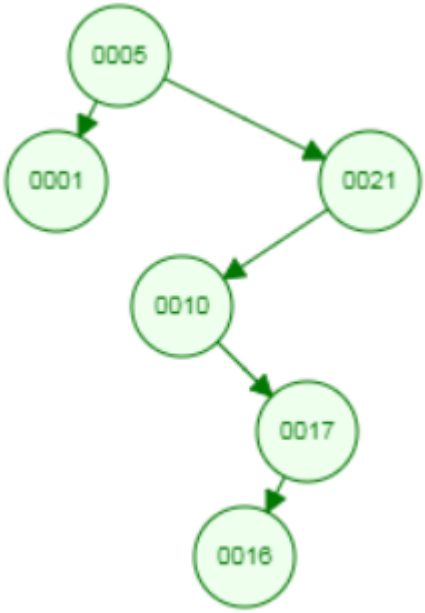


4. Delete node 4 from the below tree:




**Solution:**
Delete node 4 and replace with next biggest node, 5. Because 5 was the right child of 4, all of node 5's children will remain the same.

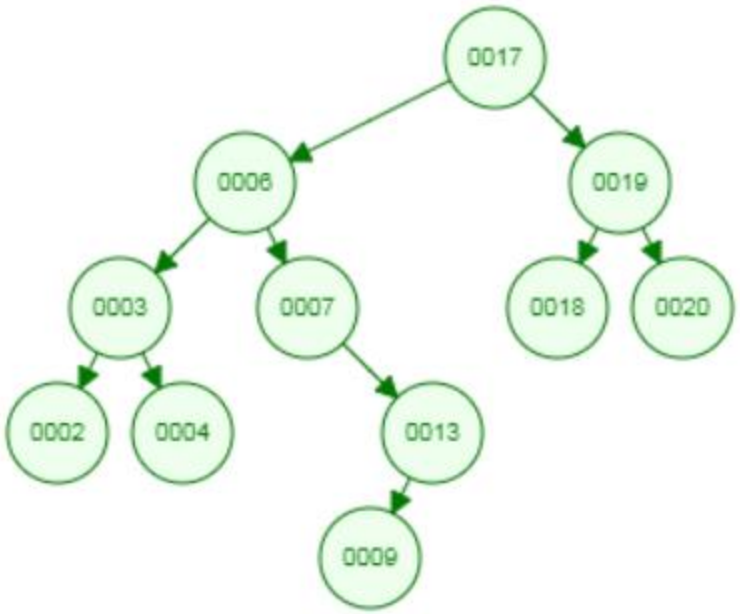
Resulting tree:



5. Delete node 15 from the below tree.

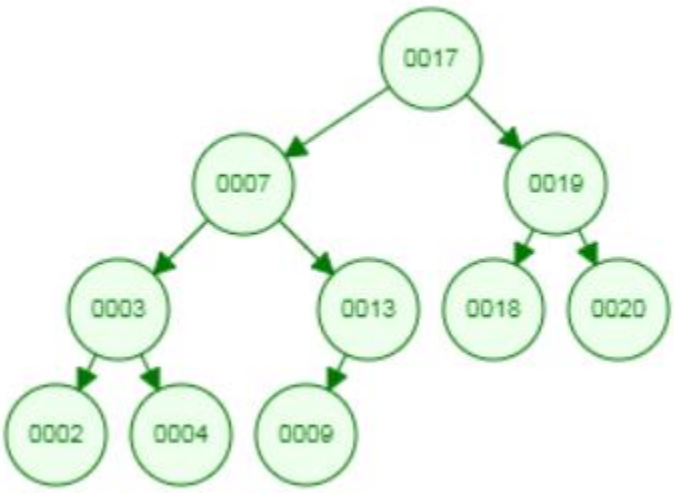
   **Solution:**
   Since the next biggest node, 17, is not node 15's right child, replace node 17 with its Right child, 18. Then replace node 15 with node 17.

   Resulting tree:




6. Then delete node 6 from the tree.

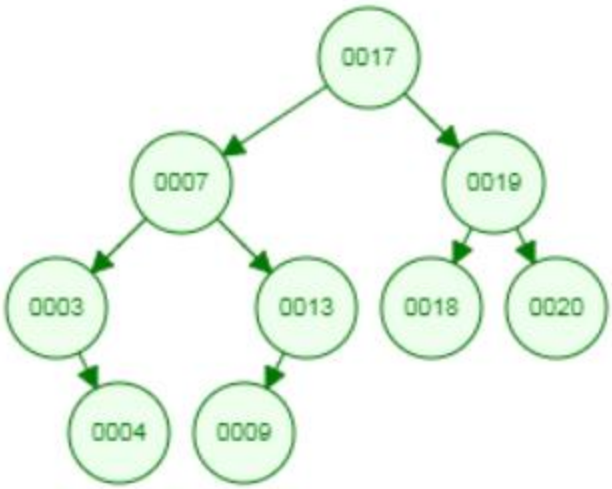
   **Solution:**
   Delete node 6 and replace with next biggest node, 7. Because 7 was the right child of 6, all of node 5's children will remain the same.

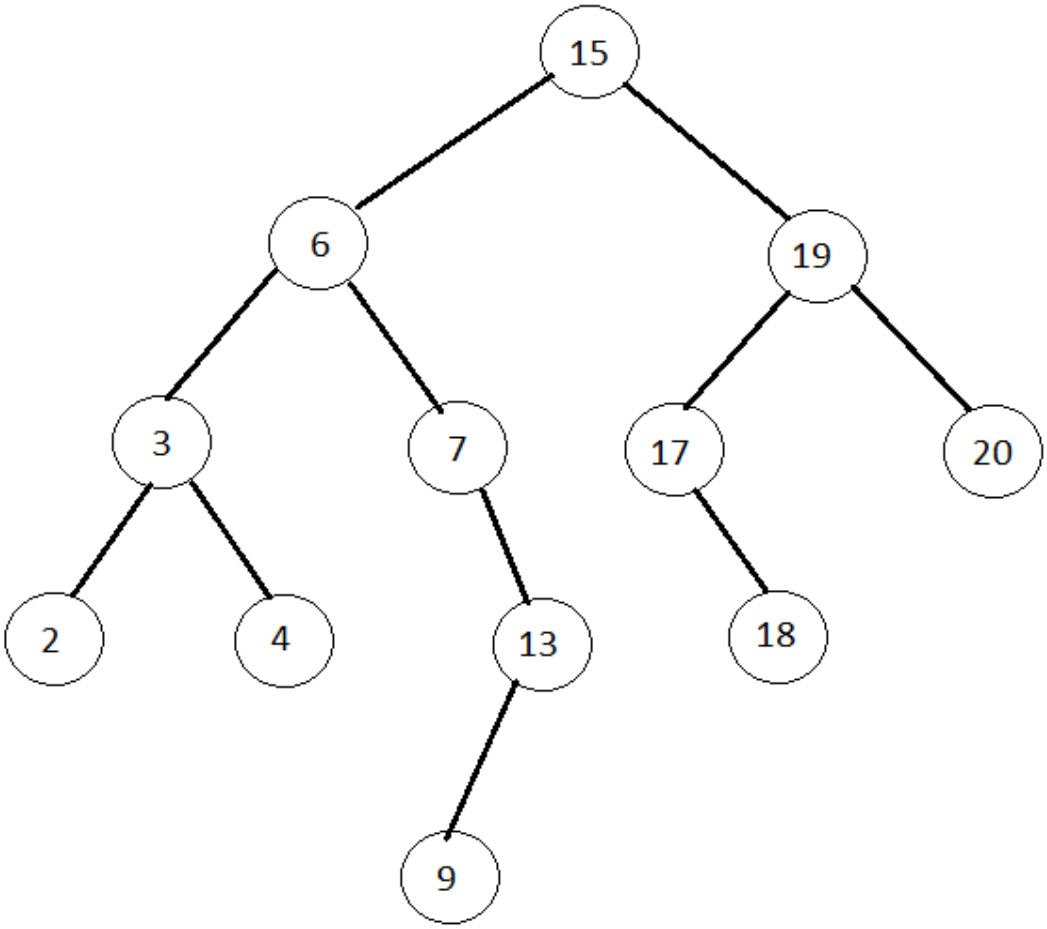


7. Then delete node 2 from the tree.

   **Solution:**
   Since node 2 is a leaf, you can just delete it (replace the node with NIL).

   Resulting tree:






8. Provide the In Order, Pre Order, and Post Order traversal of the above tree (without the deletions).

   **Solution:**

   **In Order:**
   2, 3, 4, 6, 7, 9, 13, 15, 17, 18, 19, 20

   **Pre Order:**
   15, 6, 3, 2, 4, 7, 13, 9, 19, 17, 18, 20

   **Post Order:**
   2, 4, 3, 9, 13, 7, 6, 18, 17, 20, 19, 15