HW7_Part3_5-8

Part 3 - BST Solution

Question 5: Construct BSTs and Write Preorder, Inorder, and Postorder Traversals

5(a): `100, 150, 70, 80, 85, 110, 60`

```
       100
      /   \
    70     150
   /  \    /
  60   80 110
        \
         85
```

- **Preorder**: `100, 70, 60, 80, 85, 150, 110`
- **Inorder**: `60, 70, 80, 85, 100, 110, 150`
- **Postorder**: `60, 85, 80, 70, 110, 150, 100`

5(b): `60, 70, 85, 80, 100, 150, 110`

```
       60
        \
         70
           \
            85
           /
         80
            \
             100
               \
                150
                /
              110
```

- **Preorder**: `60, 70, 85, 80, 100, 150, 110`
- **Inorder**: `60, 70, 80, 85, 100, 110, 150`
- **Postorder**: `80, 110, 150, 100, 85, 70, 60`

5(c): `110, 100, 80, 70, 85, 60`

```
                110
               /
             100
            /
           80
          /  \
         70    85
    /
   60
```

- **Preorder**: `110, 100, 80, 70, 60, 85`
- **Inorder**: `60, 70, 80, 85, 100, 110`
- **Postorder**: `60, 70, 85, 80, 100, 110`

Question 6: What can you say about the inorder traversal of a BST?

Answer:

- The **inorder traversal** of a BST always produces a sorted sequence of elements in ascending order.
- This property is guaranteed because, in a BST, the left subtree contains smaller elements, the root is the middle value, and the right subtree contains larger elements. Inorder traversal visits nodes in the left subtree first, then the root, and finally the right subtree.

Question 7: Modifications to the Tree in 5(a)

7(a): Remove `150`

```
     100
    /   \
  70     110
 /  \
60   80
      \
       85
```

- **Preorder**: `100, 70, 60, 80, 85, 110`
- **Inorder**: `60, 70, 80, 85, 100, 110`
- **Postorder**: `60, 85, 80, 70, 110, 100`

7(b): Remove `110`

```
     100
    /
  70
 /  \
60   80
      \
       85
```

- **Preorder**: `100, 70, 60, 80, 85`
- **Inorder**: `60, 70, 80, 85, 100`
- **Postorder**: `60, 85, 80, 70, 100`

7(c): Remove `70`

```
     100
    /
  80
 /  \
60   85
```

- **Preorder**: `100, 80, 60, 85`
- **Inorder**: `60, 80, 85, 100`
- **Postorder**: `60, 85, 80, 100`

Question 8: Modifications to the Tree from Given Sequence

Initial Tree:
`50, 70, 40, 45, 47, 46, 30, 20, 35`:

```
        50
       /  \
     40    70
    /  \
  30    45
 /  \      \
20   35     47
            /
           46
```

Remove `50`:

```
        70
       /
     40
    /  \
  30    45
 /  \      \
20   35     47
            /
           46
```

- **Preorder**: `70, 40, 30, 20, 35, 45, 47, 46`
- **Inorder**: `20, 30, 35, 40, 45, 46, 47, 70`
- **Postorder**: `20, 35, 30, 46, 47, 45, 40, 70`