Problem 1 Testing

1. Test Objective

To verify the correctness of the **Morris Inorder Traversal** implementation. This test ensures that:

1. The Morris algorithm produces the correct Inorder sequence compared to a standard recursive DFS.
2. The algorithm correctly identifies predecessors and threads the tree.
3. **Crucially:** The algorithm restores the binary tree to its original structure after traversal (no permanent modification of pointers).

Test 1: Baseline & Traversal Output

Description: Run the application. The system should print the "Before" state (standard recursive) and the "Morris" traversal result.

- **Expected Result:**
    - Recursive Inorder: `[4, 2, 5, 1, 3, 6]`
    - Morris Inorder: `[4, 2, 5, 1, 3, 6]`

Evidence:

```
Standard recursive inorder before Morris: [4, 2, 5, 1, 3, 6]
Standard recursive preorder before Morris: [1, 2, 4, 5, 3, 6]
Morris inorder: [4, 2, 5, 1, 3, 6]
Standard recursive inorder after Morris: [4, 2, 5, 1, 3, 6]
Standard recursive preorder after Morris: [1, 2, 4, 5, 3, 6]
```

Test 2: Structure Restoration Output

Description: After the Morris traversal completes, the system runs the standard traversals again to ensure the tree pointers were reset (the `predecessor.Right = null` step in the code).

- **Expected Result:**
    - Recursive Inorder (After): `[4, 2, 5, 1, 3, 6]`

○ Recursive Preorder (After): `[1, 2, 4, 5, 3, 6]` (Must match the "Before" Preorder).

Evidence:

```
Standard recursive inorder before Morris: [4, 2, 5, 1, 3, 6]
Standard recursive preorder before Morris: [1, 2, 4, 5, 3, 6]
Morris inorder: [4, 2, 5, 1, 3, 6]
Standard recursive inorder after Morris: [4, 2, 5, 1, 3, 6]
Standard recursive preorder after Morris: [1, 2, 4, 5, 3, 6]
```

Test 3: Automated Verification Logic

Description: The `Main` method runs boolean checks (`SeqEqual`) to programmatically confirm data integrity.

- **Expected Result:** All three checks must read **PASS**.
    1. Morris produced same inorder: **PASS**
    2. Tree structure reinstated: **PASS**
    3. Inorder before equals inorder after: **PASS**

Evidence:

```
Verification:
 - Morris produced same inorder as recursive: PASS
 - Tree structure reinstated (preorder before vs after): PASS
 - Inorder before equals inorder after: PASS
All checks passed: Morris traversal correct and tree restored.
```

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4. Conclusion

Overall Status: [PASS]