Experiment 4B

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Aim: RB Tree Deletion

Theory: Deletion in a red black tree is a bit more complicated than insertion. When a node is to be deleted it can either have no children, one children, or two children. Here are the steps involved in deleting a node in a red-black tree.

- If the node to be deleted has no children, simply remove it and update the parent node.
- If the node to be deleted has only one child, replace the node with its child.
- If the node to be deleted has two children then replace the node with its in-order successor, which is the leftmost node in the right subtree, then delete the in-order successor node as if it has atmost one child.
- After the node is deleted, the red-black properties might be violated. To restore those properties, some color changes and rotations are performed on the nodes in the tree. The changes are similar to those performed during insertion, but with different conditions.
- The deletion operation in a red-black tree takes O(log n) time on average, making it a good choice for searching and deleting elements in large datasets.

Conclusion: The implementation of red-black tree deletion aims to maintain the balance and properties of tree while removing nodes efficiency.