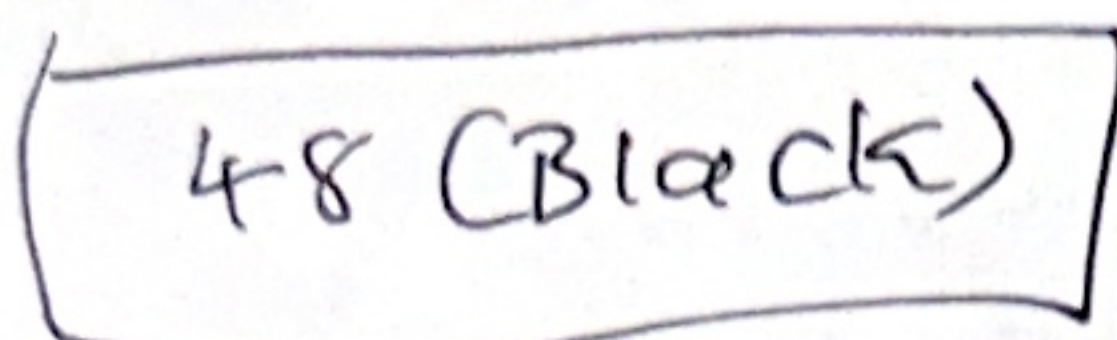
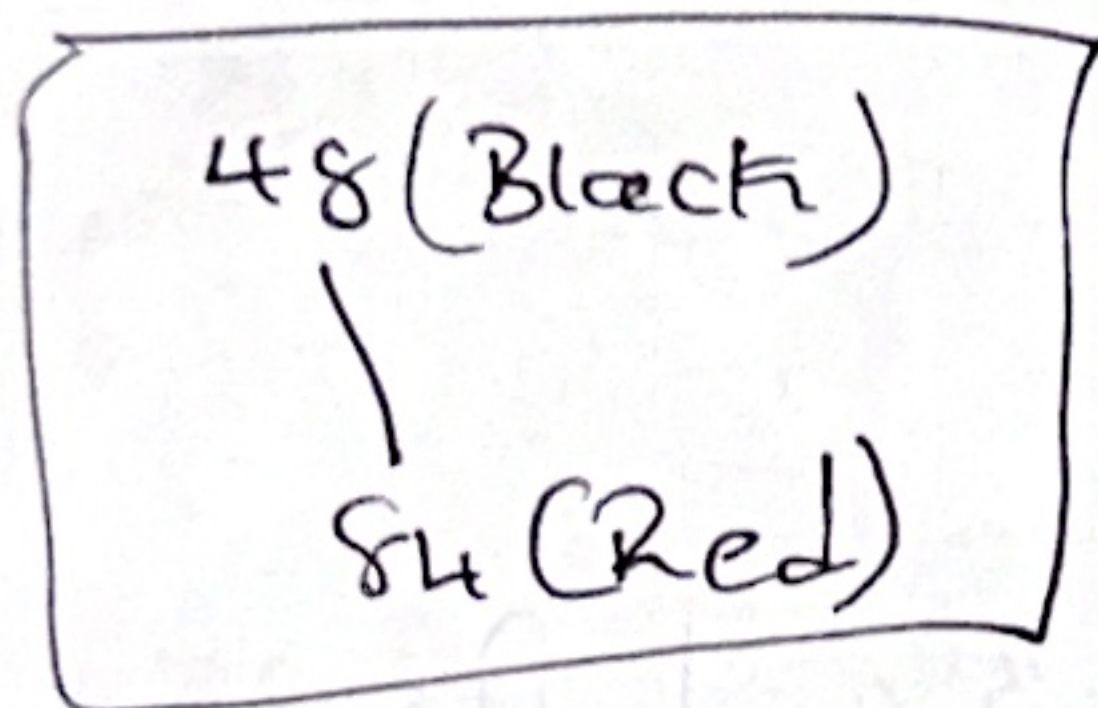


### Problem 3:

1. Insert 48: Since this is the first node, it becomes the root. It's colored black.



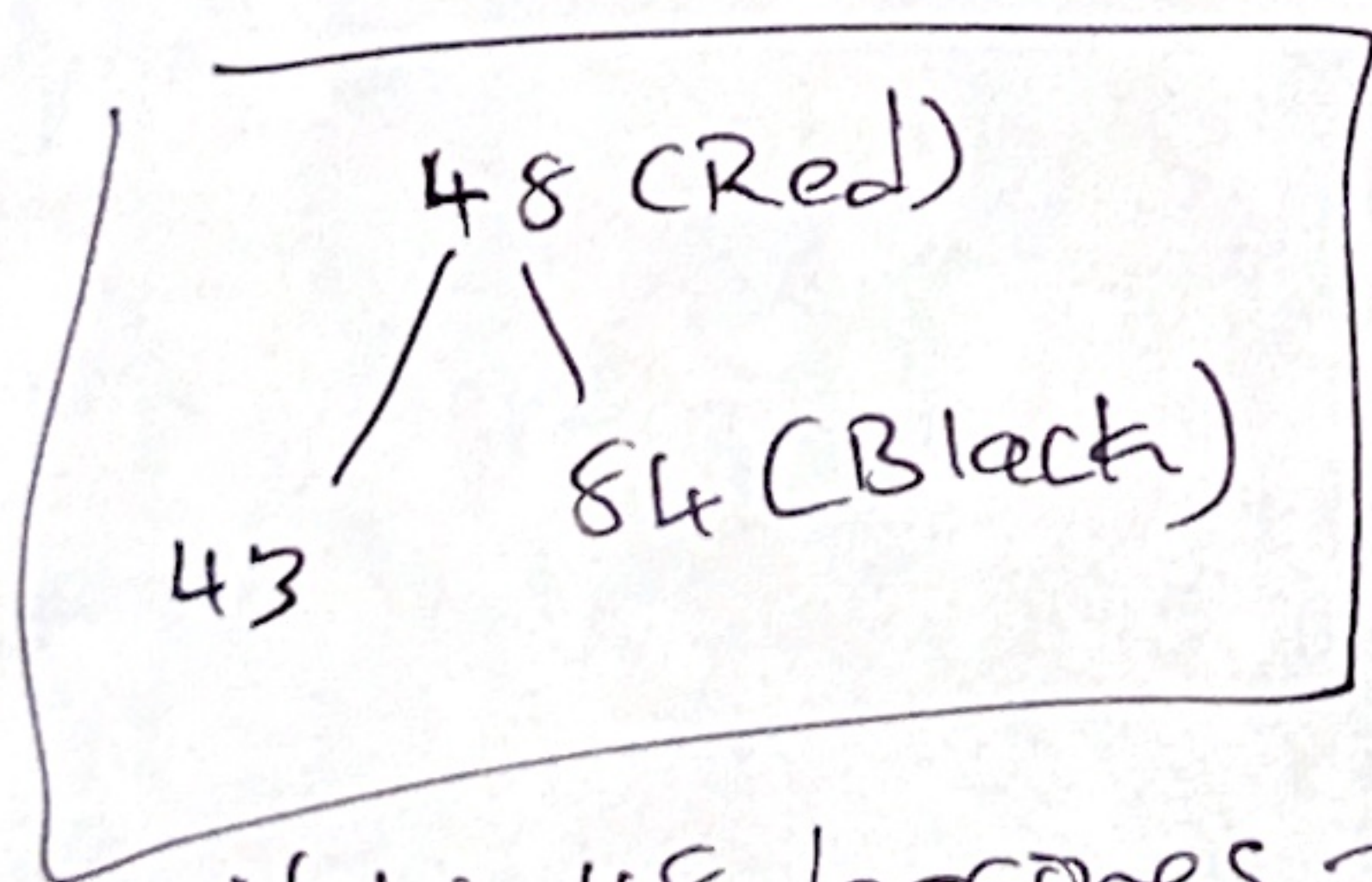
2. Insert 84: Since 84 is greater than 48, it goes to the right of 48. We color it red.



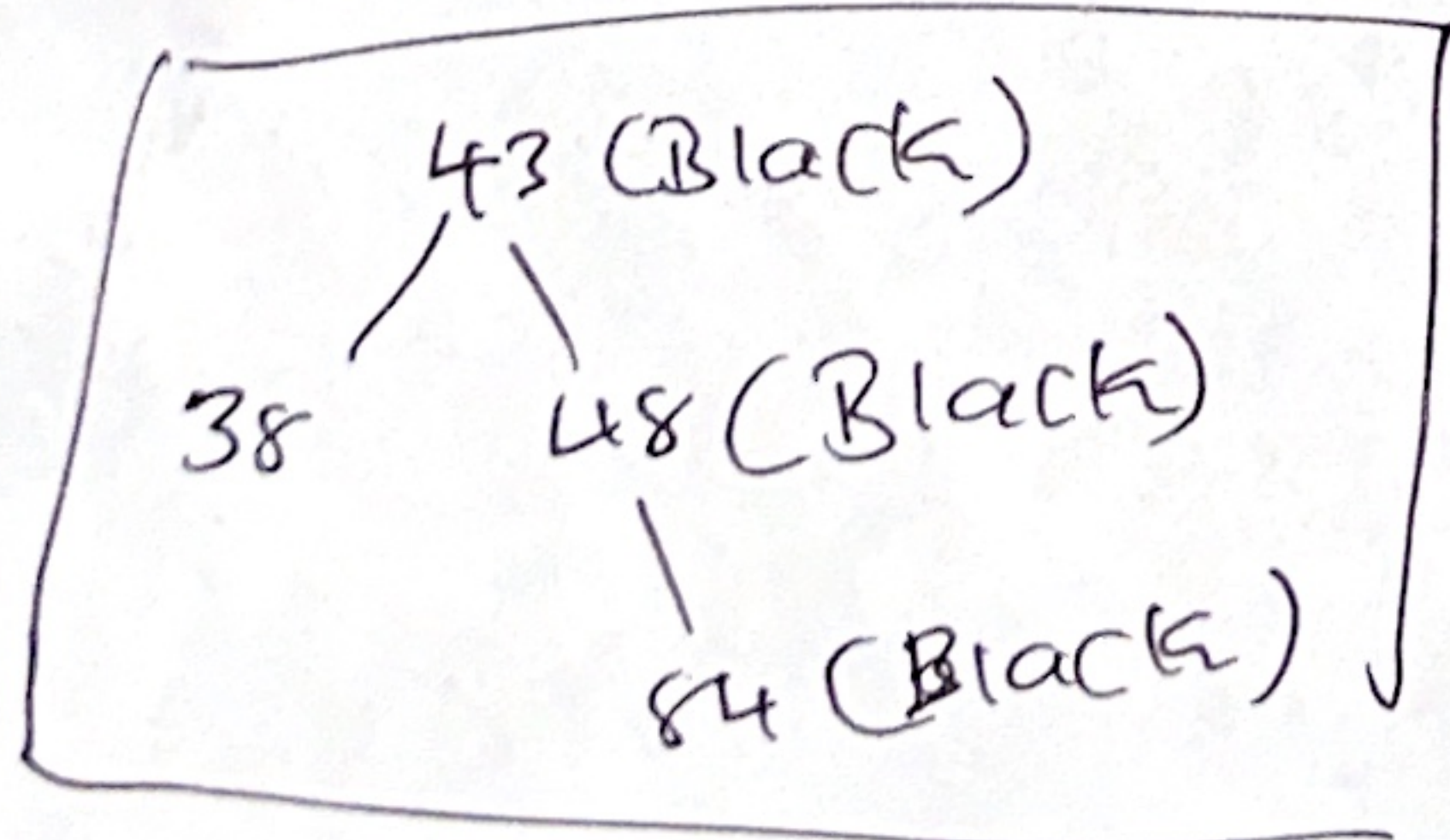
3. Insert 43: 43 is less than 48, so it goes to the left of 48. Since it's Red and its parent (48) is also Red, we need to fix the tree.

- Case 1: The uncle of 43 (which is nil, colored as black) is black.
- Case 2: 43 is a left child and its parent (48) is a left child too.

Do a Right rotation on the Parent (48)

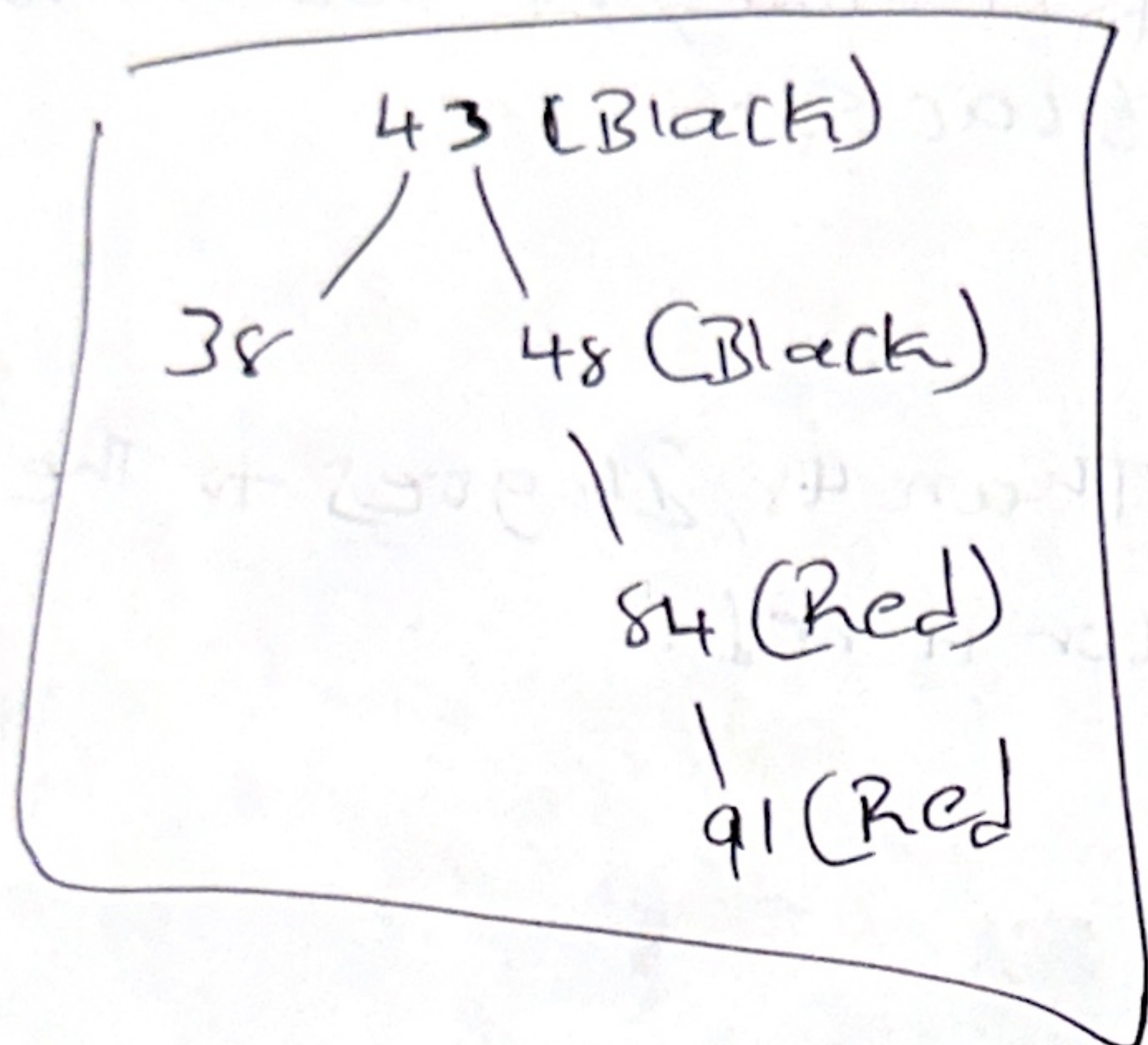


Now, 48 becomes the right child of 43.





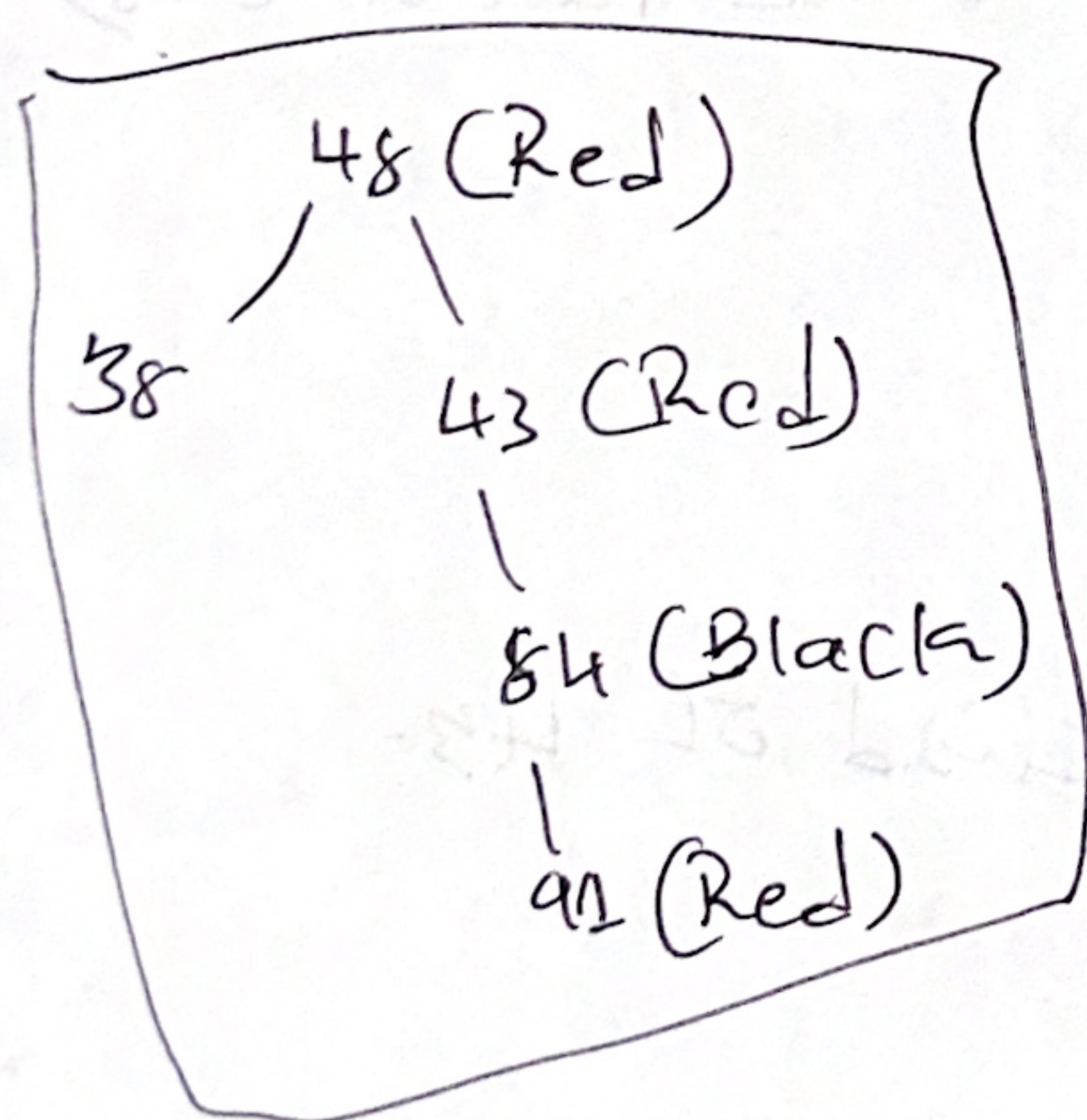
4. Insert 91: 91 is greater than 43, so it goes to the right since its Red and its parent (43) is black.



5. Insert 38: 38 is less than 43 and its parent (43) is red, so we need fixing.

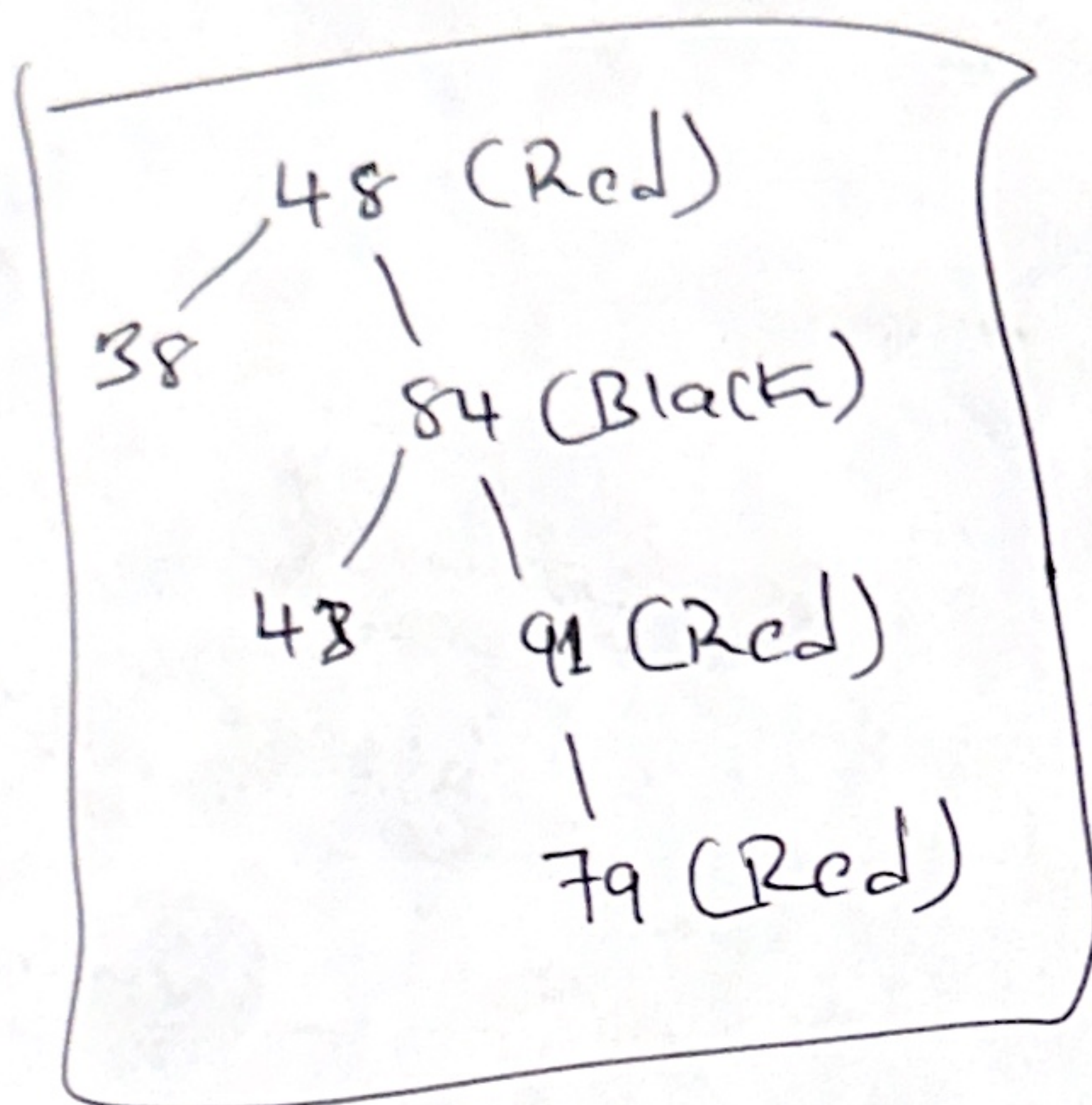
- Case 1: The uncle of 38 (which is nil, considered as black) is black.
- Case 2: 38 is a left child and its parent (43) is a right child.

Left rotation on parent (43) followed by a right rotation on the grandparent (48).



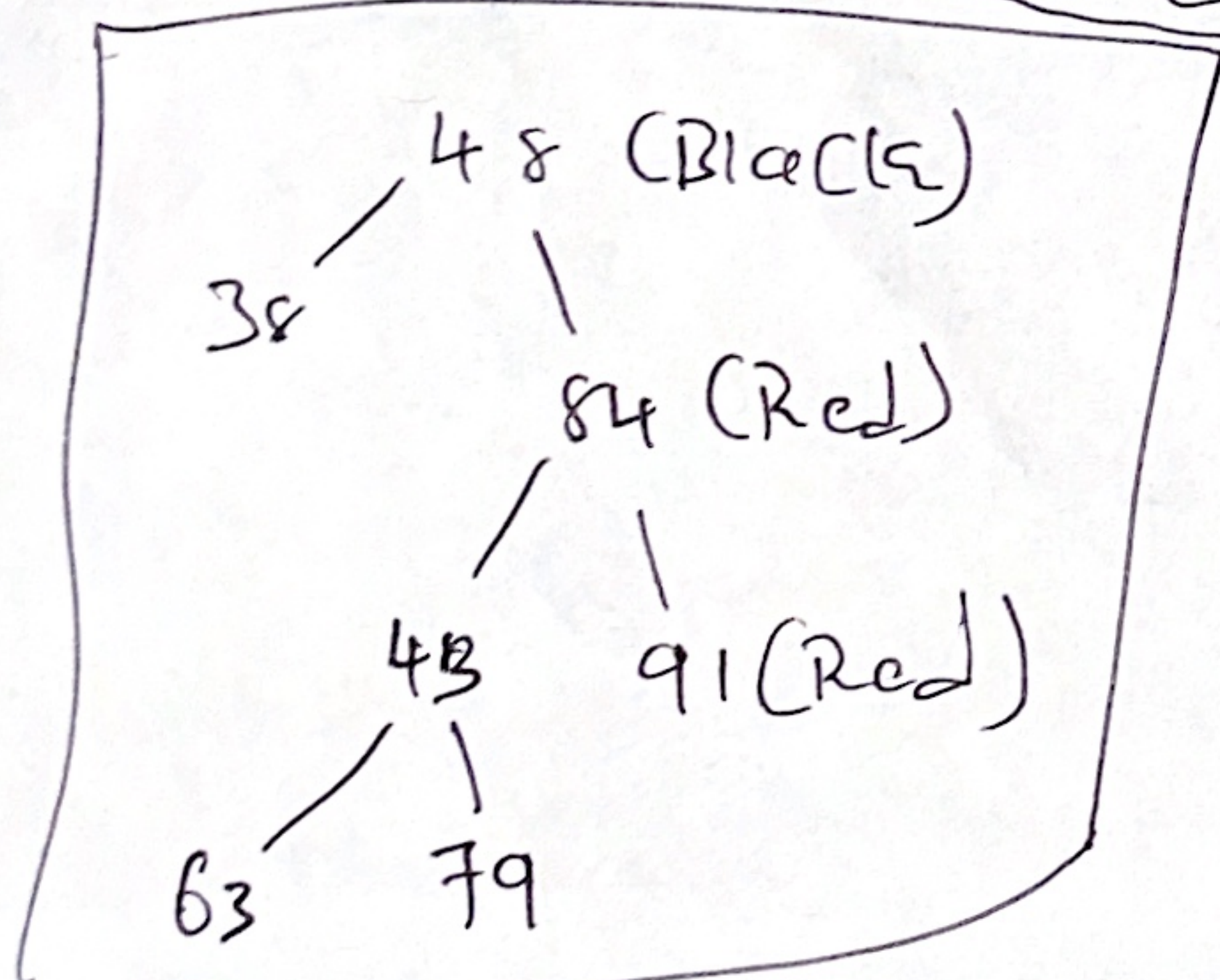


6. Insert 79: 79 is greater than 48 and less than 84, so it goes to the left of 84. Since its parent (84) is Black, the tree remains valid.



7. Insert 63: 63 is greater than 48 and less than 84, so it goes to the left of 84. Since its parent (84) is red, the tree needs fixing.

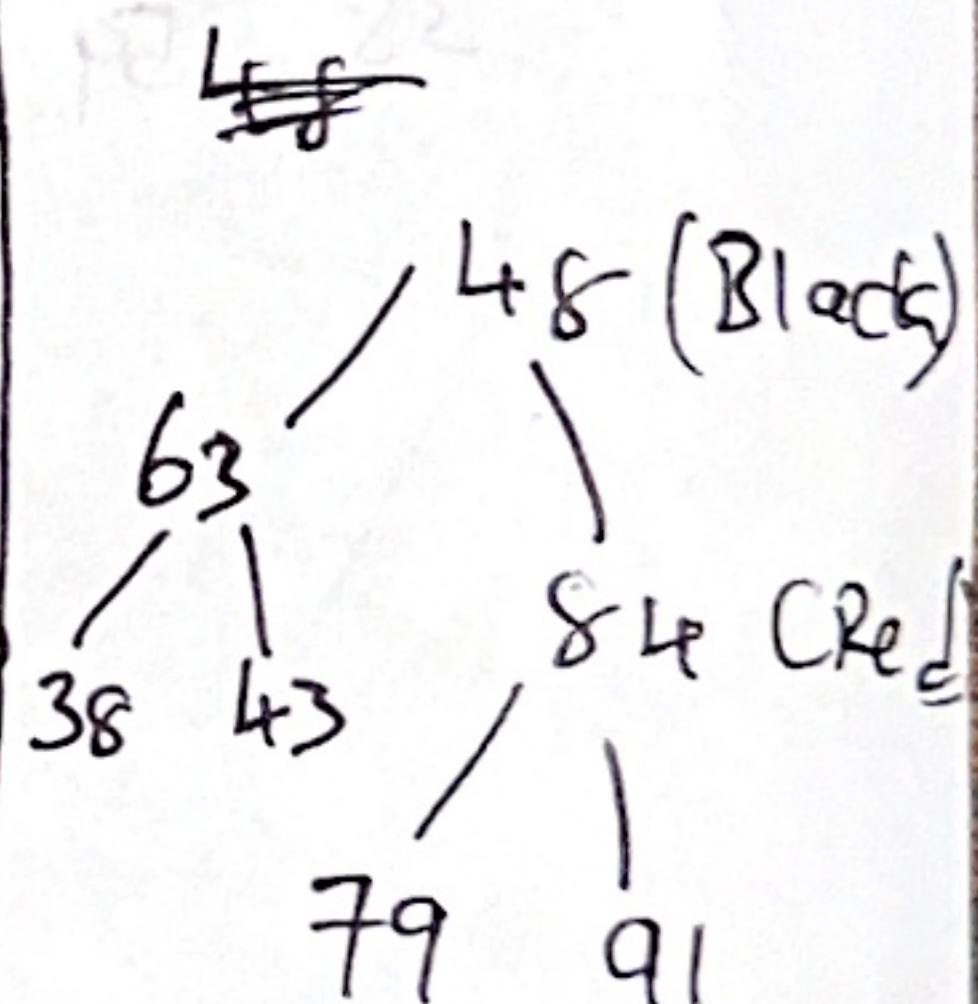
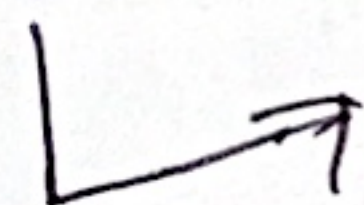
- Case 1: The uncle of 63 (which is 79) is Red.
- Case 4: Perform color flips on the parent (84), uncle (79), and grandparent (48).



Now the tree is valid, but we have two red nodes in a row, 63 and 79.

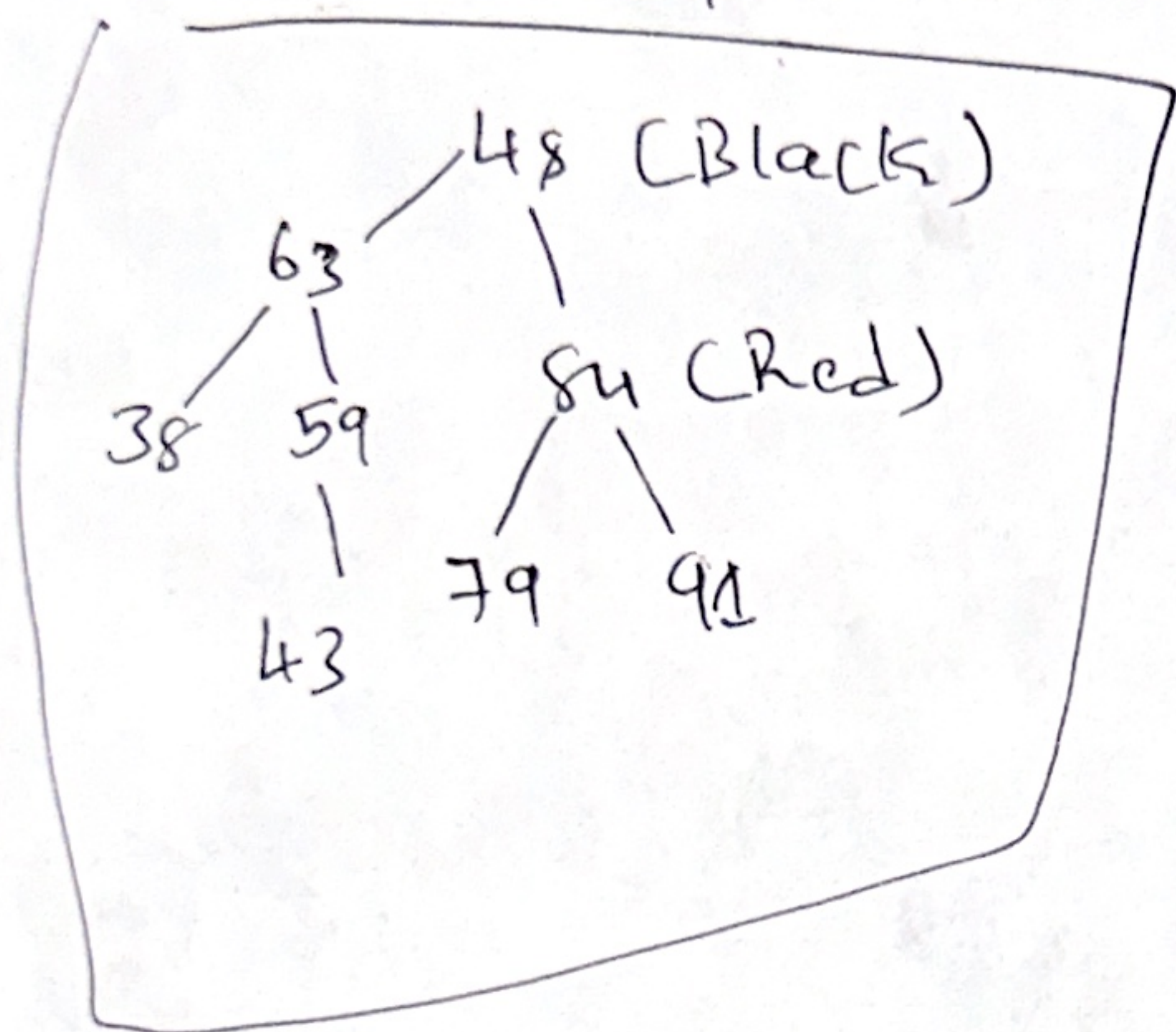
Case 1: Parent of 63 (43) and uncle of 63 (79) are black

Case 3: Perform a left rotation on parent (43).

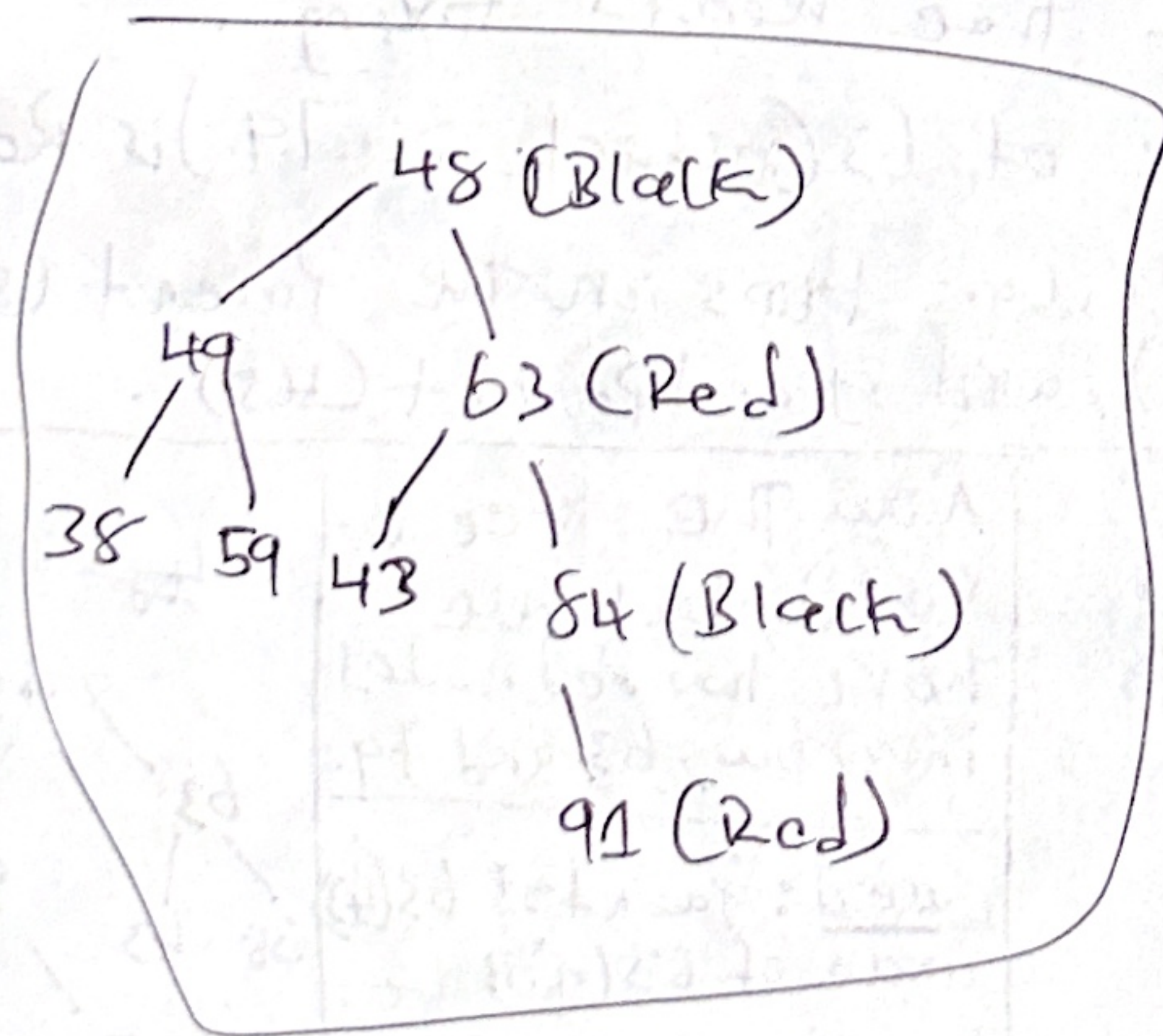




8. Insert 59: 59 is less than 63 and greater than 48. It goes to the right of 63 - since its parent (63) is black, the tree remains valid.



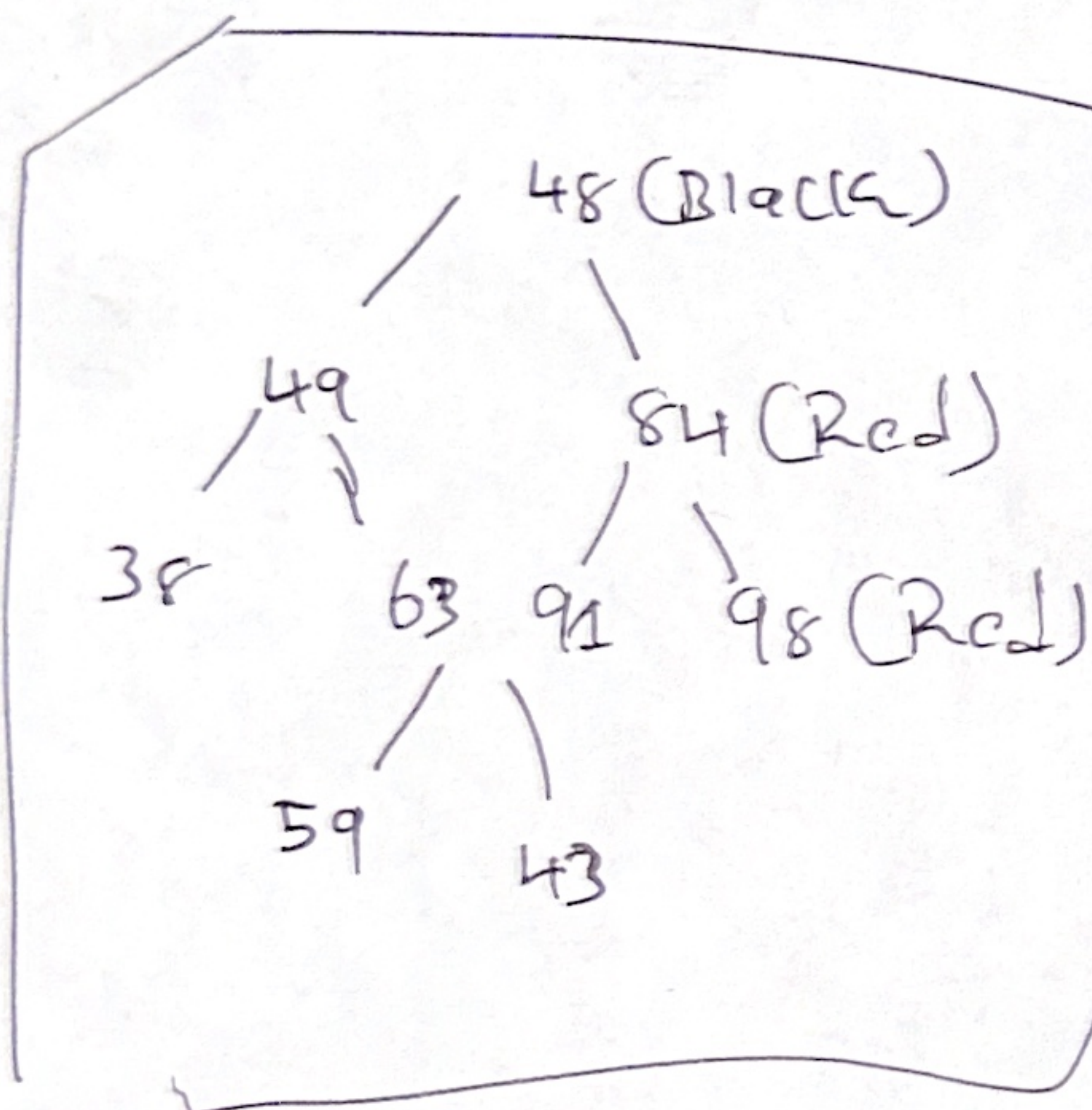
9. Insert 49: 49 is greater than 48 and less than 63, so it goes to the left of 63, since its parent (63) is black, the tree remains valid.





10. Insert 98: 98 is greater than 84, so it goes to the right of 84. Since its parent ~~84~~ (84) is Red, the tree needs fixing

- Case 1: The uncle of 98 (94) is Red.
- Case 4: Perform color flips on the parent (84), uncle ~~94~~ (94), and grandparent (48).



final TREE

Now the tree is valid.  
~~the~~ I have successfully inserted all numbers into Red-Black Tree.