ADS HOMEWORK 9

Problem 9.1

A) Inserting the values [13,44,37,7,22,16] into an empty Red-Black Tree in the given order:
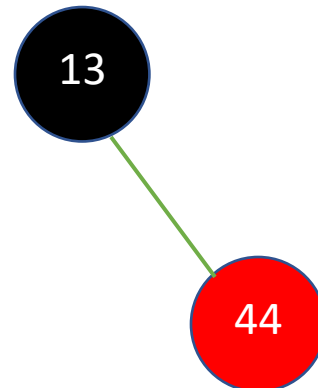
Inserting the first value (13):
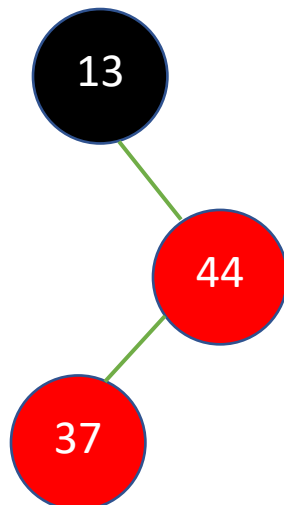
> Now 13 is the black root.
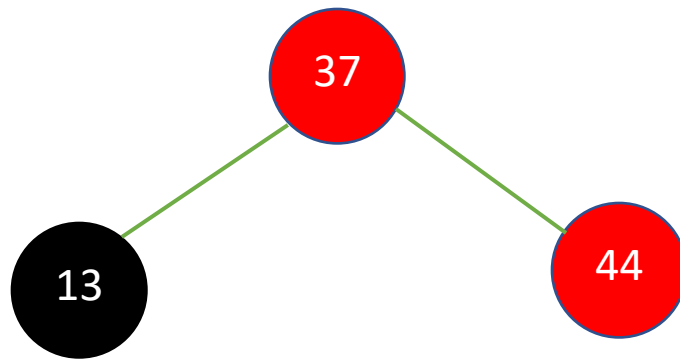

Inserting the second value (44):

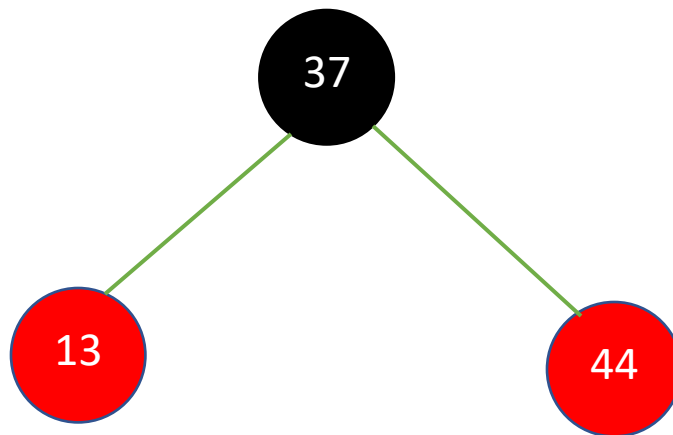> 44 becomes red as every inserted value is red till the color is changed while recoloring
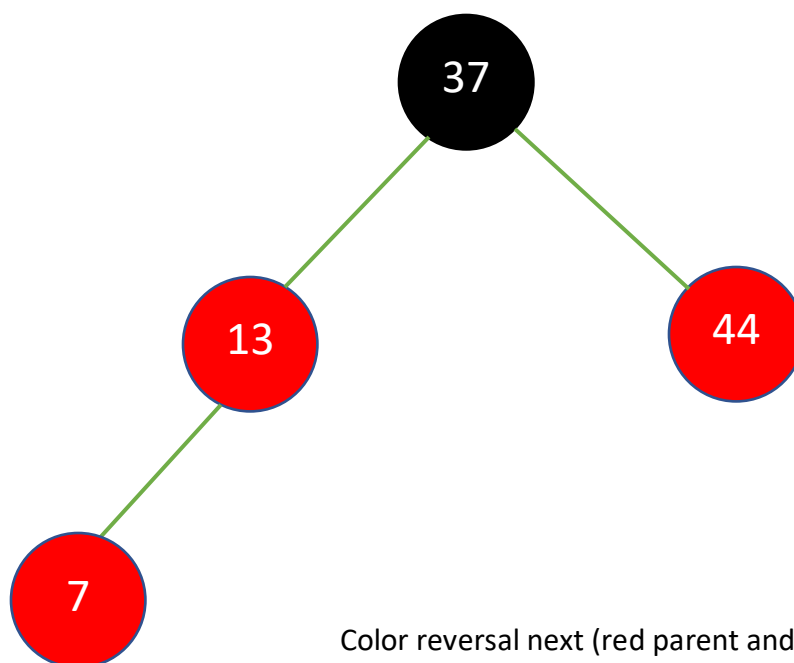

Inserting the third value (37):

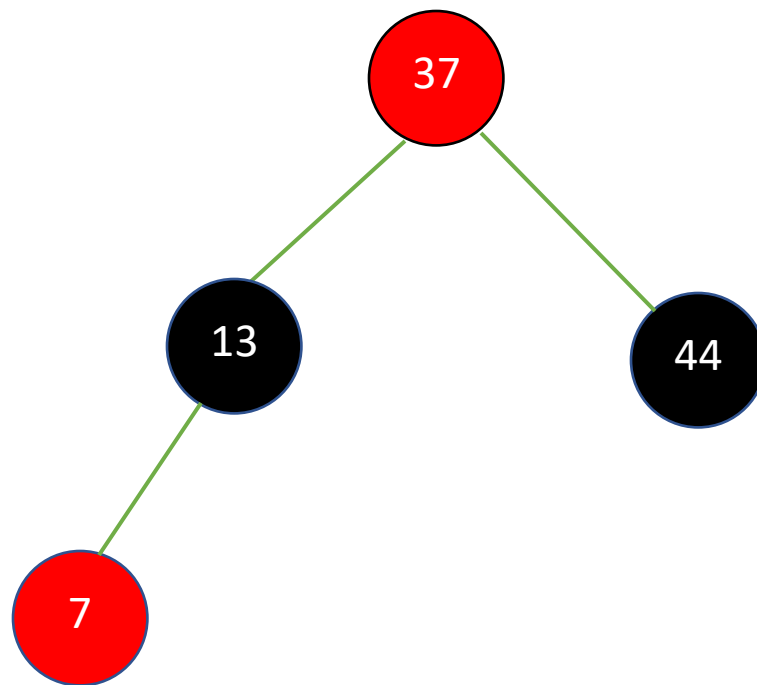Black Uncle is NIL, rotation from right to left next

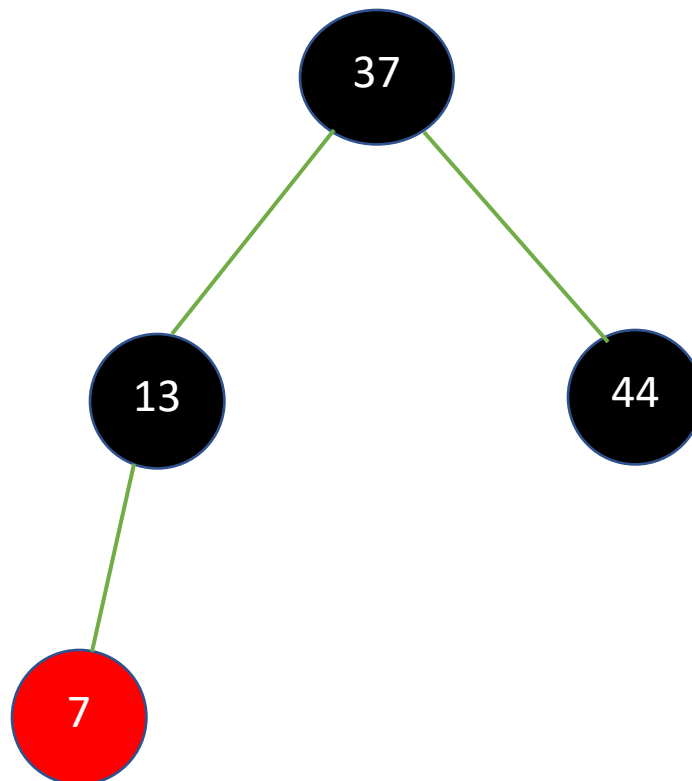Black parent with red children after recoloring:
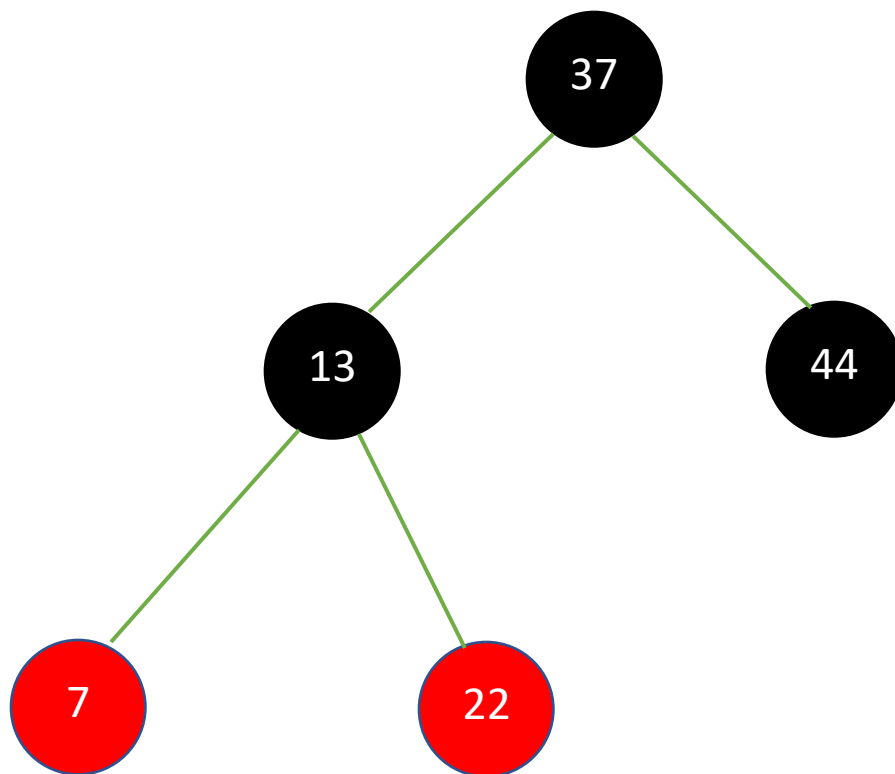

Inserting the fourth value (7):

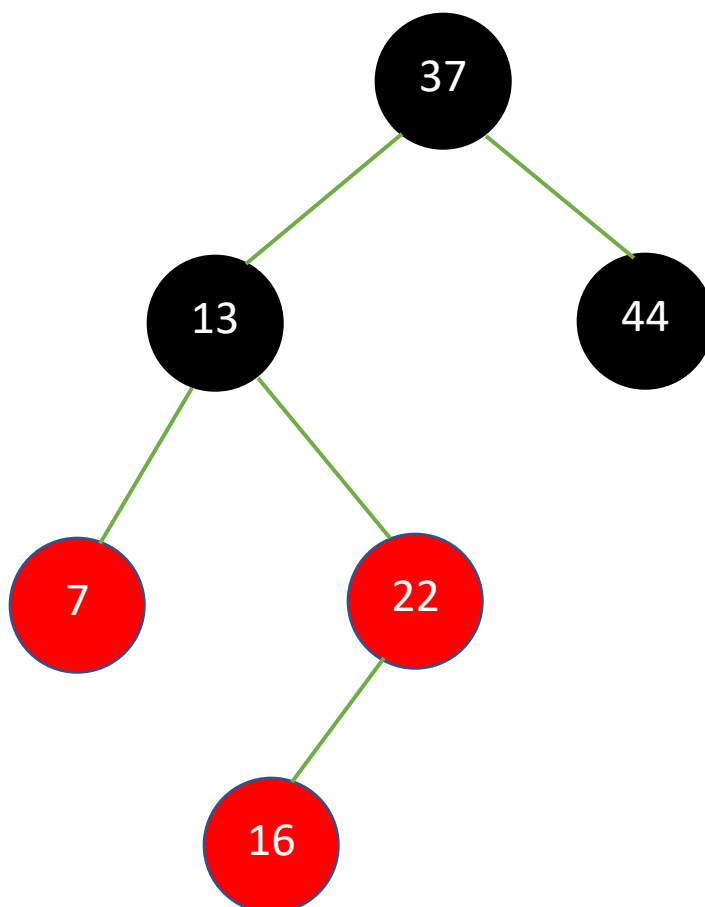Color reversal next (red parent and black children):

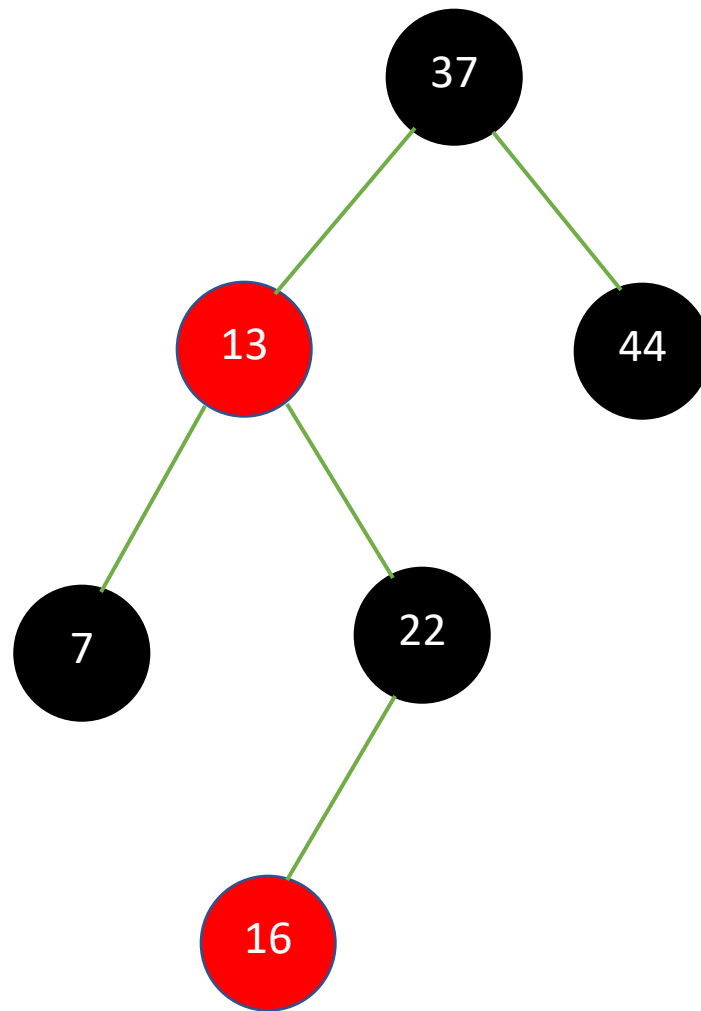The root's color is changed to black next

Inserting the fifth value (22):

Inserting the sixth value (16):

Color reversal of 13,7,22 (red parent and black children):

- Finally, the Red Black Tree will look as above. Although not drawn in the figure above, there are NIL nodes at the end of each leaf.
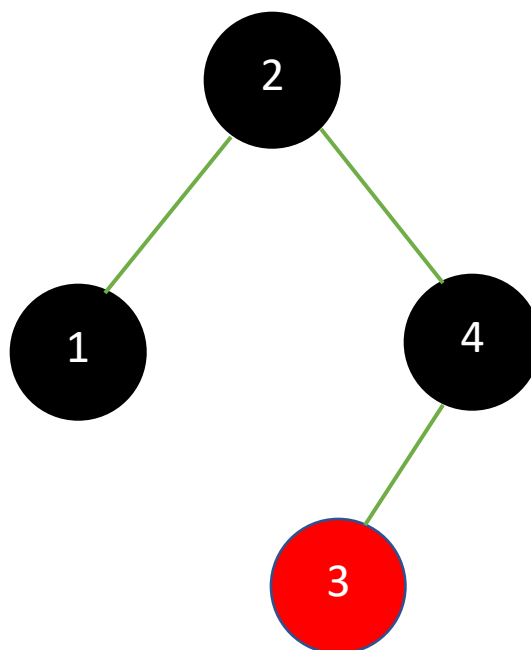
B) All valid Red Black Trees that store the values [1,2,3,4]:

If the root is 1 or 4, all the children will be on only one side of it and that is not possible and since every red node must have black children and there is always more than one black node present, the only possible roots are 2 and 3 giving us the following 4 arrangements.
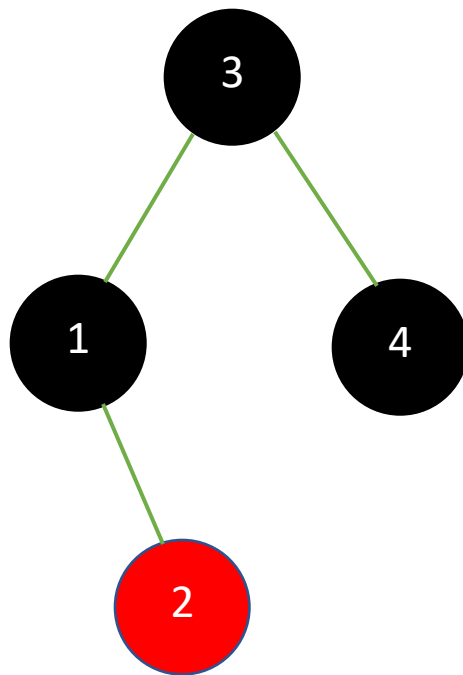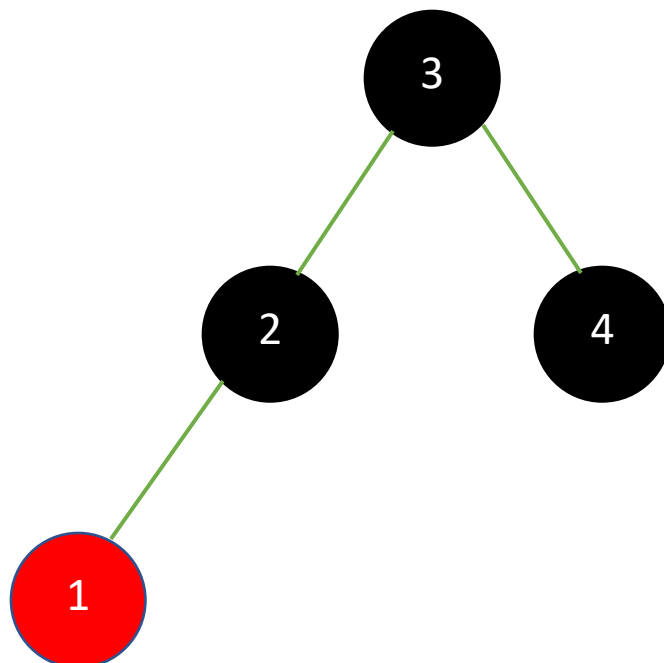
- Red Black Tree 1
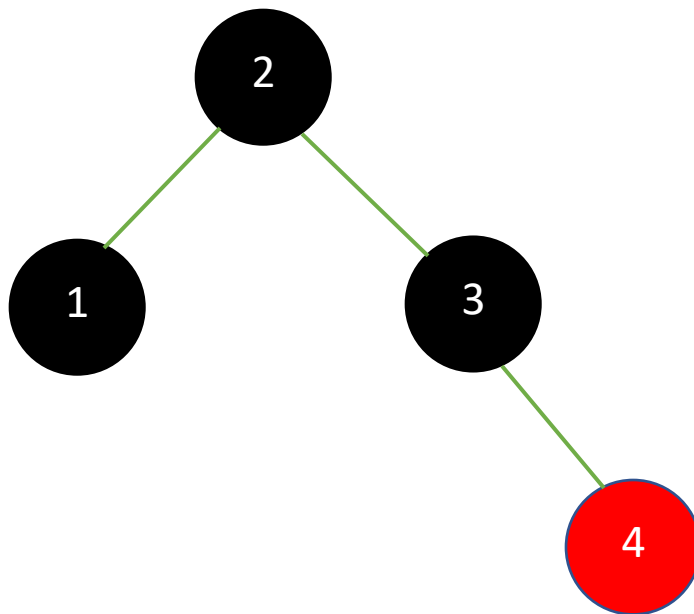
- Red Black Tree 2

- Red Black Tree 3

- Red Black Tree 4

The above trees are all the possible valid Red Black Trees.