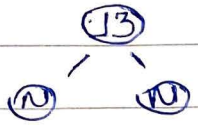
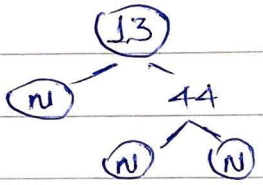
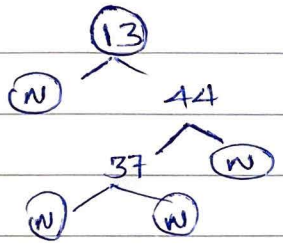
Musab Mehadi mmehadi@jacobs-university.de



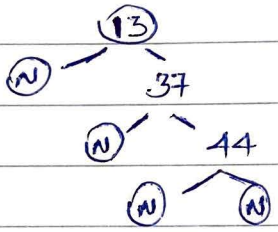


* Circled Nodes represent Black nodes while uncircled nodes represent Red.

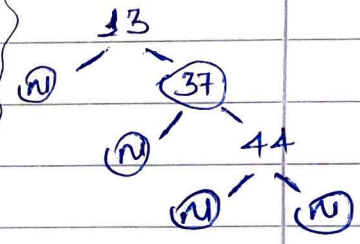
* Cases 1,2,3 named after the lecture slide representations



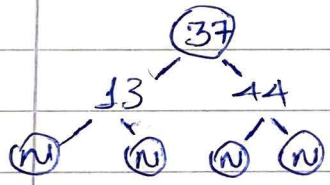
Case 2



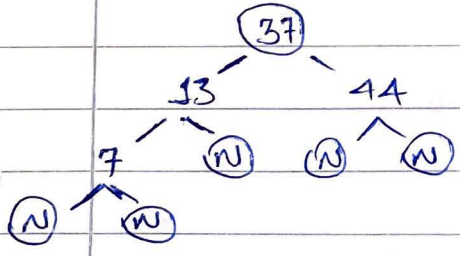
Case 3



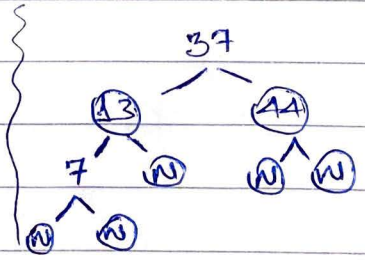
Recoloring



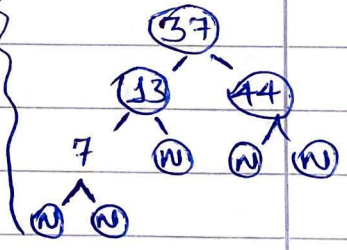
⇐ Balancing ~~addressing~~



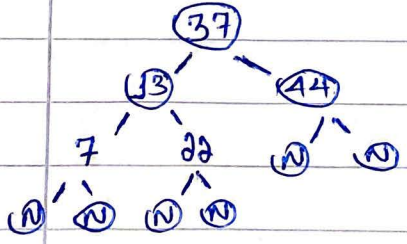
Case 1 (uncle is red)



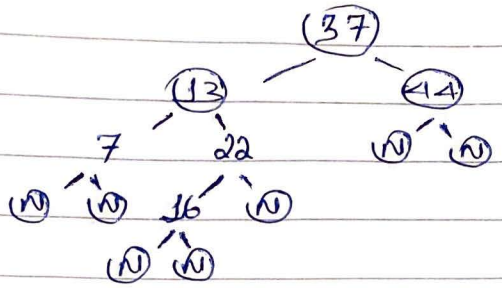
Recoloring



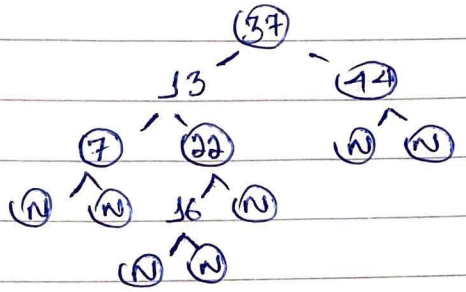
Fixing Root color



⇐ Does not need FIX-UP



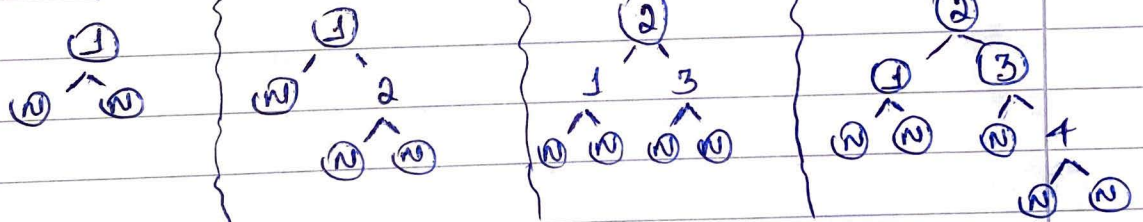
case 1 (uncle is red)



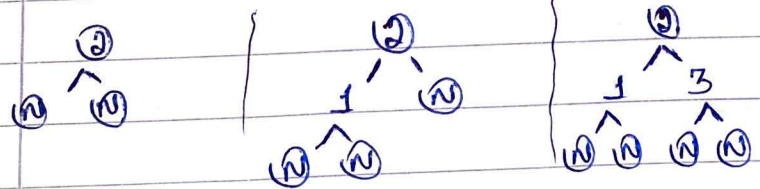
(Final Result)

9.2 In order to determine how many RED BLACK trees can be formed by {1, 2, 3, 4}, we will take each element as a root and add the rest of the elements.

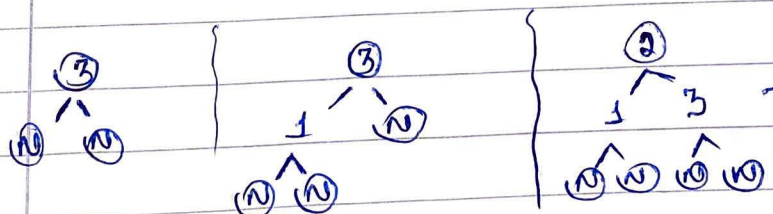
i)



ii)

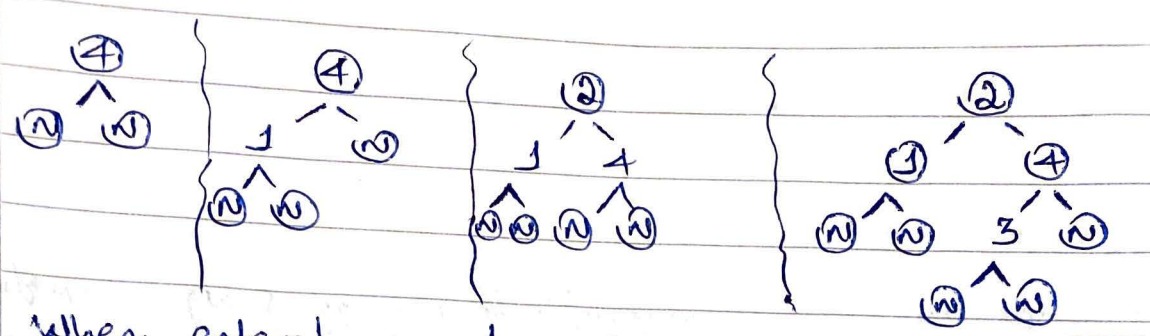


iii)



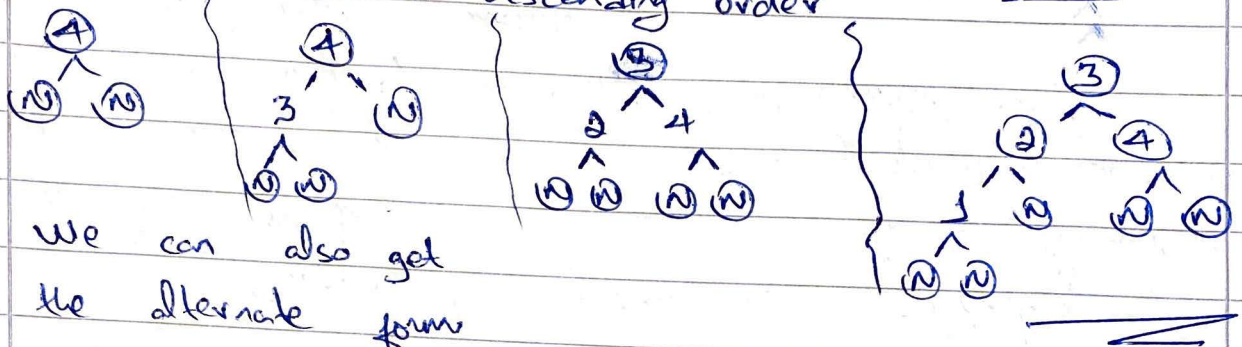
★ The three cases give us the same final output.

iv)

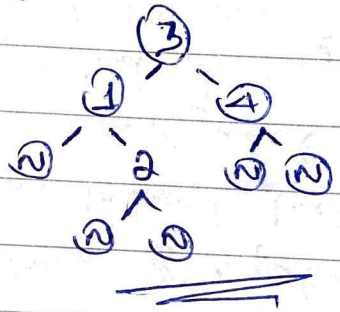


When entered in descending order

v)



We can also get the alternate form



As we can see, we can have four RED BLACK trees using {1, 2, 3, 4}