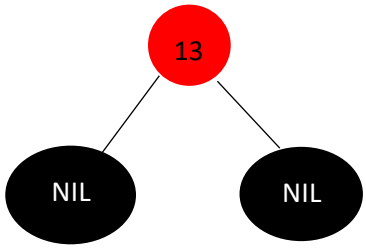
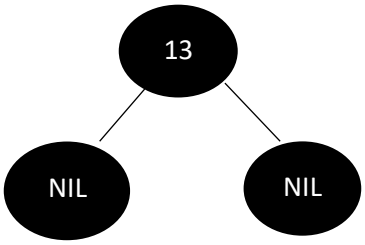
Problem 10.1 Understanding Red Black Trees

a)

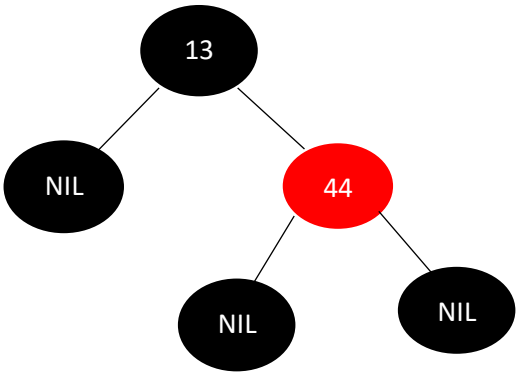
- Insert 13



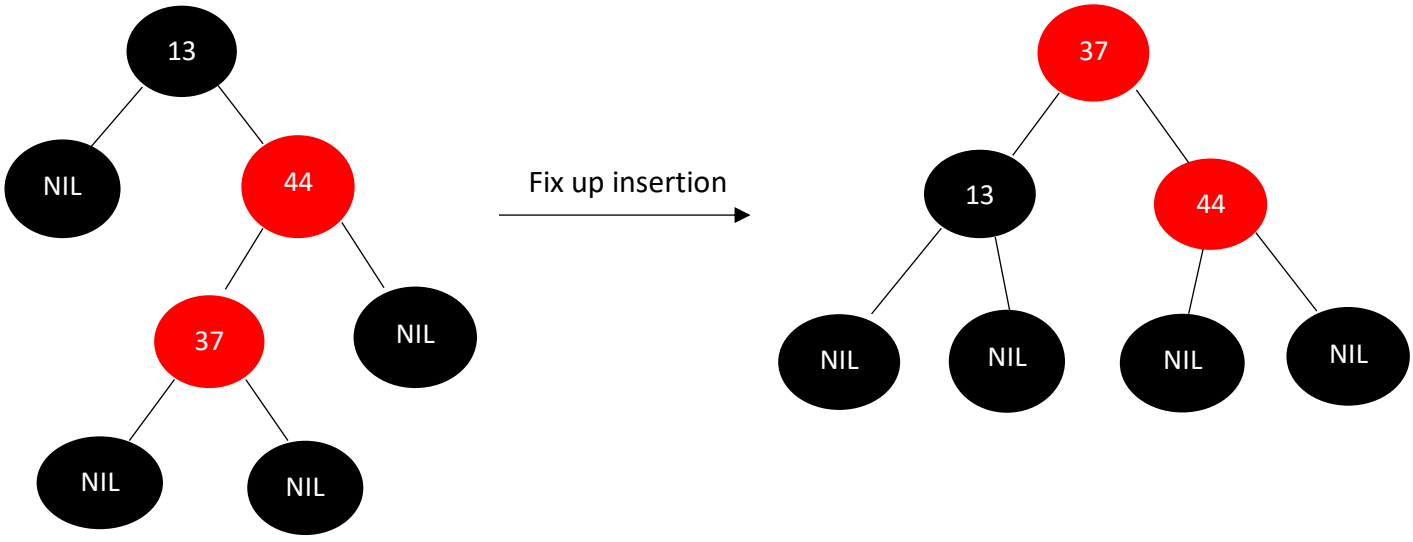
Fix up insertion:

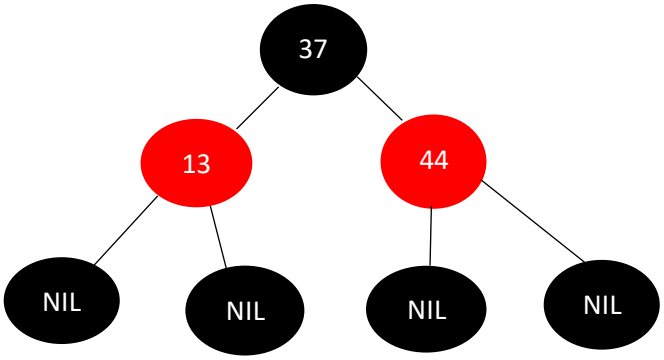


- Insert 44

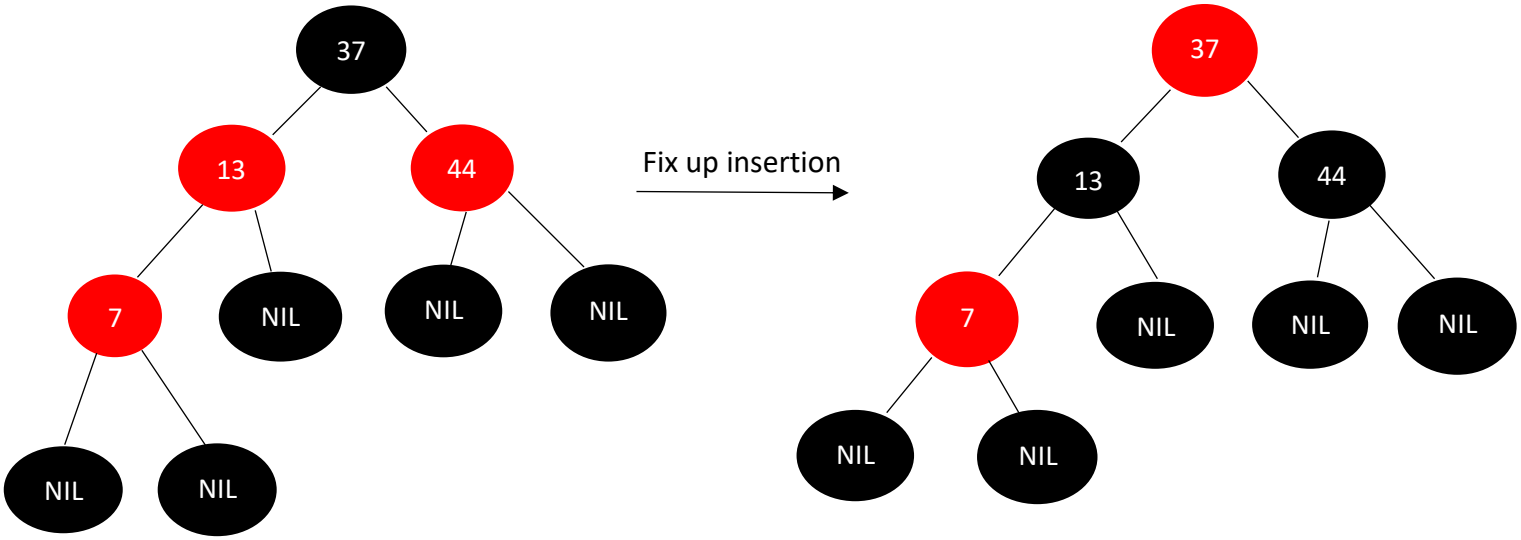


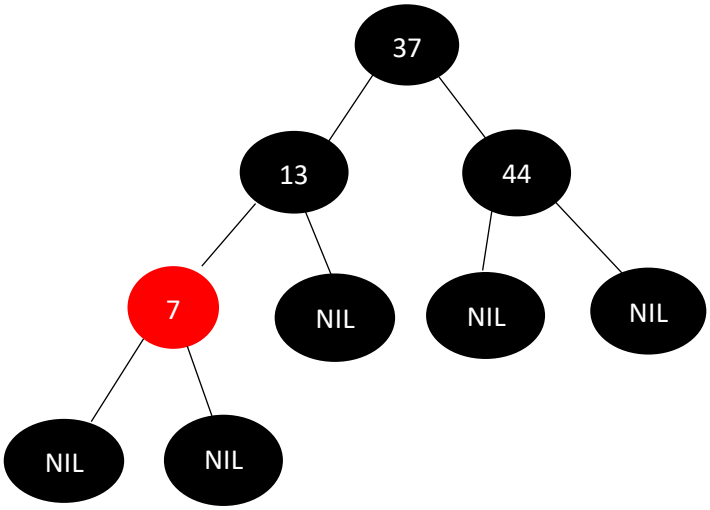
- Insert 37



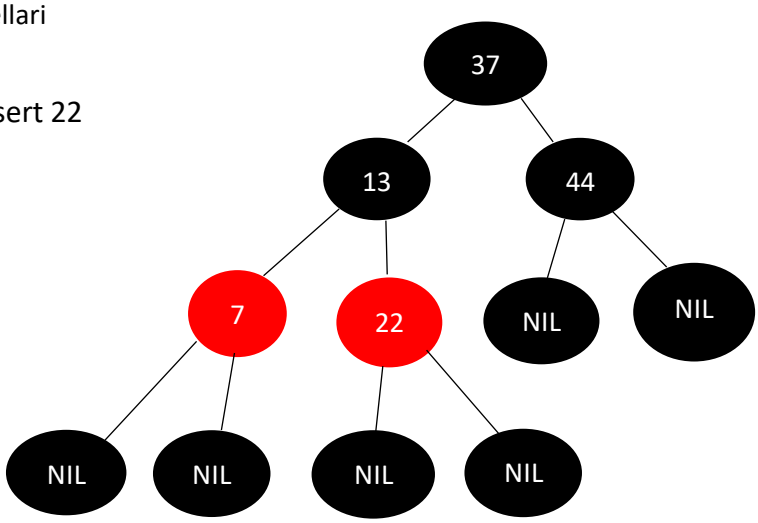

37
13
44
NIL
NIL
NIL
NIL

- Insert 7

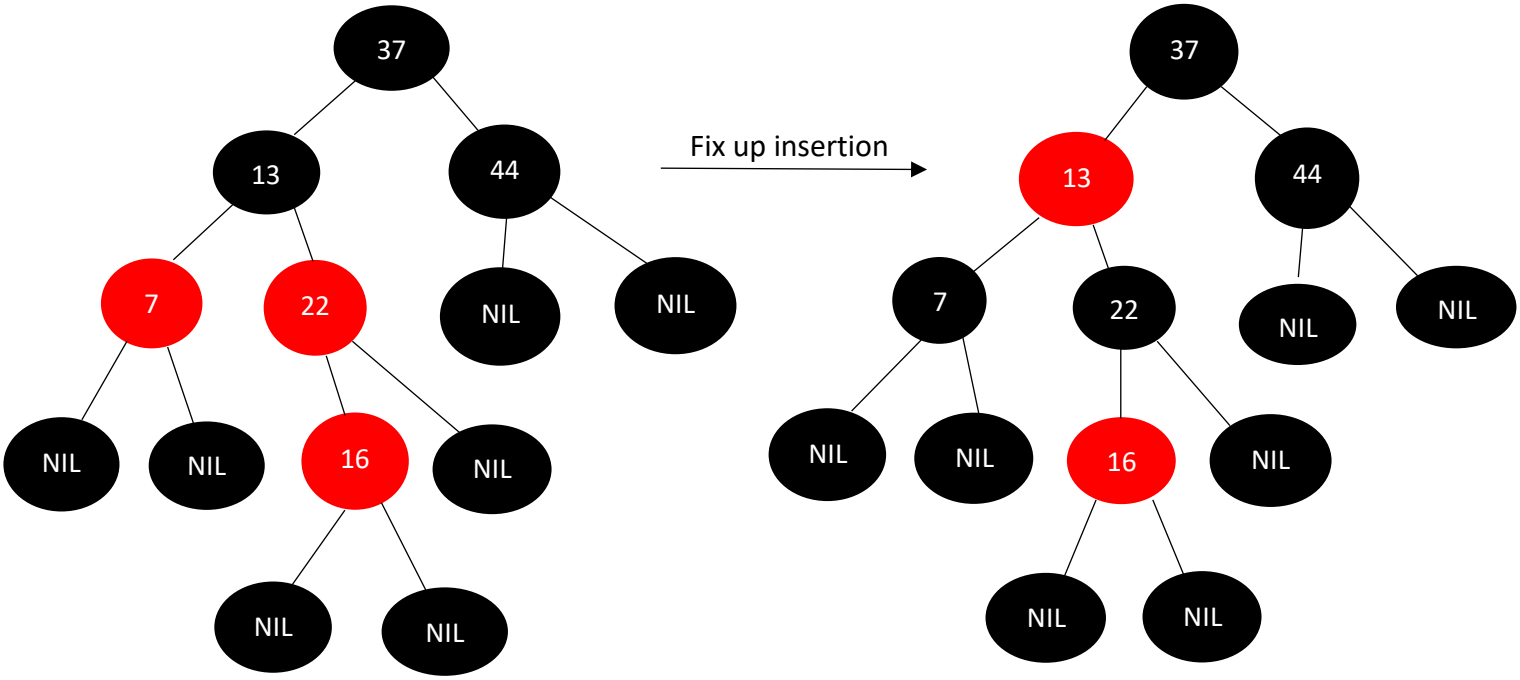

37
13
44
7
NIL
NIL
NIL
NIL
NIL
NIL
Fix up insertion
37
13
44
7
NIL
NIL
NIL
NIL
NIL
NIL


37
13
44
7
NIL
NIL
NIL
NIL
NIL
NIL

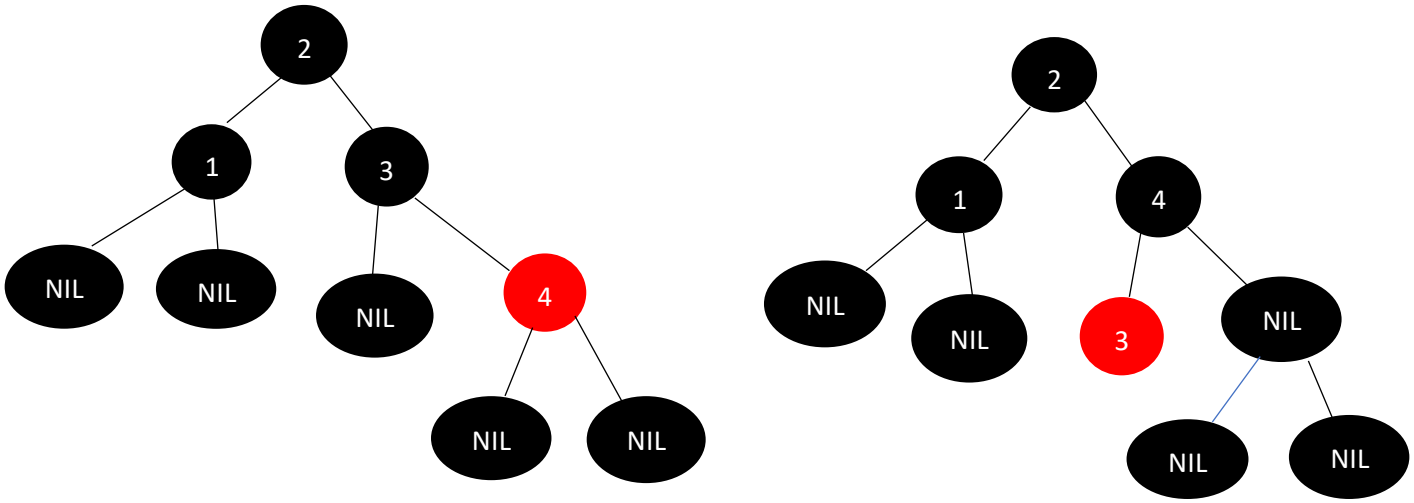
- Insert 22

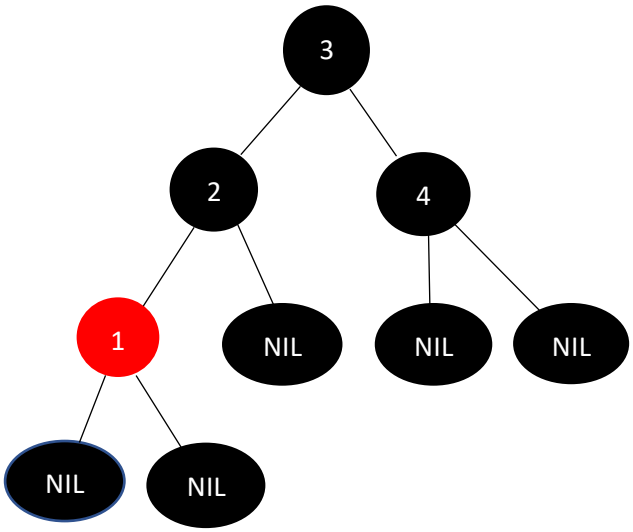


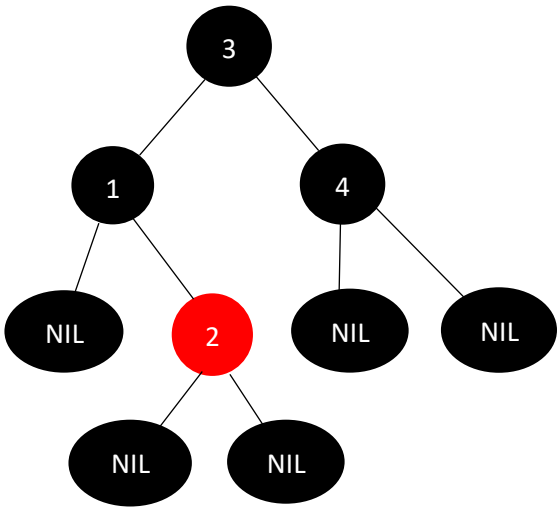
- Insert 16



b) All valid red-black trees that store the values {1, 2, 3, 4} are:







1 is the leftmost element and 4 is the rightmost element so they cannot be root as the tree would not be balanced anymore.