

Problem 1.[10] Observe figure 1, the tree is unbalanced. Perform a series a operation (one after another) and show the tree after each operation.

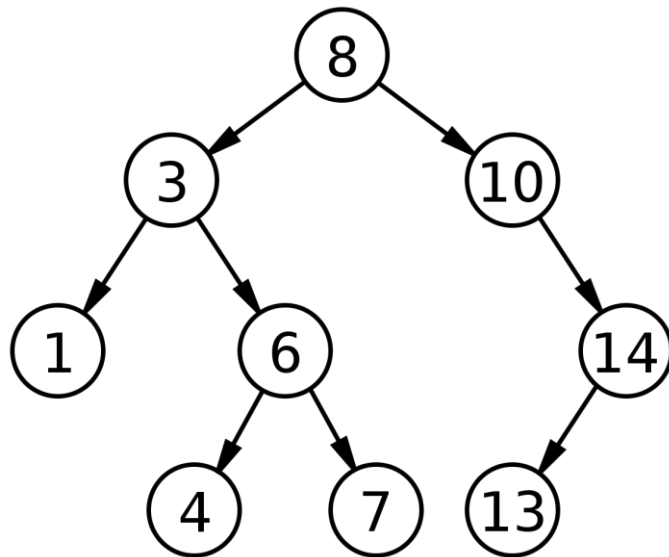


Figure 1. an unbalanced BST

- a) Balance the tree by performing appropriate rotations
- b) Delete 1
- c) Insert 12
- d) Delete 8

Problem 2. [10] Observe figure 2, perform a series of operations (one after another) and show the tree after each operation

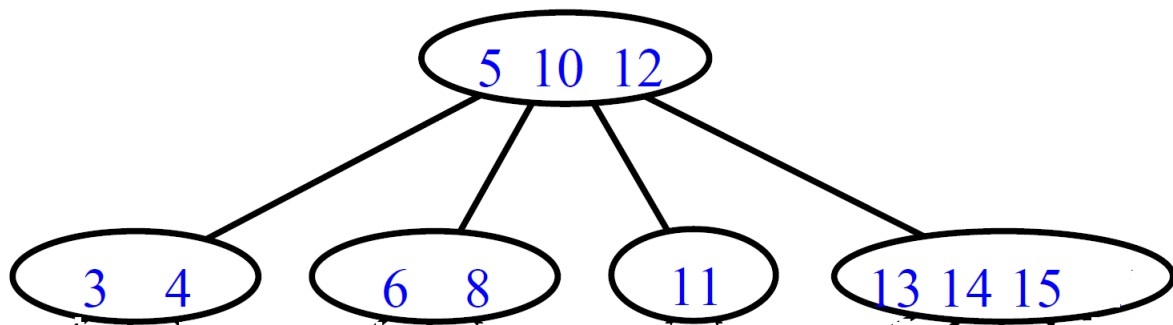
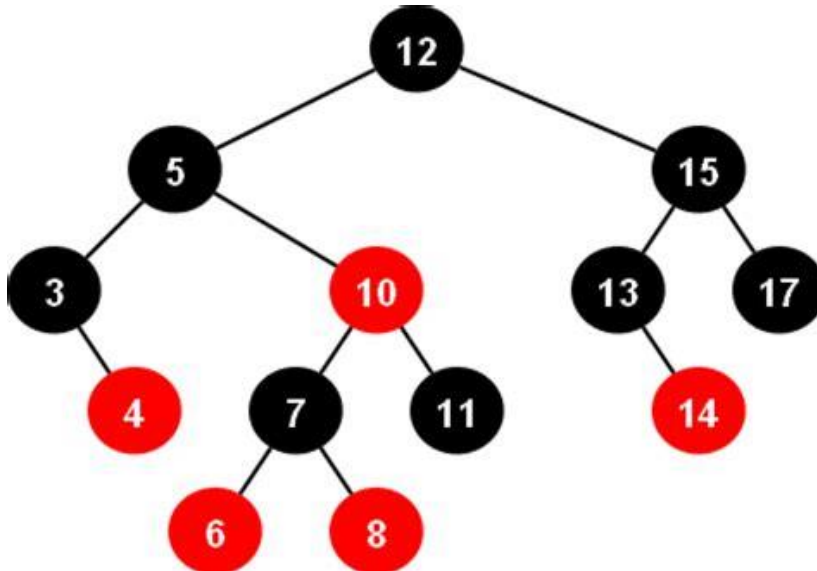


Figure 2: a 2,4 tree

- a) Insert 17
- b) Delete 6
- c) Delete 8
- d) Delete 11

Problem 3. [10]

- a) Convert original tree shown in figure 2 into a redblack tree.
- b) Perform a series of operations in the following red-black tree and show the tree after each operations



- a. Insert 9
- b. Delete 17
- c. Convert the original tree into a 2-4 tree