

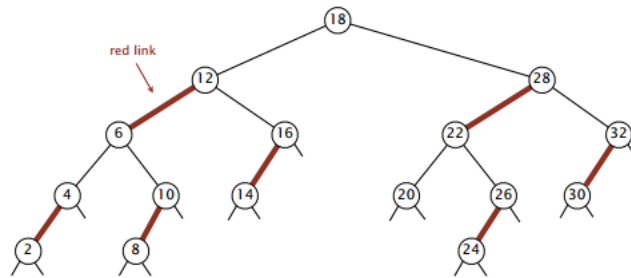
1 Exercises

Exercise 1. Consider inserting the following keys into an initially empty 2-3 search tree.

E A S Y Q U T I O N

- What is the height of the tree that results (assume root to be at height zero)? What is the minimum and maximum number of keys that a 2-3 search tree of this height can hold?
- What are the 2-nodes in the tree?
- What are the 3-nodes in the tree?

Exercise 2. Suppose you insert the key 23 into the following left-leaning red-black BST:



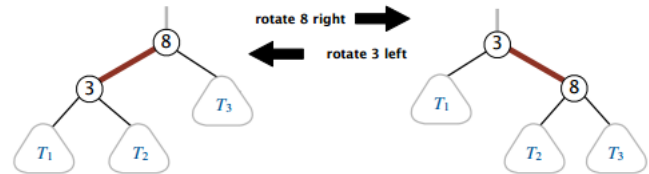
- Which of the following color flips result? Select all that apply.

- Color flip 18
- Color flip 22
- Color flip 23
- Color flip 24
- Color flip 26
- Color flip 28



b. Which of the following rotations result? Select all that apply.

- A. Rotate 18 left
- B. Rotate 18 right
- C. Rotate 22 left
- D. Rotate 22 right
- E. Rotate 23 left
- F. Rotate 23 right
- G. Rotate 24 left
- H. Rotate 24 right
- I. Rotate 26 left
- J. Rotate 26 right
- K. Rotate 28 left
- L. Rotate 28 right



2 Solutions to Exercises

Solution 1.

- a. 2; 7 and 14
- b. (S), (U), (A), (Q), (T), (Y)
- c. (E, O), (I, N)

Solution 2.

- a. E (Color flip 24)
- b. A (Rotate 18 left), C (Rotate 22 left), J (Rotate 26 right), L (Rotate 28 right)