Practice Worksheet
Due: not for credit

1   Reading

Read Chapters 13.1 – 13.3 of the textbook.

2   Exercises

Write out solutions to the exercises below, following the syntax in the textbook. Please include the names of everyone in your group.

1. Describe a valid red-black tree with n keys that has the largest possible ratio of red internal nodes to black internal nodes. (An internal node is a node that is not a leaf.) Derive this ratio. Describe a tree that has the smallest possible ratio of red to black internal nodes, and give that ratio.

2. When we insert a new node into a red-black tree, we set the color of the newly inserted node n to red. Observe that if we had chosen to set n's color to black, then property 4 of a red-black tree would not be violated. Why don't we choose to set n's color to black?

3. Argue that in every n-node binary search tree, there are exactly $n - 1$ possible rotations.

4. If you take a subtree of a red-black tree, that subtree is a BST on its own. Which of the five red-black properties are true for that subtree? How can we fix the other properties so we end up with a proper red-black tree from the subtree?