

DATA STRUCTURES AND ALGORITHM ANALYSIS Midterm Study Guide

1. Thorough understanding of the 4 notations used in time complexity analysis.
2. Determine the complexity of a given code segment and be able to sort complexities. Sort the following:

100000000	$(\log n)^{1000}$	$n^{1/2}$	$n \log n$	$n^3 - 100n^2$
$(\log n)^n$	$n/\log n$	$6n^3/(\log n + 1)n^2$		

3. Understand the conditions based upon which you will decide to use the various data structures you have learnt so far.
4. Recursive function and recursive program.
5. Program to perform traversals of a binary tree.
 - You may be asked to perform inorder, postorder or preorder traversals of a tree.
 - You may be asked to accomplish tasks such as finding the height, the number of leaves, the longest path from a given node (review your homework and the practices in chapter 12 of [OpenDSA Data Structures and Algorithms](#)).
6. For a binary tree of height h , what are the minimum/maximum number of leaf nodes it can have? What about its minimum/maximum number of nodes?
7. What is a binary search tree? How are elements inserted, deleted and other operations (e.g. find, findMin, findMax) that can be performed on binary search trees? What is the best, worst, and average case of time complexity for each operation? (e.g., insert, delete, find, traversal, etc.)
8. What is an AVL tree? You need to know how to insert and remove elements into a tree and perform necessary single or double rotations for maintaining an AVL tree. What is the best, worst, and average case of time complexity for each operation? (single/double rotation, insert, and remove)
9. What is a Red-Black tree? You need to know how to insert a node into a RB tree and perform necessary rotations and/or color flipping for maintaining a RB tree. What is the best, worst, and average case of time complexity for each operation? (rotation and insert)
10. Review the two programming assignments you have and will have done? You are required to understand what, why, and how you did in the assignments.

