

School of Computer Science and Software Engineering
Clayton Campus, Monash University
CSE1303 Part A
Summer Semester, 2002

Tutorial 5: Recursion, Binary Search Trees and Complexity

Please attempt all starred questions before your tutorial class.

Exercise 1.

Assume that the Linked List is defined as it is in the lecture notes to hold items of type **float**. Write a function **void killList(List* listPtr)**, which deletes all the nodes in the Linked List.

Exercise 2.*

Assume that the Binary Search Tree is defined as it is in the lecture notes to hold items of type **float**.

Write a recursive function **void killTree(TreeNode* nodePtr)**, which deletes all the nodes in the Binary Search Tree, where **nodePtr** contains the address of the root node.

Exercise 3.*

Draw an Expression Tree for the following expressions:

- $(a * q - b * p) / (a - b)$
- $((a - b) * (c - d)) / ((b - c) * (d - a))$

Exercise 4.*

For the expressions in Exercise 3, write them in following notations:

- Prefix
- Infix
- Postfix

Exercise 5.*

Assume the Binary Search Tree stores strings in alphabetical order. Insert the following 14 names into an empty Binary Search Tree in the order they appear and draw the final Binary Search Tree.

Jan, Guy, Jon, Ann, Jim, Eva, Amy, Tim, Ron, Kim, Tom, Roy, Kay, Dot

Exercise 6.*

For the Binary Search Tree constructed in Exercise 5, write the names in the order given by the following traversal methods:

- Preorder
- Inorder
- Postorder

Exercise 7.

(a) Given the following unsorted list:

5	7	8	1	6
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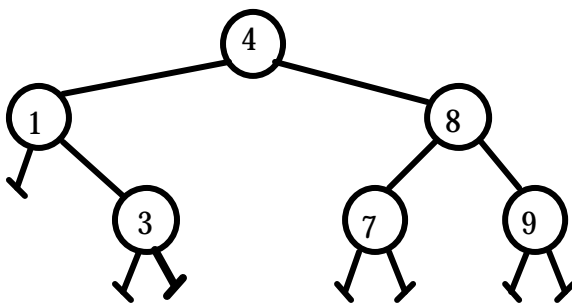
- What is the number of swaps needed to sort the list using selection sort (assume you are using the algorithm that doesn't swap if the element is in the correct place)?
- Give an example of a list which is the worst case (takes the most number of steps) to sort using selection sort.
- How many steps (moving an element) are needed to sort the list using insertion sort?
- Give an example of a list which is the worst case to sort using insertion sort.

(b) Given the following sorted list:

3	6	9	11	12
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- How many comparisons does the worst case for a linear search of this list take and what does it search for?
- What is the average number of comparisons for a linear search in this list?
- How many comparisons does the worst case for a binary search of this list take and what does it search for?
- What is the average number of comparisons for a binary search in this list?

(c) Given the following binary search tree:



- How many comparisons does the worst case for a search of this tree take, and what does it search for?
- What is the average number of comparisons to search for an item that is in this binary search tree?
- Give an example of a tree which has $O(n)$ worst case to search for an item which is in the tree.

Additional Exercises

Kruse et al, 2nd Edition

Exercises 3.4: E1, E2

Exercises 9.1: E1, E2, E3, E4, E5, E6, E7, E13, E14, E15

Exercises 9.2: E1, E2, E4, E6,

Review Questions Chapter 3: 3, 4, 5, 13

Review Questions Chapter 9: 1, 2, 3, 4, 5, 6

Deitel & Deitel 2nd Edition

Self Review Exercises: 12.1 k, l, m, n, o, 12.5

Exercises: 12.20, 12.21, 12.25