Name:

Data Structures & Algorithms (CISC 610)

FALL 2016 Final

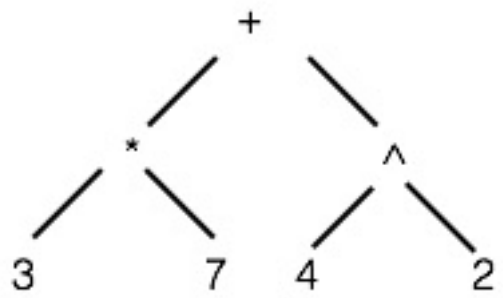
Test-Taking Instructions

- Please do not plagiarize.
- Turn cell-phones off
- Answer clearly and legibly and fully erase mistakes.
- You have 120 minutes
- You may write on the test for scratch work.
- Write all the steps including the rule/principle that you are using to solve a particular problem.
- Upload your answers to Moodle.

  Write your assumptions if you think a question may be ambiguous

Question	Score	Out of
1	_____	5
2	_____	5
3	_____	5
4	_____	5
5	_____	5
TOTAL	_____	25

1. Using the tree below as input, write the output of the following traversal algorithms:

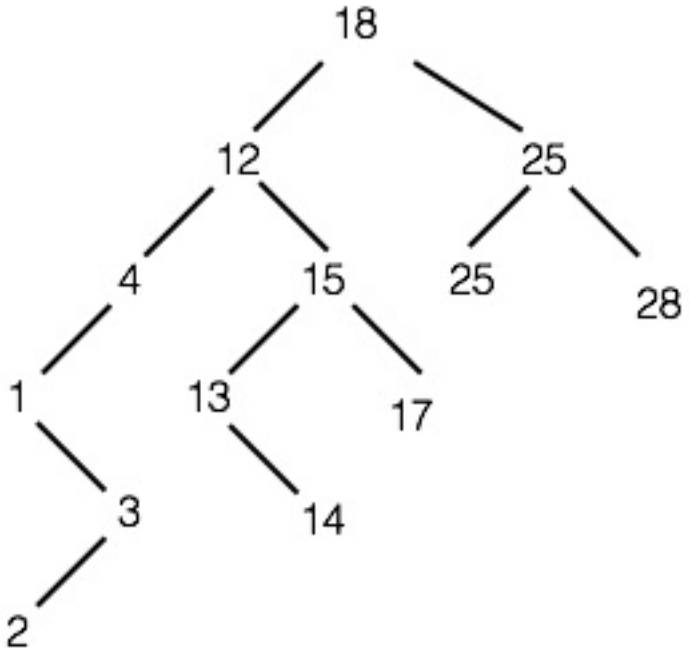


(a) Preorder

(b) Inorder

(c) Postorder

2. Show the resulting tree when the node with the key 12 is removed from the below tree. Show your reasoning.



3. For each of the algorithms listed below write the asymptotic upper bound for its worst-case running time. Assume n is the number of input elements.

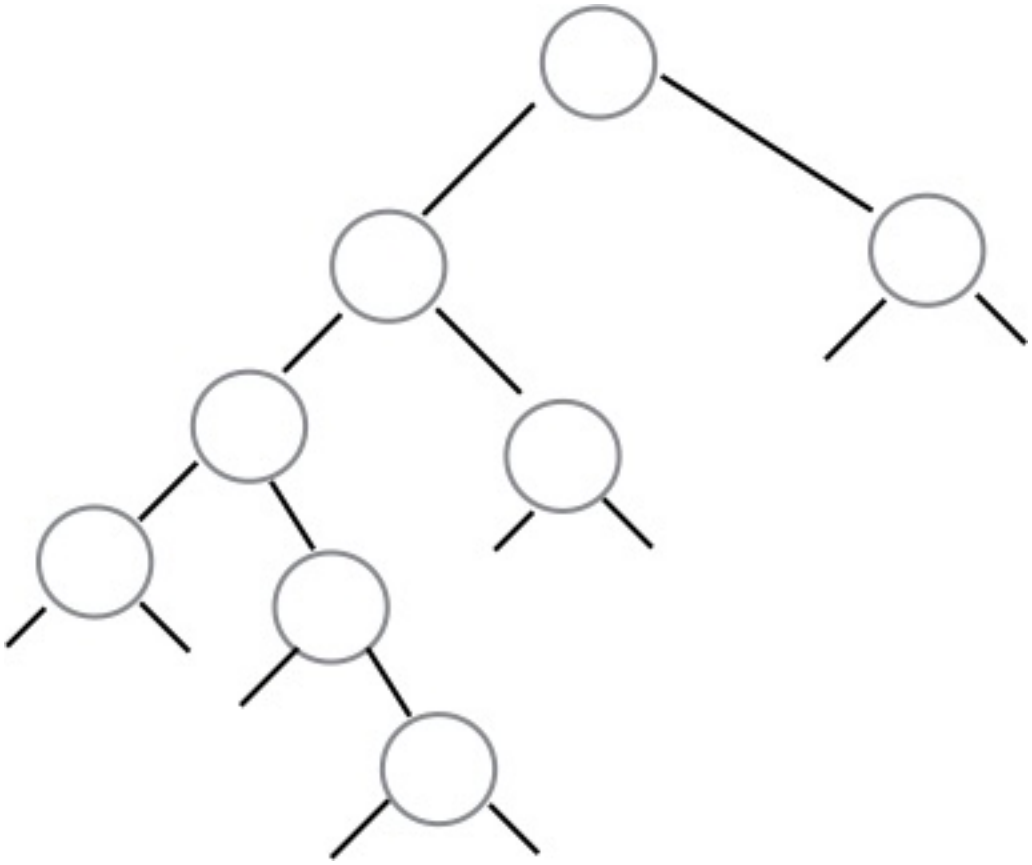
   (a) Insertion sort

   (b) Heapsort

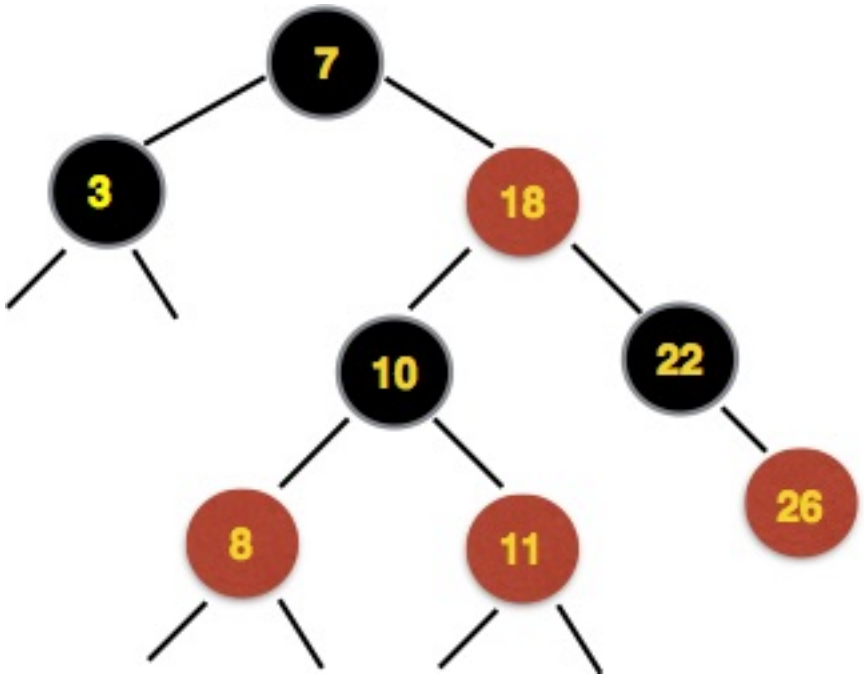
   (c) Quicksort

   (d) Red-Black trees

4. Assign the keys 2, 3, 5, 7, 11, 13, 17, 19 to the nodes of the binary search tree below so that they satisfy the binary-search-tree property.



5. In the following red-black tree, insert a red node with a key value of 15. Resolve any



red-black tree property violations and show the intermediate as well as the final trees. Write your steps concisely.
Note: If you are writing on a paper use shade to distinguish between red and black nodes.

1 SCRATCH WORK SHEET