

Data Structures 2018

Exercise 5 (Week 41)

- **Notice that based on university's new regulations on degrees, you can have a degree fail from the course which is put to the register.**

If a student does not participate in the course and does not cancel his/her enrollment, or if he/she discontinues the course, he/she will be assigned a fail grade for the course in question.

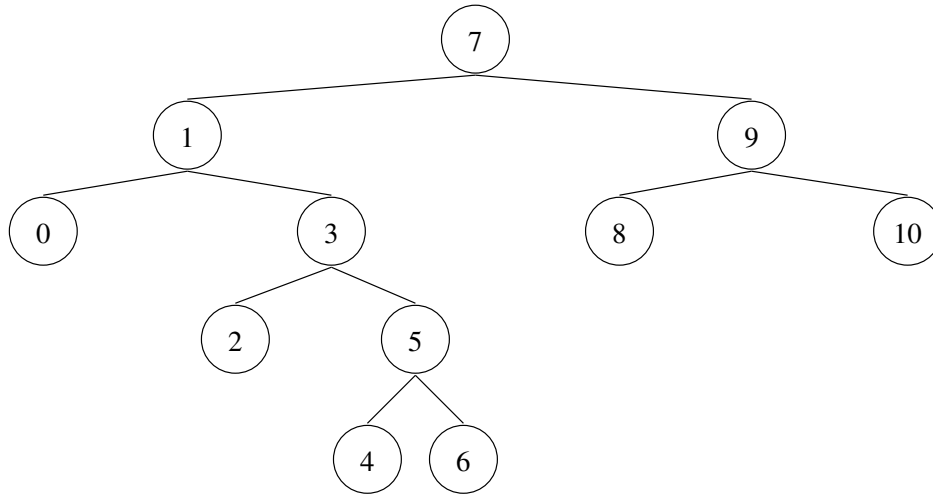
- **Students who participate in exercise group must be in place before the exercise group begins (12.15/14.15/16.15). Students who come late do not get the exercise points.**
- **Check the numbers of exercises made before you come to the exercise group. By this means we can save a lot of time when filling the exercise point list.**
- **Notice that pseudocode does not mean the same this as Java code. Pseudocode is not a programming language dependent presentation for an algorithm.**

1.-3. Implement the following operations in the file LinkedList.java

- a) insertFront, which inserts the integer given the parameter into the front of the list,
- b) find, which returns true if the given integer is in the list, else returns false,
- c) delete, which deletes first occurrence of the given integer from the list and returns true if the operation is successful. Delete returns false if the deletion is unsuccessful (e.g. the list is empty or the given integer is not in the list)
- d) sort, which sorts the list in ascending order.

Test your implementations with the given test program ListTest.java. Test 1 tests the operations a) to c) and test 2 tests the sorting.

4. Enumerate the nodes of the following tree in a) preorder, b) inorder and c) postorder.



5. Describe in pseudocode an iterative (that is, non-recursive) algorithm, using a stack, that prints the nodes of a binary tree in postorder.
6. Describe the following arithmetic expressions as binary trees.
- (a) $1 + 2$
 - (b) $2 - 4 + 3 - 2 + 1$
 - (c) $((5 + 7) * (3 - 5)) / 5$
7. Describe in pseudocode an algorithm, that computes from a binary tree
- (a) the number of nodes,
 - (b) the number of leaf nodes and
 - (c) the height of the tree.
8. Describe in pseudocode an algorithm `LevelNodes(k, r)`, that receives as parameters an integer k and a binary tree root node r , and calculates the number of nodes in the tree that are in level k .