

1. Consider the binary tree class described in lecture where we have 1) variable `root` that is the `TreeNode` representing the root of the binary tree and 2) each `TreeNode` consists of an integer data element, and two `TreeNode` pointers called `left` and `right`.

What does `fun(root)` return?

```
int fun(TreeNode * curr) {
    if (curr != null) {
        ret1 = fun(curr->left);
        ret2 = fun(curr->right);
        return 1 + min(ret1, ret2);
    }
    else return -1;
}
```

- A. Correct Answer Your Answer `fun` returns the shortest distance from root to leaf.
- B. None of the other options is correct.
- C. `fun` returns the height of the tree.
- D. `fun` returns the sum of all elements in the tree.
- E. `fun` returns the number of elements in the tree.

2. Which of the following sequences of keys is a possible In-order traversal of a Binary Tree that is ordered, i.e at every level, the subroot is not smaller than all the elements in the left-subtree, and not larger than all the elements in the right subtree.

- A. 5 121 4 135 3 123 2 118
- B. Two of these are **VALID** In-order traversals.
- C. None of the options are correct.
- D. 223 224 225 55 43 34 33 23
- E. Correct Answer Your Answer 60 65 66 92 95 98 170 190

3. Choose the appropriate running time from the list below.

The variable  $n$  represents the number of items (keys, data, or key/data pairs) in the structure. In answering this question you should assume the best possible implementation given the constraints, and also assume that every array is sufficiently large to handle all items (unless otherwise stated).

Perform a Post-order traversal of a Binary Tree.

- A.  $O(\log n)$
- B.  $O(n^2)$
- C. Correct Answer Your Answer  $O(n)$
- D.  $O(n \log n)$
- E.  $O(1)$

4. Which of the following statements about binary trees is **NOT** true?

- A. Correct Answer Your Answer Every binary tree has at least one node.
- B. Every node has at most two children.
- C. Every non-empty tree has exactly one root node.
- D. A node can have no children.
- E. Every non-root node has exactly one parent.

5. Choose the appropriate running time from the list below.

The variable  $n$  represents the number of items (keys, data, or key/data pairs) in the tree and  $h$  represents the height of the tree. In answering this question you should assume the best possible implementation given the constraints, and also assume that every array is sufficiently large to handle all items (unless otherwise stated).

Given a *complete* binary tree, compute the length of the longest path from  $v$  down to a descendant leaf.

- A.  $O(1)$
- B. None of the options is correct
- C.  $O(n^2)$
- D. Correct Answer Your Answer  $O(h)$
- E.  $O(n)$