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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 curr->data + ret1 + ret2;
   }
   else return 0;
}
```

- A. None of the other options is correct.
- B. fun returns the shortest distance from root to leaf.
- C. [Correct Answer] [Your Answer] fun returns the sum of all elements in the tree.
- D. fun returns the number of elements in the tree.
- E. fun returns the height of the tree.
- **2.** What is the **maximum** number of nodes in a **complete** binary tree of height 3?
 - A. [Correct Answer] 15
 - B. 4
 - C. 11
 - D. [Your Answer] None of the options are correct.
 - E. 7
- 3. Among the following choices, which abstract data type should be used for a level order traversal of a binary tree?
 - A. [Correct Answer] [Your Answer] queue
 - B. array
 - C. hash table
 - D. linked list
 - E. stack

4. 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. $O(n^2)$
- B. O(nlogn)
- C. O(logn)
- D. [Correct Answer] [Your Answer] O(n)
- E. O(1)
- 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 *perfect* binary tree, compute the length of the longest path from v down to a descendant leaf.

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