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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. $O(n\log n)$
C. $O(\log n)$
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] $O(n)$