1. 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 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).

Find the minimum key in a Binary Tree

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

2. 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?

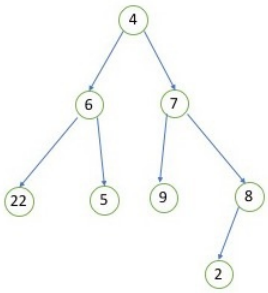
```
int fun(treeNode * curr) {
   if (curr != null) {
      ret1 = fun(curr->left);
      ret2 = fun(curr->right);
      return 1 + ret1 + ret2;
   }
   else return 0;
}
```

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

3. What is the **minimum** number of nodes in a **perfect** binary tree of height 3?

A. None of the options are correct.
B. 8
C. 31
D. [Correct Answer] [Your Answer] 15
E. [Correct Answer] 15

4. What is the Post-order traversal of the binary tree given below?



A. [Correct Answer] [Your Answer] `22 5 6 9 2 8 7 4`
B. `4 6 22 5 7 9 8 2`
C. None of the options is correct
D. `22 6 5 4 9 7 2 8`
E. `4 6 7 22 5 9 8 2`

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 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 Pre-order traversal of a Binary Tree.

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