- These must be completed and shown to your lab TA either by the end of this lab, or by the start of your next lab.
- You are required to work with a partner for this lab.

1. Download the binary search tree code from the course web page under Lab 5. There are a number of failing tests which you must pass. You can run the tests with:

   ```
   > ./bst
   ```

   You also have the ability to write your own testing/debugging code and run that instead. To do that, just supply your test keys as command line arguments:

   ```
   > ./bst 5 3 2 1 6 8 4 7 9
   ```

2. To fix the failing tests, first implement the following functions in `bst.cc`:

   ```
   /**
    * Returns the number of nodes in the tree rooted at root.
    */
   int numNodes( Node* root );

   /**
    * Returns the number of leaves in the tree rooted at root.
    */
   int numLeaves( Node* root );

   /**
    * Returns the height of node x.
    */
   int height( Node* x );

   /**
    * Returns the depth of node x in the tree rooted at root.
    */
   int depth( Node* x , Node* root );

   /**
    * Traverse a tree rooted at rootNode in-order and use 'v' to visit each node.
    */
   void in_order( Node*& rootNode, int level, Visitor& v );

   /**
    * Traverse a tree rooted at rootNode pre-order and use 'v' to visit each node.
    */
   ```

```
void pre_order( Node*& rootNode, int level, Visitor& v );

/**
 * Traverse a tree rooted at rootNode post-order and use 'v' to visit each node.
 */
void post_order( Node*& rootNode, int level, Visitor& v );
```

3. When that is done, you can complete the missing portion of `delete_node` in `bst.cc`:

```
/**
 * Deletes a node containing 'key' in the tree rooted at 'root'.
 */
bool delete_node(Node*& root, KType key);
```

4. Which functions would change if the Nodes were part of a binary tree that didn't have the search tree property (the invariant that requires `left < parent < right`)?

5. Be sure to show your work to your TA before you leave, or at the start of the next lab, or you will not receive credit for the lab!