# CS 211 Practice Lab Final

The rules:

* Closed book.
* You are allowed one single-sided sheet of notes.
* You are only required to complete 5 of the 6 programming challenges (your choice).
* Closed neighbor. Merely ***looking*** at the work of others is cheating and carries all of the normal consequences.

Note that each question specifies which data structures are acceptable to use. Using extra data structures is allowed, but you will receive a reduced score.

Questions #1 and #2 use the following class definition to build binary trees:

|  |
| --- |
| class TreeNode { public:  int value;  TreeNode \*left = nullptr;  TreeNode \*right = nullptr;  TreeNode(int v = 0)  {  value = v;  } }; |

1. [10] Write a function called searchTree that searches a binary search tree for the supplied value. Find should return Boolean TRUE when the value is found and Boolean FALSE when it is not.

2. [10] Write a function called bstToVector that returns the supplied binary search tree into a sorted STL vector (HINT: a certain traversal makes this much easier).

3. [10] Write a function called isHeap that accepts an STL vector of integers and determines whether or not the vector is a valid 0-based min heap.

4. [10] Write a function called mergeSorted that accepts two sorted STL vectors of integers and returns a merged sorted vector. Note that you are **not allowed** to use a sorting algorithm to solve this problem.

5. [10] Write a function called findNthSmallest that accepts a vector and returns the Nth smallest item in the vector.

6. [10] Write a function called findMostCommon that finds the most commonly used character in the supplied string. HINT: using an STL unordered\_map makes this much easier.