Section One - C++ concepts

1. It has been said that the two major differences between Java and C++ are the scoping of symbols and the direct access to pointers.
   Explain what is meant by the difference in scoping of symbols.

2. It has been said that the two major differences between Java and C++ are the scoping of symbols and the direct access to pointers.
   Explain what is meant by the difference with regard to pointers.

3. There are three different standard uses of const in C++ .
   What are they and how would you use it?

4. Friend operator methods can be used in relation to objects, however, you may also overload the operator as part of the object.
   Explain the difference in the two and where one would be used over the other.

5. Makefiles are used for various purposes in C/C++. List three of them.

6. Pointers can be generally used with three different functionalities. Name them

7. What is the difference between pass by value and pass by reference? Why would you use one over the other?

8. What is the purpose of a prototype for a function?

9. What is the purpose of a destructor?

10. What is the purpose of a header file?

11. What is a memory leak? What causes them? How can you check for one?

Section Two - Software Engineering Principles

1. In addition to the answer of number ten, what is an advantage of listing things in a header file?

2. What is a UML diagram? (You don't have to draw one, but it's good knowledge to know what one is)

3. You've implicitly been using version control throughout the semester, describe what it is.

4. Styling code is vital. Name three reasons as to why keeping good style and running cpplint is a good practice for software engineering.

5. Along with styling, name a few reasons why documentation is vital.

6. What are a few reasons to have a consistent testing machine (i.e. Linux Lab)

7. What is Unit Testing?

8. What are test cases?

9. What is Black Box testing?

10. What is White Box testing?

11. What are examples of each form of testing? How do they relate to your experiences in the class?

12. What is debugging?

Section Three - Programming Exercises

1. You have the following main program, which does compile and execute when provided with the appropriate wrapping. You may assume that the functions IsInteger and ConvertToInteger do exactly what you would expect them to do given the function names.

   Write the necessary code for MyFunc so that it either adds integers or concatenates strings.

```
void main(int argc, char *argv[]) {
        int i1 = -1, i2 = -1;
        string s1 = "", s2 = "";
        cin >> s1 >> s2;

        if (IsInteger(s1) && IsInteger(s2)) {
                i1 = ConvertToInteger(s1);
                i2 = ConvertToInteger(s2);
                cout << MyFunc(i1, i2) << endl;
        }
        else {
                cout << MyFunc(s1, s2) << endl;
        }
}
```

   What is the output from executing the following code?

2. Write a void function that will accept an int parameter *parm* will return this *parm* by reference with a value 7 larger than when it was passed in.

3. Write a function that takes in a string reference, and returns a character pointer of the characters inside the string.

4. Write a function that accepts a separate Complex value, and returns the value of "this" Complex minus the other Complex.

5. Answer the following sections of this program

```
void main() {
  string name = "Joe Programmin Daddy";
  int size = name.size();
  char * name_ptr = name.c_str();
  int * ascii_ptr = nullptr;

  // QUESTION 6
  // Append the ASCII equivalent to the ascii pointer

  // QUESTION 7
  // Print out the elements inside of the ascii pointer

  // QUESTION 8
  // Create a new string that is the reverse of 'name'

  // QUESTION 9
  // Create a new string that is the combined 'name' and reversed name.

  // QUESTION 10
  // Assert that the new string is a palindrome
}
```

Section 4 - Previous Exam Questions

You are to write a function that will take five lines of input, each of which is an arithmetic command, and then do the arithmetic. Your input will have lines like the following:

10 times 15
11 plus 12
8 times 7
18 times 2
9 plus 17

Write a function that will read a file in this format from standard input, do the correct arithmetic, and and write out a correct statement to standard output. The output for this particular file would be

10 times 15 is 150
11 plus 12 is 23
8 times 7 is 56
18 times 2 is 36
9 plus 17 is 26

You may hard code the formatting of the reading of a single line of input. That is, you may assume the input is a string that is an integer followed by a string followed by a string that is an integer. The requirement for five lines of input means you can use a for loop.

What is the output from executing the following code?

```
#include <iostream>
#include <string>
using namespace std;

string my_string = "constraint\n";
void zork(string my_string) {
	cout << my_string << endl;
}

void widget() {
	cout << my_string << endl;
}

int main(int argc, char* argv[]) {
	zork("argument\n");
	widget();
	string my_string("whatever\n");
	zork(my_string);
	widget();
}
```