Lab 05
Inheritance

Section 1: Guess program outputs.

1. What will the following program display?

```
#include <iostream>
// #include <memory>

using namespace std;

class Base
{
public:
    Base()
    {
        cout << "Entering the base.\n";
    }
    virtual ~Base()
    {
        cout << "Leaving the base.\n";
    }
};

class Camp : public Base
{
public :
    Camp()
    {
        cout << "Entering the camp.\n";
    }
    virtual ~Camp()
    {
        cout << "Leaving the camp.\n";
    }
};

int main()
{
   // shared_ptr<Camp> outpost = make_shared<Camp> ();
   Camp* outpost = new Camp;
   delete outpost;
   outpost = nullptr;
   return 0;
}
```

2. What will the following program display?

```
#include <iostream>
#include <string>
// #include <memory>

using namespace std;

class Base
{
```

```
public:
    Base() { cout << "Entering the base.\n"; }
    Base(string str)
    {
       cout << "This base is "<< str << ".\n";
    }
    virtual ~Base() { cout << "Leaving the base.\n"; }
};

class Camp : public Base
{
public:
    Camp() { cout << "Entering the camp.\n"; }
    Camp(string str1, string str2) : Base(str1)
    {
        cout << "The camp is "<< str2 << ".\n";
    }
};

int main()
{
   // shared_ptr<Camp> outpost = make_shared<Camp>("secure", "secluded");

   Camp* outpost = new Camp( "secure", "secluded");
   delete outpost;
   outpost = nullptr;

   return 0;
}
```

Section 2: Review Questions and Exercises

1. What type of relationship between classes is realized by inheritance?

2. What is the difference between private members and protected members?

3. What is the reason that base class constructors are called before derived class constructors?

Section 3: Programming Challenges

1. Palindrome Testing

A palindrome is a string that reads the same backward as forward. For example, the words mom, dad, madam and radar are all palindromes . Write a class Pstring that is derived from the STL string class. The Pstring class adds a member function

bool isPalindrome( )

that determines whether the string is a palindrome. Include a constructor that takes an STL string object as parameter and passes it to the string base class constructor. Test your class by having a main program that asks the user to enter a string. The program uses the string to initialize a Pstring object and then calls isPalindrome() to determine whether the string entered is a palindrome.

You may find it useful to use the subscript operator [ ] of the string class: If str is a string object and k is an integer, then str[k] returns the character at position k in the string.

2. String Encryption

Write a class EncryptableString that is derived from the STL string class. The Encryptable string class adds a member function

void encrypt( )

that encrypts the string contained in the object by replacing each letter with its successor in the ASCII ordering. For example, the string baa would be encrypted to cbb. Assume that all characters that are part of an EncryptableString object are letters a, .., z and A, .., Z, and that the successor of z is a and the successor of Z is A. Test your class with a program that asks the user to enter strings that are then encrypted and printed.