**CMPE 50 – Spring 2021**

**Lab #7– Classes II (friends, const functions)**

**Instructions**: You should submit your answers through Canvas->Assignment->Lab 7->Submission. Please submit your answers (.cpp files with output embedded and appropriate documentation/comments) even if you couldn’t complete/run them.

**Exercise 1:**

Create a class Resource. The class should have:

1. Two private variables status and writeTo representing integer value either 0 or 1.
2. One default constructor that initializes the status and writeTo to zero.
3. One single parameterized constructor to initialize the writeTo variable.
4. Two constant accessor functions per class that return the values of status and writeTo separately.
5. Two mutator functions per class that set the values of status and writeTo separately.
6. One output (member) function that outputs the resource status. The output function should be able to print on the screen or an output file.

void output(ostream &out\_stream);

1. A friend function check\_status that accesses the status variables of two input objects. If status in each resource object is set to “1”, display “resource available” else display “resource unavailable”.

bool check\_status(Resource &res1, Resource &res2)

{

// Define status checking code here.

// return true if res1 status and res2 status are both 1

// else return false.

}

**Exercise 2:**

Define a class Rational for rational numbers. A rational number is a number that can be represented as the quotient of two integers. For example, 1/2, 3/4, 64/2, and so forth are all rational numbers. (By 1/2, etc., we mean the everyday meaning of the fraction, not the integer division that this expression would produce in a C++ program.) Represent rational numbers as two values of type int, one for the numerator and one for the denominator. Declare both member variables as private.

Include a constructor with two arguments that can be used to initialize the member variables of an object to any legitimate values. This class should have the following public member or friend functions:

1. Two functions called input and output. The input takes an argument of type of istream&. It allows the input from the input stream to both the numerator and denominator member variables. The output function, having an argument of type ostream&, will output the rational number in a form 1/2, 15/32, 300/401, and so forth to the output stream. Note that the numerator, the denominator, or both may contain a minus sign, so -1/2, 15/32, and -300/-401 are also possible inputs.
2. Friend functions add, subtract, multiply, and divide. Each of these friend functions return a Rational object and has two input arguments of type Rational&. These friend functions should apply correctly to the type Rational.
3. Friend functions equal and less\_than, which both return a bool value. They take two const arguments of type Rational&.

Write a test program to test your class.

(Hint: Two rational numbers a/b and c/d are equal if a\*d equals c\*b. If b and d are positive rational numbers, a/b is less than c/d provided a\*d is less than c\*b. You should include a helper function to normalize the values stored so that, after normalization, the denominator is positive and the numerator and denominator are as small as possible. For example, after normalization 4/-8 would be represented the same as -1/2. The following sample code gives a clue on how to find the greatest common denominator GCD of two positive numbers.)

**int** gcd(**int** n1, **int** n2)

{

**int** temp;

**while** (n2 != 0)

{

// cout << "n2 = " << n2 << endl;

temp = n1;

n1 = n2;

n2 = temp % n2;

}

**return** abs(n1);

}