Systems Software
Lab 3: Object Oriented Programming in C++

Lab Objectives

In this activity, students should demonstrate the following abilities:

1. Create and instantiate classes in C++
2. Overload operators for class types
3. Create a library for class types

Lab Assignment

In this lab, you will create a new type to manipulate fractions in C++. Follow the directions below.

1. Create a class **`Fraction`** that has two data members of type **`int`**, one for the numerator and the other for the denominator. Define two constructors for the class, a default constructor and one with two parameters. The default constructor should initialize the numerator to **0** and the denominator to **1**. Add appropriate getters and setters to the class.

2. Define an additional member function **`reduce`** to simplify a fraction.

3. Overload the following operators for the class **`Fraction`**: **+**, **–**, *****, **/**, **==**, **!=**, **<**, **<=**, **>**, **>=**, **>>**, and **<<**. All the operator overloading functions should be member functions of the class except for the operators **>>** and **<<** which should be defined outside the class.

4. Define the class interface in the file **`fraction.h`** and the class implementation in the file **`fraction.cpp`**. Create a static library **`libfraction.a`** that contains the object file of the class implementation (**`fraction.o`**)

5. Write a C++ program to manipulate fractions. The program uses the library **`fraction`** to allow users to perform operations on fractions. A sample run of the program is provided at end of this document for testing.

6. Include all your files in a main folder named **`lab4`**. Submit the folder **`lab4`** zipped on courseSite.

```
>>./fraction_calculator
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
1/3 + 2/3
 = 1

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
3/4 - 1/2
 = 1/4

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
1/2 * 1/2
 = 1/4

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
1/2 / 1/2
 = 1

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
1/3 == 2/3
= false

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
2/3 < 3/4
= true

Do you want to perform another operation? (y/n):y
Enter a fraction operation of the form: f1 operation f2
f1, f2 in the form 2/3 for example
operation: (+, -, *, /, ==, !=, <, <=, >, >=)
3/18 == 1/6
= true

Do you want to perform another operation? (y/n):n
```