**National University of Computer and Emerging Sciences**



**Lab Manual 8**

***for***

**Object Oriented Programming (OOP)**

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**Lab Manual 8**  
  
 The objective of this task is to implement operator overloading in C++ to work with fractions. You will overload arithmetic and relational operators to perform operations on fractions.

**Task Description:**

You are required to create a class `Fraction` that represents fractions (numerator/denominator) and overload the following operators:

1. Addition (`+`)

2. Subtraction (`-`)

3. Multiplication (`\*`)

4. Division (`/`)

5. Equality (`==`)

6. Output stream (`<<`)

7. Input stream (`>>`)

Each fraction will be represented as:

numerator / denominator

**Steps to Complete the Task:**

**1. Class Definition**: Define a class `Fraction` with the following private data members:

- `numerator` (int)

- `denominator` (int)

**2. Constructor**: Implement a default constructor to initialize the fraction as `0/1`. Implement a parameterized constructor to initialize the fraction with user-provided values.

**3. Overload the `+` Operator**: Overload the `+` operator to add two fractions and return the result as a new `Fraction` object.

Formula: (a/b) + (c/d) = (a\*d + b\*c) / (b\*d)

**4. Overload the `-` Operator**: Overload the `-` operator to subtract two fractions.

Formula: (a/b) - (c/d) = (a\*d - b\*c) / (b\*d)

**5. Overload the `\*` Operator**: Overload the `\*` operator to multiply two fractions.

Formula: (a/b) \* (c/d) = (a\*c) / (b\*d)

**6. Overload the `/` Operator**: Overload the `/` operator to divide two fractions.

Formula: (a/b) / (c/d) = (a\*d) / (b\*c)

**7. Overload the `==` Operator**: Overload the equality (`==`) operator to compare two fractions.

Formula: (a/b) == (c/d) if a\*d == b\*c

**8. Overload the `<<` and `>>` Operators**: Overload the `<<` operator to display a fraction in the format `numerator/denominator`. Overload the `>>` operator to input the numerator and denominator of a fraction from the user.

**Sample Main()**:

int main() {

Fraction f1, f2, result;

// Input two fractions

cout << "Enter first fraction (numerator and denominator): ";

cin >> f1;

cout << "Enter second fraction (numerator and denominator): ";

cin >> f2;

// Perform addition

result = f1 + f2;

cout << "Sum: " << result << endl;

// Perform subtraction

result = f1 - f2;

cout << "Difference: " << result << endl;

// Perform multiplication

result = f1 \* f2;

cout << "Product: " << result << endl;

// Perform division

result = f1 / f2;

cout << "Quotient: " << result << endl;

// Check equality

if (f1 == f2)

cout << "The fractions are equal." << endl;

else

cout << "The fractions are not equal." << endl;

return 0;

}

**Requirements**:

1. Implement the `Fraction` class with all the required overloaded operators.

2. Test the addition, subtraction, multiplication, and division of two fractions.

3. Test the input and output of fractions using `<<` and `>>` operators.

4. Check the equality of two fractions using the `==` operator.