# Northeastern University

ETC 1103 - C++ Application Development

Final Project - 30 points

Define a class 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 ½, etc we mean the everyday meaning of the fraction, not the integer division 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. Call the class rationalNum

Include a constructor with two arguments that can be used to set the member variables of an object to any legitimate value. Also include a constructor that has only a single parameter of type int; call this single parameter *whole\_number* and define the constructor so that the object will be initialized to the rational number *whole\_number*/1. Also include a default constructor that initializes an object to 0 (that is, to 0/1).

Overload the input and output operators >> and <<. Numbers are to be input and output in the form 1/2, 15/32, 300/401, and so forth. Note that the numerator, the denominator, or both may contain a minus sign, so -1/2, 15/32, -300/-400 are all possible inputs. Overload all of the following operators so that they correctly apply to the type Rational: ==, <, >, +, -, \*, and /.

Write a test program to test your class.

[*Hints*: Two rational numbers **a/b** and **c/d** are equal if a\*d equals c\*b. If b and d are positive numbers, a/b is less than c/d provided a\*d is less than c\*b.

1. (a/b + c/d) is given by:

Numerator =a\*d + c\*b

Denominator = b\*d

1. (a/b – c/d) is given by

Numerator = a\*d - c\*b

Denominator = b\*d

1. (a/b \* c/d) is given by

Numerator = a\*c

Denominator = b\*d

1. (a/b divided by c/d) is given by

Numerator = a\*d

Denominator = b\*c

]

Here’s the function that you call to normalize the fraction. It must be a member function of the rationalNum class.

Normalize()

{

rationalNum temp;

int x,y,z;

x=numerator;

y=denominator;

z=(x\*x < y\*y)? (z=x):(z=y);

for (int i=2; i\*i<=z\*z; i++){

while ((x%i)==0 && (y%i)==0 )

{

x=x/i;

y=y/i;

z=z/i;

}

}

if (y<0){

temp.numerator=-x;

temp.denominator=-y;

}

else {

temp.numerator=x;

temp.denominator=y;

}