ELEC 2543 Object-Oriented Programming and Data Structures

Programming Exercise 2a

Topics: Java Classes

Released: Jan 29, 2021 (Friday)

Due: 9:30am, Feb 11, 2021 (Thursday)

Overview: This exercise introduces how to define a class to represent a type of objects. You are required to use the provided methods and write some methods that return some values. Java method syntax is the same as C++.

Define a class called Fraction which satisfies the following:

1. It consists of two data variables, one for representing the numerator and the other for the denominator of a fraction. [What data type would you use for them?] Use private as the visibility modifier. No other data variables are allowed.
2. There is only one constructor and it accepts two integers as parameters. The first parameter represents the numerator and the second parameter represents the denominator. You should modify the numerator and denominator values kept in your data variables in your class according to the following:
3. If 0 is supplied as the numerator, denominator is changed to 1 in the constructor
4. If 0 is supplied as the denominator with non-zero numerator, set the fraction to the default value (numerator = 1 and denominator = 2)

Note: 0/0 should become 0/1 according to Rule (a)

1. For negative fractions, always make the numerator negative and the denominator positive
2. The fraction should be kept in its simplified form. That is, fraction 3/6 should be stored as ½. A method for finding the greatest common divisor (Method gcd) has been provided.
3. Method value() returns the numerical value of the fraction in type double. For example, the value of fraction of ½ is 0.5.
4. Method toString() is defined so that the fraction is printed in format numerator/denominator. Negative sign is put in front of the numerator if appropriate. Positive sign is not needed.
5. Make sure you define the appropriate return type (if needed) for each method. Use public visibility modifier for all the methods you have to develop.

After you have defined your Fraction class, run file TestFraction.java to test whether your implementation is correct. To run TestFraction.java, import the file into the same Eclipse project as Fraction.java. Open TestFraction.java and click the run button on Eclipse.

TestFraction.java would print out four fractions and one double value. The correct values are provided. For example, the correct output is as follows:

1/2 // Correct answer: 1/2

0/1 // Correct answer: 0/1

0/1 // Correct answer: 0/1

3/4 // Correct answer: 3/4

-3/4 // Correct answer: -3/4

-0.75 // Correct answer: -0.75

3/2 // Correct answer: 3/2

1.0 // Correct answer: 1.0