

# PROJECT #1

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## Rational Numbers

**Due: Oct. 20, 8AM**

**Late projects loose 1 point per hour.**

For this project you'll be implementing a "rational number" class. Rational numbers are numbers that can be expressed as the ratio of two integers - a numerator and a denominator:  $n/d$ .

You will define basic operations on rational numbers -

- “toString()” for printing,
- addition, subtraction, division, multiplication
- test for equality (equals).
- Accessors to return the numerator and the denominator
- Constructors

The following general formulas may be useful for your project:

$$\begin{aligned} n1/d1 + n2/d2 &= (n1*d2 + n2*d1)/(d1*d2) \\ n1/d1 - n2/d2 &= (n1*d2 - n2*d1)/(d1*d2) \\ n1/d1 * n2/d2 &= (n1*n2)/(d1*d2) \\ n1/d1 / n2/d2 &= (n1*d2)/(d1*n2) \\ n1/d1 == n2/d2 &\text{ iff } n1*d2 = d1*n2 \end{aligned}$$

Additionally, always implement reduction of the rational numbers to their simplest form, in which the denominator and numerator are coprime and the denominator is positive. For example:

```
MyRational x1 = new MyRational(4,-9); // x1 == -4/9
MyRational x2 = new MyRational(1,9); // x2 == 1/9
MyRational x3 = x1.plus(x2); // addition gives -3/9 which should be automatically
// reduced to -1/3
// neither x1 nor x2 should be altered

int n1 = x3.numerator(); // n1 should be -1 not -3
int d1 = x3.denominator(); // d1 should be 3 not 9
```

## HANDIN ON WEBCT

1. Source and class files for Rational class (no "main")
  1. must be properly formatted and documented
  2. must include javadoc comments
2. HTML pages generated from running javadoc on your source file
3. Source and class files for RationalTest class
  1. includes "main"
  2. demonstrates all functionality
  3. Main must prompt user at least 3 times
4. Printout of "main" running
  1. Must take input from user (console readline)
  2. Printouts must prompt user for values and explain what is going on
    1. example
      1. "Please enter a numerator and denominator"
      2. > 1 3
      3. "Please enter another numerator and denominator"
      4. > 2 5
      5. "Addition test :  $1/3 + 2/5 == 11/15$ "
      6. "Subtraction test: . . "
      7. etc. etc.
    8. Printout of "main" running
5. A short "cover report" named "README" describing the assignment, your solution, what is in each of the other files, and how to run the test.