

```

import java.io.*;

//////////////////////////////////////////////////////////////////
//
//      The following program is used to calculate Fractions.      //
//
//                               WRITTEN BY:                       //
//                               ALAIN DADAIAN                     //
//
//////////////////////////////////////////////////////////////////

class Fraction
{
    private int numerator, denominator;
    private static int counter = 0;

    //-----
    // This is the first Fraction Constructor. This constructor takes
    // in two arguments a numerator and a denominator both of type
    // int. Then if the numerator is 0 and the denominator is greater
    // or less than 0 its sets the numerator to 0 and the denominator
    // to 1, which is the default fraction for this program. The
    // constructor also then checks to see if the denominator is -
    // and the numerator is + and switches the sign so the numerator
    // is - and the denominator is +. It also checks to see if both
    // the numerator and denominator are - and changes them both to +.
    // Lastly it also simplifies the fraction.
    //-----
    public Fraction (int numerator, int denominator)
    {
        if (numerator == 0 && denominator != 0)
        {
            numerator = 0;
            denominator = 1;
        }
        else
        {
            if ((denominator < 0 && numerator > 0) || (denominator < 0 && numerator < 0))
            {
                numerator *= -1;
                denominator *= -1;
            }
            else
            {
                int gcd = gcd (Math.abs(numerator), Math.abs(denominator));

                numerator /= gcd;
                denominator /= gcd;
            }
        }

        this.numerator = numerator;
        this.denominator = denominator;

        counter++;
    }

    //-----
    // This is the second Fraction constructor. This constructor
    // doesn't take any arguments and sets the default Fraction to
    // be 0/1.
    //-----
    public Fraction ()
    {
        numerator = 0;
        denominator = 1;

        counter++;
    }

    //-----
    // Computes and returns the greatest common divisor of the two
    // positive parameters. Uses Euclid's algorithm.
    //-----
    private int gcd (int num1, int num2)
    {
        while (num1 != num2)
            if (num1 > num2)
                num1 = num1 - num2;
    }
}

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        else
            num2 = num2 - num1;
        return num1;
    }

//-----
// Print a Fraction in the format of numerator/denominator.
//-----
public void print()
{
    int numerator1 = this.numerator;
    int denominator1 = this.denominator;

    System.out.print (numerator1 + "/" + denominator1);
}

//-----
// Returns the numerator of a Fraction.
//-----
private int getnumerator()
{
    return numerator;
}

//-----
// Returns the denominator of a Fraction.
//-----
private int getdenominator()
{
    return denominator;
}

//-----
// Adds two Fractions together and returns the result in a new
// Fraction.
//-----
public Fraction add (Fraction z)
{
    int numeratorsum, denominatorsum;
    int numerator1 = this.numerator;
    int denominator1 = this.denominator;
    int numerator2 = z.getnumerator();
    int denominator2 = z.getdenominator();

    if (denominator1 == denominator2)
    {
        numeratorsum = numerator1 + numerator2;
        denominatorsum = denominator1;
    }
    else
    {
        if ((denominator1 % denominator2) == 0)
        {
            denominatorsum = denominator2 * (denominator1 / denominator2);
            numeratorsum = numerator1 + numerator2 * (denominator1 / denominator2);
        }
        else
        {
            if ((denominator2 % denominator1) == 0)
            {
                denominatorsum = denominator1 * (denominator2 / denominator1);
                numeratorsum = numerator2 + numerator1 * (denominator2 / denominator1);
            }
            else
            {
                denominatorsum = denominator1 * denominator2;
                numeratorsum = numerator1 * denominator2 + numerator2 * denominator1;
            }
        }
    }
}

return new Fraction (numeratorsum, denominatorsum);
}

//-----
// Subtracts two Fractions together and returns the result in a
// new Fraction.

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//-----
public Fraction sub (Fraction z)
{
    int numeratorsum, denominatorsum;
    int numerator1 = this.numerator;
    int denominator1 = this.denominator;
    int numerator2 = z.getnumerator();
    int denominator2 = z.getdenominator();

    if (denominator1 == denominator2)
    {
        numeratorsum = numerator1 - numerator2;
        denominatorsum = denominator1;
    }
    else
    {
        if ((denominator1 % denominator2) == 0)
        {
            denominatorsum = denominator2 * (denominator1 / denominator2);
            numeratorsum = numerator1 - numerator2 * (denominator1 / denominator2);
        }
        else
        {
            if ((denominator2 % denominator1) == 0)
            {
                denominatorsum = denominator1 * (denominator2 / denominator1);
                numeratorsum = numerator2 - numerator1 * (denominator2 / denominator1);
            }
            else
            {
                denominatorsum = denominator1 * denominator2;
                numeratorsum = numerator1 * denominator2 - numerator2 * denominator1;
            }
        }
    }

    return new Fraction (numeratorsum, denominatorsum);
}

//-----
// Multitplies two Fractions together and returns the result in a
// new Fraction.
//-----
public Fraction times (Fraction z)
{
    int numeratorsum, denominatorsum;
    int numerator1 = this.numerator;
    int denominator1 = this.denominator;
    int numerator2 = z.getnumerator();
    int denominator2 = z.getdenominator();

    numeratorsum = numerator1 * numerator2;
    denominatorsum = denominator1 * denominator2;

    return new Fraction (numeratorsum, denominatorsum);
}

//-----
// Divides two Fractions together and returns the result in a
// new Fraction.
//-----
public Fraction div (Fraction z)
{
    int numeratorsum, denominatorsum;
    int numerator1 = this.numerator;
    int denominator1 = this.denominator;
    int numerator2 = z.getnumerator();
    int denominator2 = z.getdenominator();

    numeratorsum = numerator1 * denominator2;
    denominatorsum = denominator1 * numerator2;

    return new Fraction (numeratorsum, denominatorsum);
}

//-----
// Returns the number of Fractions created.
//-----
public static int numberOfFractions()

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{
    return counter;
}

//-----
// Computes and prints the decimal number of a Fraction.
//-----
public void printAsFloat()
{
    float numerator = (float) this.numerator;
    float denominator = (float) this.denominator;
    float total;

    total = numerator / denominator;

    System.out.print (total);
}

//-----
// Promps the user to enter a numerator and denominator and
// creates a new Fraction with the numerator and denominator
// supplied by the user.
//-----
public static Fraction read (PrintStream ps, BufferedReader br) throws Exception
{
    int numerator, denominator;

    ps.print("Enter a numerator: ");
    numerator = Integer.parseInt(br.readLine());

    ps.print("Enter a denominator: ");
    denominator = Integer.parseInt(br.readLine());

    System.out.println();

    return new Fraction (numerator, denominator);
}

//-----
// Used to run a test on the program to see if it works correctly.
//-----
public static void testDriver()
{
    Fraction a = new Fraction(0,3);
    Fraction b = new Fraction(1,-3);
    Fraction c = new Fraction(1,3);
    Fraction d = new Fraction(2,4);
    Fraction e = new Fraction();

    System.out.print("e = "); e.print(); System.out.println();

    c.print();
    System.out.print(" + ");
    d.print();
    System.out.print(" = ");
    e = c.add(d);
    e.print();
    System.out.print(" = ");
    e.printAsFloat();
    System.out.println();

    System.out.print("0/3 = ");
    a.print();
    System.out.print(" = ");
    a.printAsFloat();
    System.out.println();

    System.out.print("1/-3 = ");
    b.print();
    System.out.print(" = ");
    b.printAsFloat();
    System.out.println();

    d.print();
    System.out.print(" - ");
    c.print();
    System.out.print(" = ");
    e = d.sub(c);
    e.print();
}

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        System.out.println("* \t 6. DISPLAY NUMBER OF FRACTIONS CREATED      *");
        System.out.println("* \t 7. EXIT \t\t\t\t\t *");
        System.out.println(" *");
        System.out.println("*****\n\n");
        break;
    case 1:
        System.out.println("For the first fraction: ");
        a = Fraction.read(ps, br);
        System.out.println("For the second fraction: ");
        b = Fraction.read(ps, br);

        c = a.add(b);

        a.print();
        System.out.print(" + ");
        b.print();
        System.out.print(" = ");
        c.print();
        System.out.println();

        System.out.print("If you would like to get the decimal value of ");
        c.print();
        System.out.print(" please press 1 else press 2.");
        choice2 = Integer.parseInt(br2.readLine());

        switch(choice2)
        {
            case 1:
                System.out.print("The decimal value of ");
                c.print();
                System.out.print(" is ");
                c.printAsFloat();
                System.out.println(".");
                break;
            case 2:
                break;
            default:
                System.out.print("Not valid selection!");
                System.out.print(" please press 1 or 2. ");
                choice2 = Integer.parseInt(br2.readLine());

                if (choice2 == 1)
                {
                    System.out.print("The decimal value of ");
                    c.print();
                    System.out.print(" is ");
                    c.printAsFloat();
                    System.out.println(".");
                }
                else
                {
                    if (choice2 == 2)
                    {
                        break;
                    }
                }
            }

        }

        break;
    case 2:
        System.out.println("For the first fraction: ");
        a = Fraction.read(ps, br);
        System.out.println("For the second fraction: ");
        b = Fraction.read(ps, br);

        c = a.sub(b);

        a.print();
        System.out.print(" - ");
        b.print();
        System.out.print(" = ");
        c.print();
        System.out.println();

        System.out.print("If you would like to get the decimal value of ");
        c.print();
        System.out.print(" please press 1 else press 2.");
        choice2 = Integer.parseInt(br2.readLine());

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switch(choice2)
{
    case 1:
        System.out.print("The decimal value of ");
        c.print();
        System.out.print(" is ");
        c.printAsFloat();
        System.out.println(".");
        break;
    case 2:
        break;
    default:
        System.out.print("Not valid selection!");
        System.out.print(" please press 1 or 2. ");
        choice2 = Integer.parseInt(br2.readLine());

        if (choice2 == 1)
        {
            System.out.print("The decimal value of ");
            c.print();
            System.out.print(" is ");
            c.printAsFloat();
            System.out.println(".");
        }
        else
        {
            if (choice2 == 2)
            {
                break;
            }
        }
    }

    break;
case 3:
    System.out.println("For the first fraction: ");
    a = Fraction.read(ps, br);
    System.out.println("For the second fraction: ");
    b = Fraction.read(ps, br);

    c = a.times(b);

    a.print();
    System.out.print(" * ");
    b.print();
    System.out.print(" = ");
    c.print();
    System.out.println();

    System.out.print("If you would like to get the decimal value of ");
    c.print();
    System.out.print(" please press 1 else press 2.");
    choice2 = Integer.parseInt(br2.readLine());

    switch(choice2)
    {
        case 1:
            System.out.print("The decimal value of ");
            c.print();
            System.out.print(" is ");
            c.printAsFloat();
            System.out.println(".");
            break;
        case 2:
            break;
        default:
            System.out.print("Not valid selection!");
            System.out.print(" please press 1 or 2. ");
            choice2 = Integer.parseInt(br2.readLine());

            if (choice2 == 1)
            {
                System.out.print("The decimal value of ");
                c.print();
                System.out.print(" is ");
                c.printAsFloat();
                System.out.println(".");
            }
            else

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        {
            if (choice2 == 2)
            {
                break;
            }
        }
    }

    break;
case 4:
    System.out.println("For the first fraction: ");
    a = Fraction.read(ps, br);
    System.out.println("For the second fraction: ");
    b = Fraction.read(ps, br);

    c = a.div(b);

    a.print();
    System.out.print(" / ");
    b.print();
    System.out.print(" = ");
    c.print();
    System.out.println();

    System.out.print("If you would like to get the decimal value of ");
    c.print();
    System.out.print(" please press 1 else press 2.");
    choice2 = Integer.parseInt(br2.readLine());

    switch(choice2)
    {
        case 1:
            System.out.print("The decimal value of ");
            c.print();
            System.out.print(" is ");
            c.printAsFloat();
            System.out.println(".");
            break;
        case 2:
            break;
        default:
            System.out.print("Not valid selection!");
            System.out.print(" please press 1 or 2. ");
            choice2 = Integer.parseInt(br2.readLine());

            if (choice2 == 1)
            {
                System.out.print("The decimal value of ");
                c.print();
                System.out.print(" is ");
                c.printAsFloat();
                System.out.println(".");
            }
            else
            {
                if (choice2 == 2)
                {
                    break;
                }
            }
        }

    break;
case 5:
    Fraction.testDriver();
    break;
case 6:
    System.out.print("The number of fraction created up to now are ");
    System.out.println(Fraction.numberOfFractions() + ".");
    break;
case 7:
    end = 1;
    break;
default:
    System.out.println("You have entered an invalid selection!");
}
}
}
} // end of the Hw01 class

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