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import java.text.DecimalFormat;
import java.io.*;

/////////////////////////////////////////////////////////////////
//
// The following program calculates Fibonacci numbers and prints them as a //
// list of a table. Also it calculates and returns an nth Fibonacci number. //
//
//                               WRITTEN BY:                               //
//                               Alain Dadaian                          //
//
/////////////////////////////////////////////////////////////////

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class Fibonacci
{
    private int num1, num2;

    //-----
    // This is the constructor for the Fibonacci class. It takes in
    // two arguments, num1 and num2 both of type int, and returns
    // nothing.
    //-----
    public Fibonacci(int num1, int num2)
    {
        this.num1 = num1;
        this.num2 = num2;
    }

    //-----
    // Calculates and prints a certain number of Fibonacci numbers
    // in a list.
    //-----
    public void list(int limit, PrintStream ps)
    {
        int f1 = num1, f2 = num2, fn, counter = 3;

        ps.print(f1 + " " + f2 + " ");

        while (counter <= limit)
        {
            fn = f1 + f2;
            f1 = f2;
            f2 = fn;

            ps.print(fn + " ");

            counter++;
        }
    }

    //-----
    // Calculates and prints a certain number of Fibonacci and their
    // ratios in a certain format.
    //-----
    public void table(int limit, PrintStream ps)
    {
        int f1 = num1, f2 = num2, fn, counter = 2;
        float ratio;
        String s1 = f1 + "";

        if (s1.length() == 1 )
            ps.println ("      " + " 1" + "          " + f1);
        else
            ps.println ("      " + " 1" + "          " + f1);

        while (counter <= limit)
        {
            fn = f1 + f2;

            if (counter == 2)
            {
                fn = f2;
                f2 = f1;
            }

            f1 = f2;
            f2 = fn;
            ratio = (float)f2 / f1;

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// casts integer to string
String s2 = counter + "";
String s3 = fn + "";

// puts the length of the strings into integers
int length1 = s2.length ();
int length2 = s3.length ();

String indent1 = "";
String indent2 = "";

/* using the length of the digits of n, spaces are added where
   needed to right justify the numbers */
if (length1 == 1)
    indent1 = " " + s2;
if (length1 == 2)
    indent1 = s2;

/* using the length of the digits of fn, spaces are added where
   needed to right justify the numbers */
if (length2 == 1)
    indent2 = " " + s3;
if (length2 == 2)
    indent2 = "  " + s3;
if (length2 == 3)
    indent2 = "   " + s3;
if (length2 == 4)
    indent2 = "    " + s3;
if (length2 == 5)
    indent2 = s3;

String s4 = (int)ratio + "";

DecimalFormat fmt = new DecimalFormat ("0.000000");
ps.print ("      " + indent1 + "    " + indent2);

if (ratio < 0 || s4.length() == 2)
    ps.println ("      " + fmt.format(ratio));
else
    ps.println ("\t" + fmt.format(ratio));

    counter++;
}
}

//-----
// Returns a certain Fibonacci number.
//-----
public int nth(int limit, PrintStream ps)
{
    int f1 = num1, f2 = num2, fn = 0, counter = 3;

    if (limit > 2)
    {
        while (counter <= limit)
        {
            fn = f1 + f2;
            f1 = f2;
            f2 = fn;

            counter++;
        }
    }

    if (limit == 1)
        fn = f1;

    if (limit == 2)
        fn = f2;

    if (limit < 1)
    {
        ps.println("An illegal Fibonacci number has been requested");
        fn = 0;
    }

    return fn;
}

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//-----
} // end of class Fibonacci

////////////////////////////////////

class Hw05
{
    public static void main(String [] args)
    {
        Fibonacci f1 = new Fibonacci(1,1);
        System.out.print("Here's a list of 7 Fibonacci numbers: ");
        f1.list(7,System.out);
        System.out.println();
        System.out.println("\nHere's a table of 10 Fibonacci numbers " +
            "and their ratios:");
        f1.table(10,System.out);
        // Fibonacci series don't necessarily begin with 1,1.
        Fibonacci f2 = new Fibonacci(7,4);
        System.out.println("\nHere's a table of 15 Fibonacci numbers " +
            "and their ratios:");
        f2.table(15,System.out);
        System.out.println();

        System.out.println("The 5th Fibonacci number is: " + f2.nth(5, System.out));
        System.out.println();

        Fibonacci f3 = new Fibonacci(5,-2);
        System.out.print("Here's a list of 9 Fibonacci numbers: ");
        f3.list(9,System.out);
        System.out.println();
        System.out.println("\nHere's a table of 12 Fibonacci numbers " +
            "and their ratios:");
        f3.table(12,System.out);
        System.out.println();

        System.out.println("The 12th Fibonacci number is: " + f3.nth(12, System.out));
        System.out.println();

        System.out.println("The -10th Fibonacci number is: " + f3.nth(-10, System.out));
        System.out.println();

        Fibonacci f4 = new Fibonacci(-5,3);
        System.out.println("\nHere's a table of 25 Fibonacci numbers " +
            "and their ratios:");
        f4.table(25,System.out);
        System.out.println();

        System.out.println("The 22nd Fibonacci number is: " + f4.nth(22, System.out));
        System.out.println();

        Fibonacci f5 = new Fibonacci(9,22);
        System.out.print("Here's a list of 13 Fibonacci numbers: ");
        f5.list(13,System.out);
        System.out.println();
        System.out.println("\nHere's a table of 8 Fibonacci numbers " +
            "and their ratios:");
        f5.table(8,System.out);

        Fibonacci f6 = new Fibonacci(20,2);
        System.out.println("\nHere's a table of 18 Fibonacci numbers " +
            "and their ratios:");
        f6.table(18,System.out);
        System.out.println();
    }
} // end of class Hw05

////////////////////////////////////

```