Due date: Wednesday, Feb 13 (11:59 PM)

CS 271, Winter 2013 — Programming Assignment 2

Submission instructions

- Submit a single MIPS assembly file via TEACH: `http://engr.oregonstate.edu/teach`
- Your file must be named `PA2`[your-username]`.asm`
- For example, my submission would be named `PA2walkiner.asm`

Learning objectives

The goal of this assignment is to continue learning MIPS assembly language. By the end of this assignment, you should be able to:

1. read a string from standard input
2. write an algorithm in pseudocode
3. translate that pseudocode into assembly
4. implement control structures for branching and looping

Description and Requirements

Write and test a friendly MIPS assembly program that calculates and prints Fibonacci numbers. Specifically, your program should be divided into the following four sections, which must perform several specific tasks.

Section 1: Introduction

- Print an introduction that includes: your name, a title, and (optionally) a description of the program.
- Prompt the user to enter their name and read in the string input. (You should reserve 64 bytes in data memory for this string.)
- Print a greeting that includes the user's name.

Section 2: Get and validate n

- Prompt the user to enter a number between 1 and 47 (inclusive); read in the input (we'll call this n).
- Check that n is within the range. If not, print an error message and prompt the user again.
- Repeat until the user enters a valid number.

Section 3: Calculate and print the first n Fibonacci numbers

- Calculate and print each of the Fibonacci numbers up to and including the nth.
- The first several numbers should be: 0, 1, 1, 2, 3, 5, 8, 13, 21, … (Note that you should start at 0!)
- Numbers should be printed exactly *five per line*, with at least *four spaces between* numbers on a line.
- Note that you *do not* need to store the Fibonacci numbers in memory. You may just print them as they are computed.

Section 4: Conclusion

- Print a farewell message that again refers to the user's name.
- Use the exit system call to end your program.

Important: To get full credit, your code must be fully documented using the format we discussed in class. Specifically, the following are required:

- Your program should have a *header block* comment containing your name, the date, and a brief description of your program.
- Each section should have a *section block* comment containing the name of the section and a pseudocode implementation of the algorithm that the section will implement. You should do this before writing your assembly code—it will help!
- You must provide a *mapping* between register names and pseudocode variable names. You may do this once for the program or per section, whichever is more convenient.
- Your in-line comments after assembly instructions should refer to the pseudocode implementation. For example, you should use pseudocode variable names rather than the corresponding registers (which are already named in the instruction itself).

Extra credit: (Small amount. Standard requirements must be fulfilled first!)

1. In Section 3, print the Fibonacci numbers in *aligned columns*. Note that you must still have at least four spaces between each number in a line.
2. Do something astoundingly creative! If you do, note it in the description you print out in the introduction, and make it clear that it might be extra-credit worthy. :)

Example execution

Below is an example execution that illustrates what your program should do. Your output need not match this output exactly. The important thing is that it must be clear and easy to tell that your program is computing and printing the correct results.

Program output is in `typewriter font` while user input is in ***red, bold, italic font***.

```
Fibonacci Numbers by, Eric Walkingshaw

What is your name?: Leonardo Pisano
Hi, Leonardo Pisano

How many Fibonacci numbers should I display?
Enter an integer in the range [1..47]: -7
That number was out of range, try again.

How many Fibonacci numbers should I display?
Enter an integer in the range [1..47]: 50
That number was out of range, try again.

How many Fibonacci numbers should I display?
Enter an integer in the range [1..47]: 22

0    1    1    2    3
5    8    13    21    34
55    89    144    233    377
610    987    1597    2584    4181
6765    10946

Goodbye, Leonardo Pisano
```