

## CS 218

### Homework, MIPS Asst. #4

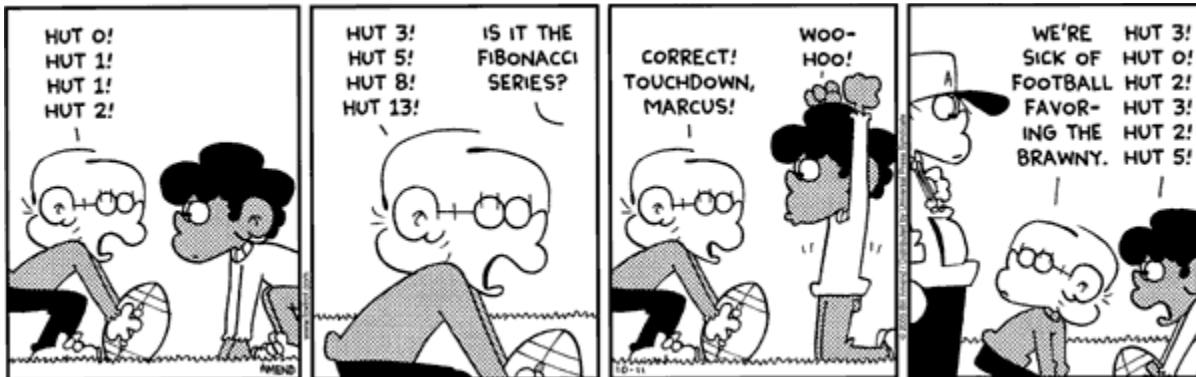
Purpose: Become familiar with the MIPS Instruction Set, and the MIPS procedure calling convention, and basic recursion.

Due: Thursday (7/06)

Points: 70

### Assignment:

Write a recursive assembly language program to compute the Fibonacci and Perrin sequences.



The provided main program will call the following functions:

- Function, **fibonacci()**, that recursively computes the Fibonacci number. Must be recursive for credit. The Fibonacci Sequence is defined as follows:

$$\text{fibonacci}(n) = \begin{cases} n & \text{if } n=0 \text{ or } n=1 \\ \text{fibonacci}(n-2) + \text{fibonacci}(n-1) & \text{if } n \geq 2 \end{cases}$$

- Function, **perrin()**, that recursively computes the Perrin number. Must be recursive for credit. The Perrin sequence is defined as follows:

$$\text{perrin}(n) = \begin{cases} 3 & \text{if } n=0 \\ 0 & \text{if } n=1 \\ 2 & \text{if } n=2 \\ \text{perrin}(n-2) + \text{perrin}(n-3) & \text{if } n > 2 \end{cases}$$

- Function, **getNumber()**, that prompts for and reads the N value from the user. The program must verify that N is between 3 and 45 (inclusive).
  - If  $N \leq 25$  display the message “This should be quick”.
  - If  $N > 25$ , display “This is going to take a while ( $n > 25$ )”.
  - If  $N > 30$ , display “This is going to take a long time ( $n > 30$ )”.
  - If  $N > 35$ , display “This going to take a really long time ( $n > 35$ )”.
  - If  $N > 40$ , display “This is going to take a very long time ( $> 30$  minutes)”.
  - If  $N < 3$  or  $N > 45$ , display “Error, value of range. Please re-enter.” and re-prompt.

Note, the QtSpim system service to read an integer (\$v0=5) does not provide error handling for non-digit input. As such, that is not required on this assignment.

- Function, ***prrtLine()***, that displays the information in the specified format, including right justifying the numbers. Note the *N* values will have up to 2 digits (max) and the Fibonacci and numbers will have up to 10 digits (max) and the Perrin numbers will have up to 7 digits (max). The formatting must accommodate these sizes and match the example output (below).

Do not change the data types of the provided data. You may define additional variables as required.

### **Submission:**

When complete, submit:

- A copy of the **source file** via the class web page by class time.
- A copy of the log file (Including the “Console” and “Text Segment” options) showing executions for 19, 27, and 32.

*Assignments received after the start time of class will not be accepted.*

### **Example Output:**

An example, an execution might look like:

```

MIPS Assignment #4
Fibonacci and Perrin Numbers Program

Enter N (3-45, 0 to terminate): 19

This should be quick.

num = 0   fibonacci =      0   perrin =      3
num = 1   fibonacci =      1   perrin =      0
num = 2   fibonacci =      1   perrin =      2
num = 3   fibonacci =      2   perrin =      3
num = 4   fibonacci =      3   perrin =      2
num = 5   fibonacci =      5   perrin =      5
num = 6   fibonacci =      8   perrin =      5
num = 7   fibonacci =     13   perrin =      7
num = 8   fibonacci =     21   perrin =     10
num = 9   fibonacci =     34   perrin =     12
num = 10  fibonacci =     55   perrin =     17
num = 11  fibonacci =     89   perrin =     22
num = 12  fibonacci =    144   perrin =     29
num = 13  fibonacci =    233   perrin =     39
num = 14  fibonacci =    377   perrin =     51
num = 15  fibonacci =    610   perrin =     68
num = 16  fibonacci =    987   perrin =     90
num = 17  fibonacci =   1597   perrin =    119
num = 18  fibonacci =   2584   perrin =    158
num = 19  fibonacci =   4181   perrin =    209

Enter N (3-45, 0 to terminate): 0

Game Over, thank you for playing.

```

*Note:* The *N* value has a max of 2 digits, Fibonacci numbers have a max of 10 digits, and Perrin numbers have a max of 7 digits.