CS 61 - Programming Assignment 01

Objective

The purpose of this assignment is to familiarize you with the basics of LC3 assembly language programming, the SIMPL emulator, and rudimentary debugging.

Your Tasks

Implement the LC3 program from the image below.

Note: This is similar to, but not quite the same as, the program you worked on in Lab 2: it uses a DO-WHILE loop to multiply two numbers together.

First (as with all your labs and assignments) open Piazza to the GitHub Classroom Lab and Assignment Links post, and click on the assn 1 link to create your GitHub repo, then clone it to your cs account.

Type the code from the image into your assn1.asm file *(again, the registers are assigned differently from your Lab 2 exercise, so **don't** copy that!)*:

```
gedit assn1.asm &
```

and then launch & run simpl:

```
simpl assn1.asm &
```

***Remember**: whenever you run simpl, you must ALWAYS keep the Text Window open so you can see warnings & error messages from the emulator!*

When the emulator opens, place a *breakpoint* at the beginning of the DO-WHILE loop by right-mouse-clicking that line of code and selecting "Mark as Breakpoint".

Lastly, create a table to record the register contents for *each* register (R0 through R7)

- Before entering the loop (i.e. the first time the program halts at the breakpoint)
- After each iteration of the loop (each subsequent breakpoint halt)
  Note that since your breakpoint is at the start of the loop, the values for the end of the final iteration will just be the values when the program has ended, as suggested by the naming of the last row in the image below.

How many rows do you think you will end up with in your table?

Record the table as a block of comments beneath your header and above the actual LC3 code, just like the table in the image below *(but obviously with the actual values from ALL your registers!)*

The following program performs the action:

R3 <-- 6 * 12

(i.e. multiply 6 by 12 and write the result into Register 3)
using the equivalent of a DO-WHILE loop:

```
;-------------------------------------------------------
; Name: Hayao Miyazaki
; Login: hayam
; Email address: hayam@cs.ucr.edu
; Assignment: assn1
; Lab Section: <021 or 022>
; TA: Sean Foley
;
; I attest that this code was totally given
; to me and that I didn't come up with
; any of it  =P
;-------------------------------------------------------

; ------------------------------------------------------------------------------
; REG VALUES      R0  R1  R2  R3  R4  R5  R6  R7
; ------------------------------------------------------------------------------
; Pre-loop        x   x   x   x   x   x   x   x
; Iteration 01    x   x   x   x   x   x   x   x
; Iteration 02    x   x   x   x   x   x   x   x
; ...
; Iteration n     x   x   x   x   x   x   x   x
; End of program  x   x   x   x   x   x   x   x
; ------------------------------------------------------------------------------

.ORIG x3000                         ; Program begins here
;-----------------
; Instructions
;-----------------
LD   R1,  DEC_6                     ; R1 <-- 6
LD   R2,  DEC_12                    ; R2 <-- 12
LD   R3,  DEC_0                     ; R3 <-- 0

DO_WHILE    ADD R3,  R3,  R2        ; R3 <-- R3 + R2
            ADD R1,  R1,  #-1       ; R1 <-- R1 - 1
            BRp DO_WHILE            ; if ( LMR > 0 ) goto DO_WHILE

HALT                                ; Terminate the program
;---------
; Data
;---------
DEC_0   .FILL    #0         ; Put the value 0 into memory here
DEC_6   .FILL    #6         ; Put the value 6 into memory here
DEC_12  .FILL    #12        ; Put the value 12 into memory here

.END
```

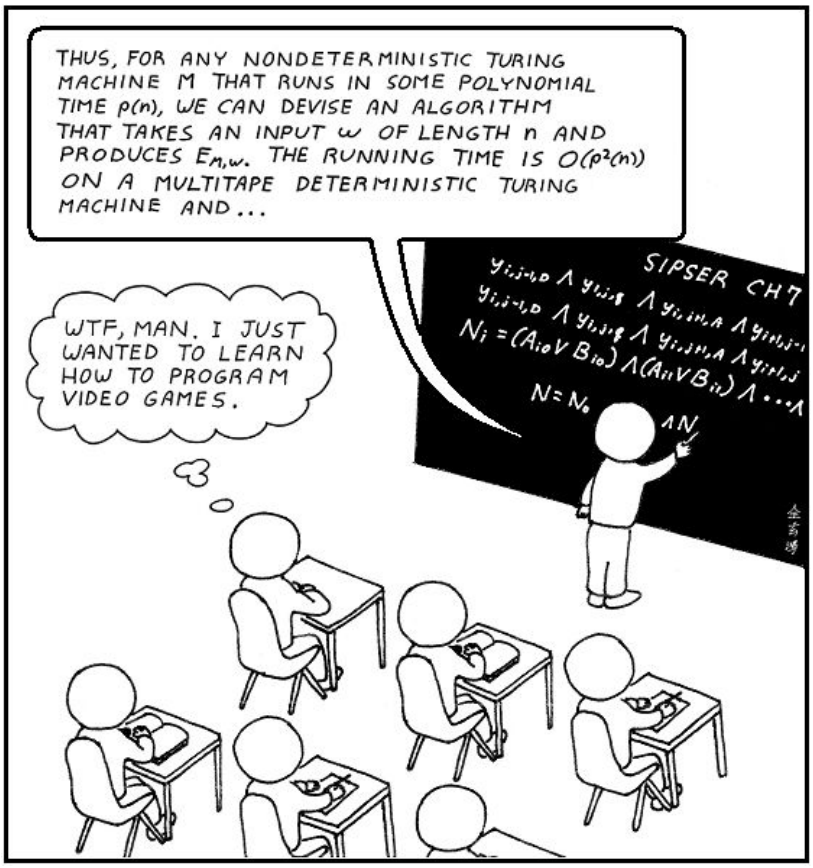
Submission Instructions

Submit to GitHub as we taught you in lab: git pull; git add; git commit; git push
See the GitHub guide again if needed.

Rubric

- There is nothing for you to actually get wrong in this assignment (we give you the code!) - so the only way to mess up and lose points would be to fail to follow instructions!
  So get into the habit of reading the instructions fully & carefully :)
- This assignment has to be graded manually (i.e. we have to look at your code formatting and your register table), so your results file (results.html) will be pushed to your repo only once, after the deadline - so get it right the first time. See the point above!
- For this and all assignments, use of the template given to you in the GitHub repo is **required**.

Comics??!Sweet!!!



Source: https://xkcd.com/