

## CISS360: Computer Systems and Assembly Language Quiz q1301

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Open `main.tex` and enter answers (look for `answercode`, `answerbox`, `answerlong`). Turn the page for detailed instructions. To rebuild and view pdf, in bash shell execute `make`. To build a gzip-tar file, in bash shell execute `make s` and you'll get `submit.tar.gz`.

Q1. The following program should print the following:

```
in f ... in g ... out g ... out f ...
```

But it doesn't. Run it and you'll see that it has an infinite loop. (You can single-step through the program and watch which chunk of instructions are continually executed; you can also watch the `$PC`.)

ANSWER:

```
#####
#                                                                    #
# text segment                                                         #
#                                                                    #
#####
        .text
        .globl main
main:
        jal     f           # call f
        li      $v0, 10      # exit
        syscall

#-----
# f prints "in f ... ", calls function g, prints "out f ..."
#-----
f:      addi     $sp, $sp, -4   # adjust sp
        sw      $ra, 0($sp)    # save -----
        li      $v0, 4         # print "in f ..."
        la      $a0, F_IN
        syscall
        jal     g             # call g
        li      $v0, 4         # print "out f ..."
        la      $a0, F_OUT
        syscall
        lw      $ra, 0($sp)    # restore -----
        addi     $sp, $sp, 4    # adjust sp
        jr      $ra           # return

#-----
# g prints "in g ... " and "out g ..."
#-----
```

```
g:      addi      $sp, $sp, -4    # adjust sp
        sw        $ra, 0($sp)    # save -----
        li        $v0, 4         # print "in g ..."
        la        $a0, G_IN
        syscall
        li        $v0, 4         # print "out g ..."
        la        $a0, G_OUT
        syscall
        lw        $ra, 0($sp)    # save -----
        addi      $sp, $sp, 4    # adjust sp
        jr        $ra           # return
#####
#                                           #
# data segment                           #
#                                           #
#####
        .data
F_IN:   .asciiz "in f ... "
F_OUT:  .asciiz "out f ... "
G_IN:   .asciiz "in g ... "
G_OUT:  .asciiz "out g ... "
```

## INSTRUCTIONS

In `main.tex` change the email address in

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

to yours. In the bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`. Execute “`make s`” to create `submit.tar.gz` for submission.

For each question, you’ll see boxes for you to fill. You write your answers in `main.tex` file. For small boxes, if you see

```
1 + 1 = \answerbox{}
```

you do this:

```
1 + 1 = \answerbox{2}
```

`answerbox` will also appear in “true/false” and “multiple-choice” questions.

For longer answers that needs typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
int x;
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?
\begin{answerlong}
\end{answerlong}
```

you can write

```
What is the color of the sky?
\begin{answerlong}
The color of the sky is blue.
\end{answerlong}
```

For students beyond 245: You can put  $\LaTeX$  commands in `answerbox` and `answerlong`.

A question that begins with “T or F or M” requires you to identify whether it is true or false, or meaningless. “Meaningless” means something’s wrong with the statement and it is not well-defined. Something like “ $1+_2$ ” or “ $\{2\}^{\{3\}}$ ” is not well-defined. Therefore a question such as “Is  $42 = 1+_2$  true or false?” or “Is  $42 = \{2\}^{\{3\}}$  true or false?” does not make sense. “Is  $P(42) = \{42\}$  true or false?” is meaningless because  $P(X)$  is only defined if  $X$  is a set. For “Is  $1 + 2 + 3$  true or false?”, “ $1 + 2 + 3$ ” is well-defined but as a “numerical expression”, not as a “proposition”, i.e., it cannot be true or false. Therefore “Is  $1 + 2 + 3$  true or false?” is also not a well-defined question.

When writing results of computations, make sure it’s simplified. For instance write 2 instead of  $1 + 1$ . When you write down sets, if the answer is  $\{1\}$ , I do not want to see  $\{1, 1\}$ .

When writing a counterexample, always write the simplest.

Here are some examples (see `instructions.tex` for details):

1. T or F or M:  $1 + 1 = 2$  ..... T

2. T or F or M:  $1 + 1 = 3$  ..... F

3. T or F or M:  $1+_2 =$  ..... M

4.  $1 + 2 =$  3

5. Write a C++ statement to declare an integer variable named **x**.

```
int x;
```

6. Solve  $x^2 - 1 = 0$ .

Since  $x^2 - 1 = (x - 1)(x + 1)$ ,  $x^2 - 1 = 0$  implies  $(x - 1)(x + 1) = 0$ . Therefore  $x - 1 = 0$  or  $x = -1$ . Hence  $x = 1$  or  $x = -1$ .

7. Which is true? ..... C

(A)  $1 + 1 = 0$

(B)  $1 + 1 = 1$

(C)  $1 + 1 = 2$

(D)  $1 + 1 = 3$

(E)  $1 + 1 = 4$