CISS360: Computer Systems and Assembly Language
Quiz q0305

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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. Write a MIPS program that places the following integers in the data segment (start at the beginning, starting at 0x10010000): 1, 2, 3, 4, 5, 6, 7, 8. Get an integer x from the user and place x in your data segment as the first integer (i.e. where the value is 1). Get another integer y from the user and place y in your data segment as the second integer (i.e., where the value is 2). Read the first three integers from the data segment, add them, and put the sum at the fourth word in the data segment.

Do NOT hardcode any address values; you must use labels.

Answer:

```
                .text
        .globl main

main:
        la     $t0, integers               # load the address of the label into t0

        li     $v0, 5                         # get x from user
        syscall
        sw     $v0, 0($t0)                   # replace 1 with x

        li     $v0, 5                         # get y from user
        syscall
        sw     $v0, 4($t0)                   # replace 2 with y

        lw     $t1, 0($t0)                   # store x in t1
        lw     $t2, 4($t0)                   # store y in t2
        lw     $t3, 8($t0)                   # store third integer in t3

        add    $t1, $t1, $t2                # t1 = x + y
        add    $t1, $t1, $t3                # t1 = x + y + 3
        sw     $t1, 12($t0)                    # sum is in the fourth place

        li     $v0, 1
        lw     $a0, 12($t0)                   # print the sum
        syscall
```

```
        li      $v0, 4
        la      $a0, NEWLINE
        syscall

        li      $v0, 10
        syscall

        .data
integers:
        .word 1 2 3 4 5 6 7 8
NEWLINE:
        .asciiz "\n"
```

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) $1 + 1 = 4$