

## CS 240

**Laboratory 2 Assignment** (due at beginning of lab – please print and hand in hard-copy; you may hand-write the answers, you do not have to type them)

Refer to the lab notes from Lab 1, which is a simple overview of what you have learned about MIPS so far. You may also refer to the lecture notes and text.

1. Show that you understand the difference between the load instructions **li**, **la**, **lb**, **lh**, and **lw** by listing the contents of the register after each of the load instructions is executed in the following code fragment.

Assume that the starting address of the text segment is 0x400000, and that the starting address of the data segment is 0x10010000.

Show the contents of all 4 bytes for each register and memory location, using hexadecimal notation.

```
.text
.globl main

main: li $v0,4           // $v0 =
      la $a0,prompt     // $a0 =
      lb $t0,value      // $t0 =
      lh $t1, value     // $t1 =
      lw $t2, value     // $t2 =

.data
prompt: .asciiz "Enter a value: "
value: .word 0x01020304
```

2. Given the below code fragment (it does not represent a full program), explain in English what the code does:

Assume that the starting address of the text segment is 0x400000, the starting address of the data segment is 0x1001000, and that the user enters a value 7 when prompted.

For each instruction, show the contents of all 4 bytes for each register and memory location (using hexadecimal notation) after the instruction is executed. List ONLY the values on each line that change as a result of the instruction on that line being executed.

	\$v0	\$a0	\$t0	x	y
	0x00000000	0x00000000	0x00000000	0x00000003	0x00000000
.text					
.globl main					
main: li \$v0,4					
la \$a0,prompt					
syscall					
li \$v0,5					
syscall					
lw \$t0,x					
add \$t0,\$t0,\$v0					
sw \$t0,y					
.data					
prompt: .asciiz "Enter a value"					
x: .word 3					
y: .word 0					

3. What is the difference between the following assembly directives for data definitions?

```

v:   .ascii "8"
w:   .space 8
x:   .half 8
y:   .word 8
z:   .byte 8

```

Assume the first data item goes on the bottom of memory, as shown in lecture and lab, and that the data segment starts at address 0x10010000, and grows upward from there.

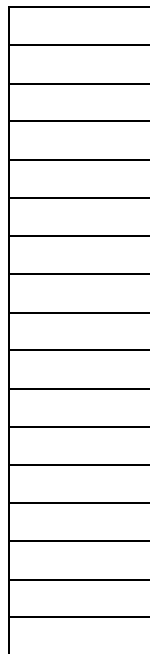
Indicate how many bytes of data will be reserved by each of the definitions, and what the value stored in memory will be, by filling in the stack diagram of memory. Show **one byte** per row. Also list the corresponding labels (v,w,x,y,z) at the correct addresses.

You can find the `ascii` value for the character '8' in the ASCII table in your textbook, or find a table online. Please record the hexadecimal value, not the decimal value.

Address

Label

Data



0x10010000