Week 3

COMP1521

2. If the data segment of a particular MIPS program starts at the address `0x10000020`, then what addresses are the following labels associated with, and what value is stored in each 4-byte memory cell?

```
    .data
a:  .word   42
b:  .space  4
c:  .asciiz "abcde"
    .align  2
d:  .byte   1, 2, 3, 4
e:  .word   1, 2, 3, 4
f:  .space  1
```

- .align, next field after will be aligned on 2^n boundary

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```

Label	Address	Contents	Contents in hex
a	0x10010020	42	0x0000002A
b	0x10010024	???	0x????????
c	0x10010028	'a' 'b' 'c' 'd'	0x61626364
	0x1001002C	'e' '\0' ? ?	0x6500????
d	0x1001030	1, 2, 3, 4	0x01020304
e	0x1001034	1	0x00000001
	0x1001038	2	0x00000002
	0x100103C	3	0x00000003
	0x1001040	4	0x00000004
f	0x1001044	?	0x????????

3. Give MIPS directives to represent the following variables:

   a. `int u;`
   b. `int v = 42;`
   c. `char w;`
   d. `char x = 'a';`
   e. `double y;`
   f. `int z[20];`

```
u: .space 4

v: .word 42

w: .space 1

x: .byte 'a'

y: .space 8

z: .space 80
```

4. Consider the following memory state:

```
Address     Data Definition
0x10010000  aa:  .word 42
0x10010004  bb:  .word 666
0x10010008  cc:  .word 1
0x1001000C       .word 3
0x10010010       .word 5
0x10010014       .word 7
```

What address will be calculated, and what value will be loaded into register `$t0`, after each of the following statements (or pairs of statements)?

```
la   $t0, aa
```

```
lw   $t0, bb
```

```
lb   $t0, bb
```

```
lw   $t0, aa+4
```

```
la   $t1, cc
lw   $t0, ($t1)
```

```
la   $t1, cc
lw   $t0, 8($t1)
```

```
li   $t1, 8
lw   $t0, cc($t1)
```

```
la   $t1, cc
lw   $t0, 2($t1)
```

$t0 = 0x10010000

$t0 = 666

$t0 = 0xffffff9a

$t0 = 666

$t1 = 0x10010008
$t0 = 1

$t1 = 0x10010008
$t0 = 5

$t1 = 0x10010008
$t0 = ???