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ICS 312

**Homework #2**

**Exercise 1: Memory Layout**

A dw 011FAh  
B db 043h, 0BBh, 0CEh  
C times 3 dw 21  
D dd 178  
E db "a", 54, "b", 0  
F times 2 dw -8  
G dw 009h

Q1. What are the contents of the 25 memory bytes starting at address A, **in hex**, on a machine that uses Little Endian?

A) dw = 2 bytes

11 FA

\*for little endian we reverse the hex order since its multibytes!

B) db = 1 byte

43 BB CE

\*since each is a single byte, the order stays the same.

C) dw = 2 bytes

21d = ?h

= (16 x 1) + 5

= 1 5 h => 0015

00 15 00 15 00 15

\*for little endian we reverse the hex order since its multibytes!

D) dd = 4 bytes

178d = ?h

= (11 x 16) + 2

= B 2 h => 000000B2

00 00 00 B2

\*for little endian we reverse the hex order since its multibytes!

E) db = 1 byte

“a” = 61h

54d = ?h

= (3 x 16) + 6

= 3 6 h

“b” = 62h

0d = 00h

61 36 62 00

\*since each is a single byte, the order stays the same.

F) dw = 2 bytes

-8d = ?h

8d = 00 08h

= FF F7h (flip/complement)

= FF F8h (+1)

-8d = FF F8h

FF F8 FF F8

\*for little endian we reverse the hex order since its multibytes!

G) dw = 2 bytes

00 09

\*for little endian we reverse the hex order since its multibytes!

Little Endian

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FA | 11 | 43 | BB | CE | 15 | 00 | 15 | 00 | 15 | 00 | B2 | 00 | 00 | 00 | 61 | 36 | 62 | 00 | F8 | FF | F8 | FF | 09 | 00 |

|---A----|-------B-------|---------------C--------------|---------D---------|----------E---------|--------F----------|----E----|

Q2.

Big Endian

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11 | FA | 43 | BB | CE | 00 | 15 | 00 | 15 | 00 | 15 | 00 | 00 | 00 | B2 | 61 | 36 | 62 | 00 | FF | F8 | FF | F8 | 00 | 09 |

|---A----|-------B-------|---------------C--------------|---------D---------|----------E---------|--------F----------|----E----|

**Exercise 2: Memory and Registers**

L1 dw 435  
L2 db "h","e","l","l","o",0  
L3 db 0A1h, 0B2h, 0C3h  
L4 dw 23o

mov eax, [L3]  
inc eax  
mov [L2], eax  
mov bx, [L1]  
mov eax, L3  
inc eax  
mov [eax], bx

L1) dw = 2 bytes

435d = ?h

= (1 x 16^2) + (11 x 16^1) + 3

= 1 B 3 h

01 B3

\*for little endian we reverse the hex order since its multibytes!

L2) db = 1 byte

“h” = 68h

“e” = 65h

“l” = 6Ch

“l” = 6Ch

“o” = 6Fh

0d = 00h

\*since each is a single byte, the order stays the same.

L3) db = 1 byte

A1 B2 C3

\*since each is a single byte, the order stays the same.

L4) dw = 2 btyes

23o = ?h

= (2 x 8^1) + (3 x 8^0)

= 16 + 3 = 19d

= (1 x 16^1) + 3

= 1 3 h

00 13

\*for little endian we reverse the hex order since its multibytes!

Initial Memory Content (Little Endian):

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B3 | 01 | 68 | 65 | 6C | 6C | 6F | 00 | A1 | B2 | C3 | 13 | 00 |

|---L1----|---------------L2--------------|-------L3------|---L4----|

mov eax, [L3]

eax = 13 C3 B2 A1

inc eax

eax = 13 C3 B2 A2

mov [L2], eax

L2 = A2 B2 C3 13

mov bx, [L1]

bx = 01 B3

mov eax, L3

eax -> L3 [A1, B2, C3, ...]

inc eax

eax -> L3 + 1 [B2, C3, 13, ...]

mov [eax], bx

eax = B3 01 [13, 00]

Final Memory Content (Little Endian):

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| B3 | 01 | A2 | B2 | C3 | 13 | 6F | 00 | A1 | B3 | 01 | 13 | 00 |

|---L1----|---------------L2--------------|-------L3------|---L4----|