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Assignment 0

3.1 $35_{10} = 00100011_2$ $32+2+1$

3.2 $32_{10} = 00100000_2$

3.3 $0001\ 0101_2 = 21_{10}$
$1\ 2\ 5\ 10\ 21$

3.4 $00011001 = 25_{10}$
$1\ 3\ 6\ 12\ 25$

3.5 The least significant digit in a binary number has a place value of $2^0 = 1$. This value is not divisible by 2 so it is odd, while all other place values are even. Thus, the least significant digit in a binary number determines whether the number is even or odd.

3.6 $0001\ 0101 = 0x15$

3.7 $00011001 = 0x19$

3.8 $0x15 = 1 \cdot 16 + 5 \cdot 1 = 21_{10}$

3.9 $0x19 = 1 \cdot 16 + 9 \cdot 1 = 25_{10}$

3.10 $-35 \rightarrow |-35| = 35_{10} = 00100011_2 \rightarrow 11011101$

3.11 $-32 \rightarrow |-32| = 32_{10} = 00100000_2 \rightarrow 1110\ 0000$

3.12 a $1000\ 0001_2 \rightarrow -0111\ 1111_2 = -127_{10}$

b $1111\ 1111_2 \rightarrow -0000\ 0001 = -1_{10}$

c $01010000_2 = 80_{10}$

d $1110\ 0000_2 \rightarrow -0010\ 0000_2 = -32_{10}$

e $1000\ 0011_2 \rightarrow -0111\ 1101_2 = -125_{10}$

3.13 $204_8 = 2 \cdot 64 + 4 \cdot 1 = 132_{10}$

3.14 $204_7 = 2 \cdot 49 + 4 \cdot 1 = 102_{10}$

3.15 $204_6 = 2 \cdot 36 + 4 \cdot 1 = 76_{10}$

3.16 $204_5 = 2 \cdot 25 + 4 \cdot 1 = 54_{10}$

3.17 $81_{10} \div 9 = 9 r 0 \quad 9 \div 9 = 1 r 0 \quad 1 \div 9 = 0 r 1 \quad 0$

$81_{10} = 10_9$

3.18

16 bit binary	Hexadecimal	Decimal	
1111 1111 0011 1100	0xFF3C	-196	-0000 0000 1100 0100 = -196
1111 1111 1000 1000	0xFF88	-120	-0000 0000 0111 1000 = -120
1111 1111 1000 0000	0xFF80	-128	0000 0000 1000 0000 → 1111 1111 1000 0000
1111 1111 1111 1010	0xFFFA	-6	-0000 0000 0000 0110 = -6
0000 0000 0001 0001	0x0011	17	
1111 1111 1110 0111	0xFFE7	-25	0000 0000 0001 1001 → 1111 1111 1110 0111

3.19
```
 1 1 1 1   1 1
 0 1 1 0   1 1 1 0
+0 0 0 1   1 0 1 0
-----------------
 1 0 0 0   1 0 0 0
```
There is signed overflow, carry in is different from the carry out. $0 \neq 1$

3.20
```
   0 1 0 0 0 1 1 0
   1 1 1 0 1 0 0 0
-  0 0 0 1 0 0 1 1
-----------------
   1 1 0 1 0 1 0 1
```
There is no signed overflow, carry in is equal to carry out. $1 = 1$

3.21 $0x88 = 1000\,1000_2 \rightarrow 1111\ 1111\ 1000\ 1000_2 = 0xFF88$

3.23 $X = 1001\,0100_2 \rightarrow -0110\ 1100_2 = -108_{10}$

$Y = 0010\,1100_2 = 44_{10}$

```
 1 1 1 1        1 1 1          1 1 1
 1 0 0 1 0 1 0 0   1 0 0 1 0 1 0 0   0 0 1 0 1 1 0 0
+0 0 1 0 1 1 0 0  +1 1 0 1 0 1 0 0  +0 1 1 0 1 1 0 0
---------------  ---------------  ---------------
 1 1 0 0 0 0 0 0   1 0 1 1 0 1 0 0   1 0 0 1 1 0 0 0
```

Signed overflow

Signed overflow