CSCI 4593 Spring 2014	Homework #3	**Vince Coghlan**

3.1) I just did it half-byte by half-byte. $D - A = 3$, *etc...*

$$\begin{array}{cccccc} & 5 & E & D & 4 \\ - & 0 & 7 & A & 4 \\ \hline & 5 & E & 3 & 0 \end{array}$$

3.4) This was done in a similar fasion, except that I needed to carry a one in from the fourth octal number.

$$\begin{array}{cccccc} & \cancel{4}^{3} & 3 & 6 & 5 \\ - & 3 & 4 & 1 & 2 \\ \hline & 0 & 7 & 5 & 3 \end{array}$$

3.6) 63. Neither over or underflow, since since this number fits well within an 8 bit value.

3.12) $62 \times 12 = 744$, lets see if we can do this using the process that a computer uses.

Iteration	Step	Multiplier	Multiplicant	Product
0	Initial Values	1100	0000111110	0000000000
1	$0 \Rightarrow$ Nop	1100	0000111110	0000000000
	Shift left m-cand	1100	0001111100	0000000000
	Shift right m-plier	0110	0001111100	0000000000
2	$0 \Rightarrow$ Nop	0110	0001111100	0000000000
	Shift left m-cand	0110	0011111000	0000000000
	Shift right m-plier	0011	0011111000	0000000000
3	$1 \Rightarrow$ add to product	0011	0011111000	0011111000
	Shift left m-cand	0011	0111110000	0011111000
	Shift right m-plier	0001	0111110000	0011111000
4	$1 \Rightarrow$ add to product	0001	0111110000	1011101000
	Shift left m-cand	0001	1111100000	1011101000
	Shift right m-plier	0000	1111100000	1011101000

Since we are out of multiplier, we can see that the product is indeed 744.

3.17) We can represent 0x33 $\times$ 0x55 as $(2 \times 2 \times 2 \times 2 \times 2 \times 2 + 0\text{x}15) \times 0\text{x}33$ or

$$(0\text{x}33 << 6) + (2 \times 2 \times 2 \times 2 + 0\text{x}5) \times 0\text{x}33$$

$$(0\text{x}33 << 6) + (0\text{x}33 << 4) + (0\text{x}33 << 2) + 0\text{x}33$$

$$= 0x10EF \text{ or } 4335$$

3.19)

Iteration	Step	Quotient	Divisor	Remainder
0	Initial Values	0000	1000100000	00111100
1	rem=rem-div	0000	1000100000	negative
	rem<0⇒+Div, sll Q, $Q_0 = 0$	0000	1000100000	00111100
	shift div right	0000	0100010000	00111100
2	rem=rem-div	0000	0100010000	negative
	rem<0⇒+Div, sll Q, $Q_0 = 0$	0000	0100010000	00111100
	shift div right	0000	0010001000	00111100
3	rem=rem-div	0000	0010001000	negative
	rem<0⇒+Div, sll Q, $Q_0 = 0$	0000	0010001000	00111100
	shift div right	0000	0001000100	00111100
4	rem=rem-div	0000	0001000100	negative
	rem<0⇒+Div, sll Q, $Q_0 = 0$	0000	0001000100	00111100
	shift div right	0000	0000100010	00111100
5	rem=rem-div	0000	0000100010	00011010
	rem$\geq 0 \Rightarrow$ sll Q, $Q_0 = 1$	0001	0000100010	00011010
	shift div right	0001	0000010001	00011010
6	rem=rem-div	0001	0000010001	00001001
	rem$\geq 0 \Rightarrow$ sll Q, $Q_0 = 1$	0011	0000010001	00001001
	shift div right	0011	0000001000	00001001

And our answer is $q = 3$ and $r = 11$. Lo and behold, if we pull out a calculator and type in $3 * 21 + 11$ we will attain 74.

3.22) 0x0C000000 Gives us that $s = 0$, $e = 24$, and $m = 1$ (1.fraction). This will be:

$$(-1)^0 \times 1 \times 2^{24-127} \approx 9.8607613 \cdot 10^{-32}$$

3.23) First I will figure out the fraction like so:

$$63.25 = 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 + 2^{-2}$$

Which is going to look like: 111111.01. Our mantissa bit will therefore take the form 111110100000... We know that the exponent will need to be the largest bit, 2^5 so we can know that the exponent field is 5+127 or 10000100. The sign bit is obviously zero. Our number is therefor: 01000010011111010000000000000000. It is easier to read 0x427d0000.