HW3

L. Hachmann

1. $91_{10} + C6_{16}$

$91_{10} \rightarrow$ base 2: $2^6 + 2^4 + 2^3 + 2^1 + 2^0 \rightarrow 1011011$

$C6_{16} = 6 \times 16^0 + 12 \times 16^1 = 192_{10}$

1100 0110 $\rightarrow 11000110_b$

```
  1 1 1 1
  1100 0110
+ 1011011
-----------
1 0010 0001
```

$100100001_b \rightarrow 2^8 + 2^5 + 2^0 = \boxed{289_{10}}$

2. $11_8 - 11_{10}$ $\qquad 11_{10} \rightarrow 2^3 + 2^1 + 2^0 \rightarrow 1011_b$

$11_8 = 1 \times 8^0 + 1 \times 8^1 = 9_{10} = 2^3 + 2^0 \rightarrow 1001$

```
  1001
- 1011
```

$\Rightarrow$

```
+/-
 0   1001
 1   0100
 0   0001
-----------
 1   1110
```

$-2^3 + 2^2 + 2^1$

$-8 + 4 + 2 = \boxed{-2_{10}}$

1 = neg; 1110 = -2

3. $12.3125_{10} + 0110_{1's\,Q2}$

$12.3125 \rightarrow 2^3 + 2^2 + 2^{-2} + 2^{-4} \rightarrow 1100.0101_2$

(.3125 = 5/16)

```
  1100.0101
+ 0001.1000
-------------
  1101.1101
```

$2^3 + 2^2 + 2^0$ $\qquad 1/2 + 1/4 + 1/16$

$= \boxed{13\ 13/16}$

4. $5.75_{10} - 7.125_{10}$

$5.75_{10} = 2^2 + 2^0 + 2^{-1} + 2^{-2}$ $\quad -7.125 = -2^3 + 1/2 + 1/4 + 1/8$

$5.75 = 101.11_2$ $\quad -7.125 = 1000.111$

$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 1000.111 \\ +\ 0101.110 \\ \hline 1110.101 \end{array}$$

↳ $-2^3 + 2^2 + 2^1 + 1/2 + 1/8 = \boxed{-1.375_{10}}$

5. $9_{10} \cdot 3_{10}$

$9_{10}: 2^3 + 2^0 \rightarrow 1001$

$3_{10}: 0011$

$$\begin{array}{r} 1001 \\ \times\ 0011 \\ \hline 1001 \\ 10010 \\ \hline 11011_2 \end{array}$$

$\rightarrow 2^4 + 2^3 + 2^1 + 2^0$

$16 + 8 + 2 + 1$

$= \boxed{27_{10}}$

6. $(-5)_{10} \cdot (-6)_{16}$

↳ $-2^3 + 2^1 + 2^0 = 1011$

$-6 \times 16^0 = -6$

$= -2^3 + 2^1$

$= 1010$

sign extend for 30

$$\begin{array}{r} 11011 \quad 15 \\ \times\ 11010 \\ \hline 00000 \\ 11011\ 0 \\ 00000\ 00 \\ 11011\ 000 \\ 11011\ 0000 \\ \hline 10101\ 11110 \quad 15 \end{array}$$

~~$2^1 + 2^2 + 2^3 + 2^4$~~

~~$2^4 + 2^3$~~

$16 + 8 + 4 + 2 = 24 + 6 = \boxed{30_{10}}$

LJ Hachmann

7. $9.5_{10} \cdot 2.625_{10}$

$9.5_{10} = 2^3 + 2^0 + 2^{-1}$

$= 1001.1$

$2.625_{10} = 10.101$

```
      1001.100
        10.101
  ------------
      1001100
     0000000
    10011000
   00000000
  100110000000
  ------------
  11000.111100
```

$2^4 + 2^3 \quad + 1/2 + 1/4 + 1/8 + 1/16$

$= \boxed{24.9375_{10}}$

8. $-1.25_{10} \cdot 3.5_{10}$

$-1.25_{10} = -2^1 + 2^0 + 2^{-2}$

$= 111.01$

$3.5_{10} = 2^1 + 2^0 + 2^{-1}$

010.10

sign extension

```
      1110.110
      0011.100
  ------------
  1 1 0000000   0  0
    1 1111000   0  1
  1   1110000   1  2
  1     10000   1  3
  1 1 1 00000   1
  ------------
  11101.101000
```

$= -2^3 + 2^1 + 2^0 + 2^{-1} + 2^{-3} = \boxed{-4.375_{10}}$