CompArch HW3 Write Up
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1. $91_{10} = 2^6 + 2^4 + 2^3 + 2^1 + 2^0 = \boxed{1011011_2}$ (7 bit unsigned int

   $C6_{16} = 12 \cdot 16^1 + 6 \cdot 16^0 = \boxed{11000110_2}$ 8 bit unsigned int

   9 bit unsigned integers

   $\quad\quad 001011011_2$
   $\quad +011000110_2$
   $\quad\overline{\boxed{100100001_2}} = 2^8 + 2^5 + 2^0 = \boxed{289_{10}}$

2. $11_8 = 1 \cdot 8^1 + 1 \cdot 8^0 = \boxed{1001_2}$ 4 bit unsigned int $-11_{10} = -2^3 - 2^1 - 2^0 = \boxed{10101_2}$ signed 5 bit int.

   5 bit signed ints.
   $\quad\quad 0 1 0 1 1$
   $\quad\quad 01001_2$
   $\quad +10101_2$
   $\quad\overline{\boxed{11110_2}} = -2^1 = \boxed{-2_{10}}$

3. $12.3125_{10} = 2^3 + 2^2 + 2^{-2} + 2^{-4} = \boxed{11000101_2}$ U4Q4 fixed point

   U4Q4 fixed
   $\quad\quad 11000101_2$
   $\quad +00011000_2$
   $\quad\overline{\boxed{11011101_2}} = 2^3 + 2^2 + 2^0 + 2^{-1} + 2^{-2} + 2^{-4} = \boxed{13.8125_{10}}$

4. $5.75_{10} = 2^2 + 2^0 + 2^{-1} + 2^{-2} = \boxed{10111_2}$ U3Q2 fixed

   $-7.125_{10} = -2^2 - 2^1 - 2^0 - 2^{-3} = \boxed{1000111_2}$ I4Q3 fixed
   $\quad 0 1 1 \quad 1 0 0 1$

   $\quad\quad 1 1 1$
   $\quad\quad 0101110_2$ I4Q3
   $\quad +1000111_2$
   $\quad\overline{\boxed{1110101_2}} = -2^0 - 2^{-2} - 2^{-3} = \boxed{-1.375_{10}}$
   $\quad 0 0 0 1 0 1 1$

5. $9_{10} = 2^3 + 2^0 = \boxed{1001_2}$ 4 bit unsigned int.

   $3_{10} = 2^1 + 2^0 = \boxed{11_2}$ 2 bit unsigned int

   4 bit int 1001_2
   unsigned $\times 0011_2$
   $\quad\quad 1001$
   $\quad\quad 1001$
   $\quad\quad 0000$
   $\quad\quad 0000$

   5 bit unsigned int $\overline{\boxed{11011_2}} = 2^4 + 2^3 + 2^1 + 2^0 = \boxed{27_{10}}$

6. $-5_{10} = -2^2 - 2^0 = \boxed{1011_2}$ signed 4 bit int
   $\quad 0 1 0 1$

   $-6_{16} = -6 \cdot 16^0 = \boxed{1010_2}$ signed 4 bit int
   $\quad 0 1 1 0$

   $\quad\quad 11111011_2$
   $\quad \times 11111010_2$ sign extend to 8 bit
   $\quad\quad 1101 \quad\quad 0$
   $\quad\quad 11111011$
   $\quad\quad\quad\quad\quad 0$
   $\quad 11111011$
   $\quad 11111011$
   $\quad 11111011$
   $\quad 11111011$
   $\quad 11111011$
   $\quad\overline{\cdots \boxed{00011110_2}} = 2^4 + 2^3 + 2^2 + 2^1 = \boxed{30_{10}}$

7. $9.5_{10} = 2^3 + 2^0 + 2^{-1} = \boxed{10011_2}$ U4Q1 fixed

$2.625_{10} = 2^1 + 2^{-1} + 2^{-3} = \boxed{10101_2}$ U2Q3 fixed

$$\begin{array}{r}
1001100_2 \\
\times\ 0010101_2 \\
\hline
1001100 \\
0 \\
1001100 \\
0 \\
1001100 \\
\end{array}$$

U4Q3

U8Q6 $\boxed{000110001111100_2} = 2^4 + 2^3 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4}$

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

8. $-1.25_{10} = -2^0 - 2^{-2} = \boxed{1011_2}$ I2Q2 fixed

0101

$3.5_{10} = 2^1 + 2^0 + 2^{-1} = \boxed{111_2}$ U2Q1 fixed

$$\begin{array}{r}
11111011_2 \\
\times\ 00001110_2 \\
\hline
10101111\ 0 \\
11111011 \\
11111011 \\
11111011 \\
\end{array}$$

I6Q2 fixed

I12Q4 $\boxed{\cdots 11110111010_2} = -2^2 - 2^{-2} - 2^{-3} = \boxed{-4.375_{10}}$

0100.0110