

Comp arch HW3

1. $9_{10} + C6_{16}$ Unsigned 9bit integer

$$\begin{array}{r}
 2^8 \ 2^7 \ 2^6 \ 2^5 \ 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0 \\
 0 \ 0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1_2 \\
 0 \ 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0_2 \\
 \hline
 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1_2 = \boxed{289_{10}}
 \end{array}$$

2. $11_8 - 11_{10}$ signed, 4bit integer

$$\begin{array}{r}
 8 \ 4 \ 2 \ 1 \\
 1 \ 0 \ 0 \ 1_2 = 1 \ 0 \ 0 \ 1_2 \\
 -1 \ 0 \ 1 \ 1_2 = 0 \ 1 \ 0 \ 0_2 \\
 + 0 \ 0 \ 0 \ 1_2 \\
 \hline
 1 \ 1 \ 1 \ 0_2 = \boxed{-2_{10}}
 \end{array}$$

3. $12.3125 + 01.10_{12Q2}$

$$\begin{array}{r}
 = 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0 \ 2^{-1} \ 2^{-2} \ 2^{-3} \ 2^{-4} \\
 1 \ 1 \ 0 \ 0 . 0 \ 1 \ 0 \ 1_2 \text{ 4Q4} \\
 + 0 \ 0 \ 0 \ 1 . 1 \ 0 \ 0 \ 0_2 \text{ fixed} \\
 \hline
 1 \ 1 \ 0 \ 1 . 1 \ 1 \ 0 \ 1 = \boxed{13.8125_{10}}
 \end{array}$$

4. $5.75_{10} - 7.125_{10}$ 13Q3

$$\begin{array}{r}
 1 \ 0 \ 1 . 1 \ 1_2 \text{ 11, 601}_2 \text{ fixed} \\
 1 \ 0 \ 1 . 1 \ 1_2 \\
 0 \ 0 \ 0 . 1 \ 1_2 \\
 + 0 \ 0 \ 0 . 0 \ 0_2 \\
 \hline
 1 \ 1 \ 0 . 1 \ 0_2 = \boxed{-1.375_{10}}
 \end{array}$$

5. $9_{10} \cdot 3_{10}$ V4 x V2 =

$$\begin{array}{r}
 1 \ 0 \ 0 \ 1_2 \\
 \times 0 \ 0 \ 1 \ 1_2 \\
 \hline
 1 \ 0 \ 0 \ 1_2 \text{ Vint5} \\
 1 \ 0 \ 0 \ 1_2 \\
 \hline
 1 \ 1 \ 0 \ 1 \ 1_2 = \boxed{27_{10}}
 \end{array}$$

6. $-5_{10} \cdot -6_{10} = 5_{10} \cdot 6_{10}$

$$\begin{array}{r}
 5_{10} = 0 \ 1 \ 0 \ 1_2 \text{ V4 x V4} \\
 6_{10} = 0 \ 1 \ 1 \ 0_2 \\
 \hline
 0 \ 0 \ 0 \ 0 \text{ Vint0} \\
 0 \ 1 \ 0 \ 1 \\
 \hline
 0 \ 1 \ 0 \ 1 \\
 0 \ 1 \ 1 \ 1 \ 0_2 = \boxed{30_{10}}
 \end{array}$$

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

$$\begin{array}{r}
 1 \ 0 \ 0 \ 1 . 1 \ 0 \ 0 \ 0_2 \text{ V4Q4 fixed} \\
 0 \ 0 \ 1 \ 0 . 1 \ 0 \ 1 \ 0_2 \text{ V4Q4} \\
 \hline
 1 \ 0 \ 0 \ 1 . 1 \ 0 \ 0 \ 0_2 \\
 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 0 \times \times \times_2 \\
 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 0 \times \times \times \times_2 \\
 1 \ 1 \ 0 \ 0 \ 0 . 1 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0_2
 \end{array}$$

8. $-1.25_{10} / 3.5_{10}$ $3.5_{10} = 11.10_2$ 12Q2 fixed
 $-1.25_{10} = 10.11_2$ 12Q2 fixed
 product: 14Q4 fixed

$$\begin{array}{r}
 = 11.10_2 / 11.10_2 \\
 \begin{array}{r}
 1 \ 1 . 1 \ 0_2 \\
 \times 0 \ 1 . 0 \ 1_2 \\
 \hline
 1 \ 1 \ 1 \ 0 \times \times \times_2 \\
 1 \ 1 \ 1 \ 0 \ 1 \ 1 \times \times \times_2 \\
 1 \ 0 \ 1 \ 1 \times \times \times \times_2 \\
 \hline
 1 \ 0 \ 1 \ 1 . 0 \ 1 \ 0_2
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 1 \ 0 . 1 \ 1_2 \\
 \times 1 \ 1 . 1 \ 0_2 \\
 \hline
 1 \ 0 \ 1 \ 1 \times_2 \\
 1 \ 1 \ 0 \ 1 \ 1 \times \times_2 \\
 1 \ 0 \ 1 \ 1 \times \times \times_2 \\
 \hline
 1 \ 1 \ 1 \ 1 . 1 \ 0 \ 1 \ 0_2 = \boxed{-4.375_{10}}
 \end{array}$$

+ 0100.01102 = -4.