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

$91_{10} \rightarrow \frac{1}{64}\ \frac{0}{32}\ \frac{1}{16}\ \frac{1}{8}\ \frac{0}{4}\ \frac{1}{2}\ \frac{1}{1}_2$

$C6_{16} \rightarrow \frac{1}{128}\ \frac{1}{64}\ \frac{0}{32}\ \frac{0}{16}\ \frac{0}{8}\ \frac{1}{4}\ \frac{1}{2}\ \frac{0}{1}_2$

01011011_2 ← 8 bits, unsigned integer

$+\ 11000110_2$ ←

$100100001_2 \rightarrow 1 + 32 + 256 = \boxed{289_{10}}$

↑ 9 bits, unsigned integer

3) $12.3125_{10} + 0110_{12Q2}$

$12.3125_{10} \rightarrow \frac{0}{\text{sign}}\ \frac{1}{8}\ \frac{1}{4}\ \frac{0}{2}\ \frac{0}{1}\ .\ \frac{0}{.5}\ \frac{1}{.25}\ \frac{0}{.125}\ \frac{1}{.0625}$

15Q4

01100.0101_{15Q4} $0110_{12Q2} \rightarrow 00001.1000_{15Q4}$

$+\ 00001.1000_{15Q4}$

$01101.1101_{15Q4} \rightarrow 1 + 4 + 8 + .5 + .25 + .0625$

9 bits, signed float

$= \boxed{13.8125_{10}}$

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

$5.75_{10} \rightarrow \frac{0}{\text{sign}}\ \frac{1}{4}\ \frac{0}{2}\ \frac{1}{1}\ .\ \frac{1}{.5}\ \frac{1}{.25}\ \frac{0}{.125}\ {}_{14Q3}$

$0101110_{14Q3} - 0011001_{14Q3}$ $7.125_{10} \rightarrow \frac{0}{\text{sign}}\ \frac{1}{4}\ \frac{1}{2}\ \frac{1}{1}\ .\ \frac{0}{.5}\ \frac{0}{.25}\ \frac{1}{.125}\ {}_{14Q3}$

$=$

$-(0111.001_{14Q3} - 0101.110_{14Q3})$

0111.001_{14Q3}

$-\ 0101.110_{14Q3}$

0001.011_{14Q3} → $-(0001.011_{14Q3}) = \underbrace{1110.101_{14Q3}}$

7 bits, signed float

$1110.101_{14Q3} \rightarrow \boxed{-1.375_{10}}$

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

$9_{10} \rightarrow \frac{1}{8}\frac{0}{4}\frac{0}{2}\frac{1}{1}{}_2$

$3_{10} \rightarrow \frac{0}{8}\frac{0}{4}\frac{1}{2}\frac{1}{1}{}_2$

unsigned 4 bit integer

$$\begin{array}{r} 1001_2 \\ \times\ 0011_2 \\ \hline 1001 \\ 1001 \\ \hline 0 \\ \hline 0 \\ \hline 00011011_2 \end{array}$$

unsigned 8 bit integer

$00011011_2 \rightarrow 1+2+8+16 = \boxed{27_{10}}$

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

$-5_{10} \rightarrow \frac{1}{\text{sign}}\frac{0}{4}\frac{1}{2}\frac{1}{1}{}_2$

$-6_{10} \rightarrow \frac{1}{\text{sign}}\frac{0}{4}\frac{1}{2}\frac{0}{1}{}_2$

signed 4 bit integer

$$\begin{array}{r} 1011_2 \\ \times\ 1010_2 \\ \hline 0000 \\ 1011 \\ 0000 \\ 1011 \\ \hline 00011110_2 \end{array}$$

8 bit signed integer

$00011110_2 \rightarrow 2+4+8+16 = \boxed{30_{10}}$

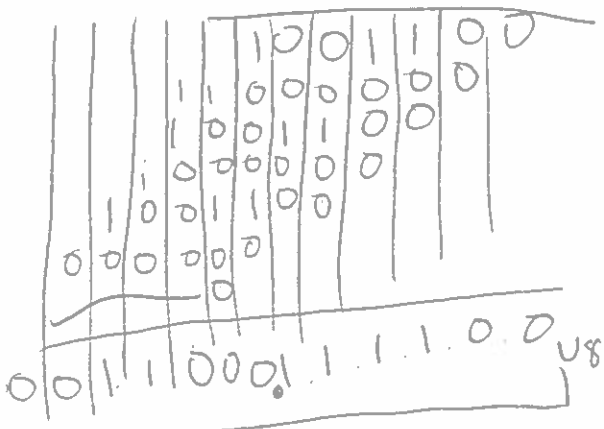
7) $9.5_{10} \cdot 2.625_{10}$

$9.5_{10} \rightarrow \frac{1}{8}\frac{0}{4}\frac{0}{2}\frac{1}{1}.\frac{1}{.5}\frac{0}{.25}\frac{0}{.125}$ U4Q3

$2.625_{10} \rightarrow \frac{0}{8}\frac{0}{4}\frac{1}{2}\frac{0}{1}.\frac{1}{.5}\frac{0}{.25}\frac{1}{.125}$ U4Q3

U4Q3

1001.100
× 0010.101



00011000.111100 U8Q6

U8Q6

$8+16+.5+.25+.125+.0625$

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