Logan Sweet
Comp Arch HW #3

→ Convert to binary
→ do arithmatic
→ Convert to decimal

for each: # of bits
Signed or unsigned
integer, fixed point, floating point

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① $91_{10} + C6_{16}$ 2 bits, unsigned, integer

$91_{10} = 9 \cdot 10^1 + 1 \cdot 10^0 = 91_{10}$

$C6_{16} = 12_{10} \cdot 16^1 + 6 \cdot 16^0 = 192_{10} + 6_{10} = 198_{10}$

$= \underline{1\ 0\ 1\ 1\ 0\ 1\ 1}_2$ 7 bits unsigned integer
$= \underline{1\ 1\ 0\ 0\ 0\ 1\ 1\ 0}_2$ 8 bits unsigned integer

$\begin{array}{r} 1011011 \\ + 11000110 \\ \hline 100100001_2 \end{array}$ 9 bits unsigned integer

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

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② $11_8 - 11_{10} \rightarrow 11_8 + (-11_{10})$ 2 bits signed integer

$11_8 = 1 \cdot 8^1 + 1 \cdot 8^0 = 8 + 1 = 9_{10}$ $= \underline{1\ 0\ 0\ 1}_2$
$11_{10} = 1 \cdot 10^1 + 1 \cdot 10^0 = 11_{10}$ $= \underline{0\ 1\ 0\ 1\ 1}_2 \xrightarrow{to\ \ominus} 0101_2$

$\left.\begin{array}{r}\end{array}\right\}$ 4 bits Signed integer

$\begin{array}{r} 1001 \\ + 0101 \\ \hline 1110_2 \end{array}$ 4 bits signed integer

$= \boxed{-2_{10}}$

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④ $5.75_{10} - 7.125_{10}$

$5.75_{10} = \underline{1\ 0\ 1\ 1\ 1\ 0}_2$ $I\overset{4}{3}Q3$
$7.125_{10} = \underline{1\ 1\ 1\ 0\ 0\ 1}_2 \xrightarrow{to\ -} 1000111$ $I4Q3$

$\begin{array}{r} 101110 \\ + 1000111 \\ \hline 1110101_2 \end{array}$ $I4Q3$

$\overset{to\ +}{\underset{}{\hookrightarrow}} 0010.011_2 \rightarrow \boxed{2.375_{10}}$

5) $9_{10} \cdot 3_{10}$ unsigned 1 bit integer

$9_{10} = 1\ 0\ 0\ 1$ ⎫ unsigned 4 bit integer
$3_{10} = 0\ 0\ 1\ 0$ ⎭

$11011_2 \rightarrow 27_{10}$

```
  1001
  0010
  ‾‾‾‾‾
    1 0 0 1
   0 0 0 1
  0 0 0 0
 0 0 0 0
 ‾‾‾‾‾‾‾‾‾
 1 1 0 1 1₂
```
unsigned 5 bit integer

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

$5_{10} = 101_2$ $-5_{10} = 1011_2$ ⎫ signed 4 bit integer
$6_{16} = 111_2$ $-6_{10} = 1010_2$ ⎭

```
  1011
 ·1010
 ‾‾‾‾‾
     0 0 0 0
    1 0 1 1
   0 0 0 0
  1 0 1 1
 ‾‾‾‾‾‾‾‾‾‾‾
 1 1 1 0 0 1 1 1 0₂
```
signed 7 bit integer

```
 ...111011
 ...111010
 ‾‾‾‾‾‾‾‾‾
      0 0 0 0 0
     0 0 0 1
    0 0 0 0 0
   1 0 1 1
  0 0 1 1
 1 0 1 1
 ‾‾‾‾‾‾‾‾‾‾
 0 1 0 1 1 1 1 0
```
Signed 5 bit integer $01110_2 = 30_{10}$

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

$9.5_{10} = 10011$ U4Q1 → 1001100_2 U4Q3

$2.625_{10} = 10101$ U2Q3 → 0010101_2 U4Q3

```
  1001100
  0010101
  ‾‾‾‾‾‾‾
      1 0 0 1 1 0 0
     0 0 0 0 0 0 0
    1 0 0 1 1 0 0
   0 0 0 0 0 0 0
  1 0 0 1 1 0 0
 0 0 0 0 0 0 0
0 1 1 0 0 0 1 1 1 1 0 0₂ → U5Q6
```

$110001111100_2 \rightarrow 11000\,1111_2$ U5Q4 → 24.9375_{10}

.5
.25
.125