$$7104 = 7 \times 10^3 + 1 \times 10^2 + 0 \times 10^1 + 4 \times 10^0$$

$$13_{10} = 1101_2$$

$$27_{10} = 11011_2$$

$$27_{10} = 36_7$$

$$37_{10} = 41_9$$

$$= 4 \times 9^1 + 1 \times 9^0$$

$$92_{10} = 134_8 \quad = 1 \times 8^2 + 3 \times 8 + 4$$

$10 - A$ $11 - B$ $\cdots$

$12 - C$ $13 - D$

$14 - E$ $15 - F$

$13_{10} = D_{16}$

$27_{10} = 1B$

$\hookrightarrow 1 \times 16 + 1 \times 11$

$152_{10} = 17 \times 13 + 9 \times 1 = 1B_{16}$

$= B9_{13}$

$$1 \text{ byte} = 8 \text{ bits}$$
$$= \text{bit } (0 \text{ or } 1)$$

$$\underbrace{11 \cdots 1}_{8} = 2^7 + 2^6 \cdots - +2^0$$

$$= 2^8 - 1 = 255$$

$$2^{10} = 1024$$

$$\underbrace{}_{8} \underbrace{}_{8} = 2^{16} - 1 = 65535$$

$$2^{20} \approx 10^6$$

$$2^{30} \approx 10^9$$

$$\approx 2^{24} \approx$$

$$4 \text{ bytes} \approx 2^{32} = \boxed{4 \text{ billion}}$$

$$N_{16} \rightleftarrows N'_2$$

$$0101 \; 1001 \; 1001$$
$$\underbrace{0101}_{5} \; \underbrace{1001}_{9} \; \underbrace{1001}_{9}$$

$$29_{10} = 11101_2$$

$$\underbrace{1}_{1} \quad \underbrace{1101}_{D}$$

$$29_{10} = 1D_{16}$$

$$N = x_n \times 2^n + \cdots \cdots x_1 \times 2^1 + x_0 \times 2^0 \quad (x_0 \cdots x_n \in [0,1])$$

$$= x_0 \times 2^0 + x_1 \times 2^1 - \; - \; - \; + x_n \times 2^n$$

$$= (x_0 + 2x_1 + 4x_2 + 8x_3) + 16(x_4 + 2x_5 + 4x_6 + 8x_7) + 16^2(\cdot)$$

$$\rightarrow = y_0 + 16^1 \times y_1 + 16^2 \times y_2 + \; - - \; - \quad (y_0 \cdots y_m \in [0,1 \cdots ,15])$$

$$29_{10} = 1\ 1101$$

$$= 1D_{16}$$

$$= 35_8$$

$$1\ D_{16} \longrightarrow \underbrace{0001}\ \underbrace{1101}$$

binary = $\underbrace{\quad}_{4}\ \underbrace{\quad}_{4}$

$$\frac{11}{3}\ \frac{101}{5}$$
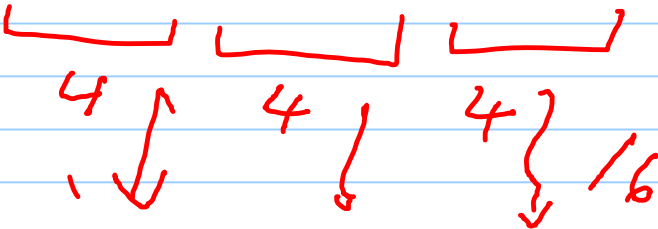
$$24_8 = \underbrace{010}\ \underbrace{100}_{2}$$

$$20_{10} \qquad 20_{10}$$

binary =

$\underbrace{\quad}_{4} \Big\downarrow \quad \underbrace{\quad}_{4} \Big\} \quad \underbrace{\quad}_{4} \Big\} \Big/ 16$

0x 1D (=29)

binary =

$\underbrace{\quad}_{3} \quad \underbrace{\quad}_{3} \quad \underbrace{\quad}_{3} \, 8$
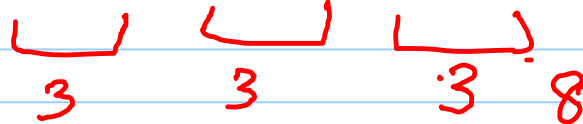
0 (remaining base $_8$)

Conversion

$b_2 \longrightarrow \square_{16}$

29   0x 1D (hex)

035 (octal)

$$-5$$

$$\begin{array}{r} 100 \\ =90 \\ +10 \end{array}$$
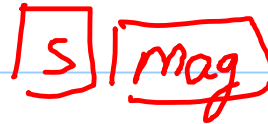
$$\begin{array}{r} 5 \\ +4 \\ \hline 9 \end{array}$$

$$\begin{array}{r} 0101 \\ +0100 \\ \hline 1001 \end{array}$$
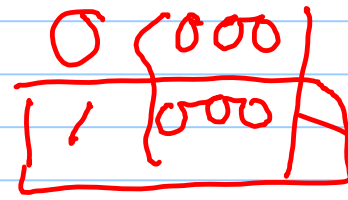
$$\begin{array}{r} 100 \\ -99 \\ \hline 001 \end{array}$$

$$\begin{array}{r} 0 \quad 9 \quad \textcircled{10} \\ \cancel{1} \; \cancel{0} \; \cancel{0} \end{array}$$

$$\begin{array}{r} 2000 \\ =1990 \\ +10 \end{array}$$

$$\begin{array}{r} -\;99 \\ \hline 0 \;0\; 1 \end{array}$$

$$\begin{array}{r} 5 \\ -4 \\ \hline 1 \end{array}$$

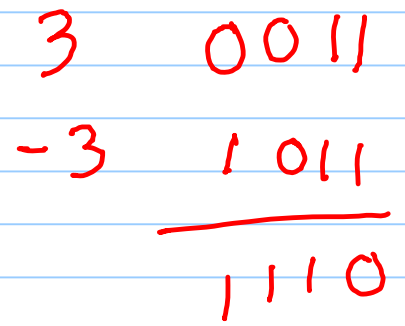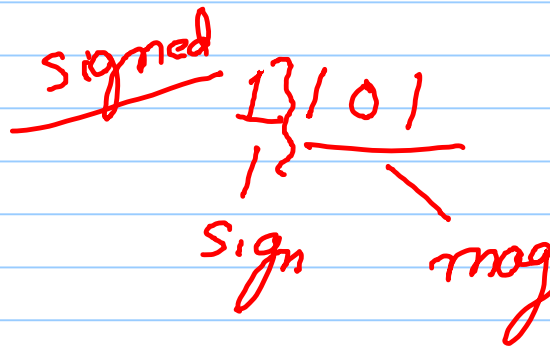$$\begin{array}{r} 0101 \\ -0100 \\ \hline 0001 \end{array}$$

$$\begin{array}{r} 4 \\ -3 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 0100 \\ -0011 \\ \hline \cancel{} \\ 001 \end{array}$$

$$\begin{array}{r} 9 \;10 \\ 2\,0\,\cancel{0}\,\cancel{0} \\ -1999 \end{array}$$

$$\begin{array}{r} 1\; 9\,9\; 10 \\ \cancel{2}\,\cancel{0}\,\cancel{0}\,\cancel{0} \\ -1999 \\ \hline 0001 \end{array}$$

-5

$\boxed{S}\boxed{mag}$

signed

$1\ 1\ 0\ 1$

Sign   mag

3 0011

-3 $1\ 011$

$\overline{}$

1110

$0\ (000$

$1\ (000$
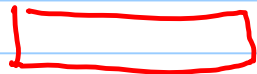
Sign magnitude

$-1 > 0$
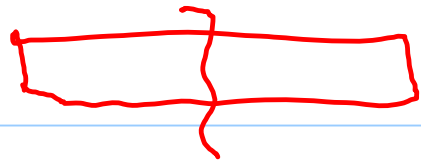
biased

4 bits

0 ··· ·15

$u \rightarrow F(u)$

biased: $F(u) = u + bias$

$F(u) = u + 7$

$-7 ·· 3 ·· 8$

$\downarrow ·· \downarrow ·· \downarrow$

$0 \quad 10 \quad 15$