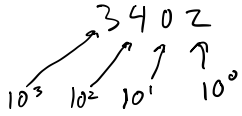
Binary, hexadecimal, and decimal

Decimal



$$3 * 10^3 + 4 * 10^2 + 0 * 10^1 + 2 * 10^0$$

Binary

1 0 1 1

2^3 2^2 2^1 2^0

8 4 2 1 ← decimal place values

to decimal: $1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0$

$8 + 0 + 2 + 1 = 11$

$$1011_2 = 11_{10}$$

Decimal

$$\begin{array}{r} 11 \\ +\ 1 \\ \hline 12 \end{array}$$

Binary

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 1011 \\ +\quad 1 \\ \hline 1100 \end{array}$$

1 byte = 8 bits

Hexadecimal	Decimal	Binary
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111

$$\underline{1101}\ \underline{1011}_2 = DB_{16} = 0xDB$$

Decimal to binary

$$22 = 16 + 4 + 2$$
$$= 2^4 + 2^2 + 2^1$$
$$= 10110_2$$

$$15 = 8 + 4 + 2 + 1$$
$$= 2^3 + 2^2 + 2^1 + 2^0$$
$$= 1111_2$$