Decimal : 0 1 2 3 4 5 6 7 8 9 10 11 12

Binaire 0 1 10 11 100 101 ...

Octal 0 1 2 3 4 5 6 7 10 11 12 ...

Hexadecimal 0 1 ... 9 A B C D E F 10 ... 1F...

$$N_B = \sum_0^p C_m N^P$$

Poids

$$(1^5 0^4 1^3 1^2 0^1 1^0)_2 = 1 \times 2^0 + 0 \times 2^1 + \dots$$

Base

$2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0$

1	0	0	0	0	0
2	0	0	0	0	1
3	0	0	0	1	0
4	0	0	0	1	1
5	0	0	1	0	0
6	0	0	1	0	1
7	0	0	1	1	0
8	0	0	1	1	1
9	0	1	0	0	0
10	0	1	0	0	1
11 12	0	1	0	1	0
13	0	1	0	1	1
14	0	1	1	0	0
15	0	1	1	0	1
16	0	1	1	1	0
17	0	1	1	1	1
18	1	0	0	0	0
19	1	0	0	0	1
20	1	0	0	1	0
21	1	0	0	1	1
22	1	0	1	0	0
23	1	0	1	0	1
24	1	0	1	1	0

25	1	0	1	1	1
26	1	1	0	0	0
27	1	1	0	0	1
28	1	1	0	1	0
29	1	1	0	1	1
30	1	1	1	0	0
31	1	1	1	0	1
32	1	1	1	1	0

$(128)_{10} = (10000000)_2$

$(342)_{10} = (11010110)$

$(621)_{10} = (1111111101)_2$

$(512)_{10} = (1000000000)_2$

$342 \,\lfloor 2$
$0 \quad 171 \,\lfloor 2$
$1 \quad 85 \,\lfloor 2$
$42 \,\lfloor 2$
$1 \quad 21 \,\lfloor 2$
$0 \quad 10 \,\lfloor 2$
$1 \quad 5 \,\lfloor 2$
$0 \quad 2 \,\lfloor 2$
$1 \quad 1 \quad 0$

$621 \,\lfloor 2$
$\boxed{1} \quad 310 \,\lfloor 2$
$255 \,\lfloor 2$
$\boxed{0} \quad 127 \,\lfloor 2$
$\boxed{1} \quad 63 \,\lfloor 2$
$\boxed{1} \quad \boxed{1} \quad 31 \,\lfloor 2$
$\boxed{1} \quad 15 \,\lfloor 2$
$\boxed{1} \quad 7 \,\lfloor 2$
$\boxed{1} \quad 3 \,\lfloor 2$
$\boxed{1} \quad \boxed{1}$

$(\overset{5}{1}\overset{4}{0}\overset{3}{0}\overset{2}{1}\overset{1}{0}\overset{0}{0})_2 = 4 + 32$
$= (36)_{10}$

$(\overset{9}{1}\overset{8}{0}\overset{7}{1}\overset{6}{0}\overset{5}{1}\overset{4}{0}\overset{3}{1}\overset{2}{0}\overset{1}{1}\overset{0}{0}) = 2 + 8 + 32 + 128 + 512$

$= (682)_{10}$

$\overset{8}{1}\overset{7}{1}\overset{6}{1}\overset{5}{1}\overset{4}{0}\overset{3}{0}\overset{2}{0}\overset{1}{0}$

$(11110000)_2 = 16 + 32 + 64 + 128$

$= (240)_{10}$

$\overset{10}{1}\overset{9}{0}\overset{8}{0}\overset{7}{1}\overset{6}{1}\overset{5}{0}\overset{4}{1}\overset{3}{1}\overset{2}{0}\overset{1}{1}$

$(1001101101) = 1 + 4 + 8 + 32 + 64 + 512$

$= 631$

Decimal → octal

$(122)_{10} = (172)_8$

122 ⌊8
$\boxed{2}$ 15 ⌊8
$\boxed{7}$ 1

$(156)_{10} = (234)_8$

156 ⌊8
$\boxed{4}$ 19 ⌊8
$\boxed{3}$ 2 ⌊8
2 0

$(221)_{10} = (335)_8$

221 ⌊8
5 27 ⌊8
$\boxed{3}$ 3 ⌊8
$\boxed{3}$ 0

Octal → Decimal

$$\overset{2}{(1}\overset{1}{1}\overset{0}{7})_8 = 7 + 8 + 64$$
$$= (79)_{10}$$

$$\cancel{\overset{2}{(3}\overset{1}{8}\overset{0}{2})_8 = 2 + (8 \times 8) + (3 \times 64)}$$
$$\cancel{= 194 + 64}$$
$$\cancel{= (258)_{10}}$$

$$\overset{2}{(4}\overset{1}{5}\overset{0}{6})_8 = 6 + 40 + (192 + 64)$$
$$= 46 + 256$$
$$= (302)_{10}$$

Decimal → Hexadecimal

$$(230)_{10} = (E6)_{16}$$

$230 \,\underline{|16}$
$6 \quad 14 \,\underline{|16}$
$E \quad 0$

$$(16384)_{10} = (4000)_{16}$$

$$
\begin{array}{l}
16384 \;\lfloor 16 \\
\quad 0 \quad 1024 \;\lfloor 16 \\
\qquad\quad 0 \quad 64 \;\lfloor 16 \\
\qquad\qquad\quad 0 \quad 4 \;\lfloor 16 \\
\qquad\qquad\qquad\quad 4 \quad 0
\end{array}
$$

Hexadecimal $\longrightarrow$ Decimal :

$$(\overset{3}{2}\overset{2}{F}\overset{1}{A}\overset{0}{5})_{16} = 5 \times 16^0 + 10 \times 16^1 + 15 \times 16^2 + 2 \times 16^3$$

$$= 5 + 160 + 3840 + 8192$$

$$= 12197$$

$$(\overset{4}{3}\overset{3}{F}\overset{2}{C}\overset{1}{B}\overset{0}{1}) = 1 + 2816 + 3072 + 61440 + 196608$$

$$= 263\,937$$

Astuces

conversion Base 2 $\rightarrow$ Base 8 :

$8 = 2^3$

$(\underbrace{01}\ \underbrace{111}\ \underbrace{000}\ \underbrace{111})_2$

$(1 \quad 7 \quad 0 \quad 7)_8$

A l'inverse :

$(132)_8 = (\underbrace{001}\ \underbrace{011}\ \underbrace{010})_2$

meme chose Base 2 $\rightarrow$ Base 16

$2^4 = 16$

$(\underbrace{01\,11}_{3}\underbrace{1\,000}_{12}\underbrace{0\,111}_{7})_2$

$(3D7)_{16}$

A l'inverse :

$(3BA)_{16} = (\underbrace{0011}_{3}\ \underbrace{1011}_{B}\ \underbrace{1010}_{A})_2$

$(10111011) = (273)_8$

$(111000111000) = (E\ 3\ 8)$

$(178)_8 =$ syntax Error

$(ABF3)_{16} = (1010\ 1011\ 1110\ 0011)_2$

Complement a 1 :

inverser chaque bit

$(1010100) = N$

$\downarrow$

$(0101011) = \overline{N}$

complement a 2 :

$$\bar{\bar{N}} = \bar{N} + 1$$

Addition :

$0 + 0 = 0$

$0 + 1 = 1$

$1 + 0 = 1$

$1 + 1 = 0 \text{ R } 1$

$$
\begin{array}{r}
10110 \\
10101 \\
\hline
= 101011
\end{array}
$$

$$
\begin{array}{r}
1011 \\
+11101 \\
\hline
110000
\end{array}
\qquad
\begin{array}{r}
1011 \\
+\ 101 \\
\hline
10000
\end{array}
$$

Multiplication :

```
   111
 × 101
 -----
 11111
  000.
 111..
 -----
100011
```

Exercices :

I) $(10)_{10} = (1010)_2$

$(50)_{10} = (110010)_2$

$(1024)_{10} = (10000000000)_2$

$(1993)_{10} = (111110001001)_2$

$(3496)_{10} = (110110101000)_2$

$(9999)_{10} = (10011100001111)_2$

```
3496 |2
[0] 1748 |2
    [0] 874 |2
        [0] 437 |2
            [1] 218 |2
                [0] 109 |2
                    [1] 54
```

$(101010)_2 = (42)_{10}$

$(110110011)_2 = 1 \times 2^0 + 1 \times 2^2 + 1 \times 2^4 + 2^5 + 2^7 + 2^8$

$= 219$

$11101101 = 477$

Les puissance

$2^6 = 64$

$(-3)^5 = -243$

$5^3 \cdot 5^2 = 5^5 = 3125$

$\frac{7^8}{7^3} = 7^5$

$(2^3)^4 = 2^{12}$

Decomposition nb premier

$180 = 90 \times 2 = 2 \times 2 \times 45$
$= 2 \times 2 \times 5 \times 9$
$= 2^2 \times 5 \times 3^2$

$450 = 2 \times 225 = 2 \times 5 \times 45$
$= 2 \times 5 \times 5 \times 9$
$= 2 \times 5^2 \times 3^2$

$672 = 2 \times 336 = 2 \times 2 \times 168$
$= 2^2 \times 2 \times 84$
$= 2^3 \times 2 \times 42$
$= 2^4 \times 2 \times 21$
$= 2^5 \times 3 \times 7$

$784 = 2 \times 392 = 2^4 \times 7^2$

$924 = 2 \times 462 = 2 \times 2 \times 231$
$= 2 \times 2 \times 3 \times 77$
$= 2^2 \times 3 \times 7 \times 11$

Plus grand diviseur commun

$(8, 15) \rightarrow$ premier entre eux car gdc $= 1$

$(12, 18) \rightarrow 12 \div 2 = 6 \quad 18 \div 2 = 9$

$(35, 64) \rightarrow$ premier entre eux

$(21, 22) \to$ premier entre eux

$(14, 49) \to gdc(14, 49) = 7$

Pgcd par decomposition en fact. premiers

$180 = 2^2 \times 3^3 \times 5$
$252 = 2^2 \times 3^2 \times 7$

$gcd(180, 252) = 2^2 \times 3^2$

$(84, 120)$

$84 = 2 \times 2 \times 3 \times 7$
$120 = 2 \times 2 \times 2 \times 3 \times 5$

$gcd(84, 120) = 2^2 \times 3$