Bases

Friday, 6 August 2021 6:07 PM

✓ Unsigned Integer
3, 5, 9

Denary
↑↓
Binary
↓↑
Hex

2's Complement.
1's Complement.
BCD.
Binary Addition.

} Signed Integers
-3, +5, -103

0
1
9
A 10
B 11
C 12
D 13
E 14
F 15.

Binary.

	8	4	2	1	8	4	2	① LSb	
Den.	128	64	32	16	8	4	2	1	Hex
20	0	0	0	1	0	1	0	0	14
100	0	1	1	0	0	1	0	0	64
167	1	0	1	0	0	1	1	1	A7

$(14)_{16} = (20)_{10} = (00010100)_2$

$(64)_{16} = (100)_{10} = (01100100)_2$

$(A7)_{16} = (167)_{10} = (10100111)_2$

Range

$2^{\#\text{ of bits}} = N$ — Min → 0, — Max

N = Number of numbers

10 — 0, — 9

Examples:

$2^8 = 256$ — 0, — 255

$(11111111)_2 = (255)_{10}$

~Nibble~

$2^4 = 16$ — 0, — 15

$(1111)_2 = (15)_{10}$

Signed Integers: msb

-128	64	32	16	8	4	2	1

Range: -128 — 0 — +127.

256

-8 4 2 1

-8 — 0 — +7

- × + = -

$$\begin{array}{r} -128 \\ +126 \\ \hline -2 \end{array}$$

-128	64	32	16	8	4	2	1	
1	1	1	1	1	1	1	0	-2
1	1	1	1	1	0	1	1	-5

$$\begin{array}{r} -128 \\ +123 \\ \hline -5 \end{array}$$

Actual Concept.

2's Complement	Humans'
1's Complement	Computers'

Sign bit

+5 ✓	0 0 0 0 0 1 0 1 ←
-5	1 1 1 1 1 0 1 1
+2	0 0 0 0 0 0 1 0 ←
-2	1 1 1 1 1 1 1 0
-38	1 1 0 1 1 0 1 0

2's Complement.

$$\begin{array}{lrl} +5 & 00000101 & \\ & 11111010 & \text{Inverse} \\ & 00000001 + & \text{Add 1} \\ \hline -5 & 11111011 & \end{array}$$

1's Complement

$$\begin{array}{lrl} -38 & 11011010 & \\ \hline & 00100101 & \text{Inverse} \\ & 00000001 & \text{INC / Add 1.} \\ \hline +38 & 00100110 & \end{array}$$

Binary Coded Decimal (BCD): System clocks, Currency, PSB.

For every denary digit there are four bits allocated.

$(54)_{10}$

$(01010100)_{BCD}$

Currency (Decimal in VB)
BCD.

127

$(000000000100100111)_{BCD}$

If the number of digits in given denary number is "odd" then add a prefix '0' to it. This is done to complete the byte.

32.91

00110010 . 10010001

$2^4 = 16$

BCD 0—9 = 10 Digits

$$\begin{array}{r} 16 \\ -10 \\ \hline \boxed{6} \end{array}$$

Error Removal.

$(0100\underline{1010})_{BCD}$

⑩ Doesn't exist in BCD

This is not BCD.

BCD Addition:

15.52 + 39.13 using BCD.

$$\begin{array}{rr} \overset{1}{0}\overset{1}{0}01 & \overset{1}{0}101 \\ 0011 & 1001 \\ \hline 0100 & 1110 \\ & 0110 \\ \hline 0101 & 0100 \\ 5 & 4 \end{array} \quad \begin{array}{r} .0\overset{1}{1}01\overset{1}{0}010 \\ .00010011 \\ \hline .01100101 \\ 00000000 \\ \hline 0110\ 0101 \\ 6 \quad 5 \end{array}$$

⑮ ⑭ . 6 5 ✓✓

⑪ 4 . 6 5 ✓✓✓

$$\begin{array}{r} \overset{1}{1}5.52 \\ 39.13 \\ \hline \boxed{54.65} \end{array}$$