Section 1 - Binary and Counting

Wednesday, June 19, 2019 10:37 AM

· SECTION 1 ·

BINARY + COUNTING

DECIMAL - A NUMBER IN BASE 10

BINARY - A NUMBER IN BASE 2

$$205$$

$$10^2 \quad 10^1 \quad 10^0$$

$$(10^2 \cdot 2) + (10^1 \cdot 0) + (10^0 \cdot 5) = 205$$

$$11001101$$

$$2^7 \; 2^6 \; 2^5 \; 2^4 \; 2^3 \; 2^2 \; 2^1 \; 2^0$$

$$(2^7 \cdot 1) + (2^6 \cdot 1) + (2^5 \cdot 0) + (2^4 \cdot 0) + (2^3 \cdot 1) + (2^2 \cdot 1) + (2^1 \cdot 0) + (2^0 \cdot 1)$$

$$= 205$$

SO WHAT'S HAPPENING?

- WE HAVE BASE B.
- EACH DIGIT CAN BE $0 \to B-1$
- TYPICALLY NUMBERS HAVE SUBSCRIPTS WITH THE BASES. EG 92_{10} 1001_2

$$\frac{v}{B^n} \cdots \frac{w}{B^2} \quad \frac{y}{B^1} \quad \frac{z}{B^0}$$

$$(v \times B^n) + \ldots + (w \cdot B^2) + (y \cdot B^1) + (z \cdot B^0)$$

- THE ABOVE CONVERTS ANY NUMBER TO BASE 10
- WHAT ABOUT THE OTHER WAY?

$$73_{10}$$

$$\frac{73}{5} \qquad \frac{14}{5} \qquad \frac{2}{5}$$

$$\boxed{14} \text{ rem } \underline{3} \qquad \boxed{2} \text{ rem } \underline{4} \qquad 0 \text{ rem } \underline{2}$$

$$243_5$$

- ALWAYS CONVERT TO BASE 10 THEN TO NEW BASE

~ BINARY + HEXADECIMAL ~

- BINARY IS BASE 2
- HEXA DECIMAL IS BASE 16
- 4 BITS IN BINARY IS A HEX DIGIT

1010 → A

1010 0101 → A 5

DECIMAL	BINARY	HEX	DEC	BINARY	HEX
0	0000	0	8	1000	8
1	0001	1	9	1001	9
2	0010	2	10	1010	A
3	0011	3	11	1011	B
4	0100	4	12	1100	C
5	0101	5	13	1101	D
6	0110	6	14	1110	E
7	0111	7	15	1111	F