01-NUM-Numeric_Representation_and_Codes

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1 01 - NUM - Numeric Representation and Codes

1.1 Number System

1.1.1 Representation Integer

$$A = \sum_{i=0}^{n-1} a_i * p^i$$

$$0 \le a_i \le p - 1$$

$$0 \le A \le p^n$$

1.1.2 Decimal System

$$245_{10} = 2 * 10^2 + 4 * 10^1 + 5 * 10^0$$

1.1.3 Binary System

$$11110101_2 = 1 * 2^7 + 1 * 2^6 + 1 * 2^5 + 1 * 2^4 + 0 * 2^4 + 0 * 2^3 + 1 + 2^2 + 0 * 2^1 + 1 * 2^0$$

1.1.4 Hexadecimal System

$$F5_{16} = F * 16^1 + 5 * 16^1 + 5 * 16^0$$

Decimal	Hexadecimal	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011

Decimal	Hexadecimal	Binary
12	C	1100
13	D	1101
14	E	1110
15	F	1111

1.2 Transformations of Number Systems

1.2.1 Binary to Decimal

$11110101_2 = 2^7 + 2^6 + 2^5 + 2^4 + 2^2 + 2^0$ $\qquad\qquad 128 + 64 + 32 + 16 + 4 + 1 = 245_{10}$

1.2.2 Decimal to Binary

$$77_{10} = ...128 + \underline{64} + 32 + 16 + \underline{8} + \underline{4} + \underline{1} = 01001101_2$$

1.2.3 Hexadecimal to Binary

$$F5_{16} = 11110101_2$$

1.2.4 Binary to Hexadecimal

1.2.5 Hexadecimal to Decimal

$F5_{16} = 15 * 16^1 + 5 + 16^0$ $\qquad\qquad 15 * 16 + 5 + 1 = 254_{10}$

1.2.6 Decimal to Hexaddecimal

1.3 Operation on Integers

1.3.1 Binary Addition

1.3.2 Binary Substraction

1.3.3 Binary Multiplication