PHILOSOPHY OF NUMBER SYSTEMS

In binary number system the bit on the far right is known as the least significant bit (LSB). The bit on the far left is known as the most significant bit (MSB). For example in 100010 LSB is 0 and MSB is 1.

Notations used in digital systems:

4 bits = Nibble

8 bits = Byte

16 bits = Word

32 bits = Double word

64 bits = Quad Word (or paragraph)

When writing binary numbers you will need to signify that the number is binary (base 2), for example, let's take the value **101**. As it is written, it would be hard to work out whether it is a binary or decimal value. To get around this problem it is common to denote the base to which the number belongs, by writing the base value with the number, for example: $(12)_{10}$ is a decimal number and $(100001)_2$ is a binary number.

Conversion between Different Number Systems

Any base system to decimal number system

Other number systems use different bases. The **binary** number system uses base 2, so the place values of the digits of a binary number correspond to powers of 2. For example, the value of the binary number 10011 is determined by computing the place value of each of the digits of the number:

1	0	0	1	1	the binary number
2^4	2^3	2^2	2^1	2^0	place values

So the binary number 10011.01 represents the value

$1*2^4 + 0*2^3 + 0*2^2 + 1*2^1 + 1*2^0 + 0*2^{-1} + 1*2^{-2}$

$16 + 0 + 0 + 2 + 1 + 0 + 0.25$

$(19.25)_{10}$

convert $(2132)_5$ to decimal number

2	1	3	2	number in base 5
5^3	5^2	5^1	5^0	place values

So the value of the number is

(2 * 5^3) + (1 * 5^2) + (3 * 5^1) + (2 * 5^0)

= (2 * 125) + (1 * 25) + (3 * 5) + (2 * 1)

= 250 + 25 + 15 + 2

= 292