BINARY ARITHMETIC: BASIC CONVERSIONS

1. Decimal system

Numbers are used in counting and measuring. The everyday number system is the decimal system, which uses the base 10. The significance of this is shown below.

10^5	10^4	10^3	10^2	10^1	10^0	The value of the number 2 5 7 1 0 9 is then
100000,	10000,	1000,	100,	10,	1	
2	5	7	1	0	9	or

$$100000 \times 2 + 10000 \times 5 + 1000 \times 7 + 100 \times 1 + 10 \times 0 + 1 \times 9 = 257109$$

We are so familiar with the decimal system that the explanation given above is really quite unnecessary. But is the base 10 the only possible base? Instead of using the base 10 we could use the base 2; this is called the binary system.

The Binary system of numbers uses the base 2. Although this would be rather unhandy for manual calculations, it forms the basis for all counting systems in computers. For each power of 2 there can be only two values, 0 or 1. This is represented in computers by devices which are either on (1) or off (0). The values of the lower powers of 2 are:

2^6	2^5	2^4	2^3	2^2	2^1	2^0
64	32	16	8	4	2	1

2.Conversion from binary to decimal

		64	32	16	8	4	2	1		
1	Binary number					1	0	1		
	Decimal value					4	0	1	= 5	
2	Binary number				1	0	1	0		
	Decimal value				8	0	2	0	= 10	
3	Binary number				1	1	0	1		
	Decimal value				8	4	0	1	= 13	
4	Binary number			1	0	1	0	1		
	Decimal value			16	0	4	0	1	= 21	
5	Binary number			1	1	0	1	1		
	Decimal value			16	8	0	2	1	= 27	
6	Binary number		1	1	0	1	1	0		
	Decimal value		32	16	0	4	2	0	= 54	