Base of a Number system

In a Number system, the **base** is the number of single digits present in it.

There are infinite numbers possible but only finite number of digits are present. As the count goes on, when the digits are over, they are combined to make the other numbers of the number system. The combination is done in a way that every number is unique.

The base of a number is written as subscript beside the number.

For example:

Binary number	$(1011)_2$	$(110001)_2$
Octal number	$(2647)_8$	$(652173)_8$
Decimal number	$(9152)_{10}$	$(1548963)_{10}$
Hexadecimal number	$(2A3B)_{16}$	$(98BA12FE)_{16}$

Let us now look into the various Number systems.

Various Number Systems

Decimal Number System

The most commonly used number system is Decimal number system. It has ten digits which are: 0 1 2 3 4 5 6 7 8 9

It is used universally for counting and representing any number.

15

Example of Decimal numbers:

69   3245   578109   80970521

Binary Number System

It is a kind of number system in which there are only two digits 0, 1. Digital computers use binary numbers to represent all kind of data and information. Binary numbers cannot contain any digit other than 0 & 1.

Binary numbers are used in electronic systems that run on power. A computer understands the language made from Binary number system, which is called the machine language.

Example of Binary numbers:

1011   10110101   100101   110110

Octal Number System

It is a kind of number system in which there are eight digits 0, 1, 2, 3, 4, 5, 6, 7.

Each octal digit is represented by three binary digits. The advantage of octal numbers is that they are very easy to convert to and from binary number system.

16

Example of Octal numbers:

76   2641   630072   367410

Note: Octal numbers can have digits only from 0 to 7 and cannot have digits 8 and 9

Hexadecimal Numbers

It is a kind of number system in which there are sixteen digits.

The digits are 0 1 2 3 4 5 6 7 8 9 A B C D E F

Each hexadecimal digit is represented by four binary digits. The advantage of hexadecimal numbers is that they are very easy to convert to and from binary number system and they can store more information than octal numbers.

Example of Binary numbers:

5A   8CB1   FADE   C2D9E

Note: *Hexadecimal numbers can have digits from 0 to 9 and also from A to F only. The six alphabets used in hexadecimal numbers are part of the number.*

Number Chart of Decimal and Binary

DECIMAL	BINARY
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
...	...

DECIMAL	BINARY
8	1000
9	1001
10	1010
11	1011
12	1100
13	1101
14	1110
15	1111
...	...

Note: *Binary number system is useful for representing bits of computer signals, which can be either 0 or 1.*