

**Binary
Decimal
Octal and
Hexadecimal number systems**

A number can be represented with different base values. We are familiar with the numbers in the base 10 (known as decimal numbers), with digits taking values 0,1,2,...,8,9.

A computer uses a Binary number system which has a base 2 and digits can have only TWO values: 0 and 1.

A decimal number with a few digits can be expressed in binary form using a large number of digits. Thus the number 65 can be expressed in binary form as 1000001.

The binary form can be expressed more compactly by grouping 3 binary digits together to form an octal number. An octal number with base 8 makes use of the EIGHT digits 0,1,2,3,4,5,6 and 7.

A more compact representation is used by Hexadecimal representation which groups 4 binary digits together. It can make use of 16 digits, but since we have only 10 digits, the remaining 6 digits are made up of first 6 letters of the alphabet. Thus the hexadecimal base uses 0,1,2,...,8,9,A,B,C,D,E,F as digits.

To summarize

Decimal : base 10

Binary : base 2

Octal: base 8

Hexadecimal : base 16

Decimal, Binary, Octal, and Hex Numbers

Decimal	Binary	Octal	Hexadecimal
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F