Number System

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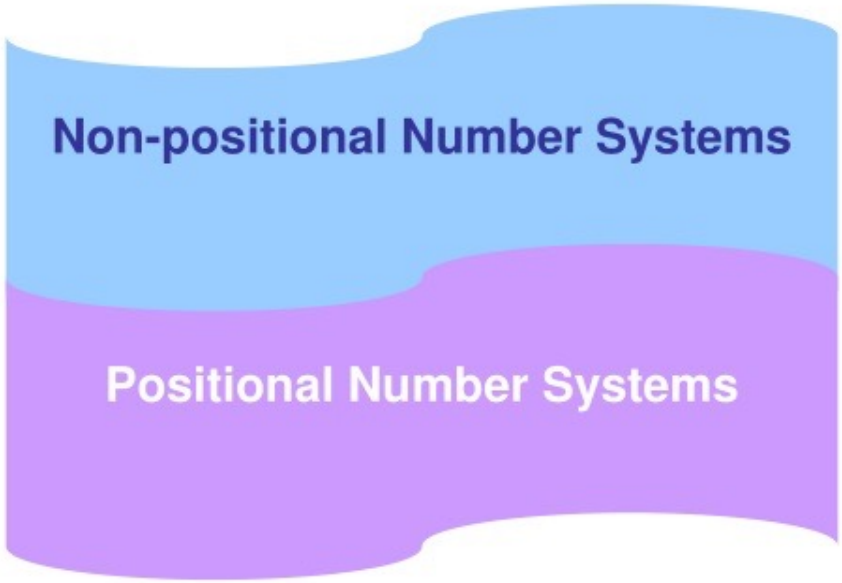
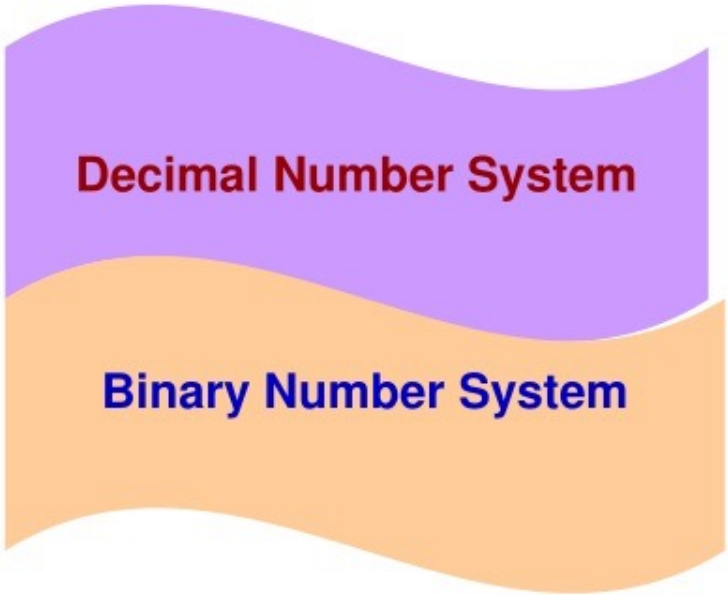


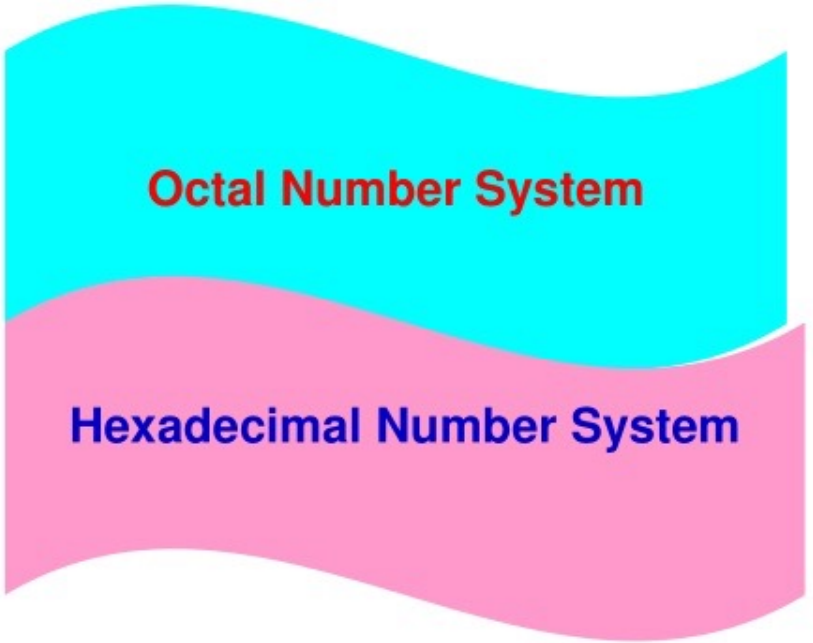
Non-positional Number Systems

- In early days, human being counted on fingers,. When ten fingers are not adequate, stones, pebbles, or sticks were used to indicate values. This method of counting uses an Non-positional Number Systems.

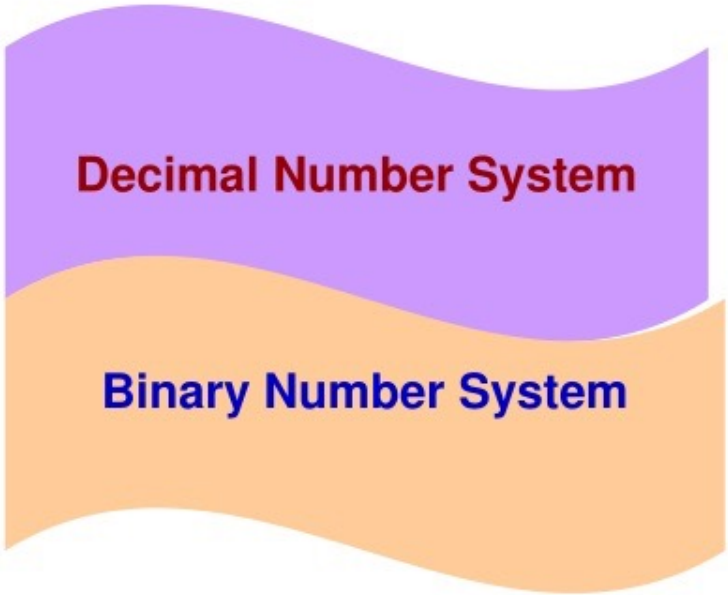
- In this system symbols such as I for 1. II for 2, III for 3, IIII for 4 etc.

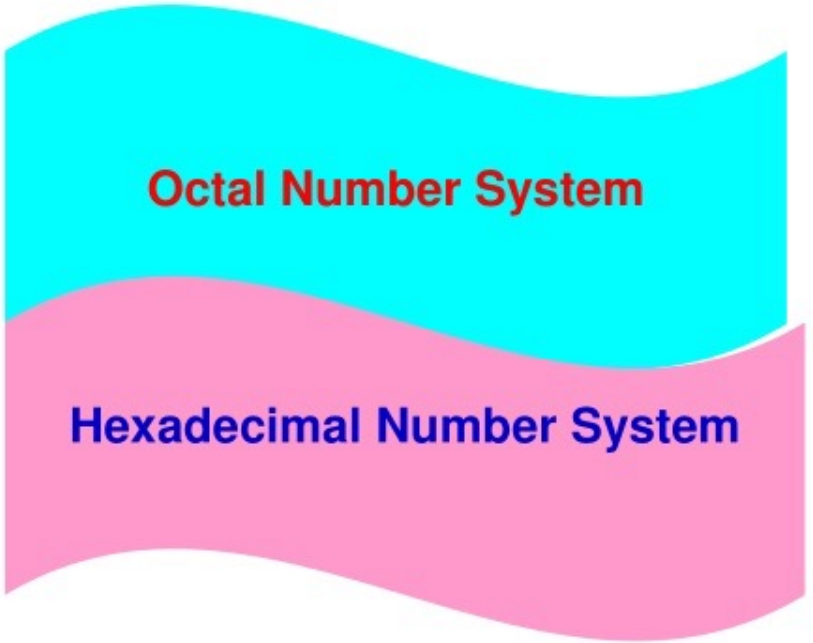
Positional Number Systems





Positional Number Systems





Decimal Number System

- The number system that we use in our day to day life is called the Decimal Number System.

- We have ten symbols or digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) that can be used in this number system.

Example: 1234_{10}

Binary Number System

- The binary number system is exactly like the decimal design except that the base is 2 instead of 10.

- We have only two symbols or digits (0 and 1) that can be used in this number system

Example: 1010_2

Octal Number System

- In the octal number system the base is 8.
- So in this system there are eight symbols or digits : 0, 1, 2, 3, 4, 5, 6 and 7

Example : 2057_8

Hexadecimal Number System

- The Hexadecimal Number System is one with a base of 16. The base of 16 suggests choices of 16 single character digits or symbols. Then first 10 digits are the digits of a decimal system 0, 1, 2, 3, 4, 5, 6, 7, 8, ,9. The remaining six digits are denoted by A, B,C, D, E, F representing the decimal values 10, 11, 12, 13, 14, 15 respectively.

Example : $69BBA_{16}$

Converting One Number System to Another

- Converting from a base other than 10 to base other than 10

- Example:
  1. $545_6 = ?_4$
  2. $10110_2 = ?_8$

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Shortcut method for Binary to Octal conversion

E.g. $101110_2 = ?_8$

Shortcut method for octal to binary conversion

Example: $562_8 = ?_2$

Shortcut method for binary to hexadecimal conversion

Example: $11010011_2 = ?_{16}$

Shortcut method for hexadecimal to binary conversion

e.g. 1. $2AB_{16}=?_2$

2. $ABC_{16}=?_2$

Fractional Numbers

Q : Find the decimal equivalent of the binary number 110.101 and octal number 127.54 and hexadecimal number 2B.C4

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Memory Dump

- Every computer stores numbers, letters, and other special characters in binary form. There are several occasions when computer professionals need to know the raw data contained in a computer memory. A commonly used way of doing this is to print out the memory contents on a printer. This printout is called a *memory dump.*

What is a 'bit' in computer terminology

- "*Binary digit*" is often to referred to by the common abbreviation bit. Hence, a bit in computer terminology means either a 0 or a 1.

- A binary number consisting of 'n' bits is called n-bit number.

'bit' in computer terminology

- How many different patterns of bits are possible with n-bits?

Examples: 1. 6 bits

2. 7 bits

3. 8 bits