PROJECT NAME:

NUMBER SYSTEM CONVERSION

PROJECT REPORT

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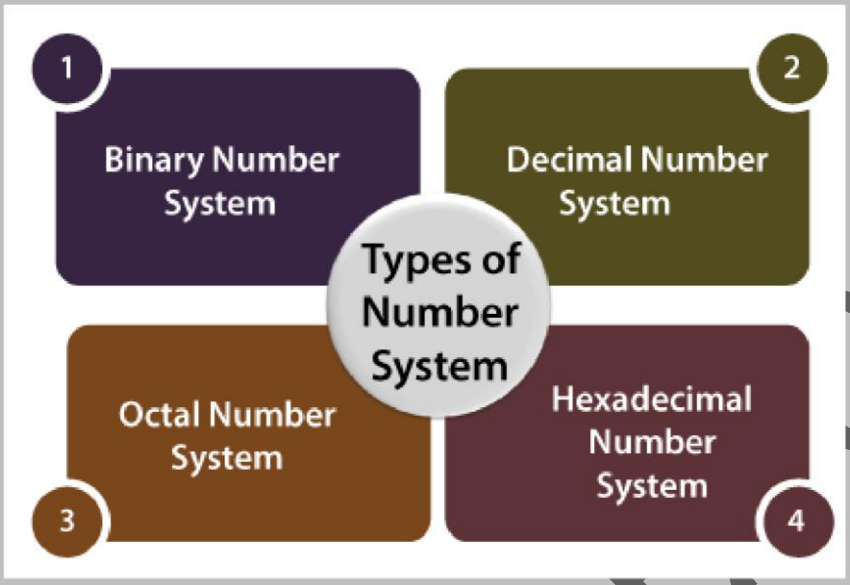
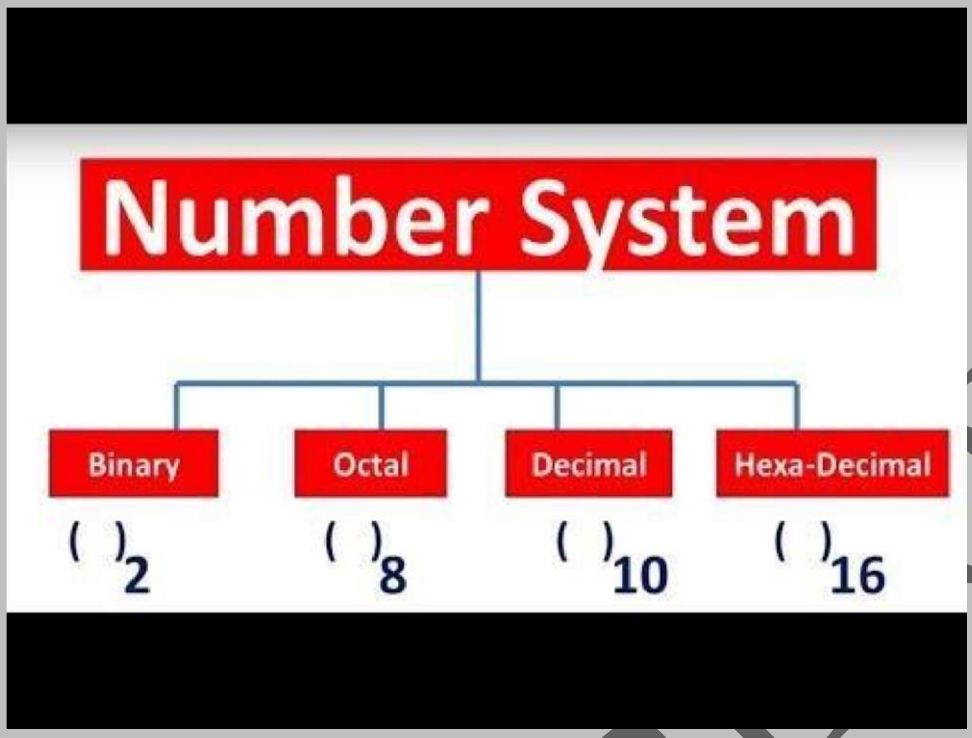
4 TYPES OF NUMBER SYSTEM:



Computer architecture support following number system:

1. Binary number system.
2. Octal number system.
3. Decimal number system.
4. Hexadecimal number system.



● BINARY NUMBER SYSTEM:

A binary number system is one of the four types of number system. In computer applications, where binary numbers are represented by only two symbols or digits, i.e. 0 (zero) and 1(one). The binary numbers here are expressed in the base-2 numeral system. For example, (101)2 is a binary number. Each digit in this system is said to be a bit.

● OCTAL NUMBER SYSTEM:

Octal Number System has a base of eight and uses the number from 0 to 7. The octal numbers, in the number system, are usually represented by binary numbers when they are grouped in pairs of three. For example, 128 is expressed as 001 0102, where 1 is equivalent to 001 and 2 is equivalent to 010.

● DECIMAL NUMBER SYSTEM:

In the decimal number system, the numbers are represented with base 10. The way of denoting the decimal numbers with base 10 is also termed as decimal notation. This number system is widely used in computer applications. It is also called the base-10 number system which consists of 10 digits, such as, 0,1,2,3,4,5,6,7,8,9.

● HEXADECIMAL NUMBER SYSTEM:

Hexadecimal Number System is one the type of Number Representation techniques, in which there value of base is 16. That means there are only 16 symbols or possible digit values, there are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Where A, B, C, D, E and F are single bit representations of decimal value 10, 11, 12, 13, 14 and 15 respectively. It requires only 4 bits to represent value of any digit.

CONVERSIONS:

- Decimal into Binary/Hex number system
- Binary into Decimal/Hex number system
- Hexadecimal into Binary/Decimal number system
- Octal into binary/decimal

➢ Decimal to binary:

Steps to convert decimal to binary:

a) **Take decimal number as dividend.**
b) **Divide this number by 2 (2 is base of binary so divisor here).**
c) **Store the remainder in an array (it will be either 0 or 1 because of divisor 2).**
d) **Repeat the above two steps until the number is greater than zero.**
e) **Print the array in reverse order (which will be equivalent binary number of given decimal number).**

➢ Decimal to hexadecimal

Steps to convert decimal to hexadecimal:

a) **Take decimal number as dividend.**

b) **Divide this number by 16 (16 is base of hexadecimal so divisor here).**

c) **Store the remainder in an array (it will be: 0 to 15 because of divisor 16, replace 10, 11, 12, 13, 14, 15 by A, B, C, D, E, F respectively).**

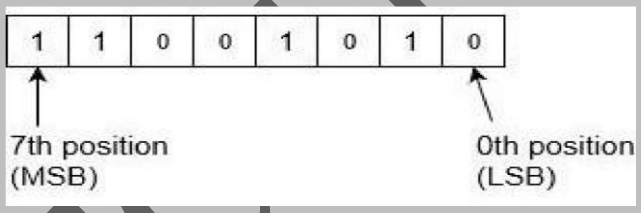
d) **Repeat the above two steps until the number is greater than zero.**

e) **Print the array in reverse order (which will be equivalent hexadecimal number of given decimal number).**

➢ Binary to decimal:

For example:

Convert binary number 11001010 into decimal number.



$= (11001010)_2$
$= 1x2^7+1x2^6+0x2^5+0x2^4+1x2^3+0x2^2+1x2^1+0x2^0$
$= 128+64+0+0+8+0+2+0$
$= (202)_{10}$

➢ Binary to Hexadecimal:

Example – Convert binary number 1101010 into hexadecimal number.

First convert this into decimal number:
$= (1101010)_2$
$= 1x2^6+1x2^5+0x2^4+1x2^3+0x2^2+1x2^1+0x2^0$
$= 64+32+0+8+0+2+0$
$= (106)_{10}$
Then, convert it into hexadecimal number
$= (106)_{10}$

```
= 6x16¹+10x16⁰
= (6A)₁₆ which is answer.
```

➢ Hexadecimal to binary:

Steps to convert hexadecimal to binary:

a) **Step 1: Take given hexadecimal number.**
b) **Step 2: Find the number of digits in the decimal.**
c) **Step 3: If it has n digits, multiply each digit with 16^{n-1} where the digit is in the nth position.**
d) **Step 4: Add the terms after multiplication.**
e) **Step 5: The result is the decimal number equivalent to the given hexadecimal number. Now we have to convert this decimal to binary number.**
f) **Step 6: Divide the decimal number with 2**
g) **Step 7: Note the remainder**
h) **Step 8: Do the above 2 steps for the quotient till the quotient is zero**
i) **Step 9: Write the remainders in the reverse order.**
j) **Step 10: The result is the required binary number.**

➢ Hexadecimal to decimal:

To convert a hexadecimal to a decimal manually, you must start by multiplying the hex number by 16. Then, you raise it to a power of 0 and increase that power by 1 each time according to the hexadecimal number equivalent.

➢ Octal to Binary:

Octal to Decimal Conversion

a) **Count the number of digits present in the given number. Let the number of digits be 'n'.**
b) **Now multiply each digit of the number with 8^{n-1}, when the digit is in the nth position from the right end of the number. If the number has a decimal part, multiply each digit in the decimal part by `$8^{-m}$` when the digit is in the m^{th} position from the decimal point.**
c) **Add all the terms after multiplication.**
d) **The obtained value is the equivalent decimal number.**

➢ Octal to Decimal:

Octal to Decimal Conversion

a) Count the number of digits present in the given number. Let the number of digits be ‘n’.
b) Now multiply each digit of the number with 8^{n-1}, when the digit is in the nth position from the right end of the number. If the number has a decimal part, multiply each digit in the decimal part by `$8^{-m}$` when the digit is in the m^{th} position from the decimal point.
c) Add all the terms after multiplication.
d) The obtained value is the equivalent decimal number.

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- We use 6 procedures in our code which are highlighted in code below.
- We use different predefined functions as well like: writehex, writedec, readdec, readhex etc.

>>>>>THE END<<<<<