

COMPUTER SCIENCE

Number System Conversion

As you know decimal, binary, octal and hexadecimal number systems are positional value number systems. To convert binary, octal and hexadecimal to decimal number, we just need to add the product of each digit with its positional value. Here we are going to learn other conversion among these number systems.

Decimal to Binary

Decimal numbers can be converted to binary by repeated division of the number

by 2 while recording the remainder. Let's take an example to see how this happens.

		Remainder	
2	43		
2	21	1	MSB ↑ LSB
2	10	1	
2	5	0	
2	2	1	
2	1	0	
	0	1	

The remainders are to be read from bottom to top to obtain the binary equivalent.

$$43_{10} = 101011_2$$

Decimal to Octal

Decimal numbers can be converted to octal by repeated division of the number by 8 while recording the remainder. Let's take an example to see how this happens.

		Remainder	
8	473		
8	59	1	MSD
8	7	3	↑
	0	7	LSD

Reading the remainders from bottom to top,

$$473_{10} = 731_8$$

Decimal to Hexadecimal

Decimal numbers can be converted to octal by repeated division of the number by 16 while recording the remainder. Let's take an example to see how this happens.

		Remainder
16	423	
16	26	7
16	1	A
	0	1

Reading the remainders from bottom to top we get,

$$423_{10} = 1A7_{16}$$

Binary to Octal and Vice Versa

To convert a binary number to octal number, these steps are followed –

- . Starting from the least significant bit, make groups of three bits.
- . If there are one or two bits less in making the groups, 0s can be added after the most significant bit

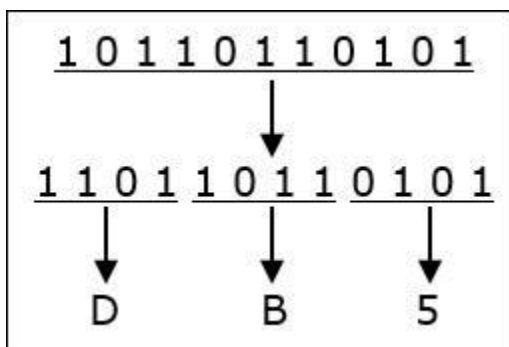
Binary to Hexadecimal

To convert a binary number to hexadecimal number, these steps are followed –

- . Starting from the least significant bit, make groups of four bits.

- . If there are one or two bits less in making the groups, 0s can be added after the most significant bit.
- . Convert each group into its equivalent octal number.

Let's take an example to understand this.



$$10110110101_2 = DB5_{16}$$

To convert an octal number to binary, each octal digit is converted to its 3-bit binary equivalent.