Hexadecimal Number System

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1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29

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It expresses the binary Number Concisely and is Commonly used in Computers. The Hexa-decimal No. is formed from a binary number (word) by grouping bits in a group of four bits each, starting at the binary Point. For ex. binary No. 1010111010 can be grouped as 10, 1011, 1010, In a group of 4 bits, the decimal Numbers 0-15 can be represented as given in the table. Binary numbers 10-15 are grouped as A to F.

Number System (Table)

Binary	Hexadecimal	Decimal	Octal
0000	0	0	0
0001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	8	8	10
1001	9	9	11
1010	A	10	12
1011	B	11	13
1100	C	12	14
1101	D	13	15
1110	E	14	16
1111	F	15	17
10000	10	16	20

Therefore,
37 AE would mean 0011, 0111, 1010, 1110
2 BA would mean 0010, 1011, 1010

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15 16 17 18 19 20 21 22 23 24 25 26 27 28
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we shall discuss the following Conversions:

(A) Decimal to binary:

Double-Dabble Method:

For this number is successively divided by 2 and its remainders are recorded. The final binary result is obtained by reading all the remainders, with the last remainder being the most significant bit (MSB). For example, to Convert 43_{10} to binary, we proceed as follows:

2)	43	R
2)	21	1
2)	10	1
2)	5	0
2)	2	1
2)	1	0
	0	1

Remainder

(101011)

Reading the remainders from the botton to top, $43_{10} = -101011_2$.

Example 1 Convert 200_{10} into binary

2)	200	R
2)	100	0
2)	50	0
2)	25	0
2)	12	1
2)	6	0
2)	3	0
2)	1	1
	0	1

Reading the remainders from the botton to top, the result is $200_{10} = 11001000_2$.

Example

Convert $(59.4375)_{10}$ into binary:

Integer Part:

$(59)_{10} = (111011)_2$ find as in example 1

Fractional Part :

0.4375 = 0.4375

× 2

0.8750 → 0.8750 (0)

× 2

1.7500 → 0.7500 (1)

× 2

1.5000 → 0.5000 (1)

× 2

1.0000 (1)

0.

So That,

$(0.4375)_{10} = (0.0111)_2$

So Complete Number is

$59.4375_{10} = 111011.0111_2$

(ii) Decimal to octal :

For This, Number is successively divided by 8 and its remainder is recorded after each division till the quotient becomes Zero. Read the remainders in reverse order (from bottom to top).

For example, Convert to octal No., the decimal No. 342.3_{10}

For integer Part :

		R
8	342	
8	42	-6
8	5	-2
	0	-5

→ 526

For Fractional Part :

0.3

× 8

2.4 → 0.4 (2)

× 8

3.2 → 0.2 (3)

× 8

1.6 → 0.6 (1)

× 8

4.8 (4)

Carry → 2, 3, 1, 4

So That $0.3_{10} = .2314_8$

Therefore, Complete Number is

$342.3_{10} = 526.2314_8$

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(iii) Decimal to hexadecimal:

Successively by 16 and remainders are recorded as shown in the following example. Remainders written from bottom to top give the desired hexadecimal Number.

Ex. 1 Convert 2564_{10} into hexadecimal Number

we divide the number

16	2564	– R
16	160	– 4
16	10	– 0
	0	← 10 → A in hexadecimal

So hexadecimal Number is $(A04)_{16}$.

Ex. 2 Convert 72905_{10} to hexadecimal:

16	72905	R↓	Hexa notation ↓
16	4556	– 9	– 9
16	284	– 12	– C
16	17	– 12	– C
16	1	– 01	– 1
	0	– 01	– 1

$(11CC9)_{16}$