

Binary

Fundamentals ch-4

1. Binary to Decimal

$$(1) (1011)_2 = (?)_{10}$$

$$\begin{aligned} 1011_2 &= (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ &= 8 + 0 + 2 + 1 \\ &= (11)_2 \end{aligned}$$

$$(1011)_2 = (11)_2$$

$$(2) (1100)_2 = (?)$$

$$\begin{aligned} 1100_2 &= (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\ &= 8 + 4 + 0 \\ &= (12)_2 \end{aligned}$$

$$(1100)_2 = (12)_2$$

$$(3) (10101010)_2 = (?)_{10}$$

$$\begin{aligned} 10101010_2 &= (1 \times 2^8) + (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\ &= 256 + 0 + 64 + 0 + 16 + 0 + 4 + 0 + 0 \\ &= (280)_2 \end{aligned}$$

$$(10101010)_2 = (280)_2$$

$$(4) (0111010)_2 = (?)_{10}$$

$$0111010$$

$$\begin{aligned} 0111010_2 &= (0 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \\ &= 32 + 16 + 8 + 0 + 2 + 0 \\ &= (58)_2 \end{aligned}$$

$$0111010 = (58)_2$$

$$(5) (111111)_2 = (?)_{10}$$

$$\begin{aligned} 111111_2 &= (1 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ &= 64 + 32 + 16 + 8 + 4 + 2 + 1 \\ &= (127)_2 \end{aligned}$$

$$111111 = (127)_2$$

$$(6) (10000000)_2 = (?)_{10}$$

$$\begin{aligned} 10000000_2 &= (1 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\ &= 128 + 0 + 0 + 0 + 0 + 0 + 0 + 0 \\ &= (128)_2 \end{aligned}$$

$$10000000 = (128)_2$$

$$(7) (1011111)_2 = (?)_{10}$$

$$\begin{aligned} 1011111_2 &= (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + \\ &\quad (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ &= 64 + 0 + 16 + 8 + 4 + 2 + 1 \\ &= (95)_{10} \end{aligned}$$

$$[1011111 = (95)_{10}]$$

$$(8) (1011010110)_2 = (?)_{10}$$

$$\begin{aligned} 1011010110_2 &= (1 \times 2^9) + (0 \times 2^8) + (1 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) \\ &\quad + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \\ &= 512 + 0 + 128 + 64 + 0 + 16 + 0 + \\ &\quad + 4 + 2 + 0 \\ &= (726)_{10} \end{aligned}$$

$$[1011010110 = (726)_{10}]$$

$$(9) (1100110011)_2 = (?)_{10}$$

$$\begin{aligned} 1100110011_2 &= (1 \times 2^9) + (1 \times 2^8) + (0 \times 2^7) + (0 \times 2^6) + (1 \times 2^5) \\ &\quad + (1 \times 2^4) + (0 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ &= 512 + 256 + 0 + 0 + 32 \\ &\quad + 16 + 0 + 0 + 2 + 1 \end{aligned}$$

$$\cancel{(818)} = (819)_{10}$$

$$[(1100110011) = (819)_{10}]$$

$$(10) (0.1101)_2 = (?)_{10}$$

$$\begin{aligned} 0.1101_2 &= (1 \times 2^{-1}) + (1 \times 2^{-2}) + (0 \times 2^{-3}) + \\ &\quad (1 \times 2^{-4}) \\ &= \frac{1}{2} + \frac{1}{4} + 0 + \frac{1}{16} \\ &= 0.8 + 0.25 + 0.0625 \\ &= 0.8125 \end{aligned}$$

$$(11) (1100.0010)_2 = (?)_{10}$$

$$\begin{aligned} 1100.0010_2 &= (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\ &= 8 + 4 + 0 + 0 \\ &= 12 \end{aligned}$$

$$\begin{aligned} 0010^{-1-2-3-4} &= (0 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) + (0 \times 2^{-4}) \\ &= 0 + 0 + \frac{1}{8} + 0 \\ &= 0.125 \end{aligned}$$

$$[(1100.0010) = 12.125]$$

$$(12) (11111.10101)_2 = (?)_{10}$$

$$\begin{aligned} \frac{4}{1} \frac{3}{1} \frac{2}{1} \frac{1}{1} \frac{0}{1} &= (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ &= 16 + 8 + 4 + 2 + 1 \\ &= (21) \end{aligned}$$

$$\begin{aligned} \frac{-2}{1} \frac{-2}{0} \frac{-3}{1} \frac{1}{0} \frac{-5}{1} &= (1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) + (0 \times 2^{-4}) \\ &\quad + (1 \times 2^{-5}) \\ &= \frac{1}{2} + 0 + \frac{1}{8} + 6 + \frac{1}{32} + \\ &= 0.65625 \end{aligned}$$

$$= 0.5 + 0.125 + 0.03125$$

$$= (0.65625)$$

$$(11111.10101)_2 = (21.65625)_{10}$$

$$(13) (101110.101011)_2 = (?)_{10}$$

$$\begin{aligned} \frac{5}{1} \frac{4}{0} \frac{3}{1} \frac{2}{1} \frac{1}{0} &= (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + \\ &\quad (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \end{aligned}$$

$$= 32 + 0 + 8 + 4 + 2$$

$$= (46)$$

$$\begin{aligned} 0.\overline{10101011} &= (1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) + (0 \times 2^{-4}) \\ &\quad (1 \times 2^{-5}) + (1 \times 2^{-6}) \end{aligned}$$

$$\begin{aligned} &= \frac{1}{2} + 0 + \frac{1}{8} + 0 + \frac{1}{32} + \frac{1}{64} \\ &= 0.5 + 0.125 + 0.03125 + 0.015625 \end{aligned}$$

$$= (0.671875)$$

$$(101110.101011)_2 = (46.671875)_{10}$$

$$(14) (10101.1010)_2 = (?)_{10}$$

$$\begin{aligned} \frac{4}{1} \frac{3}{0} \frac{2}{1} \frac{1}{0} \frac{1}{1} &= (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) \\ &\quad + (1 \times 2^0) \\ &= 16 + 0 + 4 + 0 + 1 \\ &= (21) \end{aligned}$$

$$0.\overline{1010} = (1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) + (0 \times 2^{-4})$$

$$= \frac{1}{2} + 0 + \frac{1}{8} + 0$$

$$= 0.5 + 0.125$$

$$= (0.625)$$

$$(10101.1010)_2 = (21.625)_{10}$$

2.8

table কোডের গোলি

2. Binary to octal (Base 8) (0 to 7)

→ map group off 3 digit from the right side off the table and from the left form fraction part.

Binary	Octal
0 0 0	0
0 0 1	1
0 1 0	2
0 1 1	3
1 0 0	4
1 0 1	5
1 1 0	6
1 1 1	7

$$(1010111100)_2 = (?)_8$$

$$= \underline{001} \underline{010} \underline{111} \underline{100}$$

$$= (1274)$$

$$\therefore (1010111100)_2 = (1274)$$

$$(101110111001)_2 = (?)_8$$

$$= \underline{010} \underline{111} \underline{011} \underline{001}$$

$$= (2729)_8$$

$$\therefore (101110111001)_2 = (2729)_8$$

$$(10101010100001)_2 = (?)_8$$

$$= \underline{001} \underline{010} \underline{101} \underline{010} \underline{000} \underline{1}$$

$$= (12521)_8$$

$$\therefore (10101010100001)_2 = (12521)_8$$

$$(111101010111)_2 = (?)_8$$

$$= \underline{011} \underline{110} \underline{101} \underline{011}$$

$$= 3 \ 6 \ 5 \ 3$$

$$= (3653)_8$$

$$\therefore (111101010111)_2 = 3657$$

$$(111000111000111)_2 = (?)_8$$

$$= \underline{111} \underline{000} \underline{111} \underline{000} \underline{111}$$

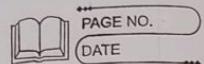
$$= 7070$$

$$= (7070)_8$$

$$\therefore (111000111000111)_2 = (7070)_8$$

* 10011

001100



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$$(6) (1001011001110)_2 = (?)_8$$

$$= \underline{001} \underline{001} \underline{011} \underline{001} \underline{110}$$

$$= (7316)_8$$

$$\therefore (1001011001110)_2 = (7316)_8$$

$$(8) (10110.10110)_2 = (?)_8$$

$$= \frac{010}{2} \frac{110}{6}$$

$$= (26)_8$$

$$= \frac{101}{5} \frac{100}{4}$$

$$= (54)_8$$

$$\therefore (10110.10110)_2 = (28.54)_8$$

* Point .

$$(7) (0110011.1011)_2 = (?)_8$$

$$= \underline{001} \underline{100} \underline{111}$$

$$= (63)_8$$

$$= 101100$$

$$= (54)_8$$

$$\therefore (0110011.1011)_2 = 63.54$$

$$(9) (1011111.1100001)_2 = (?)_8$$

$$= \underline{010} \underline{111} \underline{111} \cdot \underline{1100001} \underline{00}$$

$$\therefore (1011111.1100001)_2 = (137.604)_8$$

$$(10) (100000111100.00110111)_2 = (?)_8$$

$$= \underline{010000011100} \cdot \underline{00110111} \underline{00}$$

$$= \underline{100000111} \underline{100} \cdot \underline{001} \underline{101} \underline{110}$$

$$\therefore (10000011100.00110111)_2 = (4074.156)_8$$

3. Binary to Hexa Decimal (Base 16) (contd)

→ make a group of 4 digits from right hand side and form left hand side for fractional part.

Binary	Hexa
0 0 0 0	0
0 0 0 1	1
0 0 1 0	2
0 0 1 1	3
0 1 0 0	4
0 1 0 1	5
0 1 1 0	6
0 1 1 1	7
1 0 0 0	8
1 0 0 1	9
1 0 1 0	A
1 0 1 1	B
1 1 0 0	C
1 1 0 1	D
1 1 1 0	E
1 1 1 1	F

example :-

$$(1010111100)_2 = (?)_{16}$$

$$\begin{array}{cccc} \cancel{1} & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{array} = (2BC)_{16}$$

$$(10111011001)_{2} = (?)_{16}$$

$$= 0101 \underline{1101} \underline{001} = 5D9$$

$$\therefore (10111011001)_{2} = (5D9)_{16}$$

$$(1010101010101110)_2 = (?)_{16}$$

$$= \underline{10} \underline{10} \underline{10} \underline{10} \underline{10} \underline{1110} \\ A \quad A \quad A \quad A \quad E$$

$$\therefore (1010101010101110)_2 = (AAAE)_{16}$$

$$(11011000111110)_2 = (?)_{16}$$

$$\cancel{1} \cancel{1} \cancel{0} \cancel{1} \cancel{1} \cancel{0} \cancel{0} \cancel{0} \cancel{1} \cancel{1} \cancel{1} \cancel{0}$$

$$= \underline{0} \underline{1} \underline{1} \underline{0} \underline{1} \underline{1} \underline{0} \underline{0} \underline{1} \underline{1} \underline{1} \underline{0} \\ 3 \quad 6 \quad 3 \quad E$$

$$\therefore (11011000111110)_2 = (363E)_{16}$$

$$(110110001100100111)_2 = (?)_{16}$$

$$= \underline{0} \underline{1} \underline{1} \underline{0} \underline{1} \underline{1} \underline{0} \underline{0} \underline{0} \underline{1} \underline{0} \underline{0} \underline{1} \underline{1} \\ 3 \quad 6 \quad 3 \quad 2 \quad 7$$

$$\therefore (110110001100100111)_2 = (36327)_{16}$$

(6) $(10101.01001)_2 = (?)_{16}$

$$= \frac{0001}{1} \frac{0101}{5} \cdot \frac{0100}{4} \frac{1000}{8}$$

$\boxed{(10101.01001)_2 = (15.48)_{16}}$

(7) $(11110001.1010101)_2 = (?)_{16}$

$$= \frac{1111}{F} \frac{0001}{1} \cdot \frac{1010}{A} \frac{1010}{A}$$

$\therefore (11110001.1010101) = (F1.AA)_{16}$

(8) $(1000001111.10101111)_2 = (?)_{16}$

$$= \frac{0010}{2} \frac{0000}{0} \frac{1111}{F} \cdot \frac{1010}{A} \frac{1111}{F}$$

$\therefore (1000001111.10101111) = (20F.AF)_{16}$

(9) $(10111101010001.10000001)_2 = (?)_{16}$

$$= \frac{0101}{5} \frac{1111}{F} \frac{01010001}{5} \cdot \frac{1000}{8} \frac{0001}{1}$$

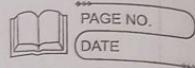
$\therefore (10111101010001.10000001)_2 = (5F51.81)_{16}$

(10) $(1010101010.10101010)_2 = (?)_{16}$

$$= \frac{0010}{2} \frac{1010}{A} \frac{1010}{A} \cdot \frac{1010}{A} \frac{1010}{A}$$

$\therefore (1010101010.10101010) = (2AA-AA)_{16}$

Decimal Number system



2. Decimal

$$\text{Base} = 10 \\ = \text{o to } 9$$

Common use.

(1) Decimal to Binary (Base=0,1)

method - II

$$(28)_{10} = (?)_2$$

$$\begin{array}{r} 2 | 28 \\ 2 | 14 \quad 0 \\ 2 | 7 \quad 0 \\ 2 | 3 \quad 1 \\ 2 | 1 \quad 1 \\ \hline & 0 \quad 1 \end{array}$$

$$= (11100)_2$$

$$\boxed{(28)_{10} = (11100)_2}$$

$$(2) (160)_{10} = (?)_2$$

$$\begin{array}{r} 2 | 160 \\ 2 | 80 \quad 0 \\ 2 | 40 \quad 0 \\ 2 | 20 \quad 0 \\ 2 | 10 \quad 0 \\ 2 | 5 \quad 0 \end{array} \quad \begin{array}{r} 2 | 2 \quad 1 \\ 2 | 1 \quad 0 \\ \hline & 0 \quad 1 \end{array}$$

$$\boxed{\therefore (160)_{10} = (10100000)_2}$$

$$(3) (198)_{10} = (?)_2$$

$$\begin{array}{r} 2 | 198 \\ 2 | 99 \quad 0 \\ 2 | 49 \quad 1 \\ 2 | 24 \quad 1 \\ 2 | 12 \quad 0 \\ 2 | 6 \quad 0 \\ 2 | 3 \quad 0 \\ 2 | 1 \quad 1 \\ \hline & 0 \quad 1 \end{array}$$

$$\therefore (198)_{10} = (11000110)_2$$

$$(4) (245)_{10} = (?)_2$$

$$\begin{array}{r} 2 | 245 \\ 2 | 122 \quad 1 \\ 2 | 62 \quad 0 \\ 2 | 30 \quad 1 \\ 2 | 15 \quad 0 \\ 2 | 7 \quad 1 \\ 2 | 3 \quad 1 \\ 2 | 1 \quad 1 \\ \hline & 0 \quad 1 \end{array}$$

$$\boxed{\therefore (245)_2 = (111010)_2}$$

$$(5) (542)_{10} = (?)_2$$

$$\begin{array}{r} 2 | 542 \\ 2 | 272 \quad 0 \\ 2 | 135 \quad 1 \\ 2 | 67 \quad 1 \\ 2 | 33 \quad 1 \\ 2 | 16 \quad 1 \\ 2 | 8 \quad 0 \end{array} \quad \begin{array}{r} 2 \quad 4 \quad 0 \\ 2 \quad 2 \quad 0 \\ 2 \quad 1 \quad 0 \\ 0 \quad 1 \end{array}$$

$$\boxed{\therefore (542)_{10} = (100001110)_2}$$

$$(6) \quad (1024)_{10} = (?)_2$$

2	1024	2	4	0
2	512	0	2	0
2	256	0	2	1
2	128	0	10	
2	64	0		
2	32	0		
2	16	0		
2	8	0		

1024 512 256 128 64 32 16 8 4 2 1

method - ②

$$(7) \quad (28)_{10} = (?)_2$$

2	1	0	1	1	0	0	1	1	1	0	0
2	0	0	1	1	0	0	0	1	1	1	1

$$(28)_{10} = (11100)_2$$

$$(8) \quad (160)_{10} = (?)_2$$

$$= \frac{128}{32} \\ = \frac{32}{16} \\ = \frac{16}{8} \\ = \frac{8}{4} \\ = \frac{4}{2} \\ = \frac{2}{1}$$

1	0	1	0	0	0	0	0
---	---	---	---	---	---	---	---

$$(160)_{10} = (10100000)_2$$

$$(9) \quad (198)_{10} = (?)_2$$

1	1	0	1	1	1	0
---	---	---	---	---	---	---

$$(198)_{10} = (110110)_2$$

$$(7) \quad (672)_{10} = (?)_2$$

2	672	2	2	0
2	336	0	2	1
2	168	0	0	
2	84	0		
2	42	0		
2	21	0		
2	10	1		
2	5	0		

$$(8) \quad (2099)_{10} = (?)_2$$

2	2099	2	2	0
2	1049	1	2	1
2	524	1	0	
2	262	0		
2	131	0		
2	65	1		
2	32	1		
2	16	0		
2	8	0		
2	4	0		

$$\therefore (2099)_{10} = (100000110011)_2$$

$$(10) \quad (245)_{10} = (?)_2$$

1	1	1	1	0	1	0	1
---	---	---	---	---	---	---	---

$$(245)_{10} = (111011)_2$$

$$(5) (542)_{10} = (?)_2$$

512 256 128 64 32 16 8 4 2 1
 1 0 0 0 0 1 1 1 1 0

$$(542)_{10} = (100001110)_2.$$

$$(6) (162.125)_{10} = (?)_2$$

128 64 32 16 8 4 2 1
 1 0 0 1 0 0 0 1 0

$$\therefore 162 = 1000010$$

$$\begin{aligned}\therefore 0.125 \times 2 \\ = 0.250\end{aligned}$$

$$\begin{aligned}\therefore 0.125 \times 2 &= 0.250 \\ \therefore 0.250 \times 2 &= 0.500 \\ \therefore 0.500 \times 2 &= 1.000 \\ \therefore 0.000 \times 2 &= 0.000\end{aligned}$$

$$(0.125) = (0.001)$$

$$(162.125) = (10100010.001)_2$$

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$$(7) (240.220)_{10} = (?)_2$$

240 = 128 64 32 16 8 4 2 1
 1 1 1 1 1 0 0 0 0

$$220 =$$

$$\begin{aligned}0.220 \times 2 &= 0.440 & 0 \\ 0.440 \times 2 &= 0.880 & 0 \\ 0.880 \times 2 &= 1.76 & 1 \\ 0.76 \times 2 &= 1.52 & 1 \\ 0.52 \times 2 &= 1.04 & 1 \\ 0.04 \times 2 &= 0.08 & 0 \\ 0.08 \times 2 &= 0.16 & 0 \\ 0.16 \times 2 &= 0.32 & 0\end{aligned}$$

$$(240.220)_{10} = (11110000.0011000)_2$$

$$(8) (520.420)_{10} = (?)_2$$

512 256 128 64 32 16 8 4 2 1
 1 0 0 0 0 0 1 0 0 0

$$520 = 1000001000$$



420

$$\begin{array}{r}
 0.420 \times 2 = 0.840 \quad 0 \\
 0.840 \times 2 = 1.680 \quad 1 \\
 1.680 \times 2 = 3.36 \quad 1 \\
 0.36 \times 2 = 0.72 \quad 0 \\
 0.72 \times 2 = 1.44 \quad 1 \\
 0.44 \times 2 = 0.88 \quad 0 \\
 0.88 \times 2 = 1.76 \quad 1 \\
 0.76 \times 2 = 1.52 \quad 1
 \end{array}$$

$$(520.420)_{10} = (100000000.011010111000)_2$$

$$(9) (489.270)_{10} = (?)_2$$

$$\begin{array}{r}
 856 \quad 728 \quad 643 \quad 26 \quad 8 \quad 4 \quad 2 \quad 1 \\
 1 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1
 \end{array}$$

$$(489)_{10} = (11110101)_2$$

$$\begin{array}{r}
 0.270 \times 2 = 0.54 \quad 0 \\
 0.54 \times 2 = 1.08 \quad 1 \\
 0.08 \times 2 = 0.16 \quad 0 \\
 0.16 \times 2 = 0.32 \quad 0 \\
 0.32 \times 2 = 0.64 \quad 0 \\
 0.64 \times 2 = 1.28 \quad 1 \\
 0.28 \times 2 = 0.56 \quad 0 \\
 0.56 \times 2 = 1.12 \quad 1
 \end{array}$$

$$(489.270) = (111101001.01000101)_2$$

(10)

$$(212.54)_{10} = (?)_2$$

$$\begin{array}{r}
 728 \quad 643 \quad 26 \quad 8 \quad 4 \quad 2 \quad 1 \\
 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0
 \end{array}$$

$$\begin{array}{r}
 0.54 \times 2 = 1.08 \quad 1 \\
 0.08 \times 2 = 0.16 \quad 0 \\
 0.16 \times 2 = 0.32 \quad 0 \\
 0.32 \times 2 = 0.64 \quad 0 \\
 0.64 \times 2 = 1.28 \quad 1 \\
 0.28 \times 2 = 0.56 \quad 0
 \end{array}$$

$$\therefore (212.54)_{10} = (1101000.10001010.00)_2$$

$$\begin{array}{r}
 0.28 \times 2 = 0.56 \quad 0 \\
 0.56 \times 2 = 1.12 \quad 1 \\
 0.12 \times 2 = 0.24 \quad 0
 \end{array}$$

(11)

$$(888.992)_{10} = (?)_2$$

$$\begin{array}{r}
 512 \quad 256 \quad 128 \quad 64 \quad 32 \quad 16 \quad 8 \quad 4 \quad 2 \quad 1 \\
 1 \quad 1 \quad 0 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0
 \end{array}$$

$$(888)_{10} = (1101101000)_2$$

$$\begin{array}{r}
 0.992 \times 2 = 1.984 \quad 1 \\
 0.984 \times 2 = 1.968 \quad 1 \\
 0.968 \times 2 = 1.936 \quad 1 \\
 0.936 \times 2 = 1.872 \quad 1 \\
 0.872 \times 2 = 1.744 \quad 1 \\
 0.744 \times 2 = 1.488 \quad 1 \\
 0.488 \times 2 = 0.976 \quad 0 \\
 0.976 \times 2 = 1.952 \quad 1
 \end{array}$$

$$(888.992)_{10} = (1101101000.1111101)_2$$

$$(12) (548.10501)_{10} = (?)_2$$

512 256 128 64 32 16 8 4 2 1
 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
 0 0 0 1 0 0 1 0 0 0

$$548 = 1000100100$$

$$\begin{aligned} 0.70501 \times 2 &= 0.21002 & 0 \\ 0.21002 \times 2 &= 0.42004 & 0 \\ 0.42004 \times 2 &= 0.84000 & 0 \\ 0.84000 \times 2 &= 1.68016 & 1 \\ 0.68016 \times 2 &= 1.36032 & 1 \\ 0.36032 \times 2 &= 0.72064 & 0 \\ 0.72064 \times 2 &= 1.44128 & 1 \end{aligned}$$

$$(13) (269.59)_{10} = (?)_2$$

256 128 64 32 16 8 4 2 1
 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
 1 0 0 0 1 1 0 1

$$269 = 100001101$$

$$\begin{aligned} 0.59 \times 2 &= 1.18 & 1 \\ 0.18 \times 2 &= 0.36 & 0 \\ 0.36 \times 2 &= 0.72 & 0 \\ 0.72 \times 2 &= 1.44 & 1 \\ 0.44 \times 2 &= 0.88 & 0 \\ 0.88 \times 2 &= 1.76 & 1 \\ 0.76 \times 2 &= 1.52 & 1 \end{aligned}$$

$$(14) (775.275)_{10} = (?)_2$$

512 256 128 64 32 16 8 4 2 1
 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
 1 1 0 0 0 0 1 1 1 1

$$(775)_{10} = 1100001111$$

$$\begin{aligned} 0.250 \times 2 &= 0.43 & 0 \\ 0.43 \times 2 &= 0.86 & 0 \\ 0.86 \times 2 &= 1.72 & 1 \\ 0.72 \times 2 &= 1.44 & 1 \\ 0.44 \times 2 &= 0.88 & 0 \\ 0.88 \times 2 &= 1.76 & 1 \\ 0.76 \times 2 &= 1.52 & 1 \end{aligned}$$

$$(775.275)_{10} = (1100001111.0011011)_2$$

$$(15) (494.949)_{10} = (?)_2$$

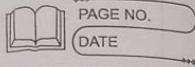
$$494 =$$

256 128 64 32 16 8 4 2 1
 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
 1 1 1 0 1 1 1 1 0

$$\begin{aligned} 0.949 \times 2 &= 1.898 & 1 \\ 0.898 \times 2 &= 1.796 & 1 \\ 0.796 \times 2 &= 1.592 & 1 \\ 0.592 \times 2 &= 1.184 & 1 \\ 0.184 \times 2 &= 0.368 & 0 \\ 0.368 \times 2 &= 0.736 & 0 \\ 0.736 \times 2 &= 1.472 & 1 \end{aligned}$$

$$\begin{aligned} (494.949)_{10} &= (111001.11101110)_2 \end{aligned}$$

L.S.A in two Row line end to Right down to
up is Ans....



* Decimal to Octal
(10 Base) (Base 8)
(0 to 9)

$$(89)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 89 \\ 8 | 11 \end{array} \quad \begin{array}{r} 8 | 89 \\ 8 | 80 \\ 8 | 09 \end{array} \quad \begin{array}{r} 8 | 72 \\ 8 | 56 \\ 8 | 03 \end{array}$$

$$(89)_{10} = (131)_8$$

$$(129)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 129 \\ 8 | 16 \end{array} \quad \begin{array}{r} 8 | 129 \\ 8 | 11 \\ 8 | 1 \end{array} \quad \begin{array}{r} 8 | 129 \\ 8 | 11 \\ 8 | 1 \end{array}$$

$$(129)_{10} = (201)_8$$

$$(494)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 494 \\ 8 | 62 \end{array} \quad \begin{array}{r} 8 | 494 \\ 8 | 62 \\ 8 | 7 \end{array}$$

$$(494)_{10} = (756)_8$$

$$(686)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 686 \\ 8 | 85 \\ 8 | 10 \end{array} \quad \begin{array}{r} 8 | 686 \\ 8 | 85 \\ 8 | 64 \\ 8 | 5 \end{array}$$

$$\begin{array}{r} 8 | 85 \\ 8 | 64 \\ 8 | 46 \\ 8 | 4 \end{array} \quad \begin{array}{r} 8 | 85 \\ 8 | 64 \\ 8 | 46 \\ 8 | 06 \end{array}$$

$$(686)_{10} = (1256)_8$$

$$(343)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 343 \\ 8 | 42 \\ 8 | 5 \end{array} \quad \begin{array}{r} 8 | 343 \\ 8 | 42 \\ 8 | 5 \\ 8 | 2 \end{array}$$

$$\begin{array}{r} 8 | 42 \\ 8 | 52 \\ 8 | 25 \\ 8 | 25 \\ 8 | 07 \end{array}$$

$$(343)_{10} = (527)_8$$

$$(1024)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 1024 \\ 8 | 128 \\ 8 | 16 \\ 8 | 2 \end{array} \quad \begin{array}{r} 8 | 1024 \\ 8 | 128 \\ 8 | 16 \\ 8 | 00 \end{array}$$

$$\begin{array}{r} 16 | 1024 \\ 16 | 128 \\ 16 | 48 \\ 16 | 48 \\ 16 | 00 \end{array} \quad \begin{array}{r} 16 | 1024 \\ 16 | 128 \\ 16 | 48 \\ 16 | 00 \\ 16 | 00 \end{array}$$

$$(1024)_{10} = (2000)_8$$

$$(7) (666)_{10} = (?)_8$$

$$\begin{array}{r} 666 \\ \hline 8 | 83 \\ 8 | 80 \quad 2 \\ 8 | 10 \quad 3 \\ \hline 1 \quad 2 \end{array}$$

$$(666)_{10} = (1232)_8$$

$$(8) (740)_{10} = (?)_8$$

$$\begin{array}{r} 740 \\ \hline 8 | 24 \\ 8 | 12 \quad 4 \\ 8 | 11 \quad 4 \\ \hline 1 \quad 3 \end{array}$$

$$(740)_{10} = (1344)_8$$

(9)

$$\begin{array}{r} 92 \\ 740 \\ \hline 72 \\ 020 \\ 16 \\ - 8 \\ \hline 04 \end{array} \quad \begin{array}{r} 72 \\ 92 \\ \hline 80 \\ 12 \\ \hline 03 \end{array} \quad \begin{array}{r} 1 \\ 8 \\ \hline 03 \end{array}$$

$$\begin{array}{r} 63 \quad 70 \\ 8 | 665 \quad 8 | 83 \\ 64 \quad 80 \\ \hline 026 \quad 03 \\ 24 \\ \hline 02 \end{array}$$

(9)

$$(0.16)_{10} = (?)_8$$

$$\begin{array}{ll} 0.16 \times 8 = 1.28 & 1 \\ 0.28 \times 8 = 2.24 & 2 \\ 0.24 \times 8 = 1.92 & 1 \\ 0.92 \times 8 = 7.36 & 7 \\ 0.36 \times 8 = 2.88 & 2 \\ 0.88 \times 8 = 7.04 & 7 \\ 0.40 \times 8 = 0.32 & 0 \end{array}$$

$$(0.16)_{10} = (0.1217270)_8$$

$$(10) (7.16)_{10} = (?)_8$$

(7) (only use if 8 is small)

$$0.16 = (0.1217270)_8$$

$$(7.16) = (7.1217270)_8$$

$$(11) (9.63)_{10} = (?)_8$$

$$\begin{array}{r} 9 \\ 71 \\ \hline 71 \\ 1 \end{array} \quad \begin{array}{r} 1 \\ 8 \\ \hline 2 \end{array}$$

$$0.63 \times 8 = 5.04$$

$$0.03 \times 8 = 0.24$$

$$0.24 \times 8 = 1.92$$

$$0.56 \times 8 = 4.48$$

$$0.48 \times 8 = 3.84$$

$$\begin{array}{r} 1 \\ 8 \\ \hline 2 \end{array}$$

$$0.84 \times 8 = 6.72$$

$$0.72 \times 8 = 5.76$$

$$0.56 \times 8 = 4.48$$

$$0.48 \times 8 = 3.84$$

$$(9.63)_{10} = (11.5024365)_8$$

$$(12) (23.66)_{10} = (?)_8$$

$$\begin{array}{r} 8 | 23 \\ -8 \quad | 7 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 8 | 27 \\ -8 \quad | 16 \\ \hline 03 \end{array}$$

$$\begin{array}{r} 2 \\ 8 | 23 \\ -16 \quad | 7 \\ \hline 07 \end{array}$$

$$0.66 \times 2 = 1.32$$

$$0.38 \times 2 = 0.64$$

$$-0.64 \times 2 = 1.28$$

$$0.28 \times 2 = 0.56$$

$$0.56 \times 2 = 1.12$$

$$0.12 \times 2 = 0.24$$

$$0.24 \times 2 = 0.48$$

$$= (27.52772702436560)_8$$

$$0.66 \times 8 = 5.28 \quad 5$$

$$0.28 \times 8 = 2.24 \quad 2$$

$$0.24 \times 8 = 1.92 \quad 1$$

$$0.92 \times 8 = 7.36 \quad 7$$

$$0.36 \times 8 = 2.88 \quad 2$$

$$0.88 \times 8 = 7.04 \quad 7$$

$$0.04 \times 8 = 0.32 \quad 0$$

Decimal to Hexadecimal:-

Ans:

$$(100)_{10} = (?)_{16}$$

$$\begin{array}{r} 16 | 100 \\ -96 \quad | 4 \\ \hline 16 \end{array} = (64)_{16}$$

$$\begin{array}{r} 16 | 100 \\ -96 \quad | 4 \\ \hline 16 \end{array} = (64)_{16}$$

$$(100)_{10} = (64)_{16}$$

$$(2) (188)_{10} = (?)_{16}$$

$$\begin{array}{r} 16 | 188 \\ -16 \quad | 28 \\ -16 \quad | 12 \\ \hline 12 \end{array}$$

$$\begin{array}{r} 16 | 188 \\ -16 \quad | 28 \\ -16 \quad | 12 \\ \hline 12 \end{array}$$

Hexa

0-9

10-A 13-D

11-B 14-E

12-C 15-F

$$(188)_{10} = (1112)_{16} \quad \therefore (188)_{10} = (BC)_{16}$$

$$(3) (590)_{10} = (?)_{16}$$

$$\begin{array}{r} 16 | 590 \\ -16 \quad | 35 \\ -16 \quad | 14 \\ -16 \quad | 2 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 16 | 590 \\ -16 \quad | 35 \\ -16 \quad | 14 \\ -16 \quad | 2 \\ \hline 4 \end{array}$$

$$(590)_{10} = (24E)_{16}$$

$$(4) (921)_{10} = (?)_{16}$$

$$\begin{array}{r|rr} 16 & 921 \\ \hline 16 & 57 & 9 \\ \hline & 3 & 9 \end{array}$$

$$\begin{array}{r|rr} 16 & 57 & 3 \\ \hline 16 & 80 & \\ \hline & 12 & 16 \\ \hline & 112 & 48 \\ \hline & 009 & 09 \end{array}$$

$$(5) (256)_{10} = (?)_{16}$$

$$\begin{array}{r|rr} 16 & 256 \\ \hline 16 & 16 & 0 \\ \hline & 1 & 0 \end{array}$$

$$\therefore (256)_{10} = (100)_{16}$$

$$(6) (1128)_{10} = (?)_{16}$$

$$\begin{array}{r|rr} 16 & 1128 \\ \hline 16 & 70 & 8 \\ \hline & 4 & 6 \end{array}$$

$$(1128)_{10} = (468)_{16}$$

$$\begin{array}{r|rr} 16 & 1128 \\ \hline 16 & 112 & \\ \hline & 0008 & \end{array}$$

$$(7) (10.16)_{10} = (?)_{16}$$

10 (converter is not ~~int~~ big 16)

$$= (10)_{10} = A$$

$$\begin{array}{r|l} 0.16 \times 16 = 2.56 & 2 \\ 0.56 \times 16 = 8.96 & 8 \\ 0.96 \times 16 = 15.36 & F \\ 0.36 \times 16 = 5.76 & 5 \\ 0.76 \times 16 = 12.16 & I \end{array}$$

∴

$$(28F5C)_{16}$$

$$(10.16)_{10} = (A.28F5C)_{16}$$

$$(8) (0.325)_{10} = (?)_{16}$$

= 0

$$\begin{array}{r|l} 0.325 \times 16 = 5.2 & 5 \\ 0.2 \times 16 = 3.2 & 3 \end{array}$$

$$0.533333$$

$$(0.325)_{10} = (0.53333)_{16}$$

$$(9) (0.00390625)_{10} = (9)_{16}$$

$$0 = (0)$$

$$0.00390625 \times 16 = 0.0625$$

$$0.0625 \times 16 = 1$$

$$= 0.01$$

$$(0.00390625)_{10} = (0.01)_{16}$$

3. Octal Base-8 & '0-7

1. Octal to Binary

0 0 0 - 0

0 0 1 - 1

0 1 0 - 2

0 1 1 - 3

1 0 0 - 4

1 0 1 - 5

1 1 0 - 6

1 1 1 - 7

table is compulsory in exam

$$(1) (123)_8 = (?)_2$$

→ Here

1 - 001

2 - 010

3 - 011

$$\therefore (123)_8 = (001010011)_2$$

$$(2) (745)_8 = (?)_2$$

→ Here

7 - 111

4 - 100

5 - 101

$$\therefore (745)_8 = (111100101)_2$$

(3) $(17635)_8 = (11)_2$

1 - 001

1 - 001

6 - 110

3 - 011

5 - 101

1 - 001

1 - 001

$$(17635)_8 = (001001110011101)_2$$

(4) $(554)_8 = (11)_2$

5 - 101

5 - 101

4 - 100

$$\boxed{(554)_8 = (101101100)_2}$$

(5) $(1247)_8 = (11)_2$

1 - 001

2 - 010

4 - 100

7 - 111

$$\boxed{(1247)_8 = (001010100111)_2}$$

(6) $(352.563)_8 = (11)_2$

3 - 011

5 - 101

2 - 010

5 - 101

6 - 110

3 - 011

$$\therefore (352.563)_8 = (0111010010.101110011)_2$$

(7) $(1022.0146)_8 = (11)_2$

1 - 001

0 - 000

2 - 010

2 - 010

0 - 000

1 - 001

4 - 100

6 - 110

$$\therefore (1022.0146)_8 = (00100010010.00000011001110)_2$$

(8) $(44.25)_8 = (11)_2$

4 - 100

4 - 100

1 - 001

5 - 101

$$\therefore (44.25)_8 = (100100.001101)_2$$



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$$(1) (56662.1346)_8 = (1)_2$$

1 - 001
3 - 011
4 - 100
6 - 110

5 - 101
6 - 110
6 - 110
6 - 110
2 - 010

$$(56662.1346)_8 = (1011001010010.00101100110)_2$$

$$(2) (4321.1234)_8 = (1)_2$$

1 - 001
2 - 010
3 - 011
4 - 100

4 - 100
3 - 011
2 - 010
1 - 001

$$(4321.1234)_8 = (100011010001.00010011100)_2$$

$$(3) (2276.7621)_8 = (1)_2$$

7 - 111
6 - 110
2 - 010
1 - 001

7 - 111
6 - 110
7 - 111
6 - 110

$$(2276.7621)_8 = (00101011110.111100001)_2$$

2. Octal to Decimal

$$(1) (275)_8 = (1)_10$$

$$\begin{array}{r} 2 \quad 7 \quad 5 \\ 2 \quad 7 \quad 5 \\ = (2 \times 8^2) + (7 \times 8^1) + (5 \times 8^0) \\ = (2 \times 64) + (56) + (5) \\ = 128 + 56 + 5 \\ = (189)_{10} \end{array}$$

$$(275)_8 = (189)_{10}$$

$$(2) (512)_8 = (1)_10$$

$$\begin{array}{r} 5 \quad 1 \quad 2 \\ 5 \quad 1 \quad 2 \\ = (5 \times 8^2) + (1 \times 8^1) + (2 \times 8^0) \\ = (5 \times 64) + (8) + (2) \\ = 320 + 8 + 2 \\ = (330)_{10} \end{array}$$

$$(512)_8 = (330)_{10}$$

$$(3) (721)_8 = (1)_10$$

$$\begin{array}{r} 7 \quad 2 \quad 1 \\ 7 \quad 2 \quad 1 \\ = (7 \times 8^2) + (2 \times 8^1) + (1 \times 8^0) \\ = (7 \times 64) + (16) + (1) \\ = 448 + 16 + 1 \\ = (465)_{10} \end{array}$$

$$(721)_8 = (465)_{10}$$



$$(4) (555)_8 = (1)_{10}$$

$$\begin{array}{r} 2 \\ 5 \quad 5^2 \quad 5^0 \\ = (5 \times 8^2) + (5 \times 8^1) + (5 \times 8^0) \\ = (5 \times 64) + (5 \times 8) + (5) \end{array}$$

$$= 320 + 40 + 5$$

$$= 365$$

$$(555)_8 = (365)_{10}$$

$$(5) (3250)_8 = (1)_{10}$$

$$\begin{array}{r} 3 \quad 2 \quad 1^2 \quad 0 \\ 2 \quad 5^0 \end{array}$$

$$\begin{aligned} &= (3 \times 8^3) + (2 \times 8^2) + (5 \times 8^1) + (0 \times 8^0) \\ &= (3 \times 512) + (2 \times 64) + (5 \times 8) + (0) \\ &= (1536) + (128) + (40) \\ &= (1704)_{10} \end{aligned}$$

$$(3250)_8 = (1704)_{10}$$

$$(6) (45236)_8 = (1)_{10}$$

$$\begin{array}{r} 4 \quad 3 \quad 2 \quad 1^2 \quad 0 \\ 4 \quad 5 \quad 2 \quad 3 \quad 6 \end{array}$$

$$\begin{aligned} &= (4 \times 8^4) + (5 \times 8^3) + (2 \times 8^2) + (3 \times 8^1) + (6 \times 8^0) \\ &= (4 \times 4096) + (5 \times 512) + (2 \times 64) + (3 \times 8) + (6) \\ &= 16384 + 2560 + 128 + 24 + 6 \\ &= (19102)_{10} \end{aligned}$$

$$(45236)_8 = (19102)_{10}$$

point

$$(7) (12.52)_8 = (1)_{10}$$

$$\begin{aligned} &= (1 \times 8^1) + (2 \times 8^0) \\ &= 8 + 2 \\ &= (10) \end{aligned}$$

$$\begin{aligned} 0.52 &= (5 \times 8^{-1}) + (2 \times 8^{-2}) \\ &= (5 \times \frac{1}{8}) + (2 \times \frac{1}{64}) \end{aligned}$$

$$= \frac{5}{8} + \frac{1}{32}$$

$$\begin{aligned} &= 0.625 + 0.03125 \\ &= (0.65625)_{10} \end{aligned}$$

$$(12.52)_8 = (10.65625)_{10}$$

$$(8) (65.45)_8 = (1)_{10}$$

$$\begin{array}{r} 6 \quad 5^0 \\ 4 \quad 5^2 \end{array}$$

$$= (6 \times 8^1) + (5 \times 8^0)$$

$$= 48 + 5$$

$$= (53)_{10}$$

$$0.45^2 = (4 \times 8^{-1}) + (5 \times 8^{-2})$$

$$= (\frac{4}{8} + \frac{5}{64})$$

$$= (\frac{1}{2} + \frac{5}{64})$$

$$= 0.5 + 0.078125$$

$$= (0.578125)_{10}$$

$$\therefore (65.45)_8 = (53.578125)_{10}$$



$$(9) \quad (417.523)_8 = (9)_10$$

$$\begin{aligned} 417 &= (4 \times 8^2) + (1 \times 8^1) + (7 \times 8^0) \\ &= (4 \times 64) + (8) + (7) \\ &= 256 + 8 + 7 \end{aligned}$$

$$\begin{aligned} 0.523 &= (5 \times 8^{-1}) + (2 \times 8^{-2}) + (3 \times 8^{-3}) \\ &= (\frac{5}{8}) + (\frac{2}{64}) + (\frac{3}{512}) \end{aligned}$$

$$\begin{aligned} &= 0.625 + 0.03125 + 0.005859 \\ &= 0.66310 \end{aligned}$$

$$(417.523)_8 = (277.66310)_10$$

$$(10) \quad (1234.567)_8 = (9)_10$$

$$\begin{aligned} 1234 &= (1 \times 8^3) + (2 \times 8^2) + (3 \times 8^1) + (4 \times 8^0) \\ &= 1 \times 512 + 2 \times 64 + 3 \times 8 + 4 \end{aligned}$$

$$= 512 + 128 + 24 + 4$$

$$= (668)_10$$

$$0.567 = (5 \times 8^{-1}) + (6 \times 8^{-2}) + (7 \times 8^{-3})$$

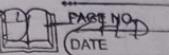
$$= (\cancel{5} \times \cancel{8}) \frac{5}{8} + \frac{6}{64} + \frac{7}{512}$$

$$= 0.625 + 0.09375 + 0.072367$$

$$= (0.7324)_10$$

$$(1234.567)_8 = (668.7324)_10$$

Octal \rightarrow Hexa



(3) Octal to Hexadecimal

$$(11) \quad (52)_8 = (?)_{16}$$

Octal no	Hexa
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

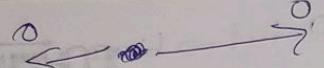
$$5 \rightarrow 102$$

$$2 \rightarrow 010$$

$$\overbrace{\underline{101010}}_2 \xrightarrow{\text{b4}} 1110$$

$$\therefore (2A)_{16}$$

$$(52)_8 = (2A)_{16}$$



Octal to hexa conversion:

(1) first convert octal to binary

(2) Then convert the binary into hex.

(3) Use tables for both.

$$(123)_8 = (?)_{16}$$

→ 1 - 001

2 - 010

3 - 011

= 000011010001

= $(053)_{16}$

$= (123)_8 = (53)_{16}$

$$(727)_{8} = (?)_{16}$$

7 = 111

2 = 010

1 = 001

= 000001010111 1000001

= $(7D7)_{16}$

$= (727)_8 = (7D7)_{16}$

$$(4) (3250)_8 = (?)_{16}$$

3 - 011

2 - 010

5 - 101

0 - 000

= 0110101000

= 6A8

$$(3250)_8 = (6A8)_{16}$$

$$(4) (7277.723)_{8} = (?)_{16}$$

7 - 111

2 - 010

7 - 111

7 - 111

1 - 001

2 - 010

3 - 011

7277 = 111010111111

= EBF

.723 = 001010010000

= 298

$$(7277.723)_8 = (EBF.298)_{16}$$

(5) $(572.45)_8 = (?)_{16}$

$$\begin{array}{r}
 5 - 101 \\
 1 - 001 \\
 2 - 010 \\
 \hline
 = 001001010
 \end{array}$$

$$= 14A.94$$

(6) $(222.23)_8 = (?)_{16}$

$$\begin{array}{r}
 1 - 001 \\
 2 - 010 \\
 2 - 010 \\
 1 - 001 \\
 3 - 011 \\
 \hline
 = 0001010010001011
 \end{array}$$

$$= 148B$$

(7) $(52.40)_8 = (?)_{16}$

$$\begin{array}{r}
 5 - 101 \\
 2 - 010 \\
 \hline
 = 001010
 \end{array}$$

$$= 100000000$$

$$= 2A.8$$

$$\therefore (52.40)_8 = (2A.8)_{16}$$

(8) $(477.432)_8 = (?)_{16}$

$$\begin{array}{r}
 4 - 100 \\
 7 - 111 \\
 7 - 111 \\
 \hline
 = 10011111
 \end{array}$$

$$= 23F.8D$$

(9) $(235.64)_8 = (?)_{16}$

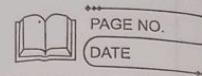
$$\begin{array}{r}
 2 - 010 \\
 3 - 011 \\
 5 - 101 \\
 \hline
 = 01001101
 \end{array}$$

$$= 11010000$$

$$= 9D.D$$

$$\therefore (235.64)_8 = (9D.D)_{16}$$

~~Ring~~



* Hexadecimal

→ Range :- 0-9, A-F

→ Base :- 0-16

→ Biggest numbers system...

(1) Hexadecimal to Binary

Hexa	Binary	Hexa	Binary
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111
8			
9			
A			
B			
C			
D			
E			
F			

$$(5678)_{16} = (?)_2$$

5 - 0101

6 - 0110

7 - 0111

8 - 1000

$$\therefore (5678)_{16} = (0101011001111000)_2$$

$$(8735)_{16} = (?)_2$$

8 - 1000

7 - 0111

3 - 0011

5 - 0101

$$\therefore (8735)_{16} = (1000011100110101)_2$$

$$(E9A)_{16} = (?)_2$$

E - 1110

9 - 1001

A - 1010

$$\therefore (E9A)_{16} = (111010011010)_2$$

$$(FABD)_{16} = (?)_2$$

F - 1111

A - 1010

B - 1011

D - 1101

$$\therefore (FABD)_{16} = (111110101011101)_2$$

Point

$$(5) (C3462.456)_{16} = (1)_2$$

3 - 0011
4 - 0100
6 - 0110
2 - 0010

4 - 0100
5 - 0101
6 - 0110

$$\therefore (3462.456)_{16} = (0011010001100010_2 \\ 010001010110)_2$$

$$(6) (64189.18999F)_{16} = (1)_2$$

6 - 0110
4 - 0100
1 - 0001
8 - 1000
9 - 1001

$$(F - 1111)_2 = (100001)_2$$

$$\therefore (64189.18999F)_{16} = (01001000000110001001_2 \\ 000110001001100110011001)_2$$

$$(7) (12F569D.AF)_{16} = (1)_2$$

1 - 0001
2 - 0010
F - 1111
5 - 0101
9 - 1001
D - 1101

$$(12F569D.AF)_{16} = (0001001011101011001110_2 \\ 1010111)_2$$

(8)

$$(C56DE179.FEC72)_{16} = (1)_2$$

E - 0101
F - 1111
G - 0110
D - 1101
E - 1110
I - 0001
J - 0011

$$(C56DE179.FEC72)_{16} = (01010110110111000010111001_2 \\ 1111110110000010010)_2$$

(9)

$$(2B65.4896D)_{16} = (1)_2$$

2 - 0010
B - 1011
6 - 0110
5 - 0101

$$(2B65.4896D)_{16} = (00101010100101_2 \\ 01001000100101101)_2$$

(10)

$$(378BEFD.ABCD)_{16} = (1)_2$$

3 - 0011
7 - 0111
8 - 1000
B - 1011
E - 1110
F - 1111
D - 1101

$$(378BEFD.ABCD)_{16} = (00110111000101111101111_2 \\ 10101010111001101)_2$$

(1) $(ABCDEF.89.897)^{33} = (9)_2$

A - 100
B - 101
C - 1100
D - 1101
E - 1111
F - 0111
3 - 0011
3 - 0011

$$\therefore = (101010111001101111)_2$$

~~10001001100010010111001101~~

• Hexadecimal to Decimal

(2) $(768)_{16} = (3)_10$

$$\begin{array}{r} 76 \\ | \quad | \\ 7 \quad 6 \\ \times \quad \times \\ \hline 76 \end{array}$$

$$\begin{array}{r} 76 \\ | \quad | \\ 7 \quad 8 \\ \times \quad \times \\ \hline 76 \end{array}$$

$$\begin{array}{r} 76 \\ | \quad | \\ 7 \quad 8 \\ \times \quad \times \\ \hline 008 \end{array}$$

$$1^2 6^2 8^0 = (2 \times 16^2) + (6 \times 16^1) + (8 \times 16^0)$$

$$= (2560 + 96 + 8)$$

$$= 360$$

$$(768)_{16} = (360)_{10}$$

(4) $(\text{F02F})_{16}$
(5) $(4567.8651)_{16}$

(2) $(1F.018)_{16} = (1)_{10}$

$$\therefore 1^0 F^1 = (1 \times 16^1) + (F \times 16^0)$$

$$= 16 + 15$$

$$= (31)$$

$$\therefore 018^{\frac{1}{16}} = (0 \times 16^1) + (1 \times 16^0) + (1 \times 16^{-1})$$

$$= 0 + 1 + \frac{1}{16} = \frac{1}{16} = 0.0625$$

$$= (0.00415625)_{10}$$

$$\therefore (1F.018)_{16} = (31.00415625)_{10}$$

$$\therefore (1F.018)_{16} = (0.006592)_{10}$$

(3) $(6784.899)_{16} = (1)_{10}$

$$6^3 7^2 8^1 4^0 = (6 \times 16^3) + (7 \times 16^2) + (8 \times 16^1) + (4 \times 16^0)$$

$$= 6 \times 4096 + 7 \times 256 + 8 \times 16 + 4$$

$$= 24576 + 1792 + 128 + 4$$

$$= (26500)_{10}$$

$$\therefore 899^{\frac{1}{16}} = (8 \times 16^1) + (9 \times 16^0) + (9 \times 16^{-1})$$

$$= \frac{8}{16} + \frac{9}{256} + \frac{9}{4096}$$

$$= 0.5 + 0.035 + 0.0021$$

$$= (0.5371)_{10}$$

$$= (26500.5371)_{10}$$

$$(4) \quad (112F)_{16} = (9)_{10}$$

$$\begin{aligned}
 3210_{10} &= (2 \times 16^3) + (13 \times 16^2) + (2 \times 16^1) + (15 \times 16^0) \\
 &= 4096 + (13 \times 256) + (2 \times 16) + 15 \\
 &= 4096 + 3328 + 32 + 15 \\
 &= 7472_{10}
 \end{aligned}$$

$$(102F)_{16} = (7472)_{10}$$

$$(5) \quad (4567 : 8657)_{16} = (?)_{20}$$

$$\begin{array}{r} \cancel{67} \cdot \cancel{66} \cancel{57} \quad 26 \quad 20 \\ \hline 4 \quad 5 \quad 6 \quad 7 \quad . \quad 8 \quad 6 \quad 52 \end{array}$$

$$= (4 \times 26^3) + (4 \times 26^2) + (6 \times 26^1) + (4 \times 26^0)$$

$$= (4 \times 4096) + (5 \times 256) + (6 \times 16) + (7)$$

$$= 16384 + 1280 + 96 + 7$$

$$= (17767)_{10}$$

$$= (8 \times 26) + (6 \times 26) + (5 \times 26) + (7 \times 26)$$

$$= \frac{85}{16} + \frac{6}{256} + \frac{5}{4096} + \frac{1}{65536}$$

$$= 0.5 + 0.023 + 0.00122 + 0.000015$$

$$= (0.5242)$$

$$[4567.8651]_{75} = [17767.5242]_{70}$$



• HexaDecimal to Octal :-

Hexa → Binary = Octal,

Hexa			Octal	
0000	P	0	000	0
0001	Q	1	001	1
0010	R	2	010	2
0011	S	3	011	3
0100	T	4	100	4
0101	U	5	101	5
0110	V	6	110	6
0111	W	7	111	7
1000	X	8		
1001	Y	9		
1010	Z	A		
1011		B		
1100		C		
1101		D		
1110		E		
1111		F		

$$(1) \quad (AB093)_{16} = (?)$$

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B - 10U

O - Doooo

9-100

3-80

1

• 100

— []

100

— 1 —

$$(2) (C921FD)_{16} = (?)_8$$

9 - 100
2 - 0010
1 - 0001
F - 1111
D - 1101

$$\begin{aligned} & (000010001111101) = (0000100010001111101)_2 \\ & (000010001111101)_2 = (1111101)_2 \\ & = (2220775)_8 \end{aligned}$$

$$(3) (123FA.FD)_{26} = (?)_8$$

1 - 0001
2 - 0010
3 - 0011
F - 1111
A - 1010

$$\begin{aligned} & (00000100010001111101)_2 \\ & = (0221772.772)_8 \end{aligned}$$

Example for practice (mix conversion)

$$(1) (121.063)_8 = (?)_{16}$$

$$= (52.198)_{16}$$

$$(2) (10111001.101)_2 = (?)_{10}$$

$$= (185.625)_{10}$$

$$(3) (EBCD.198)_{16} = (?)_8$$

$$= (165725.063)_8$$

$$(4) (16897.05027)_0 = (?)_2$$

$$=$$

$$(5) (34712.163)_8 = (?)_{16}$$

$$=$$

$$(6) (26248.C1C)_{16} = (?)_2$$

$$=$$

$$(7) (10111001000.1010)_2 = (?)_8$$

$$=$$

$$(8) (49870.8199)_8 = (?)_{16}$$

$$=$$

$$(9) (CDC132.BD)_{16} = (?)_2$$

$$=$$

$$(10) (744325.1624)_8 = (?)_{16}$$

$$=$$

$$(11) (1111010111000.0010)_2 = (?)_8$$

$$=$$

$$(12) (24302.7567)_{10} = (?)_8$$

$$=$$

$$(13) (AB987DC.D29)_{16} = (?)_8$$

$$=$$

$$(14) (22.314)_{16} = (?)_{16}$$

$$=$$

$$(15) (1100110011001100.0011001)_2 = (?)_8$$

$$=$$

$$\begin{array}{r} 332 \\ 8 \overline{) 24302} \\ 24 \\ \hline 30 \\ 24 \overline{) 06} \\ 06 \end{array}$$

$$\begin{array}{r} 41 \\ 8 \overline{) 332} \\ 32 \\ \hline 0 \times 2^0 \\ 8 \\ \hline 4 \end{array}$$

$$\begin{aligned} & (100001000000001.0000110010110011111)_2 \\ & = (39CA.398)_{16} \\ & = (10011000100100100011000001111)_2 \\ & = (2712.5)_8 \\ & = (24932.D1E4F76SF18A1DA89FSSA)_{25} \\ & = (1101100000100110001.1011101)_2 \\ & = (248021.1298828125)_{10} \\ & = (1EB8.2)_{16} \\ & = (57356.60331427261610313123)_{8} \\ & = (1256303734.6451)_8 \\ & = (336.50624112F1A9FB768B)_{15} \quad (1D2.66) \\ & = (146314.144) \end{aligned}$$