

Octal	Decimal Equivalent
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Octal Number System → In the octal number system, the base is 8. Hence there are only eight symbols or digits: 0, 1, 2, 3, 4, 5, 6, 7.

Ex- The number 3105 can be written as 3105_8 . Its decimal equivalent is:

$$(3 \times 8^3) + (1 \times 8^2) + (0 \times 8^1) + (5 \times 8^0)$$

$$= 1536 + 64 + 0 + 5$$

$$= 1605$$

$$= 3105_8 = 1605_{10}$$

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

Ex- The number 2BE can be written as $2BE_{16}$. Its decimal equivalent can be written as:

$$(2 \times 16^2) + (B \times 16^1) + (E \times 16^0)$$

$$= (2 \times 16^2) + (11 \times 16^1) + (14 \times 16^0)$$

$$= 512 + 176 + 14 = 702$$

$$\text{Hence, } 2BE_{16} = 702_{10}$$

FRACTIONAL NUMBERS →

In decimal number system:-

$$0.235 = (2 \times 10^{-1}) + (3 \times 10^{-2}) + (5 \times 10^{-3})$$

$$\text{and } 68.53 = (6 \times 10^1) + (8 \times 10^0) + (5 \times 10^{-1}) + (3 \times 10^{-2})$$

Similarly in Binary number system:-

$$0.101 = (1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3})$$

$$\text{and } 10.01 = (1 \times 2^1) + (0 \times 2^0) + (0 \times 2^{-1}) + (1 \times 2^{-2})$$

$$\text{Ex 1) } 110.101_2 = P_{10}$$

$$\begin{aligned} 110.101_2 &= (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) + (1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) \\ &= 4 + 2 + 0 + 0.5 + 0 + 0.125 \\ &= 6 + 0.5 + 0.125 = 6.625_{10} \end{aligned}$$

$$\text{Ex 2) } 127.54_8 = P_{10}$$

$$\begin{aligned} 127.54_8 &= (1 \times 8^2) + (2 \times 8^1) + (7 \times 8^0) + (5 \times 8^{-1}) + (4 \times 8^{-2}) \\ &= 64 + 16 + 7 + (5/8) + (4/64) \\ &= 87 + 0.625 + 0.0625 \\ &= 87.6875_{10} \end{aligned}$$

$$\text{Ex 3) } 2B.C4_{16} = P_{10}$$

$$\begin{aligned} 2B.C4_{16} &= (2 \times 16^1) + (B \times 16^0) + (C \times 16^{-1}) + (4 \times 16^{-2}) \\ &= 32 + B + (C/16) + (4/256) \\ &= 32 + 11 + (12/16) + (4/256) \\ &= 43 + 0.75 + 0.015625 \\ &= 43.765625_{10} \end{aligned}$$

$$\text{Ex 4) } 1011.101_2 = P_{10}$$

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