Conversion with decimal points:

* Any number with decimal point has two parts: Integral Part, fractional part

$e = 2.718$

Integral Part — fractional part

$d = (d_n \cdots d_3 d_2 d_1 d_0 \cdot d_{-1} d_{-2} d_{-3} \cdots d_{-n})$

Integral Part — Floating Point — fractional part

Decimal to other Base System

* Integral Part can be Converted using Repeated division Method in Decimal to other Base System

* fractional Part Can be Converted Using fraction Product Algorithm

Ex $(37.625)_{10} \longrightarrow (x)_2$

Repeated Division Method

Multiplication Method

$(37.625)_{10} \rightarrow (x)_2$

Division	Quotient	Remainder
37/2	18	1
18/2	9	0
9/2	4	1
4/2	2	0
2/2	1	0
1/2	q=0	1

Integral Part = $(100101)_2$

$(0.625)_{10} \rightarrow (x)_2$

fractional number × radix = Number

Integral → Store

fractional Part → Repeat until fraction part = 0

fractional × radix = Number	Integral	Store
0.625 × 2 = 1.25	1	1
0.25 × 2 = 0.50	0	0
0.50 × 2 = 1.00	1	1

fractional Part = 0

$(0.625)_2 \rightarrow (101)$

then, $(37.625)_{10} \rightarrow (100101.101)_2$

Ex $(78.025)_{10} \longrightarrow (x)_{16}$ Dec → Hex

Integral Part = 78, fractional part = 0.025

Solving integral Part

	Q	R
78/16	4	14 ⇒ E
4/16	q = 0	4

$(78)_{10} \longrightarrow (4E)_{16}$

Solving fractional Part

	Stone
0.025 × 16 = 0.40	0
0.40 × 16 = 6.40	6
0.40 × 16 = 6.40	6
0.40 × 16	6
	6

$(0.025)_{10} \longrightarrow (0666\ldots)$

$(78.025)_{10} = (4E.0\overline{66})_{16}$

Other Base System to decimal : → [Same] ← Weightage Sum of Product

↳ But after floating point, the weightage become negative

Integral | Fraction

$$d = (d_n \cdots d_3\ d_2\ d_1\ d_0 . d_{-1}\ d_{-2}\ d_{-3} \cdots d_{-n})_r$$

$$d_{10} = (d_n r^n + \cdots + d_3 r^3 + d_2 r^2 + d_1 r^1 + d_0 r^0 . d_{-1} r^{-1} + d_{-2} r^{-2} + d_{-3} r^{-3} \cdots d_{-n} r^{-n})$$

floating point

Ex $(0110110.1010)_2 \rightarrow (x)_{10}$

fractional — integral

$0\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0 \;.\; 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3} + 0\times2^{-4}$

$2^5 + 2^4 + 2^2 + 2^1 + 2^{-1} + 2^{-3}$

$\Rightarrow 32 + 16 + 4 + 2 + \frac{1}{2} + \frac{1}{8}$

$\Rightarrow 32 + 16 + 4 + 2 + 0.5 + 0.125$

$= 54 + 0.625$

$\Rightarrow (54.625)_{10}$

Ex $(7632.15)_8 \longrightarrow (x)_{10}$

$7\times8^3 + 6\times8^2 + 3\times8^1 + 2\times8^0 + 1\times8^{-1} + 5\times8^{-2}$

$7\times512 + 6\times64 + 3\times8 + 2 + \frac{1}{8} + \frac{5}{8^2}$ $\qquad \frac{1}{8} = \frac{1}{2^3}$

$\Rightarrow 3584 + 384 + 26 + 0.125 + 0.078125$

$\Rightarrow 3994 + 0.125 + 0.078125$

$\Rightarrow 3994 + 0.90625$

$\Rightarrow (3994.90625)_{10}$

Ex $(DC4F.1f)_{16} \rightarrow (x)_{10}$ {Hex → Decimal}

$D \times 16^3 + C \times 16^2 + 4 \times 16^1 + f \times 16^0 + 1 \times 16^{-1} + 6 \times 16^{-2}$

$= 13 \times 16^3 + 12 \times 16^2 + 64 + 15 + \frac{1}{16} + \frac{1}{16^2}$

$= 53248 + 3072 + 79 + 0.0625 + 0.00390625$

$= (56399.06640625)_{10}$