

## SOLVE THE PROBLEM - NUMBER SYSTEM 01

(a) Solve only 10 examples of decimal to binary containing minimum 2 fractional parts.

(1) 50.26

Remainder

(a)	2   50	0
	2   25	1
	2   12	0
	2   6	0
	2   3	1
	2   1	1

(b) 0.26

$$\begin{aligned}
 & \cdot 0.26 \times 2 = 0 + 0.52 \\
 & \cdot 0.52 \times 2 = 1 + 0.04 \\
 & \cdot 0.04 \times 2 = 0 + 0.08 \\
 & \cdot 0.08 \times 2 = 0 + 0.16 \\
 & \cdot 0.16 \times 2 = 0 + 0.32
 \end{aligned}$$

$$(50.26)_{10} = (110010.01000)_2$$

(b) 50.44

(a)

Remainder

2   50	0
2   25	1
2   12	0
2   6	0
2   3	1
2   1	1

(b) 0.44

$$\begin{aligned}
 & \cdot 0.44 \times 2 = 0 + 0.88 \\
 & \cdot 0.88 \times 2 = 1 + 0.76 \\
 & \cdot 0.76 \times 2 = 1 + 0.52 \\
 & \cdot 0.52 \times 2 = 1 + 0.04 \\
 & \cdot 0.04 \times 2 = 0 + 0.08
 \end{aligned}$$

$$(50.44)_{10} = (110010.01110)_2$$

(3) 52.48

Remainder

(a)	2	52	0
	2	26	0
	2	13	1
	2	6	0
	2	3	1
	2	1	1

$$(b) 0.48$$

$$\begin{aligned} 0.48 \times 2 &= 0 + 0.96 \\ 0.96 \times 2 &= 1 + 0.92 \\ 0.92 \times 2 &= 1 + 0.84 \\ 0.84 \times 2 &= 1 + 0.68 \\ 0.68 \times 2 &= 1 + 0.36 \end{aligned}$$

$$(52.48)_{10} = (110100.0111)_2$$

(4) 52.69

Remainder

(a)	2	52	0
	2	26	0
	2	13	1
	2	6	0
	2	3	1
	2	1	1

$$(b) 0.69$$

$$\begin{aligned} 0.69 \times 2 &= 1 + 0.38 \\ 0.38 \times 2 &= 0 + 0.76 \\ 0.76 \times 2 &= 1 + 0.52 \\ 0.52 \times 2 &= 1 + 0.04 \\ 0.04 \times 2 &= 0 + 0.08 \end{aligned}$$

$$(52.69) = (110100.10110)_2$$

(5) 53.98

Remainder

(a)	2	53	1
	2	26	0
	2	13	1
	2	6	0
	2	3	1
	2	1	1

$$(b) 0.98$$

$$\begin{aligned} 0.98 \times 2 &= 1 + 0.96 \\ 0.96 \times 2 &= 1 + 0.92 \\ 0.92 \times 2 &= 1 + 0.84 \\ 0.84 \times 2 &= 1 + 0.68 \end{aligned}$$

$$(53.98)_{10} = (110101.1111)_2$$

(6) 64.832

(a)

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

Remainders

(b) 0.832

$$\begin{aligned} & \cdot 0.832 \times 2 = 1 + 0.664 \\ & \cdot 0.664 \times 2 = 1 + 0.328 \\ & \cdot 0.328 \times 2 = 0 + 0.656 \\ & \cdot 0.656 \times 2 = 1 + 0.312 \\ & \cdot 0.312 \times 2 = 0 + 0.624 \\ & \cdot 0.624 \times 2 = 1 + 0.248 \end{aligned}$$

$$(64.832)_{10} = (1000000.110101)_2$$

(7) 75.49

(a)

2	75	1
2	37	1
2	18	0
2	9	1
2	4	0
2	2	0
2	1	1

Remainders

(b) 0.49

$$\begin{aligned} & \cdot 0.49 \times 2 = 0 + 0.98 \\ & \cdot 0.98 \times 2 = 1 + 0.96 \\ & \cdot 0.96 \times 2 = 1 + 0.92 \\ & \cdot 0.92 \times 2 = 1 + 0.84 \\ & \cdot 0.84 \times 2 = 1 + 0.68 \\ & \cdot 0.68 \times 2 = 1 + 0.36 \end{aligned}$$

$$(75.49)_{10} = (1001011.011111)_2$$

(8) 60.61

(a)

2	60	0
2	30	0
2	15	1
2	7	1
2	3	1
2	1	1

(b) 0.61

$$\begin{aligned} & \cdot 0.61 \times 2 = 1 + 0.22 \\ & \cdot 0.22 \times 2 = 0 + 0.44 \\ & \cdot 0.44 \times 2 = 0 + 0.88 \\ & \cdot 0.88 \times 2 = 1 + 0.76 \end{aligned}$$

$$(60.61)_{10} = (111100.1001)_2$$

(10) 88.62

Remainder

(a)	2	88	0
	2	44	0
	2	22	0
	2	11	1
	2	5	1
	2	2	0
	2	1	1

$$(b) 0.62$$

$$\cdot 0.62 \times 2 = 1 + 0.24$$

$$\cdot 0.24 \times 2 = 0 + 0.48$$

$$\cdot 0.48 \times 2 = 0 + 0.96$$

$$\cdot 0.96 \times 2 = 1 + 0.92$$

$$\cdot 0.92 \times 2 = 1 + 0.84$$

$$(88.62) = (1011000.1001)_2$$

(b) Solve any 10 examples of binary to decimal with 6 bit value & a six fraction value.

$$(a) 101011.1001$$

$$\begin{aligned}(101011.1001)_2 &= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 0 \times 2^4 + 1 \times 2^5 \\ &\quad + 1 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ &= 1 + 2 + 0 + 8 + 0 + 32 + \frac{1}{2} + 0 + 0 + \frac{1}{16}\end{aligned}$$

$$(101011.1001)_2 = (43.5625)_{10}$$

$$(b) 110010.0011$$

$$\begin{aligned}(110010.0011)_2 &= 0 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 1 \times 2^4 + 1 \times 2^5 \\ &\quad + 0 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} \\ &= 0 + 2 + 0 + 0 + 16 + 32 + 0 + 0 + \frac{1}{8} + \frac{1}{16}\end{aligned}$$

$$= (50.1875)_{10}$$

(c) 111000.0101

$$\begin{aligned}(111000.0101)_2 &= 0 \times 2^0 + 0 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 1 \times 2^5 \\ &\quad + 0 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ &= (56.3125)_{10}\end{aligned}$$

(d) (1100011.00110)

$$\begin{aligned}(1100011.00110)_2 &= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + \\ &\quad 1 \times 2^5 + 1 \times 2^6 + 0 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} \\ &= (99.2133)_{10}\end{aligned}$$

(e) (1000011.110101)

$$\begin{aligned}(1000011.110101)_2 &= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + \\ &\quad 0 \times 2^5 + 1 \times 2^6 + 1 \times 2^{-1} + 1 \times 2^{-2} \\ &\quad + 0 \times 2^{-3} + 1 \times 2^{-4} + 0 \times 2^{-5} \\ &= 67.839\end{aligned}$$

(f) (1010010.0001)

$$\begin{aligned}(1010010.0001)_2 &= 0 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 1 \times 2^4 + 0 \times 2^5 + 1 \times 2^6 \\ &\quad + 0 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ &= 82.094\end{aligned}$$

(g)  $(1011011 \cdot 00011)_2$

$$(1011011 \cdot 00011)_2 = 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 0 \times 2^5 + 1 \times 2^6 + 0 \times 2^7 + 0 \times 2^8 + 0 \times 2^9 + 1 \times 2^{-3}$$
$$= (91.123)_{10}$$

(h)  $(101110 \cdot 00000)_2$

$$(101110 \cdot 0000)_2 = 0 \times 2^0 + 0 \times 2^1 + 1 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 0 \times 2^5 + 0 \times 2^6 + 0 \times 2^7 + 0 \times 2^8$$
$$= (46.004)_{10}$$

(i)  $(1000111 \cdot 00111)_2$

$$(1000111 \cdot 00111)_2 = 1 \times 2^0 + 1 \times 2^1 + 1 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + 0 \times 2^5 + 1 \times 2^6 + 0 \times 2^7 + 0 \times 2^8 + 1 \times 2^9 + 1 \times 2^{-3}$$
$$= (71.234)_{10}$$

(j)  $(111011 \cdot 1011)_2$

$$(111011 \cdot 1011)_2 = 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 1 \times 2^5 + 1 \times 2^6 + 0 \times 2^7 + 1 \times 2^8 + 1 \times 2^9 + 1 \times 2^{-4}$$
$$= (59.69)_{10}$$