

Decimal to Binary number $\Rightarrow$

Each of the binary number or digit 0 or 1 is called a bit. A group of bits is called byte.

For Decimal to binary conversion, we first do the successive division of decimal integer number by '2' until the remainder comes to '0' (zero). Then we take the remainders in reverse order for the formation of binary number.

Ex convert $(62)_{10}$ into binary number

decimal number 62

		Remainder
2	62	0
2	31	1
2	15	1
2	7	1
2	3	1
	1	

$$(62)_{10} = (111110)_2$$

Ex convert $(0.3750)_{10}$ into binary number.

$$0.3750 \times 2 = 0.7500 = \text{carry } 0$$

$$0.7500 \times 2 = 1.5000 = \text{carry } 1$$

$$0.5000 \times 2 = 1.0000 = \text{carry } 1$$

$$(0.3750)_{10} = (0.111)_2$$

Ex Convert 172 into binary number.

2	172	0	Remainder (10101100) ↑ MSB
2	86	0	
2	43	1	
2	21	1	
2	10	0	
2	5	1	
2	2	0	
	1		

$$(172)_{10} = (10101100)_2$$

(27)₁₀

2	27	1	Remainder ↑ LSB (11011) ↑ MSB
2	13	1	
2	6	0	
2	3	1	
2	1	1	
	0		

$$(27)_{10} = (11011)_2$$

(0.273)₁₀

0.273 × 2 = 0.546	=	Carry 0	$(0.273)_{10}$ $(0.0100010)_2$...
0.546 × 2 = 1.092	=	Carry 1	
0.092 × 2 = 0.184	=	Carry 0	
0.184 × 2 = 0.368	=	Carry 0	
0.368 × 2 = 0.736	=	Carry 0	
0.736 × 2 = 1.472	=	Carry 1	
0.472 × 2 = 0.944	=	Carry 0	

Ex. mjc-9 Convert $(10.625)_{10}$ and $(21.1)_{10}$ into binary number, ⑤

$$(10.625)_{10}$$

2	10	
2	5	0
2	2	1
2	1	0
	0	1

$$\begin{aligned} 0.625 \times 2 &= 1.250 = 1 \text{ (carry)} \\ 0.250 \times 2 &= 0.500 = 0 \\ 0.500 \times 2 &= 1.000 = 1 \end{aligned}$$

$$(0.625)_{10} = (101)_{2}$$

$$(10)_{10} = (1010)_{2}$$

$$(10.625)_{10} = (1010.101)_{2}$$

$$(21.1)_{10}$$

2	21	
2	10	1
2	5	0
2	2	1
2	1	0
	0	1

$$0.1 \times 2 = 0.2 = 0 \text{ (carry)}$$

$$0.2 \times 2 = 0.4 = 0$$

$$0.4 \times 2 = 0.8 = 0$$

$$0.8 \times 2 = 1.6 = 1$$

$$0.6 \times 2 = 1.2 = 1$$

$$0.2 \times 2 = 0.4 = 0$$

$$0.4 \times 2 = 0.8 = 0$$

$$0.8 \times 2 = 1.6 = 1$$

$$0.6 \times 2 = 1.2 = 1$$

$$(21)_{10} = (10101)_{2}$$

when repeated process stopped.

$$(0.1)_{10} = (000110011)_{2}$$

$$(21.1)_{10} = (10101.000110011)_{2}$$

Binary into Decimal conversion $\Rightarrow$ Ex $(111110)_2$ and $(.011)_2$

$$\begin{aligned}
 (111110)_2 &= 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 \\
 &= 32 + 16 + 8 + 4 + 2 \\
 &= 62
 \end{aligned}$$

$$(111110)_2 = (62)_{10}$$

$$\begin{aligned}
 (.011)_2 &= 0 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} \\
 &= 0 + \frac{1}{4} + \frac{1}{8} \\
 &= 0.25 + 0.125 \\
 &= 0.375
 \end{aligned}$$

$$(.011)_2 = (0.375)_{10}$$

Ex ~~(1010101)~~ $(1010.101)_2$

$$\begin{aligned}
 (1010.101)_2 &= 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} \\
 &= 8 + 0 + 2 + 0 + \frac{1}{2} + 0 + \frac{1}{8} \\
 &= 10 + 0.5 + 0.125 \\
 &= 10.625
 \end{aligned}$$

$$(1010.101)_2 = (10.625)_{10}$$