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Topic: Binary Multiplication and division

### Binary Multiplication

Binary multiplication is similar to decimal multiplication. It is simpler than decimal multiplication because only 0s and 1s are involved. There are four rules of binary multiplication.

Case	A	x	B	Multiplication
1	0	x	0	0
2	0	x	1	0
3	1	x	0	0
4	1	x	1	1

Example – Multiplication

Example:

$$0011010 \times 001100 = 100111000$$

$$\begin{array}{r} 0011010 = 26_{10} \\ \times 0001100 = 12_{10} \\ \hline 0000000 \\ 0000000 \\ 0011010 \\ 0011010 \\ \hline 0100111000 = 312_{10} \end{array}$$

## Binary Division

Binary division is similar to decimal division. It is called as the long division procedure.

### Example – Division

$$101010 / 000110 = 000111$$

$$\begin{array}{r} 111 = 7_{10} \\ 000110 \overline{) 101010} = 42_{10} \\ \underline{-110} = 6_{10} \\ 1001 \\ \underline{-110} \\ 110 \\ \underline{-110} \\ 0 \end{array}$$

# Conversion of Decimal Point Number to Decimal

This can also be done in the same way, however after the decimal point the number should be multiplied with  $2^{-1}$ ,  $2^{-2}$  etc.

For example,

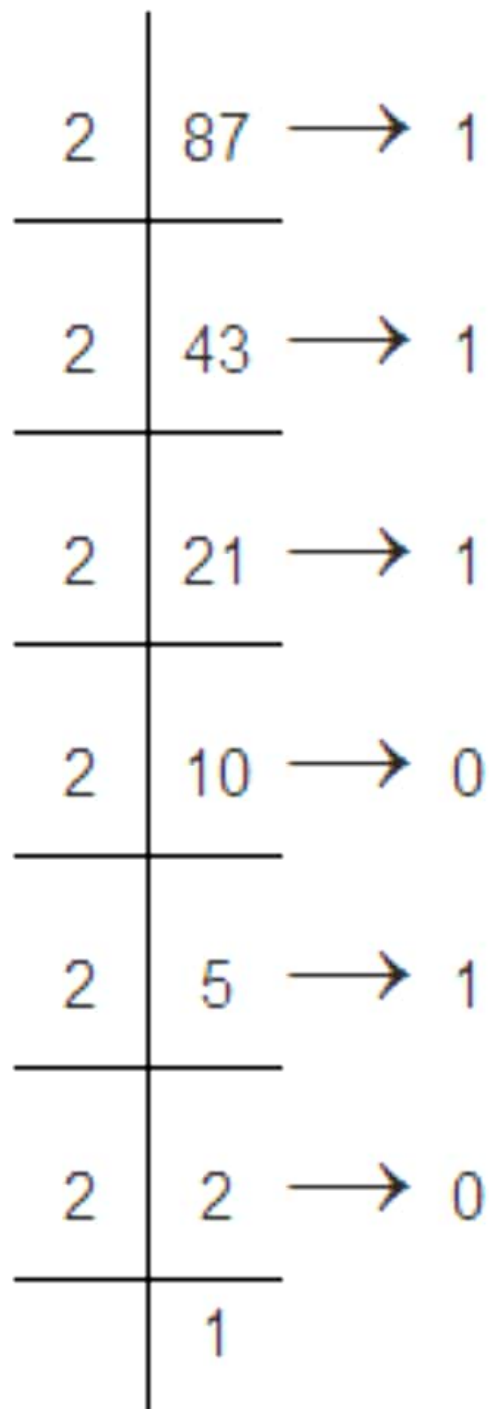
$$(1110.011)_2 = 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 0 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} \\ = (15.375)_{10}$$

# Decimal to Binary Conversion

## Integer Decimal Numbers to Binary

Divide the number by 2 and take only the remainder, if division is completed than take only the remainder which gives the binary number.

Suppose we are converting the decimal number  $(87)^{10}$ . We divide 87 by 2 and get 43 as the quotient and 1 as the remainder. These remainders are written beside as shown below.



The possibility of remainder  $(87)_{10} = (1010111)_2$  is only 1 and 0. Thus the number is counted from the last remainder. Such as  $1 \rightarrow 0 \rightarrow 1 \rightarrow 0 \rightarrow 1 \rightarrow 1 \rightarrow 1$ . This is how **decimal to binary conversion** is done.