Decimal to Octal Conversion

Similarly, to convert a number in decimal to a number in octal we have to divide the decimal number by 8 repeatedly, until the quotient of zero is obtained. Then, the remainders are noted down for each of the division steps.

Ex) Convert $(426)_{10}$ into an octal number.

Division	Quotient	Generated remainder
$\frac{426}{8}$	53	2
$\frac{53}{8}$	6	5
$\frac{6}{8}$	0	6

Hence the converted octal number is 652_8.

Ex) Convert $(635)_{10}$ into an octal number.

Fractional Conversion

For fractional number, we deal with integer and fractional parts separately as follow:

Ex) Convert $(34.525)_{10}$ into an octal number.

Solution.

Division	Quotient	Generated remainder
$\frac{34}{8}$	4	2
$\frac{4}{8}$	0	4

Therefore, $(34)_{10} = (42)_8$

Fractional Part

0.525	0.200	0.600
×8	×8	×8
4.200	1.600	4.800
↓	↓	↓
4	1	4

i.e., $(0.525)_{10} = (0.414)_8$

Therefore, $(34.525)_{10} = (42.414)_8$

Decimal to hexadecimal Conversion

The same steps are repeated but here we have to divide the decimal number by 16.

Ex) Convert $(348)_{10}$ into a hexadecimal number.

Division	Quotient	Generated remainder
$\frac{348}{16}$	21	12
$\frac{21}{16}$	1	5
$\frac{1}{16}$	0	1

Hence the converted hexadecimal number is $15C_{16}$.

Fractional Conversion

Ex) Convert $(92.85)_{10}$ into a hexadecimal number.

Solution.

Division	Quotient	Generated remainder
$\frac{92}{16}$	5	12
$\frac{5}{16}$	0	5

Therefore, $(92)_{10} = (5C)_{16}$

Fractional Part

0.85		0.60
×16	↗	×16
13.60		9.60
↓		↓
13		9

i.e., $(0.85)_{10} = (0.D9)_{16}$

Therefore, $(92.85)_{10} = (5C.D9)_{16}$

Conversion to Decimal

Now we discuss the reverse method, the method of conversion of binary, octal or hexadecimal numbers to decimal numbers. To convert to decimal, we use the following formula:

$a_n X^{n-1} + a_{n-1} X^{n-2} + a_{n-2} X^{n-2} \;.\; b_m X^{-1} + b_{m-1} X^{-2} + b_{m-2} X^{-3} + \ldots$ where,

a_n : is the digit in the nth position of the real part.

b_m : is the digit in the mth position of the fractional part.

X: $base\ or\ radix$.

Ex) Convert $(10110)_2$ into a decimal number

Solution. The binary number given is **1 0 1 1 0**

Positional weights *4 3 2 1 0*

$$1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$
$$= 16 + 0 + 4 + 2 + 0$$
$$= 22_{10}.$$

Ex) Convert $(1010.011)_2$ into a decimal number.

Solution. The binary number given is **1 0 1 0. 0 1 1**

Positional weights *3 2 1 0 -1-2-3*

$$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 0 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3}$$
$$= 8 + 0 + 2 + 0 + 0 + 0.25 + 0.125$$
$$= 10.375_{10}.$$

Ex) Convert $(362.35)_8$ into a decimal number.

Solution. The octal number given is **3 6 2. 3 5**

Positional weights *2 1 0 -1-2*

$$3 \times 8^2 + 6 \times 8^1 + 2 \times 8^0 + 3 \times 8^{-1} + 5 \times 8^{-2}$$
$$= 192 + 48 + 2 + 0.375 + 0.078125$$
$$= 242.453125_{10}.$$

Ex) Convert $(735.25)_8$ into a decimal number.

Ex) Convert $(42A.12)_{16}$ into a decimal number.

Solution. The hexadecimal number given is **4 2 A. 1 2**

Positional weights *2 1 0 -1-2*

$$4 \times 16^2 + 2 \times 16^1 + 10 \times 16^0 + 1 \times 16^{-1} + 1 \times 16^{-2}$$
$$= 1024 + 32 + 10 + 0.0625 + 0.00390625$$
$$= 1066.06640625_{10}.$$

Ex) Convert $(F7C.65)_{16}$ into a decimal number.