

OCTAL ARITHMETIC

Octal Number System

Following are the characteristics of an octal number system.

- Uses eight digits, 0,1,2,3,4,5,6,7.
- Also called base 8 number system.
- Each position in an octal number represents a 0 power of the base 8. Example: 8^0
- Last position in an octal number represents an x power of the base 8. Example: 8^x where x represents the last position - 1.

Example

Octal Number – 12570_8

Calculating Decimal Equivalent –

Step	Octal Number	Decimal Number
Step 1	12570_8	$((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0))_{10}$
Step 2	12570_8	$4096 + 1024 + 320 + 56 + 0_{10}$
Step 3	12570_8	5496_{10}

Note – 12570_8 is normally written as 12570.

Octal Addition

Following octal addition table will help you to handle octal addition.

+	0	1	2	3	4	5	6	7	
0	0	1	2	3	4	5	6	7	A
1	1	2	3	4	5	6	7	10	
2	2	3	4	5	6	7	10	11	Sum
3	3	4	5	6	7	10	11	12	
4	4	5	6	7	10	11	12	13	
5	5	6	7	10	11	12	13	14	
6	6	7	10	11	12	13	14	15	
7	7	10	11	12	13	14	15	16	

To use this table, simply follow the directions used in this example: Add 6_8 and 5_8 . Locate 6 in the A column then locate the 5 in the B column. The point in 'sum' area where these two columns intersect is the 'sum' of two numbers.

$$6_8 + 5_8 = 13_8.$$

Example – Addition

$$456_8 + 123_8 = 601_8$$

$$\begin{array}{r} 11 \text{ carry} \\ 456 = 302_{10} \\ + 123 = 83_{10} \\ \hline 601 = 385_{10} \end{array}$$

Octal Subtraction

The subtraction of octal numbers follows the same rules as the subtraction of numbers in any other number system. The only variation is in borrowed number. In the decimal system, you borrow a group of 10_{10} . In the binary system, you borrow a group of 2_{10} . In the octal system you borrow a group of 8_{10} .

Example – Subtraction

Example:

$$456_8 - 173_8 = 333_8$$

$$\begin{array}{r} 8 \text{ borrow} \\ {}^3 456 = 302_{10} \\ - 173 = 123_{10} \\ \hline 263 = 179_{10} \end{array}$$

Loading [Mathjax]/jax/output/HTML-CSS/jax.js