Chapter- 2

EXPONENTS

The numbers with negative exponents also obey the following laws:

(a) $x^m \times x^n = x^{m+n}$

(b) $x^m \div x^n = x^{m-n}$

(c) $x^m \times b^m = (xb)^m$

(d) $x^0 = 1$

(e) $\frac{x^m}{y^m} = \left(\frac{x}{y}\right)^m$

(f) $\left(\frac{x}{y}\right)^n = \left(\frac{y}{x}\right)^{-n}$

(g) $\frac{1}{x} = x^{-1}$

(h) $x^p \times x^q \times x^r \times x^s = x^{p+q+r+s}$

(i) $[(x^m)^n = x^{mn}]$

A number is said to be in the standard form, if it is expressed as the product of a number between 1 and 10 and the integral power of 10.
e.g., 149,600,000,000 = 1.496×10^{11}

Very small numbers can be expressed in standard form using negative exponents.
e.g., 0.0016 = 1610000 = 1.6×10^{-3}
If a is any non-zero integer and n is a positive integer, then a × a × a × …. × a (n times) is written as a^n,
i.e., a^n is the continued product of a multiplied by itself n times.
Here, ‘a’ is called the base and ‘n’ is called the ‘exponent’ or ‘index’. The number a^n is read as ‘a raised to the power of n’ or simply as ‘nth power of a’.
The notation a^n is called the exponential notation or power notation.

We can write large numbers more conveniently using exponents.
For example:
$10000 = 10^4$; $243 = 3^5$; $128 = 2^7$, etc.
Now, we shall learn about negative exponents.

Powers With Negative Exponents
If a is any non-zero integer and m is a positive integer, then
$a^{-m}=1/a^m$

Note: a^{-m} is called the multiplicative inverse of am as $a^{-m} \times a^m = 1$.
It is obvious that am and a-m are multiplicative inverses of each other.

Remember

- $a^n = 1 \Rightarrow n = 0$
- $1^n = 1$ where n is any integer.
- $(-1)^n = 1$ where n is any even integer.
- $(-1)^n = -1$ where is any odd integer.