

## Chapter – 12

### Exponents and Powers

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- Numbers with exponents obey the following laws of exponents.

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

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

(c)  $(a^m)^n = a^{mn}$

(d)  $a^m \times b^m = (ab)^m$

(e)  $a^0 = 1$

(f)  $\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

- Very small numbers can be expressed in standard form using negative exponents.
- Use of Exponents to Express Small Number in Standard form:
  - (i) Very large and very small numbers can be expressed in standard form.
  - (ii) Standard form is also called scientific notation form.
  - (iii) A number written as  $m \times 10^n$  is said to be in standard form if  $m$  is a decimal number such that  $1 \leq m < 10$  and  $n$  is either a positive or a negative integer.
- Examples:  $150,000,000,000 = 1.5 \times 10^{11}$ .
- Exponential notation is a powerful way to express repeated multiplication of the same number. For any non-zero rational number 'a' and a natural number  $n$ , the product  $a \times a \times a \times \dots \times a$  (n times) =  $a^n$ .

It is known as the  $n$ th power of 'a' and is read as 'a' raised to the power  $n$ '. The rational number  $a$  is called the base and  $n$  is called exponent.