

NOTES

POWER

$$\frac{a^m}{a^n} = a^{m-n}$$

$$5^3 \div 5^2 = 5^3 - 2$$

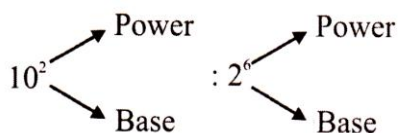
FUNDAMENTALS

- Exponential form is nothing but repeated multiplication.

There are two part of an exponent.

Exponent \rightarrow base, Power/ Index

Example:



- Base denotes the number to be multiplied and the power denotes the number of times the base is to be multiplied.

$$a \times a \times a = a^3 \text{ (read as 'a' cubed or 'a' raised to the power 3)}$$

$$a \times a \times a \times a \times a \times a = a^6 \text{ (read as 'a' raised to the power 6 or 6th power of a)}$$

.....

$$a \times a \times a \dots\dots(n \text{ factors}) = a^n \text{ (read as 'a' raise to the power n or nth power of a)}$$

- (a) When a negative number is raised to an even power the value is always positive.

$$\text{e.g., } (-5)^6 = (-5) \times (-5) \times (-5) \times (-5) \times (-5) \times (-5) = 15625$$

(b) When a negative number is raised to an odd power, the value is always negative.

$$\text{e.g., } (-3)^5 = (-3) \times (-3) \times (-3) \times (-3) \times (-3) = (-243)$$

Note: (a) $(-1)^{\text{odd number}} = -1$

(b) $(-1)^{\text{even number}} = +1$

Elementary Question 2:

Write 32 in exponent form

Ans. $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$ where base = 2
power / Index = 5

- Laws of Exponents:**

For any non-zero integers 'a' and 'b' and whole numbers 'm' and 'n',

$$(a) a \times a \times a \times \dots \times a \text{ (m factors)} = a^m$$

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

$$(c) \frac{a^m}{a^n} = a^{m-n}, \text{ if } m > n; = 1, \text{ if } m = n; = \frac{1}{a^{n-m}} \text{ if } m < n$$

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

$$(e) (ab)^m = a^m b^m$$

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

$$(g) a^0 = 1$$

Most of the questions under this chapter are applications of the above formula (a) to (g). Therefore commit them to memory (not ROT memory but learn by applying).

Evaluate: (i) $5 \times 5 \times 5$ (ii) $5^2 \times 5^3$ (iii) $\frac{5^3}{5^2}$ (iv) $(5^2)^3$

(v) $(2 \times 5)^3$ (vi) $\left(\frac{5}{2}\right)^2$; (vii) $5^0 \times 2^0 \times 3^0$

Answer: (i) $5 \times 5 \times 5$ (three times) $= 5^3 = 125$

(ii) $5^2 \times 5^3 = 5^{2+3} = 5^5 = 3125$

(iii) $\frac{5^3}{5^2} = 5^{3-2} = 5^1 = 5$

(iv) $(5^2)^3 = 5^{2 \times 3} = 5^6 = 15625$

(v) $\left(\frac{5}{2}\right)^2 = \frac{5^2}{2^2} = \frac{25}{4}$;

(vi) $(2 \times 5)^3 = 2^3 \times 5^3 = 8 \times 125 = 1000$

(vii) $5^0 \times 2^0 \times 3^0 = 1 \times 1 \times 1 = 1$

- Any number can be expressed as a decimal number between 1.0 and 10.0 including 1.0 multiplied by a power of 10. Such a form of a number is called its standard form.

For example, standard form of $63.2 = 6.32 \times 10 = 6.32 \times 10^1$