## Chapter - 13

## Exponents and Powers

- Exponents: Exponents are used to express large numbers in shorter form to make them easy to read, understand, compare and operate upon.
- Expressing Large Numbers in the Standard Form: 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 form of a number is called its standard form or scientific motion.
- Very large numbers are difficult to read, understand, compare and operate upon. To make all these easier, we use exponents, converting many of the large numbers in a shorter form.
- The following are exponential forms of some numbers?

$$
\begin{aligned}
10,000 & =10^{4}(\text { read as } 10 \text { raised to } 4) \\
& = \\
128 & =2^{7}
\end{aligned}
$$

Here, 10, 3 and 2 are the bases, whereas 4,5 and 7 are their respective exponents. We also say, 10,000 is the $4^{\text {th }}$ power of 10,243 is the $5^{\text {th }}$ power of 3 , etc.

- Numbers in exponential form obey certain laws, which are: For any non-zero integers a and b and whole numbers $m$ and $n$,
(a) $a^{\mathrm{m}} \times a^{\mathrm{n}}=a^{\mathrm{m}+\mathrm{n}}$
(b) $a^{\mathrm{m}} \div a^{\mathrm{n}}=a^{\mathrm{m}-\mathrm{n}}, m>n$
(c) $\left(a^{\mathrm{m}}\right)^{\mathrm{n}}=a^{\mathrm{mn}}$
(d) $a^{\mathrm{m}} \times b^{\mathrm{m}}=(a b)^{\mathrm{m}}$
(e) $a^{\mathrm{m}} \div b^{\mathrm{n}}=\binom{)^{\mathrm{m}}}{\mathrm{b}}^{\text {a }}$
(f) ${ }^{0}=1$
$(\mathrm{g})(-1)$ even number $=1(-1)$ odd number $=-1$

