Exponent and Power : Mathematics

- An **exponent or power** is a mathematical representation that indicates the number of times that a number is multiplied by itself.
- If a number is multiplied by itself m times, then it can be written as: $a \times a \times a \times a \times a \dots m$ times = a^m
- Here, a is called the **base**, and m is called the **exponent**, **power** or **index**.
- Numbers raised to the **power** of two are called **square numbers**.



- **Square numbers** are also read as two-square, three-square, four-square, five-square, and so on.
- Numbers raised to the **power** of three are called **cube numbers**.
- **Cube numbers** are also read as two-cube, three-cube, four-cube, five-cube, and so on.
- Negative numbers can also be written using exponents.
- If aⁿ = b, where a and b are **integers** and n is a **natural number**, then aⁿ is called the **exponential** form of b.
- The **factors** of a product can be expressed as the **powers** of the **prime factors** of 100.
- This form of expressing numbers using **exponents** is called the **prime factor product form** of **exponents**.
- Even if we interchange the **order of the factors**, the value remains the same.
- So *a* raised to the power of *x* multiplied by *b* raised to the power of *y*, is the same as *b* raised to the power of *y* multiplied by *a* raised to the power of *x*.
- The value of an **exponential number** with a **negative base** raised to the power of an **even number** is positive.
- If the base of two **exponential numbers** is the same, then the number with the **greater exponent** is greater than the number with the **smaller exponent**.
- A 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 known as its **standard form**.

Laws of Exponents

Multiplication of Powers with the Same Base

When numbers with the same base are multiplied, the power of the product is equal to the sum of the powers of the numbers.

If 'a' is a non-zero integer, and 'm' and 'n' are whole numbers then, $a^m \times a^n = a^{m+n}$.

Division of Powers with the Same Base

When numbers with the same base are divided, then the power of the quotient is equal to the difference between the powers of the dividend and the divisor.

If 'a' is a non-zero integer, and 'm' and 'n' are whole numbers then, $a^m \div a^n = a^{m-n}$.

Power of a Power

If 'a' is any non-zero integer, and 'm'and 'n' are whole numbers then, $(a^m)^n = a^{mn}$.

Multiplication of Powers with the Same Exponent

If 'a' is any non-zero integer, and 'm' is a whole number then, $a^m \times b^m = (ab)^m$.

Division of Powers with the Same Exponent

If a and b are any non-zero integers and m is a whole number then, $a^m \div b^m = (a b)^m$.

Numbers with an exponent of zero

For any non-zero integer a, $a^0 = 1$.