CLASS-7

LESSON-11 EXPONENTS AND POWERS

(This PDF Based on NCERT Book)

EXPONENTS(घातांक)-An **exponent** tells you how many times to multiply a number by itself.

Think of it as a shortcut for repeated multiplication. Instead of writing $2\times2\times2\times2\times2$, you can simply write 2^5.

In this example:

- The **base** is 2 (the number being multiplied).
- The **exponent** is 5 (the small number on top, telling you how many times to multiply).
- The result is $2\times2\times2\times2\times2=32$. This result, 32, is also called the "power."

LAWS OF EXPONENTS(घातांक का नियम)-

Here are the most fundamental laws of exponents, with examples:

Multiplication and Division Rules

- **Product Rule**: When multiplying two terms with the same base, you add the exponents. $a^m\times a^n=a^{m+n}$ Example: $4^2\times4^3=4^{2+3}=4^5$
- **Quotient Rule**: When dividing two terms with the same base, you subtract the exponents. $\frac{a^m}{a^n}=a^{m-n}$ Example: $7^5/7^2=7^{5-2}=7^3$

Special Exponent Rules

- **Zero Exponent Rule**: Any non-zero number raised to the power of zero equals 1. $A^0=1$ (where $a\neq0$) Example: $15^0=1$
- **Negative Exponent Rule**: A negative exponent means you take the reciprocal of the base and make the exponent positive. $a^{-n}=\frac{1}{a^n}$ Example: $3^{-2}=1/3^2=1/9$

Other Key Rules

- **Power of a Power Rule**: When a power is raised to another power, you multiply the exponents. $(a^m)^n=a^{m\times n}$ Example: $(5^2)^4=5^{2\times4}=5^8$
- **Power of a Product Rule**: When a product is raised to a power, you apply the exponent to each factor. $(ab)^n=a^nb^n$ Example: $(2x)^3=2^3x^3=8x^3$
- **Power of a Quotient Rule**: When a quotient (a fraction) is raised to a power, you apply the exponent to both the numerator and the denominator. $\left(\frac{a}{b}\right)^n=\frac{a^n}{b^n}$ (where $b\neq0$) Example: $(3/4)^2=3^2/4^2=9/16$

This video explains the fundamental rules of exponents and demonstrates how to apply them.

EXPRESSING LARGE NUMBER IN THE STANDARD FORM(बड़ी संख्या को मानक रूप मे व्यक्त करना)-

To express a large number in **standard form**, you simply rewrite it as a number between 1 and 10, multiplied by a power of 10. Think of it as a scientific shorthand for very big numbers.

For example, to write **4,500,000** in standard form, you follow these two steps:

1. **Find the new number**: Move the decimal point so it's after the first digit. This gives you **4.5**.
2. **Count the moves**: Count how many places you moved the decimal. You moved it 6 places to the left. This number, 6, becomes the exponent.

So, **4,500,000** in standard form is $\mathbf{4.5 \times 10^6}$. The exponent tells you to move the decimal point back to the right 6 times to get the original number.