



MAHAVIR HOUSE

INSTITUTE OF MATHEMATICS

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ICSE / ISC / CBSE / IGCSE / IB / NIOS

Class VI-XII

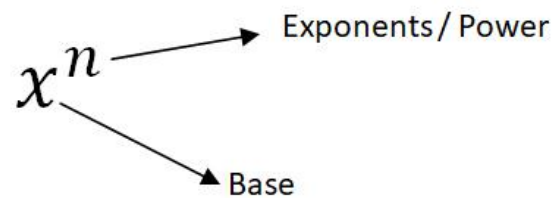
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Class VII - Exponents

Exponents are generally known as **INDEX** or **POWER** of a given **BASE**.



Ex: 3^5 , Here 3 is base and 5 is exponent. Write 3 up to 5 times $3 \times 3 \times 3 \times 3 \times 3$

☞ An expression where exponents and base are given is known as **exponential form**.

☞ For Zero power: $a^0 = 1$

Eg: $8^0 = 1, 100^0 = 1$

☞ For negative power: $a^{-n} = \frac{1}{a^n}$ & $\frac{1}{a^{-n}} = a^n$

○ $\frac{1}{2^{-5}} = 2^5 = 32$ (Ans.)

○ $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$ (Ans.)

☞ For fractional Indices: $\sqrt[n]{a} = a^{\frac{1}{n}}$



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LAW OF EXPONENTS

☞ **Product Law:** If bases are same, we will add their power.

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

Ex: $3^7 \times 3^4 = 3^{7+4} = 3^{11}$ (Ans.)

☞ **Quotient Law:** If bases are same, subtract their power

$$a^m \div a^n = a^{m-n} \text{ (where } a \neq 0 \text{)}$$

Ex: $3^7 \div 3^4 = 3^{7-4} = 3^3$ (Ans.)

☞ **Power Law:** Multiply their power

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

Ex: $(2^3)^2 = 2^{3 \times 2} = 2^6$ (Ans.)

MORE ABOUT EXPONENTS

☞ $(ab)^m = a^m \times b^m$

☞ $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ Where $(b \neq 0)$

☞ $a^n = a^m$

$\therefore n = m$, where $a > 0$ & $a \neq 1$

NOTE

☞ If 'a' is any real number and 'n' is a natural number.

○ $(-a)^n = a^n$, if **n** is even

○ $(-a)^n = -a^n$, if **n** is odd

○ $\sqrt{a} = a^{1/2}$

○ $\sqrt{a^5} = a^{5/2}$



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TYPE OF SUMS

- ☞ **Evaluate or Simplify:** Solve all the given expression & write answer in single term

LONG FORM \longrightarrow SHORT FORM

- ☞ Use law of **exponents & Simplify or compute:** Simplify the given expressions with the help of law of exponents.
- ☞ **Simplify and express as positive indices:** Simplify the given sums by simple process or exponents process (if need). & Write the answer in **POSITIVE FORM**
- ☞ **Show that / prove that:**
 - Use law of exponents in both side (if need).
 - Simplify the given expression.
 - Show L.H.S = R.H.S
- ☞ **Find the value:** Simplify the given expression and convert them in **linear equation** format to find out their value.
After all, bases will cancel & their **L.H.S Power = R.H.S Power**

EXERCISE

1. Simplify and express each of the following as a rational number:

(i) $\left(\frac{5}{3}\right)^{12} \div \left(\frac{5}{3}\right)^{15}$

2. Simplify : $\frac{16 \times 10^4 \times 3^3}{6^5 \times 5^6}$

3. Evaluate:

(i) $(-5)^3$

(ii) $\left(\frac{3}{4}\right)^5$



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4. Express each of the following in exponential notation:

(i) $\left(\frac{-7}{13}\right) \times \left(\frac{-7}{13}\right) \times \left(\frac{-7}{13}\right)$

(ii) $\left(\frac{-8}{3}\right) \times \left(\frac{-8}{3}\right) \times \left(\frac{-8}{3}\right) \times \left(\frac{-8}{3}\right)$

(iii) $\left(\frac{13}{43}\right)^7 \div \left(\frac{13}{43}\right)^2$

(iv) $\left(\frac{-16}{35}\right)^{16} \div \left(\frac{-16}{35}\right)^{32}$

(v) $\left(\frac{1}{24}\right)^{13} \div \left(\frac{1}{24}\right)^{10}$

(vi) $\left(\frac{5}{21}\right)^3 \times \left(\frac{5}{21}\right)^8$

(vii) $\left(\frac{-7}{3}\right)^{11} \times \left(\frac{-7}{3}\right)^{13}$

(viii) $\left(\frac{1}{24}\right)^{13} \div \left(\frac{1}{24}\right)^{15}$

(ix) $\left(\frac{-7}{15}\right)^{12} \div \left(\frac{-7}{15}\right)^{15}$

5. Simplify and express each of the following as a rational number:

(i) $\left(\frac{5}{4}\right)^2 \times \left(\frac{2}{3}\right)^2 \times \left(\frac{-3}{5}\right)^3$

(ii) $\frac{10^2 \times 15^3}{2^2 \times 3 \times 5^5 \times 6^4}$

(iii) $\frac{3^5 \times 25 \times 10^5}{5^7 \times 6^5}$

(iv) $\left(\frac{6}{5}\right)^3 \times \left(\frac{5}{2}\right)^2$

(v) $\left(\frac{3}{4}\right)^2 \times \left(\frac{-1}{2}\right)^5 \times 2^3$

(vi) $\left(\frac{-3}{4}\right)^3 \times \left(\frac{-5}{2}\right)^3 \times \left(\frac{2}{3}\right)^5$

(vii) $\left(\frac{7}{11}\right)^6 \div \left(\frac{7}{11}\right)^3$

(viii) $\left(\frac{-4}{3}\right)^8 \div \left(\frac{-4}{3}\right)^{12}$