

8th CBSE Math

10. Exponents and Powers

Lecture 1

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TWO WEEKS OF FREE TRIAL CLASSES

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$$2 \times 2 \times 2 \times 2 \times 2 = 2^5$$

↑ base

Power/Exponents/Index

$$7^3 = 7 \times 7 \times 7$$

$$5^4 = 5 \times 5 \times 5 \times 5$$

$$a^m = a \times a \times a \times a \dots \dots \dots m \text{ times}$$

$$a^n = a \times a \times a \times a \dots \dots \dots n \text{ times}$$

Laws of Exponents

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

$$a^m \cdot a^n$$

$$2^3 \cdot 2^5 = 2^{3+5} = 2^8$$

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

$$(2^3)^4 = 2^{3 \times 4} = 2^{12}$$

$$(iii) \quad \frac{a^m}{a^n} = a^{m-n}$$

$$a^m \times \frac{1}{a^n} = a^m \times a^{-n} \\ = a^{m+(-n)}$$

$$\frac{1}{a^n} = a^{-n} = a^{m-n}$$

$$a^{-m} = \frac{1}{a^m}$$

$$\frac{2}{3} = 2 \times \frac{1}{3} = \frac{2}{3}$$

$$(iv) a^m \cdot b^m = (ab)^m$$

Note:

$$\sqrt{x} = x^{1/2}$$

$$\sqrt{2} = 2^{1/2}$$

$$\sqrt{4} = 4^{1/2}$$

$$\sqrt[n]{a} = a^{1/n}$$

$$\sqrt[n]{a^m} = (a^m)^{1/n} = a^{(m \times \frac{1}{n})} = a^{\frac{m}{n}}$$

$$\sqrt[3]{x} = x^{1/3}$$

$$\sqrt[3]{7} = 7^{1/3}$$

$$\boxed{a^{\frac{m}{n}} = \sqrt[n]{a^m}}$$

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

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

$$\textcircled{\text{I}} \quad (-4)^5 \times (-4)^{-10}$$

$$\textcircled{\text{II}} \quad 2^5 \div 2^{-6}$$

$$\begin{aligned} \text{(i)} \quad (-4)^5 \times (-4)^{-10} &= (-4)^{5+(-10)} = (-4)^{5-10} = (-4)^{-5} \\ &= \frac{1}{(-4)^5} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \frac{2^5}{2^{-6}} &= 2^{5-(-6)} \\ &= 2^{5+6} \\ &= 2^{11} \end{aligned}$$

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

$$(i) \quad (-4)^5 \div (-4)^8$$

$$\frac{(-4)^5}{(-4)^8} = (-4)^{5-8} = (-4)^{-3} = \frac{1}{(-4)^3}$$

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

$$(iv) \quad (3^{-7} \div 3^{-10}) \times 3^{-5}$$

$$\left(\frac{3^{-7}}{3^{-10}} \right) \times 3^{-5}$$

$$\begin{aligned} &= 3^{-7 - (-10)} \times 3^{-5} \\ &= 3^{-7+10} \times 3^{-5} \\ &= 3^3 \times 3^{-5} = 3^{3+(-5)} \\ &= 3^{3-5} = 3^{-2} \end{aligned}$$

$$(v) 2^{-3} \times (-7)^{-3}$$

$$a^m \times b^m = (ab)^m$$

$$(2 \times -7)^{-3} = (-14)^{-3} = \frac{1}{(-14)^3}$$

$$(i) (2^5 \div 2^8)^5 \times 2^{-5}$$

$$\left(\frac{2^5}{2^8} \right)^5 \times 2^{-5}$$

$$= (2^{5-8})^5 \times 2^{-5}$$

$$= (2^{-3})^5 \times 2^{-5}$$

$$= 2^{-15} \times 2^{-5}$$

$$= 2^{-15+(-5)} = 2^{-15-5} = 2^{-20} = \frac{1}{2^{20}}$$

Find m so that $(-3)^{m+1} \times (-3)^5 = (-3)^7$

$$(-3)^{(m+1)+5} = (-3)^7$$

$$(-3)^{m+6} = (-3)^7$$

$$m+6 = 7$$

$$m = 7 - 6$$

$$\boxed{m = 1}$$

Find x , $2^{x+3} = 4^{x-1}$

$$2^{x+3} = (2^2)^{x-1}$$

$$2^{x+3} = 2^{2(x-1)}$$

$$x+3 = 2(x-1)$$

$$x+3 = 2x-2$$

$$3+2 = 2x-x$$

$$x = 5$$

$$\underline{x = ?}$$

$$9 \times 3^x = (27)^{2x-5}$$

$$3^2 \times 3^x = (3^3)^{2x-5}$$

$$3^{2+x} = 3^{3(2x-5)}$$

$$2+x = 3(2x-5)$$

$$2+x = 6x-15$$

$$2+15 = 6x-x$$

$$17 = 5x$$

$$\frac{17}{5} = x$$

$$3\frac{2}{5} = x$$

$$\begin{array}{r} 3 \overline{) 27} \\ \underline{3 9} \\ 3 \overline{) 3} \\ \underline{3} \\ 1 \end{array}$$

$$\begin{array}{r} \overline{5) 17} (3 \\ \underline{15} \\ 2 \end{array}$$

$$\textcircled{i} \quad \frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} \quad (t \neq 0)$$

$$\frac{5^2 \times t^{-4}}{5^{-3} \times 5^1 \times 2^1 \times t^{-8}}$$

$$2^1 \times 5^{-1}$$

$$= \frac{5^2 \times t^{-4 - (-8)}}{5^{-2} \times 2}$$

$$= \frac{5^{2 - (-2)} \times t^{-4 + 8}}{2}$$

$$= \frac{5^4 \times t^4}{2}$$

$$= \frac{5^4 \cdot t^4}{2}$$

$$(ii) \frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$$

$$3^{-5} \times (2 \times 5)^{-5} \times 5^3$$

$$5^{-7} \times (2 \times 3)^{-5}$$

$$\frac{3^{-5} \times 2^{-5} \times 5^{-5} \times 5^3}{5^{-7} \times 2^{-5} \times 3^{-5}}$$

$$\begin{array}{r} 5 \overline{) 125} \\ \underline{5} \\ 25 \\ \underline{5} \\ 5 \\ \underline{5} \\ 0 \end{array}$$

$$(a \times b)^m = a^m \times b^m$$

$$\frac{5^{-5+3}}{5^{-7}}$$

$$5^{-2}$$

$$\frac{5^{-2}}{5^{-7}}$$

$$= 5^{-2 - (-7)}$$

$$= 5^{-2+7} = 5^5$$

$$\begin{matrix} \rightarrow \\ \rightarrow \end{matrix} \quad \int -2x^2 = \underline{\underline{-\frac{2}{3}x^3}}$$

$$(ii) \frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$$

$$(30)^{-5} \times 5^3$$

$$5^{-7} \times 6^{-5}$$

$$= \frac{(5 \times 6)^{-5} \times 5^3}{5^{-7} \times 6^{-5}}$$

$$= \frac{5^{-5} \times 6^{-5} \times 5^3}{5^{-7} \times 6^{-5}}$$

$$= \frac{5^{-2}}{5^{-7} \times 6^{-5}}$$

$$= 5^5 \times 6^5$$

Thank You !!

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