Laws of Exponents

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The continued product of a number multiplied with itself a number of times can be written as the number raised to the <u>power</u> a <u>natural number</u>, equal to the number of times the number is multiplied with itself.

To make calculations easier, we have few rules or laws of exponents:

- Multiplying Powers with the same base
- Dividing Powers with the same base
- Power with Exponent zero
- Power of a Power
- Multiplying Powers with the same exponents
- Dividing Powers with the same exponents

Let's discuss each one of them in detail:

Law 1: Multiplying Powers with the same base

If 'a' is any non – zero rational number and m, n are natural numbers, then $a^m x a^n = a^{m+n}$

Also, If 'a' is any non – zero rational number and m, n, p are natural numbers, then $a^m x a^n x a^p = a^{m+n+p}$

Example: Simplify: $3^2 \times 3^5$ = 3^{2+5} = 3^7

Law 2: Dividing Powers with the same base

If 'a' is any non – zero rational number and m, n are natural numbers such that m > n, then $a^{m} \div a^{n} = a^{m-n}$ or $a^{m} = a^{m-n}$ a^{n}

Example: Simplify: $9^{12} \div 9^{10}$ = 9^{12-10} = 9^2

Law 3: Power with exponent zero

If 'a' is any non – zero rational number raise to power 0, then it is equal to 1 $a^0 = 1$

Example: $7^3 \div 7^3$ = 7^{3-3} = 7^0 = 1

Law 4: Power of a Power

If 'a' is any rational number different from zero and m, n are natural numbers, then $\binom{m}{a}^n = a^{m \times n} = \binom{n}{a}^m$

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

Law 5: Multiplying Powers with the same exponents

If a, b are non – zero rational numbers and n is a natural number, then $a^{n} x b^{n} = (ab)^{n}$

Also, If a, b, c are non – zero rational numbers and n is a natural number, then $a^n x b^n x c^n = (abc)^n$

Example: $2^5 \times 3^5$ = $(2 \times 3)^5$ = 6^5

Law 6: Dividing Powers with the same exponents

If a and b are non – zero rational numbers and n is a natural number, then

$$---\begin{pmatrix} \\ \\ \end{pmatrix} \qquad \qquad b = b$$

Example: $(2/3)^2$ = $(2 \times 2)/(3 \times 3)$ = 4/9

Now try it yourself! Should you still need any help, click here to schedule live online session with e Tutor!

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Reference Links:

- http://en.wikipedia.org/wiki/Exponentiation
- <u>http://en.wikipedia.org/wiki/Natural_number</u>
- http://en.wikipedia.org/wiki/Rational_number

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