Laws of Exponents

The continued product of a number multiplied with itself a number of times can be written as the number raised to the power a natural number, 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
$$a^m \times a^n = a^{m+n}$$

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

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
$$a^m \div a^n = a^{m-n} \text{ or } \frac{a^m}{a^n} = a^{m-n}$$

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

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

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

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

$$\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$$

Example: $(2/3)^2$

= (2 x 2)/(3 x3)

= 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
- http://en.wikipedia.org/wiki/Natural_number
- http://en.wikipedia.org/wiki/Rational_number

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