Laws of Exponents

The laws of exponents are very useful in numbers involving exponents to do the operations of multiplication and division.

Law 1: If x is a non-zero rational number, then $x^1 = x$

Example: $9^1 = 9$

Law 2: Any non-zero rational number having zero exponents is equal to one.

If x is a non-zero rational number,then $x^0 = 1$.

Example: $8^2 \div 8^2 = 8^{2-2} = 8^0 = 1$

Law 3: If x is a non-zero rational number and a and b are positive integers, then

$$x^a \times x^b = x^{(a+b)}$$

Here, if bases are the same, then the powers are added in the multiplication of numbers.

Example: $5^3 \times 5^4 = (5)^{3+4} = 5^7$

Law 4: If x is a non-zero rational number and a and b are positive integers, then

$$x^a \div x^b = x^{(a-b)}$$

Example: $3^8 \div 3^5 = 3^{8-5} = 3^3$

Law 5: If x is a non-zero rational number and a is a negative integer, then

$$x^{(-a)} = \frac{1}{x^a}$$

Example: $2^{-5} = \frac{1}{2^5}$

Law 6: If x is a non-zero rational number and a and b are positive integers, then

Laws of Exponents

$(x^a)^b = x^{ab}$

Example: $(3^3)^4 = 3^{3\times4} = 3^{12}$

Law 7: If x and y are non-zero rational numbers and a is a positive integer, then

$x^a \times y^a = (xy)^a$

Example: $3^3 \times 4^3 = 3 \times 3 \times 3 \times 4 \times 4 \times 4$

$= (3 \times 4) \times (3 \times 4) \times (3 \times 4)$

$= 12 \times 12 \times 12 = (12)^3$