

PROPERTIES OF EXPONENTS

Exponents are used in math to signify repeated multiplication. They are written as superscript numbers to the right side of the base:

For example, with the value 3^4 , 3 is the base and 4 is the exponent. In expanded form, this would be $3 \cdot 3 \cdot 3 \cdot 3 = 81$. There are 5 main properties of exponents that we use when we need to simplify algebraic expressions:

***base*^{exponent}**

Product of Powers Property

$$b^m \cdot b^n = b^{(m+n)}$$

EXAMPLE: $b^2 \cdot b^3 = ?$

Product of Powers allows us to add the exponents when the bases are the same.

$$(b^2 \cdot b^3) = b^{(2+3)} = b^5$$

Quotient of Powers Property

$$b^m / b^n = b^{(m-n)}$$

EXAMPLE: $b^5 / b^3 = ?$

Quotient of Powers allows us to divide exponents when the bases are the same.

$$b^5 / b^3 = b^{(5-3)} = b^2$$

Power of a Power Property

$$(b^m)^n = b^{m \cdot n}$$

EXAMPLE: $(b^3)^2 = ?$

Power of Powers allows us to raise a power to another exponent.

$$(b^3)^2 = b^{(3 \cdot 2)} = b^6$$

Power of a Product Property

$$(bc)^x = b^x \cdot c^x$$

EXAMPLE: $(3b^4)^2 = ?$

The exponent of each factor in the base must be multiplied by the power outside the parentheses. $(3b^4)^2 = (3^2 b^8) = 9b^8$

Power of a Quotient Property

$$(b/c)^x = b^x / c^x$$

EXAMPLE: $(b^3/c^2)^2 = ?$

The outer exponent is multiplied by the exponent in the numerator and the denominator.

$$(b^3/c^2)^2 = b^{(3 \cdot 2)} / c^{(2 \cdot 2)} = b^6 / c^4$$

