

Properties of Exponents



Review

A diagram illustrating the components of a power expression. The expression x^n is shown in a large, bold font. An arrow points from the word "base" to the x . Another arrow points from the word "exponent" to the n . A bracket underneath the x^n is labeled "power".

Key Definitions

Base: The number or variable used as the factor

Exponent: The number of times the base is a factor

Power: The base and the exponent of an expression in the form x^n

Zero Exponent Property:

For any nonzero number a ,

$$a^0 = 1$$

Simplify:

1. b^0

2. $(-3)^0$

3. $5c^0$

4. $(5c)^0$

Negative Exponent Property:

For any nonzero number a and n , where
 $a \neq 0$,

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

Simplify using positive exponents:

1. $a^2 b^{-5}$

2. $(-3)^{-2}$

Product of Powers Property:

For all numbers a, m and n where $a \neq 0$,

$$a^m * a^n = a^{m+n}$$

To multiply expressions
with the **same bases**,
add the exponents

Power of a Power Property:

For all numbers a, m and n where $a \neq 0$,

$$(a^m)^n = a^{mn}$$

Power of a Product Property:

For all numbers a, b and m where $a \neq 0$,

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

Quotient of Powers Property:

For all numbers a, m and n where $a \neq 0$,

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

To divide expressions
with the **same bases**,
subtract the exponents

Power of a Quotient Property:

For all numbers a, b and m where $b \neq 0$,

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

Exponent Property of Equality:

For all numbers b , x , and y where $b \neq 0$,
If $b^x = b^y$, then $x = y$