

Overview of Exponents

Power Expression

An **expression** that represents a repeated multiplication of the same factor
The **exponent** determines the number of times the **base** is multiplied by itself.

$$5^3$$

3 factors of 5

$$(3x)^4$$

4 factors of $3x$

Power Expression

An **expression** that represents a repeated multiplication of the same factor
The **exponent** determines the number of times the **base** is multiplied by itself.

$$-2^4$$

the negative of 4 factors of 2

$$(-2)^4$$

4 factors of -2

Power Expression

An **expression** that represents a repeated multiplication of the same factor
The **exponent** determines the number of times the **base** is multiplied by itself.

$$\begin{array}{c} \text{Base} \quad \quad \text{Exponent} \\ \swarrow \quad \quad \searrow \\ (x + 3)^2 \end{array}$$

2 factors of $x + 3$

$$\begin{array}{c} \text{Base} \quad \quad \text{Exponent} \\ \swarrow \quad \quad \searrow \\ 5(3x - 4)^2 \end{array}$$

5 times 2 factors of $3x - 4$

Properties of Exponents

Zero Exponent Property

Any number (not equal to 0)
raised to 0 power is equal to 1

$$23^0$$

$$a^0$$

Negative Exponent Property

Any number (not equal to 0) raised to
a negative power is equal to the reciprocal
of the base raised to the positive power.

$$5^{-2}$$

$$a^{-m}$$

$$\frac{1}{3^{-4}}$$

$$\frac{1}{a^{-m}}$$

Properties of Exponents

Product of Powers Property

When multiplying **like bases**,
add exponents

$$2^3 \cdot 2^4$$

$$a^m \cdot a^n$$

Quotient of Powers Property

When dividing **like bases**,
subtract exponents

$$\frac{4^6}{4^3}$$

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

Properties of Exponents

Power of a Power Property

When raising a **power** to **power**,
multiply exponents

$$(3^2)^4$$

$$(a^m)^n$$

Properties of Exponents

Power of a Product Property

When raising a **product** to a power,
apply the **exponent** to each **factor**

$$(2 \cdot 3)^4$$

$$(ab)^m$$

Power of a Quotient Property

When raising a **quotient** (**fraction**) to a
power, apply the **exponent** to **numerator**
and **denominator**

$$\left(\frac{3}{4}\right)^2$$

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