

# Algebra 1

Exponential Properties Involving Quotients;  
Zero and Negative Exponents

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Quotient of Powers Property  
Power of Quotients Property  
Zero Exponents  
Negative Exponents

Overview

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Product of Powers Property  
 $x^3 \cdot x^4 = x^{3+4} = x^7$

Power of Powers Property  
 $(x^3)^4 = x^{3 \cdot 4} = x^{12}$

Power of a Product Property  
 $(xy)^3 = x^3 y^3$

Quotient of Powers Property  
 $\frac{x^m}{x^n} = x^{m-n}$      $\frac{3^4}{3^2} = \frac{81}{9} = 9 = 3^{4-2} = 3^2 = 9$

Power of Quotients Property  
 $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$      $\left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2}$

Exponential Properties Involving Quotients; Zero and Negative Exponents

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$$\left(\frac{4x^2}{3y}\right)^3 = \frac{[4 \cdot (x^2)]^3}{[3y]^3}$$
**Power of Quotients Property**

$$= \frac{4^3 \cdot (x^2)^3}{3^3 y^3}$$
**Power of a Product Property**

$$= \frac{64x^6}{27y^3}$$
**Power of Powers Property**

Exponential Properties Involving Quotients: Zero and Negative Exponents

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Simplify:  $\left(\frac{a^2}{b}\right)^5 \cdot \frac{1}{2a^2}$

$y = mx + b$

$\Delta < 0$   $\Delta = 0$   $\Delta > 0$

You Try!

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Simplify:  $\left(\frac{a^2}{b}\right)^5 \cdot \frac{1}{2a^2}$

$\frac{(a^2)^5}{b^5} \cdot \frac{1}{2a^2} = \frac{a^{10}}{b^5} \cdot \frac{1}{2a^2}$

$= \frac{a^{10}}{2a^2 b^5} = \frac{a^8}{2b^5}$

**QUOTIENT OF POWERS PROPERTY**

You Try!

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$x^0 = 1$       **Weird!**       $2^0 = 1$   
 $2^1 = 2$   
 $2^2 = 4$   
 $2^3 = 8$

$x^{-2} = \frac{1}{x^2}$        $4^{-3} = \frac{1}{4^3} = \frac{1}{64}$   
 $\frac{1}{4^{-3}} = 4^3$

Exponential Properties Involving Quotients, Zero and Negative Exponents

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**Properties of Exponents**

$x^m * x^n = x^{m+n}$   
 $(x^m)^n = x^{m*n}$   
 $(xy)^m = x^m y^m$        $x^0 = 1$   
 $\frac{x^m}{x^n} = x^{m-n}$   
 $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$        $x^{-m} = \frac{1}{x^m}$

Exponential Properties Involving Quotients, Zero and Negative Exponents

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**Simplify  $(2x^2y^{-2})^{-3}$**

$y = mx + b$        $\Delta < 0$        $\Delta = 0$        $\Delta > 0$

You Try It!

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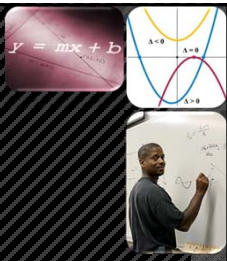
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**Simplify  $(2x^2y^{-2})^{-3}$**

$= 2^{-3}x^{2*(-3)}y^{-2*(-3)}$

$= \frac{1}{8}x^{-6}y^6$

$= \frac{y^6}{8x^6}$



**You Try!**

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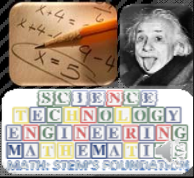
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