

ALGEBRA 1

Chapter 8, Section 3

Division Properties of Exponents

VOCABULARY:

- None

GOALS:

- Use the division properties of exponents to evaluate powers and simplify expressions.

DIVISION PROPERTIES OF EXPONENTS

Let a and b be numbers and let m and n be positive integers.

QUOTIENT OF POWERS PROPERTY

To divide powers having the same base, subtract the exponents.

$$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$$

Example: $\frac{3^7}{3^5} = 3^{7-5} = 3^2$

POWER OF A QUOTIENT PROPERTY

To find a power of a quotient, find the power of the numerator and the denominator and divide.

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$$

Example: $\left(\frac{4}{5}\right)^3 = \frac{4^3}{5^3} = \frac{64}{125}$

1. Using the quotient of powers property:

a.) $\frac{4^5}{4^4} = 4^{5-4} = 4^1$	b.) $\frac{6^2 \cdot 6^6}{6^5} = \frac{6^8}{6^5} = 6^3 = 216$	c.) $\frac{1}{x^4} \cdot x^2 = \frac{x^2}{x^4} = x^{-2} = \frac{1}{x^2}$
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Solve the following problems.

d.) $\frac{x^8}{x^{15}}$	e.) $\frac{(-5)^{14}}{(-5)^{11}}$	f.) $\frac{3^3 \cdot 3^9}{3^{17}}$
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2. Using the power of a quotient property:

a.) $\left(\frac{2}{3}\right)^2 = \frac{2^2}{3^2} = \frac{4}{9}$	b.) $\left(\frac{-3}{y}\right)^3 = \frac{(-3)^3}{y^3} = \frac{-27}{y^3}$	c.) $\left(\frac{7}{4}\right)^{-3} = \left(\frac{4}{7}\right)^3 = \frac{4^3}{7^3} = \frac{64}{343}$
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Solve the following problems.

d.) $\left(\frac{3}{7}\right)^{-2}$	e.) $\left(\frac{2^4}{x^5}\right)^{-1}$	f.) $\left(\frac{x^4}{y^7}\right)^9$
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3. Simplifying Exponential Expressions:

Simplify the following expressions

<p>a.) $\frac{2x^2y}{3x} \cdot \frac{9xy^2}{y^4} = \frac{(2x^2y)(9xy^2)}{(3x)(y^4)}$</p> $= \frac{18x^3y^3}{3xy^4}$ $= 6x^2y^{-1}$ $= \frac{6x^2}{y}$	<p>b.) $\left(\frac{2x}{y^2}\right)^4 = \frac{(2x)^4}{(y^2)^4}$</p> $= \frac{2^4 \cdot x^4}{y^{2 \cdot 4}}$ $= \frac{16x^4}{y^8}$
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Simplify the following problems.

<p>c.) $\frac{-12xy}{7x^4} \cdot \frac{21x^5y^2}{4y}$</p>	<p>d.) $\frac{-8x^6y^{-3}}{3x^{-2}y^{-5}} \cdot \frac{-6x^{-10}y}{-4x}$</p>
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