Properties of Exponents

- *Students will use Properties of Exponents to simplify expressions*

Algebra 3-4

What are the properties for exponents?

Exponent Properties:

Assumptions: No denominators = Zero
m and *n* are INTEGERS

Property	Example(s)
$a^0 = 1; a \neq 0$	$(3x)^0 = 1$ $\left(\frac{x^3y^{-7}z^{12}}{3x^2y^{-1}}\right)^0 = 1$
$(ab)^n = a^n b^n$	$(7x)^2 = 7^2x^2 = 49x^2$
$a^m a^n = a^{m+n}$	$x^3 \cdot x^7 = x^{3+7} = x^{10}$
$(a^m)^n = a^{mn}$	$(x^3)^4 = x^{12}$
$a^{-n} = \frac{1}{a^n}$	$\frac{1}{x^{-2}} = x^2$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{x^9}{x^7} = x^{9-7} = x^2$
$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{3}{x}\right)^2 = \frac{3^2}{x^2} = \frac{9}{x^2}$
$\sqrt[n]{a^m} = a^{\frac{m}{n}}$	$\sqrt[4]{x^3} = x^{\frac{3}{4}}$ $\sqrt{x} = x^{1/2}$

$x \cdot x \cdot x \cdot xxxxxxx$

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How are exponent properties used?

Examples: Simplify and rewrite each expression using only positive exponents.

a) $(5a^3)(-3a^{-4})$

$5 \cdot (-3) \cdot a^3 \cdot a^{-4} = -15a^{-1} = -\frac{15}{a}$

b) $(-4x^{-3}y^5)^2 = (-4)^2 \cdot (x^{-3})^2 (y^5)^2$

$16x^{-6}y^{10} = \frac{16y^{10}}{x^6}$

$(-4)^2$

c) $\frac{4ab^6c^3}{a^5bc^3} = \frac{4}{1} \cdot \frac{a^1}{a^5} \cdot \frac{b^6}{b^1} \cdot \frac{c^3}{c^3}$

$= 4a^{-4}b^5$

$= \frac{4b^5}{a^4}$

d) $\left(\frac{-3x^{-4}y^4z^{-18}}{96x^{-19}y^7z^5}\right)^0 = 1$