

7-2 Study Guide and Intervention *(continued)***Dividing Monomials**

Negative Exponents Any nonzero number raised to the zero power is 1; for example, $(-0.5)^0 = 1$. Any nonzero number raised to a negative power is equal to the reciprocal of the number raised to the opposite power; for example, $6^{-3} = \frac{1}{6^3}$. These definitions can be used to simplify expressions that have negative exponents.

Zero Exponent	For any nonzero number a , $a^0 = 1$.
Negative Exponent Property	For any nonzero number a and any integer n , $a^{-n} = \frac{1}{a^n}$ and $\frac{1}{a^{-n}} = a^n$.

The simplified form of an expression containing negative exponents must contain only positive exponents.

Example

Simplify $\frac{4a^{-3}b^6}{16a^2b^6c^{-5}}$. **Assume that no denominator equals zero.**

$$\begin{aligned}
 \frac{4a^{-3}b^6}{16a^2b^6c^{-5}} &= \left(\frac{4}{16}\right)\left(\frac{a^{-3}}{a^2}\right)\left(\frac{b^6}{b^6}\right)\left(\frac{1}{c^{-5}}\right) && \text{Group powers with the same base.} \\
 &= \frac{1}{4}(a^{-3-2})(b^{6-6})(c^5) && \text{Quotient of Powers and Negative Exponent Properties} \\
 &= \frac{1}{4}a^{-5}b^0c^5 && \text{Simplify.} \\
 &= \frac{1}{4}\left(\frac{1}{a^5}\right)(1)c^5 && \text{Negative Exponent and Zero Exponent Properties} \\
 &= \frac{c^5}{4a^5} && \text{Simplify.}
 \end{aligned}$$

The solution is $\frac{c^5}{4a^5}$.

Exercises

Simplify each expression. Assume that no denominator equals zero.

- $\frac{2^2}{2^{-3}}$
- $\frac{m}{m^{-4}}$
- $\frac{p^{-8}}{p^3}$
- $\frac{b^{-4}}{b^{-5}}$
- $\frac{(-x^{-1}y)^0}{4w^{-1}y^2}$
- $\frac{(a^2b^3)^2}{(ab)^{-2}}$
- $\frac{x^4y^0}{x^{-2}}$
- $\frac{(6a^{-1}b)^2}{(b^2)^4}$
- $\frac{(3rt)^2u^{-4}}{r^{-1}t^2u^7}$
- $\frac{m^{-3}t^{-5}}{(m^2t^3)^{-1}}$
- $\frac{(4m^2n^2)^0}{(8m^{-1}l)^0}$
- $\frac{(-2mn^2)^{-3}}{4m^{-6}n^4}$