Simplify Complex Fractions

TEKS *A.4.A*

GOAL Simplify complex fractions.

Key Vocabulary
• complex fraction

A **complex fraction** is a fraction that contains a fraction in its numerator, denominator, or both. To simplify a complex fraction, divide its numerator by its denominator.

KEY CONCEPT   *For Your Notebook*

Simplifying a Complex Fraction

Let a, b, c, and d be polynomials where $b \neq 0$, $c \neq 0$, and $d \neq 0$.

Algebra $\dfrac{\frac{a}{b}}{\frac{c}{d}} = \dfrac{a}{b} \div \dfrac{c}{d} = \dfrac{a}{b} \cdot \dfrac{d}{c}$

Example $\dfrac{\frac{x}{2}}{\frac{x}{3}} = \dfrac{x}{2} \div \dfrac{x}{3} = \dfrac{x}{2} \cdot \dfrac{3}{x} = \dfrac{3x}{2x} = \dfrac{3}{2}$

READING
The widest fraction bar separates the numerator of a complex fraction from the denominator.

EXAMPLE 1   **Simplify a complex fraction**

Simplify the complex fraction.

a. $\dfrac{\frac{3x}{2}}{-6x^3} = \dfrac{3x}{2} \div (-6x^3)$ **Write fraction as quotient.**

$= \dfrac{3x}{2} \cdot \dfrac{1}{-6x^3}$ **Multiply by multiplicative inverse.**

$= \dfrac{3x}{-12x^3}$ **Multiply numerators and denominators.**

$= -\dfrac{1}{4x^2}$ **Simplify.**

b. $\dfrac{x^2 - 1}{\frac{x+1}{x-1}} = (x^2 - 1) \div \dfrac{x+1}{x-1}$ **Write fraction as quotient.**

$= (x^2 - 1) \cdot \dfrac{x-1}{x+1}$ **Multiply by multiplicative inverse.**

$= \dfrac{(x^2 - 1)(x - 1)}{x + 1}$ **Multiply numerators and denominators.**

$= \dfrac{\cancel{(x+1)}(x - 1)(x - 1)}{\cancel{x+1}}$ **Factor and divide out common factor.**

$= (x - 1)^2$ **Simplify.**