12.5 Multiply and Divide Rational Expressions

TEKS A.1.C, A.4.A

Before You multiplied and divided polynomials.

Now You will multiply and divide rational expressions.

Why? So you can describe football data, as in Ex. 35.

Key Vocabulary
- **multiplicative inverse,** *p. 103*
- **polynomial,** *p. 554*
- **rational expression,** *p. 794*

Multiplying and dividing rational expressions is similar to multiplying and dividing numerical fractions.

KEY CONCEPT *For Your Notebook*

Multiplying and Dividing Rational Expressions

Let a, b, c, and d be polynomials.

Algebra $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$ where $b \neq 0$ and $d \neq 0$

$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$ where $b \neq 0$, $c \neq 0$, and $d \neq 0$

Examples $\frac{x+2}{x} \cdot \frac{3}{x^2} = \frac{3(x+2)}{x^3}$ $\qquad$ $\frac{x}{x-1} \div \frac{4}{x} = \frac{x}{x-1} \cdot \frac{x}{4} = \frac{x^2}{4(x-1)}$

EXAMPLE 1 Multiply rational expressions involving monomials

Find the product $\frac{2x^2}{3x} \cdot \frac{6x^2}{12x^3}$.

$$\frac{2x^2}{3x} \cdot \frac{6x^2}{12x^3} = \frac{(2x^2)(6x^2)}{(3x)(12x^3)}$$ Multiply numerators and denominators.

$$= \frac{12x^4}{36x^4}$$ Product of powers property

$$= \frac{12 \cdot x^4}{3 \cdot 12 \cdot x^4}$$ Factor and divide out common factors.

$$= \frac{1}{3}$$ Simplify.

APPLY EXCLUDED VALUES

When performing operations with rational expressions, remember that the answer may have excluded values. In Example 1, the excluded value is 0.

GUIDED PRACTICE for Example 1

Find the product.

1. $\frac{2y^3}{5y} \cdot \frac{15y^3}{8y^5}$

2. $\frac{7z^2}{4z^3} \cdot \frac{z^3}{14z}$