

## Performing Operations on Rational Expressions

### Part One: Products

#### Learning Targets

I can:

- determine the non-permissible values when performing operations on rational expressions
- determine, in simplified form, the product of rational expressions (AN5.1)

#### Multiplying Rational Expressions

Let  $a$ ,  $b$ ,  $c$ , and  $d$  represent polynomials.

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

#### Strategy for Multiplying Rational Expressions Involving Monomials

1. State all non-permissible values.

Note: You may want to rewrite the numerators and denominators so the coefficients and like variables are aligned vertically.

2. Cancel factors that appear in both the numerator and denominator and reduce fractions.
3. Multiply the factors remaining in the numerator and multiply the factors remaining in the denominator.

#### Sample Problems

Simplify.

a)  $\frac{5a^2}{14b^4} \cdot \frac{7b}{10a^3}$

b)  $\frac{2x^2y^3}{5y} \cdot \frac{15y^5}{8xy^5}$

c)  $\frac{24a^2b^4c}{15abc} \cdot \frac{25a^3b^6}{-8b^2c^9}$

d)  $\frac{-13x^2y^5z^7}{26xyz} \cdot \frac{-2y^2}{16x^4z^3}$

## Strategy for Multiplying Rational Expressions Involving Polynomials

1. Completely factor all numerators and denominators.
2. State the non-permissible values.
3. Cancel factors that appear in both the numerator and denominator and reduce fractions.
4. Write the remaining factors.

*Note: In most cases do not bother multiplying the factors left in the numerator and factors left in the denominator.*

### Sample Problems

Simplify.

a)  $\frac{2x-8}{x+3} \cdot \frac{x^2+4x+3}{x^2-16}$

b)  $\frac{m-7}{5m^2-13m+8} \cdot (5m-8)$

c)  $\frac{r^2+18r+80}{2r+16} \cdot \frac{r+6}{9r^3+54r^2}$

d)  $\frac{2x^2+x-6}{x^2-2x-8} \cdot \frac{2x^2-x-3}{x^2-3x-4}$

e)  $\frac{70-3n-n^2}{n^2+9n-10} \cdot \frac{1}{7-n}$

f)  $\frac{x^2+4x+3}{2x^2-x-10} \cdot \frac{2x^2+4x^3}{x^2+3x} \cdot \frac{x}{x^2+3x+2}$