

# Multiplying and Dividing Rational Expressions

To *multiply* two rational expressions, factor each numerator and denominator, determine any non-permissible values, and cancel factors (not terms) common to the numerator and the denominator. A rational expression is in simplest form when the numerator and denominator contain no common factors.

To *divide* rational expressions, multiply the first expression by the *reciprocal* of the second. Note that division by zero is not permissible, so for the example  $\frac{A}{B} \div \frac{C}{D}$ , the expressions B, C, and D must all be considered when determining non-permissible values.

## Example 1: Multiply Rational Expressions

Multiply. Write your answer in simplest form. Identify all non-permissible values.

a.  $\frac{a^2 - 13a + 36}{a^2 - 16} \cdot \frac{a^2 + 10a + 24}{a^2 - 9a}$

b.  $\frac{2x^2 + 5x - 12}{x^2 + 2x - 8} \cdot \frac{2x - x^2}{2x^2 - x - 3}$

## Example 2: Divide Rational Expressions

Divide. Write your answer in simplest form. Identify all non-permissible values.

a.  $\frac{3x - 3}{x^2 - x - 6} \div \frac{x^2 - 6x + 5}{x^2 - 3x - 10}$

b.  $\frac{6x^2 + x - 2}{2x^2 - 9x + 4} \div \frac{3x^2 + 11x + 6}{16 - x^2}$

**Example 3: Multiply and Divide Rational Expressions**

Simplify. Identify the non-permissible values.

$$\frac{x^2 + 4x - 32}{x^2 + 3x - 40} \cdot \frac{3x^2 - 75}{3x^2 - 11x - 4} \div \frac{6x^2 + 18x - 60}{4x - x^3}$$