Multiplying and Dividing Rational Expressions

Summary

1. Factor and then divide out common factors.
2. Multiply numerators and multiply denominators.
3. When dividing fractions, multiply by the reciprocal of the second fraction.

To multiply rational expressions:

1. Factor all numerators & denominators completely.
2. Divide out common factors.
3. Multiply the results.

Example 1. Simplify each.

(a) $\dfrac{x+3}{x-4} \cdot \dfrac{x^2-2x-8}{x^2-9}$

(b) $\dfrac{8x+32}{x-7} \cdot \dfrac{x^2-4x-21}{4x^2-64}$

(c) $\dfrac{5x+5}{7x-7x^2} \cdot \dfrac{2x^2+x-3}{4x^2-9}$

(d) $\dfrac{4x+8}{6x-3x^2} \cdot \dfrac{3x^2-4x-4}{9x^2-4}$

When dividing rational expressions, multiply by the first expression by the *reciprocal* of the second expression.

Example 2. Simplify each.

(a) $\dfrac{4x^2-25}{2} \div \dfrac{2x+5}{14}$

(b) $(9x^2-49) \div \dfrac{3x-7}{9}$

(c) $\dfrac{x^2+3x-10}{2x} \div \dfrac{x^2-5x+6}{x^2-3x}$

(d) $\dfrac{x^2-x-12}{5x} \div \dfrac{x^2-10x+24}{x^2-6x}$