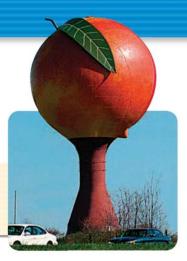
8.4 Multiply and Divide Rational Expressions



You graphed rational functions. You will multiply and divide rational expressions. So you can compare the efficiencies of two designs, as in Ex. 51.



Key Vocabulary

 simplified form of a rational expression
reciprocal, p. 4 A rational expression is in **simplified form** if its numerator and denominator have no common factors (other than ± 1). To simplify a rational expression, apply the following property.

KEY CONCEPT

For Your Notebook

Simplifying Rational Expressions

Let *a*, *b*, and *c* be expressions with $b \neq 0$ and $c \neq 0$. Then the following property applies.

Property	$\frac{ae'}{be'} = \frac{a}{b}$	Divide out the common factor c.
Examples	$\frac{15}{65} = \frac{3 \cdot 5}{13 \cdot 5} = \frac{3}{13}$	Divide out the common factor 5.
0 0 0 0 0 0 0	$\frac{4(x+3)}{(x-5)(x+3)} = \frac{4}{x-5}$	Divide out the common factor $x + 3$.

Simplifying a rational expression usually requires two steps. First, factor the numerator and denominator. Then, divide out any factors that are common to both the numerator and denominator. Here is an example:

$$\frac{x^2 + 7x}{x^2} = \frac{x(x+7)}{x \cdot x} = \frac{x+7}{x}$$

Notice that you can divide out common factors in the second expression above. However, you cannot divide out like terms in the third expression.

EXAMPLE 1Simplify a rational expressionSimplify: $\frac{x^2 - 2x - 15}{x^2 - 9}$ $\frac{x^2 - 2x - 15}{x^2 - 9} = \frac{(x + 3)(x - 5)}{(x + 3)(x - 3)}$ Factor numerator and denominator. $= \frac{(x + 3)(x - 5)}{(x + 3)(x - 3)}$ Divide out common factor. $= \frac{x - 5}{x - 3}$ Simplified form

AVOID ERRORS

Do not divide out variable terms that are not factors. x = 5

 $\frac{x-5}{x-3} \neq \frac{-5}{-3}$