

# 2.1

## Simplifying Rational Expressions



An expression of the form  $\frac{\text{polynomial}}{\text{polynomial}}$  is a **rational expression**.

**Essential Understanding** The simplified form of a rational expression is like the simplified form of a numerical fraction. The numerator and denominator have no common factor other than 1. To simplify a rational expression, divide out common factors from the numerator and denominator.

Like a numerical fraction, a rational expression is undefined when the denominator is 0. A value of a variable for which a rational expression is undefined is an **excluded value**.



### Problem 1 Simplifying a Rational Expression

**Got It?** What is the simplified form of the expression? State any excluded values.

a.  $\frac{21a^2}{7a^3}$

b.  $\frac{18d^2}{4d + 8}$

c.  $\frac{2n - 3}{6n - 9}$

d.  $\frac{26c^3 + 91c}{2c^2 + 7}$



### Problem 2 Simplifying a Rational Expression Containing a Trinomial

**Got It?** What is the simplified form of the expression? State any excluded values.

a.  $\frac{2x - 8}{x^2 - 2x - 8}$

b.  $\frac{a^2 - 3a + 2}{3a - 3}$

c.  $\frac{6z + 12}{2z^2 + 7z + 6}$

d.  $\frac{c^2 - c - 6}{c^2 + 5c + 6}$

The numerator and denominator of  $\frac{x-3}{3-x}$  are opposites. To simplify the expression, you can factor  $-1$  from  $3 - x$  to get  $-1(-3 + x)$ , which you can rewrite as  $-1(x - 3)$ . Then simplify  $\frac{x-3}{-1(x-3)}$ .



### Problem 3 Recognizing Opposite Factors

**Got It?** What is the simplified form of the expression? State any excluded values.

a.  $\frac{2x - 5}{5 - 2x}$

b.  $\frac{y^2 - 16}{4 - y}$

c.  $\frac{3 - 9d}{6d^2 + d - 1}$

d.  $\frac{3 - 3z}{2z^2 - 2}$



### Problem 4 Using a Rational Expression

**Got It?** a. A square has side length  $6x + 2$ . A rectangle with width  $3x + 1$  has the same area as the square. What is the length of the rectangle?



**Practice** 7. **Geometry** The length of a rectangular prism is 5 more than twice the width  $w$ . The volume of the prism is  $2w^3 + 7w^2 + 5w$ . What is a simplified expression for the height of the prism?

8. **Geometry** Rectangle A has length  $2x + 6$  and width  $3x$ . Rectangle B has length  $x + 2$  and an area 12 square units greater than Rectangle A's area. What is a simplified expression for the width of Rectangle B?