Factoring Polynomials Using the GCF

Lesson 7.6

Writing a polynomial as a product of factors is called *factoring*.

Key Idea

Factoring Polynomials Using the GCF

Step 1: Find the greatest common factor (GCF) of the terms.

Step 2: Use the Distributive Property to write the polynomial as a product of the GCF and its remaining factors.

EXAMPLE 1 Factoring Polynomials

Factor each polynomial.

a. $2x^2 + 18$

Step 1: Find the GCF of the terms.

$$2x^2 = 2 \cdot x \cdot x$$
$$18 = 2 \cdot 3 \cdot 3$$

The GCF is 2.

Step 2: Write the polynomial as a product of the GCF and its remaining factors.

$$2x^2 + 18 = 2(x^2) + 2(9)$$
$$= 2(x^2 + 9)$$

b. $15y^3 + 10y^2$

Step 1: Find the GCF of the terms.

$$15y^3 = 3 \cdot 5 \cdot y \cdot y \cdot y$$
$$10y^2 = 2 \cdot 5 \cdot y \cdot y$$

The GCF is $5 \cdot y \cdot y = 5y^2$.

Step 2: Write the polynomial as a product of the GCF and its remaining factors.

$$15y^3 + 10y^2 = 5y^2(3y) + 5y^2(2)$$
$$= 5y^2(3y + 2)$$

On Your Own

Factor the polynomial.

1. $5z^2 + 30$

   $5(z^2 + 6)$

2. $3x^2 + 14x$

   $x(3x + 14)$

3. $8y^2 - 24y$

   $8y(y - 3)$

To solve an equation using the Zero-Product Property, you may need to first collect the terms on one side of the equation and then factor.

EXAMPLE 2 Solving an Equation by Factoring

Solve $4g^2 = -6g$.

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$$4g^2 = -6g$$

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EXAMPLE 2 Solving an Equation by Factoring

Solve $4g^2 = -6g$.

$$4g^2 = -6g$$

$$4g^2 + 6g = 0$$

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$$4g^2 + 6g = 0$$

$$2g(2g + 3) = 0$$

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Solve $4g^2 = -6g$.

$$4g^2 = -6g$$

$$4g^2 + 6g = 0$$

$$2g(2g + 3) = 0$$

$$2g = 0 \quad \textit{or} \quad 2g + 3 = 0$$

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EXAMPLE 2 Solving an Equation by Factoring

Solve $4g^2 = -6g$.

$$4g^2 = -6g$$

$$4g^2 + 6g = 0$$

$$2g(2g + 3) = 0$$

$$2g = 0 \quad or \quad 2g + 3 = 0$$

$$g = 0 \quad or \quad g = -\frac{3}{2}$$

To solve an equation using the Zero-Product Property, you may need to first collect the terms on one side of the equation and then factor.

EXAMPLE 2 Solving an Equation by Factoring

Solve $4g^2 = -6g$.

$$4g^2 = -6g$$

$$4g^2 + 6g = 0$$

$$2g(2g + 3) = 0$$

$$2g = 0 \quad \textit{or} \quad 2g + 3 = 0$$

$$g = 0 \quad \textit{or} \quad g = -\frac{3}{2}$$

∴ The solutions are $g = 0$ and $g = -\frac{3}{2}$.

On Your Own

Solve the equation.

4. $3x^2 + 21x = 0$

$3x(x + 7) = 0$

$3x = 0 \ or \ x + 7 = 0$

$x = 0 \quad or \quad x = -7$

5. $5z^2 = 5z$

$5z^2 - 5z = 0$

$5z(z - 1) = 0$

$5z = 0 \ or \ z - 1 = 0$

$z = 0 \quad or \quad z = 1$

6. $18y = 6y^2$

$-6y^2 + 18y = 0$

$6y(-y + 3) = 0$

$6y = 0 \ or \ -y + 3 = 0$

$y = 0 \quad or \quad y = 3$

Real-Life Application

DOLPHIN A dolphin jumps straight into the air during a performance. The dolphin's height y (in feet) after t seconds can be modeled by $y = -16t^2 + 24t$.

a. How many seconds is the dolphin in the air?

$$0 = -16t^2 + 24t$$

$$0 = 8t(-2t + 3)$$

$$8t = 0 \quad or \quad -2t + 3 = 0$$

$$t = 0 \quad or \quad -2t = -3$$

$$t = 1.5$$

So the dolphin is in the air for 1.5 seconds.

b. The dolphin reaches its maximum height after 0.75 second. What is the maximum height of the jump?

Real-Life Application

DOLPHIN A dolphin jumps straight into the air during a performance. The dolphin's height y (in feet) after t seconds can be modeled by $y = -16t^2 + 24t$.

a. How many seconds is the dolphin in the air?

So the dolphin is in the air for 1.5 seconds.

b. The dolphin reaches its maximum height after 0.75 second. What is the maximum height of the jump?

$$y = -16(0.75)^2 + 24(0.75)$$

$$y = -9 + 18$$

$$y = 9$$

So the maximum height of the jump is 9 *feet*.

On Your Own

A child jumps straight in the air on a trampoline. The child's height y(in feet) above the trampoline after t seconds can be modeled by $y = -16t^2 + 18t$. How many seconds is the child in the air?

$$0 = -16t^2 + 18t$$

$$0 = 2t(-8t + 9)$$

$$2t = 0 \quad or \quad -8t + 9 = 0$$

$$t = 0 \quad or \quad -8t = -9$$

$$t = 0 \quad or \quad t = 1.125$$

So the child is in the air for 1.125 seconds.