# L8-5 Use the Distributive Property

## Use the Distributive Property

**Factor $15x + 25x^2$. The find the roots (solutions) of the equation.**

simplified form $15x + 25x^2$

Factored form $5x(3 + 5x)$

$5x \overline{)15x}$ $3$

$-15x$

$0$

$5x \overline{)25x^2}$ $5x$

$-25x^2$

$0$

① Look for GCF (coefficients & variables)

**Factor and find the solutions for $12xy + 24xy^2 - 30x^2y^4$.**

$12xy = 2 \cdot 2 \cdot 3 \cdot x \cdot y$

$24xy^2 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot x \cdot y \cdot y$

$-30x^2y^4 = 2 \cdot 3 \cdot -5 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y$

Prime Factorization of terms

$2 \cdot 3 \cdot x \cdot y = 6xy$

Use common Factors to Find GCF

$2 + 4y - 5xy^3$

$(6xy)(2 + 4y - 5xy^3)$

Put left over factors back together to make a simplified expression

**Factor and find the solutions for $3x^2y + 12xy^2$.**

$3x^2y + 12xy^2$

$3xy(x + 4y)$

$\frac{3x^2y}{3xy}$ $\quad$ $\frac{12xy^2}{3xy}$

## Relatively Prime Polynomial

① The #'s themselves are not necessarily prime #'s

② The #'s are prime relative to one another

③ The #'s have no common factors.

④ Can I find a common factor between these #'s?

$3x^2 - 19y^2 - 14z + 5$

This polynomial is relatively prime because no 2 terms have a common factor.

# Factor by Grouping

## KeyConcept Factoring by Grouping

**Words** A polynomial can be factored by grouping only if all of the following conditions exist.

- There are four or more terms.
- Terms have common factors that can be grouped together.
- There are two common factors that are identical or additive inverses of each other.

**Symbols**

$$\begin{aligned} ax + bx + ay + by &= (ax + bx) + (ay + by) \\ &= x(a + b) + y(a + b) \\ &= (x + y)(a + b) \end{aligned}$$

## KeyConcept Zero Product Property

**Words** If the product of two factors is 0, then at least one of the factors must be 0.

**Symbols** For any real numbers $a$ and $b$, if $ab = 0$, then $a = 0$, $b = 0$, or both $a$ and $b$ equal zero.

**Factor and find the solutions of $2xy + 7x - 2y - 7$.**

$(2xy - 2y) + (7x - 7)$

$2y(x-1) + 7(x-1)$

$(2y+7)(x-1)$

$2y+7=0$ $\quad x-1=0$

$2y=-7$ $\quad x=1$

$y=-\frac{7}{2}$

① Group terms based on common factors.

② Take common factor out of each group

③ Rearrange so that you have a poly. expression times poly. expression.

④ Set each expression $=0$

⑤ Solve for the roots (solutions)

**Factor and find the roots for $4xy + 3y - 20x - 15$.**

$(4xy - 20x) + (3y - 15)$

$4x(y - 5) + 3(y - 5)$ → GCF of poly. express.

$(4x + 3)(y - 5)$

$4x + 3 = 0$ $\quad y - 5 = 0$

$x = -\frac{3}{4}$ $\quad y = 5$

## Factor by Grouping with Additive Inverses

**Factor and find the roots for $15a - 3ab + 4b - 20$.**

$(15a - 3ab) + (4b - 20)$

$3a(5 - b) + 4(b - 5)$ Close

$-3a(-5 + b) + 4(b - 5)$

Factored $-3a$ instead of $3a$

Commutative Propt.

$\frac{15}{-3} = -5$

$-3a(b - 5) + 4(b - 5)$

$(-3a + 4)(b - 5)$

$-3a + 4 = 0 \quad b - 5 = 0$

$a = \frac{4}{3} \quad b = 5$

**Factor and find the roots for $-2xy - 10x + 3y + 15$.**

**Factor and find the roots for $-2xy - 10x + 3y + 15$.**

**FOOTBALL** A football is kicked into the air. The height of the football can be modeled by the equation $h = -16x^2 + 48x$, where $h$ is the height reached by the ball after $x$ seconds. Find the values of $x$ when $h = 0$.

**Juanita is jumping on a trampoline in her back yard. Juanita's jump can be modeled by the equation $h = -14t^2 + 21t$, where $h$ is the height of the jump in feet at $t$ seconds. Find the values of $t$ when $h = 0$.**