Vocabulary -

Leading Coefficient (LC) - the coefficient of the term in a polynomial with the largest degree. In a quadratic, the coefficient of the $x^2$ term.

# Factoring Quadratics
# Special Products (DOTS)

**MGSE9-12.A.REI.4** Solve quadratic equations in one variable.

**MGSE9–12.A.REI.4b** Solve quadratic equations by inspection (e.g., for x 2 = 49), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions). Build a function that models a relationship between two quantities.

## What am I learning today?

How to break a quadratic down into its factors

## How will I show that I learned it?

Factor a quadratic using special product rules

## Factoring Quadratics

-LOTS of different patterns and methods

-You are "undoing" multiplication

- You can ALWAYS check your work by multiplying.

How did we distribute opposite binomials?

conjugates

1. $(x + 2)(x - 2)$ $x^2 - 4$

2. $(4x - 1)(4x + 1)$ $16x^2 - 1$

3. $(3x + 4)(3x - 4)$ $9x^2 - 16$

4. $(3x^2 + 4)(3x^2 - 4)$ $9x^4 - 16$

What **pattern** do we notice? no b value
2 terms
subtraction b/t
perfect squares

## What does DOTS stand for?

D ifference
O f
T wo
S quares

# Factoring Special Products

1. Put in order and check for a GCF (including a negative).
2. Check for DOTS.
3. If DOTS, take a square root of each term and label a and b.
4. Put in the format (a + b)(a - b).

**Example:** $49x^2 - 100$ DOTS ✓

$a^2 = 49x^2$ $b^2 = 100$

$a = 7x$ $b = 10$

$(7x+10)(7x-10)$

## Special Patterns

Difference of two squares (**DOTS**):

$a^2$ **-** $b^2$ ⟶ factors to: (a **+** b)(a **-** b)

Examples:

1. $x^2 - 16$ DOTS ✓

$a^2 = x^2$ $b^2 = 16$

$a = x$ $b = 4$

$(x+4)(x-4)$

2. $16x^2 - 25$ DOTS ✓

$a^2 = 16x^2$ $b^2 = 25$

$a = 4x$ $b = 5$

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

## Special Patterns

Difference of two squares (**DOTS**):

$a^2 - b^2 \longrightarrow$ factors to: $(a + b)(a - b)$

Examples:

3. $4x^2 - 9$ DOTS ✓ ✓ ✓

$a=2x \quad b=3$

$(2x+3)(2x-3)$

4. $x^2 + 36$ DOTS ✗

prime

**Note: this pattern does NOT work for sums!

## Special Patterns

Difference of two squares (**DOTS**):

$a^2 - b^2 \longrightarrow$ factors to: $(a + b)(a - b)$

Examples:

5. $81x^2 - 9$

$9(9x^2-1)$ DOTS ✓ ✓ ✓

$a=3x \quad b=1$

$9(3x+1)(3x-1)$

6. $3x^2 - 9$

$3(x^2-3)$ DOTS ✓ ✓ ✗

$3(x^2-3)$

**Note: this pattern does NOT work for sums!

***CHOOSING THE RIGHT FACTORING METHOD***

$-3x^2 + 48$

$2x^2 - 9x - 18$

$-4x^2 - 8 + 3x^3 + 6x$

***1. Put in order***

$-3x^2 + 48$

$2x^2 - 9x - 18$

$*\mathbf{3x^3 - 4x^2 + 6x - 8}*$

***2. Take out any GCF, including negative LC***

$*\mathbf{-3(x^2 - 16)}*$

$2x^2 - 9x - 18$

$3x^3 - 4x^2 + 6x - 8$

***3. How many terms are in the remaining expression?***

| *2 Terms* | *3 Terms* | *4 Terms* |
|---|---|---|
| *DOTS?* | *MA Chart?* | *Grouping?* |
| $-3(x^2 - 16)$ | $2x^2 - 9x - 18$ | $3x^3 - 4x^2 + 6x - 8$ |
| $a^2 = x^2$ $b^2 = 16$ | M = -36, A = -9 | $(3x^3 - 4x^2)+(6x - 8)$ |
| a = x b = 4 | -12 and 3 | $x^2(3x-4)+2(3x-4)$ |
| (a + b)(a - b) | $2x^2 - 12x + 3x - 18$ | $\mathbf{(x^2 + 2)(3x - 4)}$ |
| $\mathbf{-3(x + 4)(x - 4)}$ | $2x(x - 6) + 3(x - 6)$ | |
| | $\mathbf{(2x + 3)(x - 6)}$ | |