Algebra Review: Factoring By Grouping

Warmup

- Go to Kahoot.it
- Work in your group.
- Enter the Game pin that appears on the screen and choose your team nickname.

Factoring Polynomials

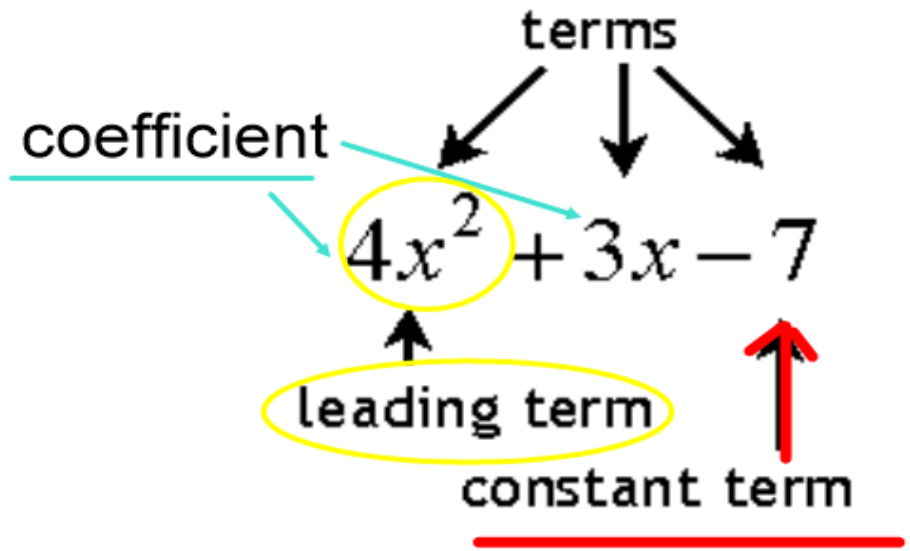
- **Objective**: Students will be able to solve quadratic functions by factoring using the grouping method.

* Question: What is a Quadratic Function?

What's a Polynomial?

Here is a typical polynomial:

Recall



What's a Quadratic

- A quadratic is a polynomial that is written in the form "$ax^2 + bx + c$" where a, b, and c are all numbers.

- Note that $b, c = 0$, but $a \neq 0$. Can you tell me why?

How to Factor A Quadratic by Grouping

- Remember the standard form for a Quadratic: $ax^2 + bx + c$
- First, find the product $a \cdot c$ (or ac). Also, take note of the value of b (including the sign).
- Next, find two numbers that multiply to get ac and add into b or have a difference of b. It would be best to create a list of factors for ac.

How to Factor A Quadratic by Grouping

- Once you have identified the appropriate factors, you will replace "bx" with a sum/difference of those factors, also multiplied by "x"

- Next, factor completely by grouping (as we will see).

Practice Factoring: When $a = 1$

- Factor the following polynomial:

$$x^2 + 5x + 6$$

$a = 1,\ b = 5,\ c = 6$

Thus, the factors of ac that adds up to 5 are 2 and 3.

List of factors of ac:

- 1,6 $1 + 6 =$
- 2,3 $2 + 3 =$

Example 1 Continued

This mean

$$x^2 + 2x + 3x + 6$$

Group the first two and the second two terms

$$x^2 + 2x + 3x + 6$$

From the groups, factor out their GCF

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

Notice that each group has a common term: "$x + 2$"

Factor that out from the group, and finally you have

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

Example

- Factor the following polynomial:

$x^2 - 6x + 8$ Factors of $ac = 8$

$a = 1$,$b = -6$,$c = 8$

The factors of 8 that add to make -6 are -2 and -4.

Thus $x^2 - 2x - 4x + 8$

Next $x(x - 2) - 4(x - 2)$

Finally $(x - 2)(x - 4)$

Critical Question

- How do we know if the factors of ac have to add up to b or must have a difference of b.

- How to remember the rules:
  - Add to b:
    - $ax^2 + bx + c$
    - $ax^2 - bx + c$
  - Difference of b:
    - $ax^2 + bx - c$
    - $ax^2 - bx - c$

Example

- Factor the Polynomial completely:

$$x^2 + 3x - 18$$

Add to b or Difference of b

Factors of $ac =$

Then

$$x^2 - 3x + 6x - 18$$
$$x(x - 3) + 6(x - 3)$$
$$(x - 3)(x + 6)$$

Day 2: Warmup

- Factor the Following Polynomials

1. $x^2 + 9x + 18$
2. $x^2 - 12x + 35$
3. $x^2 + 5x - 24$

Day 2: What about when $a > 1$?

- The rules are the same, just a little more work.
- Example:

$$2x^2 + 7x + 6$$

$a = 2$
$b = 7$
$c = 6$

Factors of $ac = 12$ that add to make $b = 7$ are

Next $2x^2 + 4x + 3x + 6$

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

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

ac	b
+12	+7
1, 12	13 ✗
2, 6	8 ✗
3, 4	7 ✓

Example

- Factor the Polynomial Completely

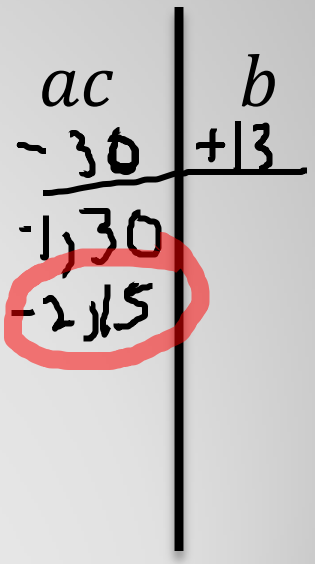
$$5x^2 + 13x - 6$$

Factors of $ac = -30$ that have a difference of $b = 13$ are

$$5x^2 + 15x - 2x - 6$$

$$5x(x + 3) - 2(x + 3)$$

$$(x + 3)(5x - 2)$$



Exit Ticket

- Factor the Following Polynomials

1. $3x^2 + 8x + 5$

2. $2x^2 - 15x - 8$