

## Factoring Quadratics

**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.

Feb 28-10:54 AM

### What am I learning today?

How to factor a polynomial trinomial or binomial

### How will I show that I learned it?

Use an M-A chart to find numbers that split the middle term for factoring by grouping

Aug 18-1:21 PM

## Standard Form of a Quadratic

$$f(x) = ax^2 + bx + c$$

**a** is always the **coefficient of  $x^2$**

**b** is always the **coefficient of  $x$**

**c** is always the **constant**

$$3x^2 + 7x + 2$$

$$a = 3$$

$$b = 7$$

$$c = 2$$

$$4x^2 - x$$

$$a = 4$$

$$b = -1$$

$$c = 0$$

$$x^2 - 9$$

$$a = 1$$

$$b = 0$$

$$c = -9$$

Sep 26-2:52 PM

## Factoring Polynomials

-You are "undoing" multiplication

-LOTS of different patterns and methods

- You can ALWAYS check your work by multiplying.

Apr 8-9:07 AM

$$(2x + 7)(x - 5)$$

$$2x(x - 5) + 7(x - 5)$$

$$2x^2 - 10x + 7x - 35$$

$$2x^2 - 3x - 35$$

Factor by Grouping

M-A chart

How do we go from the final 3 terms back to 4 terms that we can group? With an M-A Chart!

Sep 26-2:49 PM

### M-A Chart

Used to get from 2 or 3 terms to 4 terms for grouping.

You are looking for 2 numbers that multiply to the M number and add to the A number.

From standard form  $f(x) = ax^2 + bx + c$ ,

- "M" is the product of **a** and **c**.
- "A" is the **b**.

Example:  $2x^2 - 3x - 35$      $a=2$     $b=-3$     $c=-35$

$$M = 2 \cdot -35 = -70 \quad A = -3$$

-10	+7
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$$\begin{array}{l} \boxed{2x^2 - 10x} + 7x - 35 \\ 2x \overline{) x-5} \quad 7 \overline{) x-5} \end{array}$$

$$\boxed{(2x + 7)(x - 5)}$$

Sep 26-2:56 PM

Factoring Binomials and Trinomials

1. Factor out the GCF.
2. Label a, b, and c in your quadratic.
3. Multiply a and c together. Find 2 numbers that multiply to give you "ac" and add to give you "b". REMEMBER: signs are important!
4. Using these numbers as your new coefficients, split your "x" term into 2 terms and factor by grouping.

Example 1:  $3x^2 - 4x - 4$      $a=3$      $3 \cdot -4 = -12$      $A$   
 $b=-4$      $-6$      $2$   
 $c=-4$

$$\begin{array}{|l} 3x^2 - 6x + 2x - 4 \\ \hline 3x(x-2) \quad 2(x-2) \\ \hline (3x+2)(x-2) \end{array}$$

Apr 8-9:25 AM

Factoring Binomials/Trinomials

Example 2:  $4x^2 + 11x - 3$      $a=4$      $4 \cdot -3 = -12$      $A$   
 $b=11$      $+4$      $-3$   
 $c=-3$      $+6$      $-2$   
 $+12$      $-1$

$$\begin{array}{|l} 4x^2 + 12x - 1x - 3 \\ \hline 4x(x+3) \quad -1(x+3) \\ \hline (4x-1)(x+3) \end{array}$$

Example 3:  $-10x^2 + 9x - 2$      $a=10$      $10 \cdot 2 = 20$      $A$   
 $b=9$      $-10$      $2$   
 $c=2$      $-5$      $-4$

$$\begin{array}{|l} -10x^2 + 9x - 2 \\ \hline -1(10x^2 - 9x + 2) \\ \hline -1(10x^2 - 5x - 4x + 2) \\ \hline -1(5x(2x-1) - 2(2x-1)) \\ \hline -1(5x-2)(2x-1) \end{array}$$

Apr 8-9:25 AM

## Factoring Binomials/Trinomials

Example 4:  $x^2 - 36$

$$\begin{array}{l} \underline{x^2 - 6x + 6x - 36} \\ x \underline{x - 6} \quad 6 \underline{x - 6} \\ (x + 6)(x - 6) \end{array}$$

$$\begin{array}{l} a=1 \\ b=0 \\ c=-36 \end{array} \quad \begin{array}{c|c} M & A \\ \hline -36 & 0 \\ \hline -6 & +6 \end{array}$$

Example 5:  $5x^2 + 50x + 80$

$$\begin{array}{l} 5 \underline{x^2 + 10x + 16} \\ \left( \begin{array}{l} \underline{x^2 + 8x + 2x + 16} \\ x \underline{x + 8} \quad 2 \underline{x + 8} \end{array} \right) \\ \boxed{5(x + 2)(x + 8)} \end{array}$$

$$\begin{array}{l} a=1 \\ b=10 \\ c=16 \end{array} \quad \begin{array}{c|c} M & A \\ \hline 16 & 10 \\ \hline 8 & 2 \end{array}$$

Apr 8-9:25 AM

## Factoring Binomials/Trinomials

Example 6:  $81 - 36x^2$

$$\begin{array}{l} \underline{-36x^2 + 81} \\ -9 \underline{4x^2 - 9} \\ \left( \begin{array}{l} \underline{4x^2 - 6x + 6x - 9} \\ 2x \underline{2x - 3} \quad 3 \underline{2x - 3} \end{array} \right) \\ \boxed{-9(2x + 3)(2x - 3)} \end{array}$$

$$\begin{array}{l} a=4 \\ b=0 \\ c=-9 \end{array} \quad \begin{array}{c|c} M & A \\ \hline -36 & 0 \\ \hline -6 & 6 \end{array}$$

Apr 8-9:25 AM

You Try

1.  $x^2 + 5x + 6$

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

2.  $2x^2 + 8x - 10$

5.  $x^2 - 16$

3.  $2x^2 + 11x + 15$

6.  $-18x^2 + 39x + 15$

Apr 8-9:25 AM