Factoring a Trinomial of the form $ax^2 + bx + c$

I. Factoring trinomials of the form $ax^2 + bx + c$ where $a \neq 1$

A. You will learn two methods for factoring trinomials of the form $ax^2 + bx + c$ where $a \neq 1$. You can use either method.

B. Pattern we noticed in the previous section:
   i. If the constant term, $c$, is positive, the sign of the middle term, $bx$, determines the signs of both factors.
      • If the middle term is positive, use two addition symbols in your factors.
      • If the middle term is negative, use two subtraction symbols in your factors.
   ii. If the constant term is negative, you have one addition and one subtraction for the factors.

II. Method 1 — Factor by Trial and Error

Recall: Multiplying poly’s
$(2x+3)(2x+5)=$

$(4x+3)(x+5)=$

To factor a poly using trial and error:

$ax^2 + bx + c =$

IMPORTANT: We are NOT looking for numbers that multiply to $c$ and add to $b$. That is ONLY for poly’s that start with $x^2$.

Examples: Factor using Trial and Error

1) $2x^2 + 13x + 15$  
2) $3y^2 + 22y - 16$
III. Method 2 — Factor by Grouping

To use grouping we need ___ terms in the poly. In this section we have trinomials, that is, ____ term poly’s. What do we do? We rewrite the poly as follows:

Steps to factor by grouping:
1. Find two numbers that multiply to \(a \cdot c\) and add to \(b\). (If no such numbers exist, the poly is prime.)
2. Rewrite the middle term using the two numbers found in step 1 to obtain a four term poly.
3. Now you can use grouping—see section 7.2.

Examples: Factor using Grouping.
1) \(2x^2 + 13x + 15\)  
2) \(3y^2 + 22y - 16\)
3) $2x^2 - 3x + 4$  
4) $8x^2 + 19x + 6$

5) $2x^2 + 3x - 20$  
6) $6x^2 + 7x - 10$

**IV. Factor Completely**
The instructions you will see for hw will say: “factor completely”. This means first look for a GFC. If there is one, factor it out.

1) Use grouping: $10x^3 + 24x^2 + 14x$

2) Use Trial and Error: $15x^2 + 6x - 9$
Examples: Factor completely. If the poly is prime, so state.
1) $2y^2 - 9y + 4$                      2) $3x^2 + 5x - 12$

3) $3w^2 - 11w - 6$                      4) $8x^3 + 8x^2 - 6x$

5) $6x^2 + 26x + 24$