Lesson 28 Factoring Trinomials of the Type $ax^2 + bx + c$, by Grouping

Review FOIL:

$$(2x + 3)(5x + 4)$$

$$2x(5x) + 2x(4) + 3(5x) + 3(4)$$

4 Terms $\longrightarrow$ $10x^2 + \underbrace{8x + 15x}_{\text{Like Terms}} + 12$

$$10x^2 + 23x + 12$$

Factoring a Trinomial with Grouping:

10(12)

$$10x^2 + 23x + 12$$

Break into like terms

4 terms

$$\underbrace{10x^2 + 8x} + \underbrace{15x + 12}$$

$$2x(5x + 4) + 3(5x + 4)$$

$$(5x + 4)(2x + 3)$$

10(12) =

120	
1	120
2	60
3	40
4	30
5	24
6	20
+8x	+15x
10	12

Steps to follow . . .

1. Multiply the first and last numbers together.
2. Find all factor pairs of this product.
3. Find the factor pair that adds or subtracts to the middle number.
4. Assign the signs to each number in the factor pair.
5. Put an x after each number in the factor pair.
6. Replace the middle term in the trinomial with these 2 expressions.
7. Factor by grouping.

Examples: Factor each trinomial.

1. $6n^2 \boxed{+ 23n} + 7$ (6(7))

+ 42	
1	42
+ 2n	+ 21n
3	14
6	7

$\underbrace{6n^2 + 2n} + \underbrace{21n + 7}$

$2n(\cancel{3n+1}) + 7(\cancel{3n+1})$

$(3n+1)(2n+7)$

2. $2y^2 \boxed{+5y} + 2$ $\quad 2(2)$

$\underbrace{2y^2 + 1y} \underbrace{+ 4y + 2}$

$y(\cancel{2y+1}) + 2(\cancel{2y+1})$

$(2y+1)(y+2)$

4

$\boxed{+1y \quad +4y}$

$2 \quad 2$

3. $7x^2 \boxed{-26x} - 8$ $\quad 7(-8)$

$\underbrace{7x^2 + 2x} \underbrace{-28x - 8}$

$x(\cancel{7x+2}) - 4(\cancel{7x+2})$

$(7x+2)(x-4)$

-56

$1 \quad 56$

$\boxed{+2x \quad -28x}$

$4 \quad 14$

$7 \quad 8$