Bellwork

Multiply each of the following sets of binomials:

1. $(5x + 2)(2x - 3)$

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

$10x^2 - 15x + 4x - 6$

$\boxed{10x^2 - 11x - 6}$

2. $(3x - 7)(4x + 3)$

$3x(4x+3) - 7(4x+3)$

$12x^2 + 9x - 28x - 21$

$\boxed{12x^2 - 19x - 21}$

3. $(7x + 1)(8x + 7)$

$7x(8x+7) + 1(8x+7)$

$56x^2 + 49x + 8x + 7$

$\boxed{56x^2 + 57x + 7}$

4. $(6x - 5)(10x - 3)$

$6x(10x-3) - 5(10x-3)$

$60x^2 - 18x - 50x + 15$

$\boxed{60x^2 - 68x + 15}$

Recall the Distributive Property

In the notes about the Distributive Property we showed the property when multiplying two binomials, two trinomials, or a mix of the two of them.

Property of Focus:

$$\begin{aligned}(ax + b)(cx + d) &= ax(cx + d) + b(cx + d) \\ &= (ac)x^2 + (ad)x + (bc)x + bd \\ &= (ac)x^2 + (ad + bc)x + bd\end{aligned}$$

Investigation of the Trinomial Result

Property of Focus:

$(ax + b)(cx + d) = ax(cx + d) + b(cx + d)$

$= (ac)x^2 + (ad)x + (bc)x + bd$

$= (ac)x^2 + (ad + bc)x + bd$

What do you notice about the first term of the end result here? The leading coefficient is the **Product** of the coefficients on the x-terms.

What do you notice about the middle term of the end result here? The coefficient of the middle term is the **Sum** of the **Products** of the outer and inner terms.

What do you notice about the last term, the constant, of the end result here? The constant is the **Product** of the constants.

Factoring Trinomial Expressions

Standard Form:

$ax^2 + bx + c$

Focus:

We will focus on the case where $a \neq 1$

So we are really looking at -

$$ax^2 + bx + c$$

Procedure

Step 1: Multiply a and c.

Step 2: Find the factors of a and c that combine to get the middle term by the second sign.

Step 3: Rewrite the expression as follows...

ax^2 + (factor of ac)x + (factor of ac)x + c

Step 4: Group the first two terms together and group the last two terms together.

LEAVE THE SIGN IN THE MIDDLE

Note - If neg change sign inside last ( )'s.

Step 5: Find the GCF of each set of ( ) separately.

Now looks like... $f_1x(\#x + p) + f_2(\#x + p)$

Step 6: Write the final answer...

$(f_1x + f_2)(\#x + p)$

Examples

Factor each of the following expressions:

1. $6x^2 + 7x - 5$

$6(5) = \underline{30}$

1	30
2	15
3	10
5	6

$6x^2 - 3x + 10x - 5$

$(6x^2 - 3x) + (10x - 5)$

$3x(2x-1) + 5(2x-1)$

$\boxed{(3x + 5)(2x - 1)}$

2. $35x^2 + 39x + 10$

$35(10) = 350$

1	350
2	175
5	70
7	50
10	35
14	25

$35x^2 + 14x + 25x + 10$

$(35x^2 + 14x) + (25x + 10)$

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

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

More Examples

3. $18x^2 - 33x + 14$

$18(14) = 252$

1	252
2	126
3	84
4	63
6	42
7	36
9	28
12	21
14	18

$18x^2 - 12x - 21x + 14$

$(18x^2 - 12x) - (21x - 14)$

$6x(3x-2) - 7(3x-2)$

$\boxed{(6x - 7)(3x - 2)}$

4. $20x^2 + 33x + 7$

$20(7) = 140$

1	140
2	70
4	35
5	28
7	20
10	14

$20x^2 + 5x + 28x + 7$

$(20x^2 + 5x) + (28x + 7)$

$5x(4x+1) + 7(4x+1)$

$\boxed{(5x + 7)(4x + 1)}$