Learning Goals:
To factor polynomials by determining the (GCF) greatest common factor.
To factor trinomials using multiplication tables.

In this lesson, we will take a quadratic equation in standard form and rewrite it in **factored form**.
$$x^2 + 5x + 6 \rightarrow (x + 2)(x + 3)$$

PROBLEM 1 – "What About the Other Way Around?" (Page 732)

Factoring Out the (GCF) Greatest Common Factor

To factor out the greatest common factor, simply use the **Distributive Property** in reverse.
$$3(x + 5) = 3x + 15 \leftrightarrow 3x + 15 = 3(x + 5)$$

<u>Steps</u>

1) Find the GCF of all the polynomial's terms, if possible.
2) Divide each term by the GCF.
3) Rewrite the polynomial as a product of the GCF and the polynomial's factors (the result of dividing the polynomial by the GCF).

1. **Factor out the greatest common factor for each polynomial, if possible.**

   a. $4x + 12$ **d.** $x^3 - 5x$
       GCF: 4

$$\frac{4x}{4} + \frac{12}{4} = x + 3$$
       4(x + 3)

   b. $3x^2 - 9x - 3$ **e.** $-x - 7$

   c. $2x - 11$ **f.** $5x^2 - 10x + 5$

2. **How can you check to see if you factored out the GCF correctly?**

   Use the Distributive Property to find the standard form of the polynomial.
          $5(x^2 - 2x + 1) = 5(x^2) + 5(-2x) + 5(1) = 5x^2 - 10x + 5$ ✔

PROBLEM 2 – "Factoring Trinomials" (Page 733)

Factoring Trinomials Using Multiplication Tables

<u>Steps</u>

1) Create a 2 x 2 multiplication table.
2) Write the first term (x^2) of the trinomial in the top left corner of the table.

3) Write the constant in the bottom right corner.
4) List all the factors of the constant.
5) Find the sum of each factor pair.
6) Determine which sum is equal to the middle term (x) of the trinomial.
7) Write the factor pair of that sum along with the variable in the two empty spaces in the table.
8) Outside the table, write either the variable and/or number combination that make up the entries in the multiplication table. These are your binomial factors.
9) Rewrite the polynomial as a product of binomial factors (x – 1ˢᵗ factor)(x – 2ⁿᵈ factor).

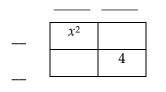1. **Write the trinomial as the product of the two factors.**

   $x^2 + 7x + 6 =$

	x	$+6$
x	x^2	$6x$
$+1$	$1x$	6

Factor Pairs of 6	Sum
1 and 6	7
2 and 3	5

   $x^2 + 7x + 6 = (x + 1)(x + 6)$

2. **Factor each trinomial.**

   a. $x^2 + 5x + 4 =$

	___	___
___	x^2	
___		4

Factor Pairs of 4	Sum

   $x^2 + 5x + 4 =$ _____

   b. $x^2 - 6x + 9 =$

	___	___
___	x^2	
___		9

Factor Pairs of 9	Sum

   $x^2 - 6x + 9 =$ _____

   c. $x^2 + 5x - 6 =$

	___	___
___	x^2	
___		-6

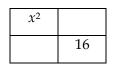 | Factor Pairs of –6 | Sum |
   |--------------------|-----|
   | | |

   $x^2 + 5x - 6 =$ _____

3. **SKIP this problem!**

4. If $x^2 + 10x + 16 = (x + 2)(x + 8)$, then **EXPLAIN WHY** the other factor pairs of 16 do not work?
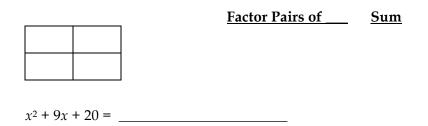
   a. **(1)(16)**

x^2	
	16

   b. **(4)(4)**

x^2	
	16

5. **Use multiplication tables to factor each trinomial.**

   a. $x^2 + 9x + 20 =$

   Factor Pairs of ____   Sum

   $x^2 + 9x + 20 =$ _____

   b. $x^2 + 11x + 18 =$

   Factor Pairs of ____   Sum

   $x^2 + 11x + 18 =$ _____