



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.

$$3(x + 5) = 3x + 15 \leftrightarrow 3x + 15 = 3(x + 5)$$

Steps

- 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. $4x + 12$

GCF: 4

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

$$4(x + 3)$$

d. $\frac{x^3 - 5x}{x} = x^2 - 5$

GCF = x

$$x(x^2 - 5)$$

b. $\frac{3x^2 - 9x - 3}{3} = x^2 - 3x - 1$

GCF = 3

$$3(x^2 - 3x - 1)$$

e. $\frac{-x - 7}{-1} = x + 7$

GCF = -1

$$-1(x + 7) \text{ or } -(x + 7)$$

c. $2x - 11$

no GCF

f. $\frac{5x^2 - 10x + 5}{5} = x^2 - 2x + 1$

GCF = 5

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

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.

$$5(x^2 - 2x + 1) = 5(x^2) + 5(-2x) + 5(1) = 5x^2 - 10x + 5 \checkmark$$

PROBLEM 2 - "Factoring Trinomials" (Page 733)

Factoring Trinomials Using Multiplication Tables

Steps

- 1) Create a 2×2 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 ($x - 1^{\text{st}} \text{ factor}$)($x - 2^{\text{nd}} \text{ factor}$).

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

$$x^2 + 7x + 6 =$$

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

<u>Factor Pairs of 6</u>	<u>Sum</u>
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	$+4$		
x^2	$4x$		
$1x$	4		

<u>Factor Pairs of 4</u>	<u>Sum</u>
1 and 4	5 ✓
2 and 2	4

$$x^2 + 5x + 4 = (x+1)(x+4)$$

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

x	-3		
x^2	$-3x$		
$-3x$	9		

<u>Factor Pairs of 9</u>	<u>Sum</u>
1 and 9	10
3 and 3	6
-1 and -9	-10
-3 and -3	-6 ✓

$$x^2 - 6x + 9 = (x-3)(x-3)$$

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

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

<u>Factor Pairs of -6</u>	<u>Sum</u>
1 and -6	-5
-1 and 6	5 ✓
2 and -3	-1
-2 and 3	1

$$x^2 + 5x - 6 = (x-1)(x+6)$$

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	$+16$
x	x^2	$16x$
$+1$	$1x$	16

$$1x + 16x \neq 10x$$

$$17x \neq 10x$$

b. (4)(4)

	x	$+4$
x	x^2	$4x$
$+4$	$4x$	16

$$4x + 4x \neq 10x$$

$$8x \neq 10x$$

Factor pairs must add up to the coefficient of the middle term.

5. Use multiplication tables to factor each trinomial.

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

	x	$+4$
x	x^2	$4x$
$+5$	$5x$	20

<u>Factor Pairs of 20</u>	<u>Sum</u>
1 and 20	21
2 and 10	12
4 and 5	9 ✓

$$x^2 + 9x + 20 = \underline{(x+5)(x+4)}$$

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

	x	$+9$
x	x^2	$9x$
$+2$	$2x$	18

<u>Factor Pairs of</u>	<u>Sum</u>
1 and 18	19
2 and 9	11 ✓
3 and 6	9 ✓

$$x^2 + 11x + 18 = \underline{(x+2)(x+9)}$$