Date: _____

9.6 Factor Quadratic Equations When the <u>Leading Coefficient IS NOT 1</u>

VOCABULARY:

- **Standard Form of a Quadratic Equation** $Ax^2 + Bx + C = 0$;

  Where A, B, C are real numbers ; and $A \neq 0$

- **Factoring** <u>is a lot more work</u> when $a \neq 1$

Example 1 *Factor when a and c <u>are</u> prime number other than 1*

$2x \cdot 7 = 14x$

$1 \cdot x = x$

<u>Steps to Factor</u> : $\overset{A}{2}x^2 + \overset{B}{15}x + \overset{C}{7} = (2x + 1)(x + 7)$

$14x + x = 15x = B$

OR $(x+7)(2x+1)$

$1 \cdot 2 \qquad 1 \cdot 7$

1) Identify a, b, and c. a = 2   b = 15   and c = 7
2) Write 2 sets of ( )'s. One for each factor.
3) What are the first terms in both factors? Why? $2x \cdot x = 2x^2$ (the 1st term)
4) What are the <u>**signs**</u> for each factor? Both positive since B + C are positive
5) What are the factors of 2 and 7? Put them under the numbers
6) Draw brackets (multiply INNER TERMS, OUTER TERMS, and their sum must be "B"
7) <u>**CHECK**</u> by Multiplying the factors

$(2x+1)(x+7) = 2x^2 + 14x + x + 7 = 2x^2 + 15x + 7 \checkmark$

CHECK POINT: Factor and Check by mentally multiplying

2) $2x^2 - 11x + 5 = (2x - 1)(x - 5)$

$2x \cdot 5 = 10x$

$1 \cdot x$

$1 \quad 2 \qquad 1 \cdot 5$

OR $(x-5)(2x-1)$

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

$5x \cdot 1 = 5x$

$-3 \cdot x = -3x$

$1 \cdot 5 \qquad 1 \cdot 3$

SIGNS +, −

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

4) $3x^2 - 8x - 3 = (3x + 1)(x - 3)$

$3x \cdot -3 = -9x$

$1 \cdot x$

$1 \cdot 3 \qquad 1 \cdot 3$

OR $(x-3)(3x+1)$

SIGNS +, −

5) $5x^2 + 55x + 150 \quad 5(x^2 + 11x + 30)$

TIP: FACTOR GCF

KEEP FACTORING

$5(x+5)(x+6)$

MUST INCLUDE THE GCF (5)

$\begin{array}{cc} 1 & 30 \\ 2 & 15 \\ 3 & 10 \\ 5 & 6 \end{array}$

Example 6 *Factor "-1" when the leading coefficient is negative*

Steps to Factor : $-2x^2 - 11x - 5 =$ $-1(2x^2 + 11x + 5)$ 1.5

1.2 — $-1(2x + 1)(x + 5)$

x / $10x$

1) Identify a, b, and c.   a = -2 b = -11 and c = -5

★ 2) Always factor out -1 when the leading coefficient is negative. ★

3) Factor **(the final answer must include "–1")**

4) Always **CHECK** by Mentally multiplying the factors !!!!!!!!!!!!!!!!!!!!

2 ANSWERS:
$-1(2x+1)(x+5)$ OR
$-1(x+5)(2x+1)$

Example 7 *Factor when a and c are NOT prime numbers*

$-21x$
$-4x$

Steps to Factor : $7x^2 - 25x + 12 =$ $(7x - 4)(x - 3)$

1 7   1 12
          2 6
          3 4

✓1) Write 2 sets of ( )'s. One for each factor.

✓2) What are the factors of 7 and 12? Put them under the numbers

3) Draw brackets

4) Factor by guess and check.

5) Always **CHECK** by Mentally multiplying the factors !!!!!!!!!!!!!!!!!!!!

2 ANSWERS

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

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

Example 8 *Solve Quadratic Equation by Factoring*

① **Factor:** $5x^2 - 18x + 16 =$ $(5x - 8)(x - 2) = 0$ Set EQUAL TO Zero

1 16
2 8
4 4

② **Solve:**

$5x - 8 = 0$ $x - 2 = 0$
$+8 \quad +8$
$\dfrac{5x}{5} = \dfrac{8}{5}$ $\boxed{x = 2}$

$\boxed{x = \frac{8}{5}}$ ← LEAVE AS SIMPLIFIED IMPROPER FRACTION

③ **Check:**
IN ORIG EQ!!

USE CALC TO check!

$C: 5\left(\frac{8}{5}\right)^2 - 18\left(\frac{8}{5}\right) + 16 = 0$

$0 = 0$ ✓

$\begin{cases} C: 5(2)^2 - 18(2) + 16 = 0 \\ 20 - 36 + 16 = 0 \\ 0 = 0 \checkmark \end{cases}$

Revised apr2019