

9.6 Factor Quadratic Equations When the Leading Coefficient IS NOT 1

VOCABULARY:

- **Standard Form of a Quadratic Equation** $AX^2 + BX + C = 0$;
Where A, B, C are real numbers ; and $A \neq 0$
- **Factoring is a lot more work when $a \neq 1$**

Example 1 Factor when a and c are prime number other than 1

Steps to Factor : $2x^2 + 15x + 7 =$

$\begin{matrix} A & B & C \\ 2 & 15 & 7 \\ 1 \cdot 2 & 1 \cdot 7 & \end{matrix}$

$\begin{matrix} 2x \cdot 7 = 14x \\ 1 \cdot x = x \\ \hline (2x+1)(x+7) \end{matrix}$ $14x + x = 15x = B$

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

- 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 **signs** 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) **CHECK** 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

<p>2) $2x^2 - 11x + 5 =$</p> <p>$\begin{matrix} 2x \cdot 5 = 10x \\ 1 \cdot x = x \\ \hline (2x-1)(x-5) \end{matrix}$</p> <p>OR $(x-5)(2x-1)$</p> <p><i>Signs $-$</i></p>	<p>3) $5x^2 + 2x - 3 =$</p> <p>$\begin{matrix} 5x \cdot 1 = 5x \\ -3 \cdot x = -3x \\ \hline (5x-3)(x+1) \end{matrix}$</p> <p>OR $(x+1)(5x-3)$</p> <p><i>Signs $+$ $-$</i></p>
<p>4) $3x^2 - 8x - 3 =$</p> <p>$\begin{matrix} 3x \cdot 3 = -9x \\ 1 \cdot x = x \\ \hline (3x+1)(x-3) \end{matrix}$</p> <p>OR $(x-3)(3x+1)$</p> <p><i>Signs $+$ $-$</i></p>	<p>TIP: FACTOR GCF</p> <p>5) $5x^2 + 55x + 150 = 5(x^2 + 11x + 30)$</p> <p>KEEP FACTORING</p> <p>$5(x+5)(x+6)$</p> <p>MUST INCLUDE THE GCF(5)</p> <p>$\begin{matrix} 1 & 30 \\ 2 & 15 \\ 3 & 10 \\ 5 & 6 \end{matrix}$</p>

Algebra 1 Notes...

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

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

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

1.2 $\xrightarrow{1.5}$

\xrightarrow{x}
 $\xrightarrow{10x}$

- 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

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

1 7 $\xrightarrow{12}$
 $\xrightarrow{26}$
 $\xrightarrow{34}$

$\xrightarrow{-21x}$
 $\xrightarrow{-4x}$

- ✓ 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:** $5x^2 - 18x + 16 = (5x - 8)(x - 2) = 0$ $\xrightarrow{\text{Set EQUAL TO Zero}}$

$\xrightarrow{116}$
 $\xrightarrow{28}$
 $\xrightarrow{44}$

② **Solve:**

$5x - 8 = 0$ $\xrightarrow{+8}$ $\xrightarrow{+8}$ $5x = 8$ $\xrightarrow{\div 5}$ $x = \frac{8}{5}$

$x - 2 = 0$ $\xrightarrow{+2}$ $x = 2$

③ **Check:** IN ORIG EQ!!

USE CALC TO CHECK!

$c: 5\left(\frac{8}{5}\right)^2 - 18\left(\frac{8}{5}\right) + 16 = 0$ $\left\{ \begin{array}{l} c: 5(2)^2 - 18(2) + 16 = 0 \\ 20 - 36 + 16 = 0 \\ 0 = 0 \checkmark \end{array} \right.$

0 = 0 ✓

LEAVE AS SIMPLIFIED IMPROPER FRACTION