

Method 3: Factoring Using the Trinomial Method

Step 1: Write the trinomial in descending order.

Step 2: Find two numbers whose product is the same as the product of the first and third coefficients and whose sum is equal to the middle coefficient. (Make a chart.)

Step 3: Rewrite the middle term as the sum of two terms.

Step 4: Use the distributive property and factor by grouping.

Step 5: Check by FOIL (or the distributive property).

Ex 1: Factor $x^2 - x - 56$

$x(-56)$	$+(-1)$
$(7)(-8)$	$7+(-8)$

✓

$$(x^2 + 7x) + (-8x) + (-56)$$

$$x(x+7) + (-8)(x+7)$$

$$\boxed{(x+7)(x-8)}$$

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

$$x^2 - x - 56 \checkmark$$

Ex 2: Factor $20y^2 + 13yz + 2z^2$

20(2)

$x(40)$	$+ (13)$
$4(10)$	$4+10x$
$5(8)$	$5+8x$

$$(20y^2 + 5yz) + (8yz + 2z^2)$$

$$5y(4y+z) + 2z(4y+z)$$

$$(4y+z)(5y+2z)$$

✓

Ex 3: Factor $2x^2 - 5x - 3$

$x(-6)$	$+ (-5)$
$2(-3)$	$2+(-3)x$
$-2(3)$	$-2+3x$
$-6(1)$	$-6+1x$

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

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

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

✓

Ex 4: Factor $x^2 - 64$

$$\begin{array}{r}
 x(-64) \mid + (0) \\
 \hline
 8(-8) \mid 8+(-8) \checkmark
 \end{array}$$

$$\begin{array}{c}
 x^2 + 0x + (-64) \\
 \wedge \\
 (x^2 + 8x) + (-8x) + (-64) \\
 x(x+8) + (-8)(x+8) \\
 \boxed{(x+8)(x+(-8))} \\
 x^2 - 8x + 8x - 64 \checkmark
 \end{array}$$

Ex 5: Factor Completely. $5x^2 + 40x + 75$

$$\begin{array}{r}
 x(15) \mid + (8) \\
 \hline
 3(5) \mid 3+5 \checkmark
 \end{array}$$

$$\begin{array}{c}
 5[x^2 + 8x + 15] \\
 5[(x^2 + 3x) + (5x + 15)] \\
 5[x(x+3) + 5(x+3)] \\
 \boxed{5(x+3)(x+5)}
 \end{array}$$

Ex 6: Factor Completely. $mx^2 - 12 + 7x - 7mx + 12m - x^2$

$$(mx^2 - 7mx + 12m) + (-x^2 + 7x - 12)$$

$$m(x^2 - 7x + 12) + (-1)(x^2 - 7x + 12)$$

$$(x^2 - 7x + 12)(m - 1)$$

$$\begin{array}{r|l} x(12) & +(-7) \\ \hline (-3)(-4) & -3+(-4) \checkmark \end{array}$$

$$\left[(x^2 + (-3x)) + (-4x + 12) \right] (m - 1)$$

$$\left[x(x + (-3)) + (-4)(x + (-3)) \right] (m - 1)$$

$$\boxed{(x + (-3))(x + (-4))(m - 1)}$$

Ex 7: Factor Completely. $4x^3 + 4x^2 - 9x - 9$

$$(4x^3 + 4x^2) + (-9x + (-9))$$

$$4x^2(x + 1) + (-9)(x + 1)$$

$$(x + 1)(4x^2 + (-9))$$

$$(x + 1)(4x^2 + 0x + (-9))$$

$$(x + 1)((4x^2 + (-6x)) + (6x + (-9)))$$

$$(x + 1)[2x(2x + (-3)) + 3(2x + (-3))]$$

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

$$\begin{array}{r|l} x(-36) & +(-9) \\ \hline -6(6) & 6+(-9) \checkmark \end{array}$$