Factoring Trinomials – The Box Method

$$Ax^2 + Bx + C$$

1. Factor coefficients A and C, listing all factors in boxes, with factors of A on top, and factors of C on bottom, listed twice – forward and reverse.
2. Multiply each combination, corner to corner.
3. Choose the combination resulting in the coefficient of the middle term.
4. List factors, and then assign signs.

Example: $3x^2 + 16x + 5$

1. Factor coefficients A and C, listing all factors in boxes, with factors of A on top, and factors of C on bottom, listed twice – forward and reverse.

3 1	3 1 ← Factors of A
5 1	1 5 ← Factors of C listed twice, forward and reverse

2. Multiply each combination, corner to corner.

3 1	3 1
5 1	1 5
3 * 1 = 3	3 * 5 = 15 ← Corner to corner products
1 * 5 = 5	1 * 1 = 1

3. Choose the combination resulting in the coefficient of the middle term.
   If C is **positive,** find the **sum** of the products that equals B.
   If C is **negative,** find the **difference** of the products that equals B.

$$3x^2 + 16x + 5$$

3 1	3 1
5 1	1 5
3 * 5 = 15	← Sum of products equal to 16
1 * 1 = 1	

4. List factors, and then assign signs.

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

Other Examples:

$6x^2+19x+15$

6 1	6 1	6 1	6 1
15 1	1 15	5 3	3 5
3 2	3 2	3 2	3 2
15 1	1 15	5 3	3 5

In this example, we are looking for the corner-to-corner products to have a **sum** of 19. The correct combination is
3 x 3 = 9
and 2 x 5 = 10: 9 + 10 = 19

$$(3x+5)(2x+3)$$

$6x^2-19x+15$

6 1	6 1	6 1	6 1
15 1	1 15	5 3	3 5
3 2	3 2	3 2	3 2
15 1	1 15	5 3	3 5

In this example, we are looking for the corner-to-corner products to have a **sum** of 19. The correct combination is
3 x 3 = 9
and 2 x 5 = 10: 9 + 10 = 19

$$(3x-5)(2x-3)$$

$6x^2+13x-15$

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

6 1	6 1	6 1	6 1
15 1	1 15	5 3	3 5
3 2	3 2	3 2	3 2
15 1	1 15	5 3	3 5

In this example, we are looking for the corner-to-corner products to have a **difference** of 13. The correct combination is 6 x 3 = 18
and 1 x 5 = 5: 18 – 5 = 13

$6x^2-13x-15$

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

6 1	6 1	6 1	6 1
15 1	1 15	5 3	3 5
3 2	3 2	3 2	3 2
15 1	1 15	5 3	3 5

In this example, we are looking for the corner-to-corner products to have a **difference** of 13. The correct combination is 6 x 3 = 18
and 1 x 5 = 5: 18 – 5 = 13