F-O-I-L = First-Outer-Inner-Last

$$(p+q)(r+s)$$
$$= \underbrace{pr}_{\text{First}} + \underbrace{ps}_{\text{Outer}} + \underbrace{qr}_{\text{Inner}} + \underbrace{qs}_{\text{Last}}$$

Examples:

$$(2x+5)(4x+3)$$
$$= 8x^2 + 6x + 20x + 15$$
$$= 8x^2 + 26x + 15$$

$$(2x+3)(x-4)$$
$$= 2x^2 - 8x + 3x - 12$$
$$= 2x^2 - 5x - 12$$

$$(3x-2)(4x+5)$$
$$= 12x^2 + 15x - 8x - 10$$
$$= 12x^2 + 7x - 10$$

$$(2x-5)(x-3)$$
$$= 2x^2 - 6x - 5x + 15$$
$$= 2x^2 - 11x + 15$$

Using F-O-I-L,

$$(a+b)(a-b) = a^2 - b^2$$

$$\begin{aligned}(a+b)(a-b) \\ &= a^2 - ab + ba - b^2 \\ &= a^2 - b^2\end{aligned}$$

Adding Exponents

$$x^m x^n = x^{m+n}$$

Example: $x^4 x^5 = x^9$

Subtracting Exponents:

$$\frac{x^m}{x^n} = x^{m-n}$$

Example: $\frac{x^8}{x^3} = x^{8-3} = x^5$