

**Day 6 – Multiplying Polynomials**

There are several different ways to multiply polynomials. Today we are going to learn the Box Method. Before we do that, let's review our rule for multiplying powers:

Original	Expanded Form	Simplified Form	Rule
$x^4 \cdot x^3$	$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	$x^7$	Multiplying Powers $x^m \cdot x^n = x^{m+n}$
$x^2 \cdot x^4$	$x \cdot x \cdot x \cdot x \cdot x \cdot x$	$x^6$	
$5x^4 \cdot -2x^4$	$5 \cdot x \cdot x \cdot x \cdot x \cdot -2 \cdot x \cdot x \cdot x \cdot x$	$-10x^8$	

**Important Reminder:** When adding and subtracting polynomials, we do NOT change the power. For example:  $x^2 + x^2 = 2x^2$

**Multiplying Binomials: Box Method**

two terms



1. Fill in the bubbles by writing one of the binomials along the top of the box, and the other down the side of the box.
2. Multiply rows times columns.
3. After multiplying, collect like terms. (They should be in the diagonal),

(add)

Example:  $(x+6)(x+4)$

Columns

Rows

	$x$	$+4$
$x$	$x \cdot x = x^2$	$x \cdot 4 = 4x$
$+6$	$6 \cdot x = 6x$	$6 \cdot 4 = 24$

$x^2$	$4x$
$6x$	$24$

$6x + 4x = 10x$

Answer:  $x^2 + 10x + 24$

Practice: Box Method

Example 1:  $(x + 2)(x + 3)$

	$x$	$+3$	
$x$	$x \cdot x = x^2$	$x \cdot 3 = 3x$	$2x + 3x = 5x$
$+2$	$2 \cdot x = 2x$	$2 \cdot 3 = 6$	

Answer:  $x^2 + 5x + 6$

Example 2:  $(x - 2)(x + 4)$

	$x$	$+4$	
$x$	$x^2$	$4x$	$-2x + 4x = +2x$
$-2$	$-2 \cdot x = -2x$	$-2 \cdot 4 = -8$	

Answer:  $x^2 + 2x - 8$

Example 3:  $(2x + 4)(x + 2)$

	$x$	$+2$	
$2x$	$2x \cdot x = 2x^2$	$2x \cdot 2 = 4x$	$4x + 4x = 8x$
$+4$	$4 \cdot x = 4x$	$4 \cdot 2 = 8$	

Answer:  $2x^2 + 8x + 8$

Example 4:  $(x + 2)^2 = (x + 2)(x + 2)$

	$x$	$+2$	
$x$	$x^2$	$2x$	$2x + 2x = 4x$
$+2$	$2x$	$4$	

Answer:  $x^2 + 4x + 4$

Challenge A:  $(2x + 3)(x^2 + 2x + 4)$

	$x^2$	$+2x$	$+4$	
$2x$	$2x \cdot x^2 = 2x^3$	$2x \cdot 2x = 4x^2$	$2x \cdot 4 = 8x$	$7x^2$
$+3$	$3 \cdot x^2 = 3x^2$	$3 \cdot 2x = 6x$	$3 \cdot 4 = 12$	

Answer:  $2x^3 + 7x^2 + 14x + 12$

Challenge B:  $(2x^3 + 3x)(x^2 + 2x + 4)$

	$x^2$	$+2x$	$+4$	
$2x^3$	$2x^3 \cdot x^2 = 2x^5$	$2x^3 \cdot 2x = 4x^4$	$2x^3 \cdot 4 = 8x^3$	$3x^3 + 8x^3 = 11x^3$
$+3x$	$3x \cdot x^2 = 3x^3$	$3x \cdot 2x = 6x^2$	$3x \cdot 4 = 12x$	

Answer:  $2x^5 + 4x^4 + 11x^3 + 6x^2 + 12x$