

## Multiplying Polynomials

**A.APR.1** Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.

**What am I learning today?**

How to multiply polynomials

**How will I show that I learned it?**

Correctly distribute and simplify when multiplying two binomial expressions

### Vocabulary:

Polynomial - An expression of algebraic terms, especially the sum of several terms that contain different powers of the same variable. (Ex:  $5x^3 - 2x^2 + 7$ )

Monomial - A polynomial expression with one term. Example:  $5x^2y$

Binomial - A polynomial expression with two terms. Example:  $3x - 2y$

Trinomial - A polynomial expression with three terms. Example:  $9x^2 + x - 1$

When multiplying monomials,  
multiply the coefficients.

(variable) · (variable) changes the exponent.

$$x \cdot x = x^2$$

Example:  $5x^3 \cdot 7x^1 = 35x^4$

Ex. 2  $-7x \cdot 11x$   
 $-77x^2$

Ex. 4  $9x \cdot -4$   
 $-36x$

Ex. 3  $-6 \cdot -12x$   
 $72x$

Ex. 5  $10xy \cdot 8xy$   
 $80x^2y^2$

For all multiplication problems  
which include addition and subtraction,  
we use the distributive property!

Example:  $5x(2x - 3) = 10x^2 - 15x$

$$5x \cdot 2x - (5x \cdot 3)$$
$$10x^2 - 15x$$

Ex. 2  $-3x(10x + 6)$

$$-30x^2 - 18x$$

Ex. 4  $7x(3x + -4)$

$$21x^2 - 28x$$

Ex. 3  $-6x(-2x - 4)$

$$12x^2 + 24x$$

Ex. 5  $5xy(4x - y)$

$$20x^2y - 5xy^2$$

For multiplying a binomial by a binomial, distribute each set of terms. Then, CLT!  
(combine like terms)

Example:  $(2x + 3)(4x - 1)$

By Distribution

$$(2x + 3)(4x - 1)$$

$$2x(4x - 1) + 3(4x - 1)$$

$$8x^2 - 2x + 12x - 3$$

$$8x^2 + 10x - 3$$

By Concrete Model

	$2x$	$+3$
$4x$	$8x^2$	$12x$
$-1$	$-2x$	$-3$

$$8x^2 + 10x - 3$$



Example 2:  $(3x + 6)(2x + 5)$

By Distribution

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

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

$$6x^2 + 15x + 12x + 30$$

$$\boxed{6x^2 + 27x + 30}$$

By Concrete Model

$$3x + 6$$

	$3x$	$+6$
$2x$	$6x^2$	$12x$
$+5$	$15x$	$30$

Example 3:  $(x - 8)(4x + 7)$

By Distribution

$$(x-8)(4x+7)$$

$$1x(4x+7) - 8(4x+7)$$

$$4x^2 + 7x - 32x - 56$$

$$4x^2 - 25x - 56$$

By Concrete Model

	$x$	$-8$
$4x$	$4x^2$	$-32x$
$+7$	$7x$	$-56$

Example 4:  $(3x^2 - 7)(2x - 7)$

By Distribution

$$(3x^2 - 7)(2x - 7)$$

$$3x^2(2x - 7) - 7(2x - 7)$$

$$6x^3 - 21x^2 - 14x + 49$$

By Concrete Model

$$3x^2 - 7$$

	$3x^2$	$-7$
$2x$	$6x^3$	$-14x$
$-7$	$-21x^2$	$49$

Example 5:  $(\underline{3x+4})(\underline{3x-4})$

By Distribution

$$(3x+4)(3x-4)$$

$$3x(3x-4) + 4(3x-4)$$

$$9x^2 - \cancel{12x} + \cancel{12x} - 16$$

$$\boxed{9x^2 - 16} \text{ D.O.T.S.}$$

By Concrete Model

$$3x + 4$$

3x	$9x^2$	<del><math>12x</math></del>
-4	<del><math>-12x</math></del>	$-16$

Example 6:  $(2x - 6)^2$

$$x^2 = x \cdot x$$

By Distribution

$$\begin{aligned} &(2x - 6)(2x - 6) \\ &2x(2x - 6) - 6(2x - 6) \\ &4x^2 - 12x - 12x + 36 \\ &\quad \quad \quad \text{CLT} \\ &\boxed{4x^2 - 24x + 36} \end{aligned}$$

By Concrete Model

	$2x$	$-6$	
$2x$	$4x^2$	$-12x$	
$-6$	$-12x$	$+36$	