

8.2 Notes – Algebra 1 – Multiplying Polynomials – Using Distributive Property

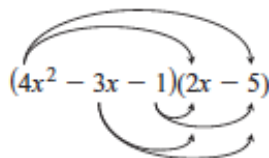
Remember how to use distributive property- Each term in the first group needs to be multiplied to each term in the other set of parentheses. LOOK AT VISUAL BELOW

Common Student Errors

- Trying to use the FOIL pattern when multiplying a binomial by a trinomial

Tip Stress that the FOIL pattern can only be used to multiply two binomials. To multiply a binomial by a trinomial you use the distributive property. Each term of one polynomial must be multiplied by each term of the other polynomial. Use colors and arrows to reinforce this.

A visual like this may help:



$$= 4x^2(2x - 5) - 3x(2x - 5) - 1(2x - 5)$$

GOAL Multiply polynomials.

EXAMPLE 1 Multiply a monomial and a polynomial

Find the product $5x^4(2x^3 - 3x^2 + x - 6)$.

Solution

$$\begin{aligned} 5x^4(2x^3 - 3x^2 + x - 6) \\ &= 5x^4(2x^3) - 5x^4(3x^2) + 5x^4(x) - 5x^4(6) \\ &= 10x^7 - 15x^6 + 5x^5 - 30x^4 \end{aligned}$$

Write product.

Distributive property

Product of powers property

Exercises for Example 1

Find the product.

1. $3x^2(7x^2 - 2x + 3)$

2. $4x^5(3x^3 - 2x^2 - 8x + 9)$

EXAMPLE 2 Multiply polynomials vertically

Find the product $(5m^2 - 2m + 3)(2m + 7)$.

Solution

STEP 1 Multiply by 7.

$$\begin{array}{r} 5m^2 - 2m + 3 \\ \times \quad 2m + 7 \\ \hline 35m^2 - 14m + 21 \end{array}$$

STEP 2 Multiply by $2m$.

$$\begin{array}{r} 5m^2 - 2m + 3 \\ \times \quad 2m + 7 \\ \hline 10m^3 - 4m^2 + 6m \end{array}$$

STEP 3 Add products.

$$\begin{array}{r} 5m^2 - 2m + 3 \\ \times \quad 2m + 7 \\ \hline 35m^2 - 14m + 21 \\ 10m^3 - 4m^2 + 6m \\ \hline 10m^3 + 31m^2 - 8m + 21 \end{array}$$

EXAMPLE 3 **Multiply polynomials horizontally**

Find the product $(9x^2 - x + 6)(5x - 2)$.

Solution

$(9x^2 - x + 6)(5x - 2)$	Write product.
$= 9x^2(5x - 2) - x(5x - 2) + 6(5x - 2)$	Distributive property
$= 45x^3 - 18x^2 - 5x^2 + 2x + 30x - 12$	Distributive property
$= 45x^3 - 23x^2 + 32x - 12$	Combine like terms.

FOIL Method – USE ONLY WHEN YOU HAVE 2 BINOMIALS

MULTIPLY – the **F**irst 2 terms in each set of parentheses

MULTIPLY – the **O**uter 2 terms in each set of parentheses

MULTIPLY – the **I**nnner 2 terms in each set of parentheses

MULTIPLY – the **L**ast 2 terms in each set of parentheses

Then combine all like terms and make sure it is in decreasing degree.

EXAMPLE 4 **Multiply binomials using FOIL pattern**

Find the product $(2x - 1)(7x + 6)$.

Solution

$(2x - 1)(7x + 6)$	Write product.
$= (2x)(7x) + (2x)(6) + (-1)(7x) + (-1)(6)$	Write product of terms.
$= 14x^2 + 12x + (-7x) + (-6)$	Multiply.
$= 14x^2 + 5x - 6$	Combine like terms.

Exercises for Examples 2, 3, and 4

Find the product.

3. $(m^2 + 6m + 4)(3m - 1)$

4. $(2n + 7)(3n + 4)$

5. $(2p^2 - p + 6)(p + 7)$

6. $(6q^2 - 5q - 4)(2q - 3)$

7. $(5t + 9)(3t - 8)$

8. $(8s - 7)(9s - 7)$