Math 10 Lecture Videos

Section 5.2:
Multiplying Polynomials

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OBJECTIVES:

1. Use the Product Rule for exponents.
2. Use the Power Rule for exponents.
3. Use the Product-to-Powers rule for exponents.
4. Multiply monomials.
5. Multiply a monomial and a polynomial.
6. Multiply polynomials when neither is a monomial.

Objective 1:
Use the Product Rule for Exponents.

$$b^m \cdot b^n = b^{m+n}$$

When multiplying exponential expressions with the same base, **add the exponents**.

Examples:

$x^3 \cdot x^5$	$= x^{3+5} = x^8$
$2^3 \cdot 2^2$	$= 2^{3+2} = 2^5 = 32$
$y^4 \cdot y^3 \cdot y^2$	$= y^{4+3+2} = y^9$

Objective 2: Use the Power Rule (Powers to Powers) for Exponents.

$$(b^m)^n = b^{mn}$$

When an exponential expression is raised to a power, **multiply the exponents**. Do not change the base.

Examples:

$(x^2)^5$	$= x^{2(5)} = x^{10}$
$(3^4)^2$	$= 3^{4(2)} = 3^8 = 6{,}561$
$(y^9)^{10}$	$= y^{9(10)} = y^{90}$

Objective 3: Use the Product to Powers Rule for Exponents

$$(ab)^n = a^n b^n$$

When a product is raised to a power, raise each factor to the power.

Examples:

$(2x)^4$	$= 2^4 x^4 = 16x^4$
$(-4y^2)^3$	$= (-4)^3 y^{2(3)} = -64y^6$

Objective 4: Multiply Monomials.

To multiply monomials with the same variable base, ***multiply the coefficients*** and then **multiply the variables**.

Use the ***product rule* for exponents** to multiply the variables: **Keep the variable and *add the exponents*.**

Objective 4: Multiply Monomials.

Example 1: Multiply: $(3x^2)(5x^7)$

$(3x^2)(5x^7)$	$= (3 \cdot 5)(x^2 \cdot x^7)$	Multiply the coefficients and multiply the variables.
	$= 15x^{2+7}$	Add the exponents
	$= 15x^9$	Simplify

Objective 4: Multiply Monomials.

Example 2: Multiply: $(6x^4y^2)(3x^7y)$

$(6x^4y^2)(3x^7y)$	$= (6 \cdot 3)(x^4 \cdot x^7) \cdot (y^2 \cdot y)$	Multiply the coefficients and multiply the variables.
	$= 18x^{4+7}y^{2+1}$	Add the exponents
	$= 18x^{11}y^3$	Simplify

Objective 5: Multiply a Monomial to a Polynomial

To multiply a monomial and a polynomial that is not a monomial, use the **distributive property** to multiply each term of the polynomial by the monomial.

Multiply: $6x^3(3x^5 - 5x^2 + 7)$.

$= (6x^3 \cdot 3x^5) - (6x^3 \cdot 5x^2) + (6x^3 \cdot 7)$
$= 18x^{(3+5)} - 30x^{(3+2)} + 42x^3$
$= 18x^8 - 30x^5 + 42x^3$

Distribute

Multiply coefficients and add exponents.

Objective 5: Multiply a Monomial to a Polynomial
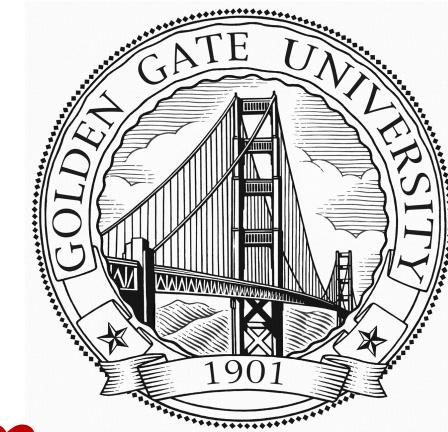
Example: Multiply $6x^2(5x^3 - 2x + 3)$

$$6x^2(5x^3 - 2x + 3) = 6x^2 \cdot 5x^3 - 6x^2 \cdot 2x + 6x^2 \cdot 3$$
$$= 30x^5 - 12x^3 + 18x^2$$

Objective 6: Multiply Polynomials When Neither is a Monomial

To multiply two polynomials, **multiply each term of one polynomial by each term of the other polynomial**. Then **combine like terms**.

Example: Multiply $(5x + 3)(2x - 7)$

$$(5x + 3)(2x - 7) = 10x^2 - 35x + 6x - 21$$
$$= 10x^2 - 29x - 21$$

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6. Multiply polynomials when neither is a monomial. ✓