Chapter 8

Rules for Exponents ("multiplying monomials")

When multiplying, treat regular numbers like regular, and ADD UP the exponents on variables.

\[ 6y^4 \cdot y^5 = 6y^9 \]
\[ (-3m^2n)(6m^5n^3) = -18m^7n^4 \]

When dividing, treat regular numbers like regular, and SUBTRACT exponents on variables.

\[ \frac{p^7q^8}{p^3q} = p^4q^7 \]

When there is a power on a parenthesis containing a monomial, apply that power to each part of the monomial.

\[ (d^4y^7)^3 = d^{12}w^{43}y^{21} \]

When there is a power on a power (Superpower!) that's when you MULTIPLY the exponents!

\[ d^{13}w^{43}y^{23} = d^3w^{12}y^{21} \]

When you have a negative exponent, it moves to the other level of a fraction.

\[ \frac{12x^{-2}y^3}{3x^4y^{-5}} = \frac{4y^3y^5}{x^2x^4} = \frac{4y^8}{x^6} \]

Polynomial Vocab and Style

The DEGREE of a polynomial is determined by adding up the exponents on variables for each term in the polynomial. The term with the largest degree wins, and thus determines the degree for the whole polynomial:

\[ 4x^5y^4 + x^6y^2 - 3xy + x \]

These terms have a degree of 9, 8, 2 and 1. The first term has the highest degree in this case, thus making this a 9th degree polynomial.
Arranging a polynomial in “descending order of powers of $x$” means write the term with the largest power of $x$ first, and then the next biggest power of $x$, then down until the smallest powers of $x$, then no $x$, and finally, constants (regular numbers by themselves).

$$x^6y^2 + 4x^5y^4 - 3x^2y - 4y + 5$$

Adding and Subtracting Polynomials

Adding polynomials: combine like terms... watch their signs. $x$ and $x^2$ are different terms.

$$(10m^2 + 3mn - 8n^2) + (2m^2 - mn + 3n^2) = 12m^2 + 2mn - 5n^2$$

Subtracting Polynomials: distribute the subtraction (like a negative 1) into the second polynomial. Then combine like terms.

$$(5n^2 - 4ny + 3y^2) - (8n^2 - 12ny + 13y^2)$$

$$5n^2 - 4ny + 3y^2 - 8n^2 + 12ny - 13y^2 = -3n^2 + 8ny - 10y^2$$

Multiplying a monomial by a polynomial

Distribute (multiply) the monomial by each term in the polynomial one by one. Follow rules for exponents for each part of the distribution.

$$2hk^2(5h^5k^3 - hk^3 + 6h^4k) = 10h^6k^5 - 2h^2k^5 + 12h^5k^3$$

Multiplying 2 polynomials (FOIL method)

Multiply each term of the first polynomial by each term in the second. Use FOIL method. Multiply the First two terms, then the Outer two terms, then the Inner two terms, then the Last two terms. Finally, combine like terms.

$$(5x + 2y)(2x - y) = 10x^2 - 5xy + 4xy - 2y^2$$

$$= 10x^2 - xy - 2y^2$$