Date _____

Dear Family,

In Chapter 7, your child will study the properties of exponents as well as how to classify, add, subtract, and multiply polynomials.

First, students will simplify and evaluate expressions containing integer exponents. Here are some examples:

$4^3 = 4 \cdot 4 \cdot 4 = 64$	The base 4 multiplied by itself 3 times.
$4^{-3} = \frac{1}{4 \cdot 4 \cdot 4} = \frac{1}{64}$	This is thee reciprocal of 4^3.
$4^0 = 1$	Any non-zero number raised to the zero power is 1.
$d^{-3} = \frac{1}{d^3}$	The rules are the same with variables.

Your child will work with powers of 10. *Positive* powers of 10 correspond to moving the decimal point to the *right*, and *negative* powers of 10 correspond to moving the decimal point to the *left*. Some examples are shown below.

10^5	Start with 1. Move 5 places right.	100,000
10^{-7}	Start with 1. Move 7 places left.	0.0000001
423×10^2	Start with 423. Move 2 places right.	42,300
3.06×10^{-4}	Start with 3.06. Move 4 places left.	0.000306

Powers of 10 are used to express very large or very small numbers in **scientific notation**. For instance, 34,000,000,000,000 can be written as 3.4×10^{13}.

The rules learned for integer exponents will be used to simplify exponential expressions containing multiplication and division. Students will use the following six properties.

Property	Algebra	Example
Product of a Power	$a^m \cdot a^n = a^{m+n}$	$4^6 \cdot 4^5 = 4^{11}$
Power of a Power	$(a^m)^n = a^{m \cdot n}$	$(5^3)^4 = 5^{12}$
Power of a Product	$(ab)^n = a^n b^n$	$(-2xy)^5 = (-2)^5 x^5 y^5 = -32x^5y^5$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{6^9}{6^4} = 6^5$
Positive Power of a Quotient	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{r}{5}\right)^3 = \frac{r^3}{5^3} = \frac{r^3}{125}$
Negative Power of a Quotient	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$	$\left(\frac{4d}{5}\right)^{-2} = \left(\frac{5}{4d}\right)^2 = \frac{25}{16d^2}$

Next, your child will learn about **polynomials**. A polynomial is a **monomial**, or a sum or difference of monomials.

Name	Terms	Example
Monomial	1	$4x^5$
Binomial	2	$3x^2 + 2y$
Trinomial	3	$5x^3 - 2x + 7$

$6x^5y^2$ is a monomial with a **degree** of 7, because the sum of the exponents is 7.

The polynomial $9x^3 - 4x$ is written in **standard form** because the terms are written from greatest to least degree. The degree of the polynomial is 3, because the term with the greatest degree has a degree of 3. The polynomial is a **cubic binomial**.

Classification	Degree
Constant	0
Linear	1
Quadratic	2
Cubic	3
Quartic	4

Students will learn to add and subtract polynomials, which involves combining like terms.

Add $(7x^2 + 9x - 6) + (3x^2 + 4x + 5)$.

$$\begin{array}{r} 7x^2 + 9x - 6 \\ +\ 3x^2 + 4x + 5 \\ \hline 10x^2 + 13x - 1 \end{array}$$

When subtracting polynomials, the opposite of every term in the second polynomial is added to the first polynomial.

Students will also multiply polynomials. This can be accomplished through the use of the Distributive Property. However, when both polynomials are binomials, a process called FOIL can be used as a shortcut.
FOIL stands for **F**irst, **O**uter, **I**nner, **L**ast. That is, multiply the **first** terms in the binomials, multiply the **outer** terms, multiply the **inner** terms, and multiply the **last** terms.

$(4x + 7)(3x - 2)$

F - First: $4x \cdot 3x = 12x^2$
O - Outer: $4x \cdot -2 = -8x$
I - Inner: $7 \cdot 3x = 21x$
L - Last: $7 \cdot -2 = -14$

$-8x + 21x = 13x$

So, $(4x + 7)(3x - 2) = 12x^2 + 13x - 14$.

There are two special products that can result from polynomial multiplication.

Name	Algebra	Example
Perfect Square Trinomial	$(a + b)^2$ $a^2 + 2ab + b^2$	$(r + 3)^2$ $r^2 + 6r + 9$
Difference of Squares	$(a + b)(a - b)$ $a^2 - b^2$	$(n^3 + 8)(n^3 - 8)$ $n^6 - 64$

For additional resources, visit go.hrw.com and enter the keyword MA7 Parent.