CHAPTER 12

Family Letter

Section A

What We Are Learning

Introduction to Polynomials

Vocabulary

These are the math words we are learning:

bimonial a polynomial with 2 terms

degree of a polynomial the degree of the term with the greatest degree

polynomial one monomial or the sum or difference of monomials

trinomial a polynomial with 3 terms

Dear Family,

In this section, the student will learn about **polynomials:** how to identify them and how to simplify them. The student will learn the differences between monomials, binomials, and trinomials, and how to classify polynomials by degree.

The student will learn how to determine whether an expression is a monomial. The following are two examples of the process.

Determine whether each expression is a monomial.

A. $5x^4y^3$ — *Yes, it is a monomial. 5 is a number; x^4 and y^3 are variables whose exponents are whole numbers.*

B. $\frac{1}{2}ab^{1.3}$ — *No, it is not a monomial. $\frac{1}{2}$ is a number, but the exponent 1.3 is not a whole number.*

Here are some examples that further show the distinction between terms that are and are not monomials.

Monomials	$5t$, x^5, $2a^2b^5$, 8
Not monomials	$y^{3.4}$, 3^x, $\sqrt{y}$, $\frac{8}{c^2}$

In this section, the student will also learn how to classify polynomials by the number of terms they contain.

Classify each expression as a monomial, a binomial, a trinomial, or not a polynomial.

A. $5.34m - 10.3n$ — *It is a binomial; a polynomial with 2 terms.*

B. $-4c^2b$ — *It is a monomial; a polynomial with 1 term.*

C. $12xy - 4x + 3y$ — *It is a trinomial; a polynomial with 3 terms.*

D. $2x^2 + 4xy - \frac{4}{y}$ — *Not a polynomial; there is a variable in the denominator.*

E. $\frac{1}{2}g^{2.8} + 7h$ — *Not a polynomial; the exponent is not a whole number.*

The student will learn how to classify polynomials by degrees. The degree of a term is the sum of its exponents. The degree of a polynomial is the degree of the greatest term in the polynomial. For example, in the polynomial $6x + x^4$, the degree of the polynomial is 4.

The student will learn how to simplify polynomials by combining like terms. Two terms are like terms if they have the same variables raised to the same power.

In $5a^4b^6 + 2a^2b^6 + 4a^4b^6$, $5a^4b^6$ and $4a^4b^6$ are like terms because they have the same variables with the same powers. However, $5a^4b^6$ and $2a^2b^6$ are not like terms because a^4 is not raised to the same power as a^2.

Simplify polynomials by combining like terms.

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

$2x^4y^3 + 3x^4y^3 + 5x^2y^2 - 2$	*Arrange in descending order.*
$2x^4y^3 + 3x^4y^3 + 4x^2y^2 - 2$	*Identify like terms.*
$5x^4y^3 + 5x^2y^2 - 2$	*Combine coefficients*: $2 + 3 = 5$.

Finally, the student will learn how to simplify polynomials by applying the Distributive Property. This means multiplying each of the terms in a polynomial that is inside parentheses by one or more terms outside the parentheses.

Simplify the polynomial by using the Distributive Property.

A. $2(3x^2 + 5x)$

$2(3x^2 + 5x)$	*Distributive Property*
$2 \cdot 3x^2 + 2 \cdot 5x$	
$6x^2 + 10x$	

B. $3(4g^2h - 2g) + 2g^2h + 1$

$3(4g^2h - 2g) + 2g^2h + 1$	*Distributive Property*
$3 \cdot 4g^2h - 3 \cdot 2g + 2g^2h + 1$	
$12g^2h - 6g + 2g^2h + 1$	*Multiply.*
$12g^2h + 2g^2h - 6g + 1$	*Arrange in descending order.*
$14g^2h - 6g + 1$	*Combine like terms.*

Sincerely,

CHAPTER 12

Family Letter

Section B

What We Are Learning

Polynomial Operations

Vocabulary

These are the math words we are learning:

FOIL an easy way to remember to do the four multiplications needed when multiplying two binomials: the "First" terms, the "Outer" terms, the "Inner" terms, and the "Last" terms of the binomials

Dear Family,

In this section, the student will learn about adding and subtracting polynomials. The student will also learn how to multiply and divide polynomials by binomials. In learning how to multiply two binomials, the student will learn the **FOIL** method.

The Associative Property states

$a + b + c = (a + b) + c = a + (b + c)$. You apply this property when adding polynomials horizontally.

Add the polynomials horizontally.

$(4a^2b - 3ab - 2) + (8ab + 6a^2b + 5)$

$4a^2b - 3ab - 2 + 8ab + 6a^2b + 5$	*Associative Property*
$4a^2b + 6a^2b - 3ab + 8ab - 2 + 5$	*Arrange in descending order.*
$10a^2b + 5ab + 3$	*Combine like terms.*

Polynomials can also be added vertically. The important thing here is to keep like terms in the same column.

Add the polynomials vertically.

$(4x^2y - 3x + 4y) + (2x^2y + 6x + 3)$

$4x^2y - 3x + 4y$	*Place like terms in columns.*
$+ \quad 2x^2y + 6x + 3$	
$6x^2y + 3x + 4y + 3$	*Combine like terms.*

The student will also learn how to subtract polynomials. Subtraction is the opposite of addition. Therefore, the student first needs to be able to find the opposite of a polynomial.

Find the opposite of each polynomial.

$-6x^2 - 2$

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

$6x^2 + 2$	*Remove the parentheses and distribute the sign.*

Subtract the polynomials horizontally.

$(a^4 + 2a^3 - 2a) - (6a - 2a^4 + 3)$

$(a^4 + 2a^3 - 2a) + (-6a + 2a^4 - 3)$	*Add the opposite*.
$a^4 + 2a^3 - 2a - 6a + 2a^4 - 3$	*Apply the Associative Property*.
$3a^4 + 2a^3 - 8a - 3$	*Combine like terms*.

The student will learn how to multiply two monomials and a polynomial by a monomial. In boths cases, when you multiply two powers of the same base, you add the exponents. To multiply two monomials, multiply the coefficients and add the exponents. To multiply a polynomial by a monomial, use the Distributive Property.

Multiply the polynomial by the monomial.

$5x^3y^2(2x^2y^4 - 3x^5y^2)$

$5x^3y^2(2x^2y^4 - 3x^5y^2)$	*Multiply each term in the parentheses by* $5x^3y^2$.
$10x^5y^6 - 15x^8y^4$	*Be sure to add exponents of the same base*.

To multiply two binomials, use the **FOIL** method. Multiply the "First" terms, then the "Outer" terms, then the "Inner" terms, then the "Last" terms.

Multiply the binomials.

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

$(x + 3)(x - 2)$	*FOIL*
$x^2 - 2x + 3x - 6$	*Arrange in descending order*.
$x^2 + x - 6$	*Combine like terms*.

Sincerely,