Math 9 – Unit 2: Algebra One

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Lesson 2.1: Collecting Like Terms

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In this unit, you will be introduced to one of the most important components to Mathematics: Algebra. Algebra comes from the Arabic word *"al-jabr"*, meaning "the coming together of broken parts", and math is about bringing together ideas to solve problems. In Algebra, we will look at how to use Mathematical symbols and the rules for manipulating them. Typically, the symbols are letters.

Learning Goal: We are learning common math terminology and using those terms to simplify algebraic expressions.

To begin, let's define some terminology that is important in Algebra.

Expression: a mathematical sentence with no equal sign, and made up of terms separated by + or − signs.

ex: $2x+7$, $3x^2+2x-1$

Variable:

- the letters used as place holders for numbers.
- the "unknown"

Coefficient:

- the number and sign (+/−) infront of a variable.

ex: $4x^2-3x-5$

Constant:

- a number without a variable.

Like terms:

- a term is one item from an expression
- terms are made up of a coefficient, a variable, and an exponent +/- #
- like terms are terms with the exact same variable and exponent.

ex: $4x^2$ and $-5x^2$ — Like

$4x^2$ and $-5x^1$ — Not like

Example: Given the following expressions, state the number of terms, the coefficients, and the constant term.

a) $3x^2 - 5x + 7$

→ 3 terms

→ 3 and −5 are coefficients

→ 7 is the constant

b) $5y + 10x + 8 + 12y$

→ 4 terms

→ 5, 10, 12 are coefficients

→ 8 is the constant.

In the above example, the second expression has 4 terms, but two of them had the same variable. This means that we can combine them together. All you need to do is add, or subtract, their coefficients only. This process is called collecting like terms.

Collect the like terms in the above example: $5y + 10x + 8 + 12y$

$5y + 12y = 17y + 10x + 8$

$$\begin{array}{r} 5y \\ +12y \\ \hline 17y \end{array}$$

Before we do more, there is one more thing to keep in mind. There is a distinct order to how we order the polynomials. That order is called Descending Order. The process is straight-forward. The highest exponent goes first, then the next. You end with the constant. The size of the coeffects do not matter.

a) $5x^3 + 2x^2 - 3x^4 + 8x^3 - 6 + 5x^2 - x^3$

$= 12x^3 + 7x^2 - 3x^4 - 6$ (② ③ ① ④)

$= -3x^4 + 12x^3 + 7x^2 - 6$

b) $-5 - 4y^2 - 8y + 6y^2 - 13y - 11$

$= 2y^2 - 21y - 16$

When an expression is simplified, we call that a polynomial, meaning many terms. However, we also have special names for expressions with one, two, or three terms.

$4x^2$ is called a monomial.

$3x^5 - 2xy$ is called a binomial.

$7y^2 + 5y - 1$ is called a trinomial.

Anything over that we just call a polynomial.

Examples: For each expression, collect the like terms and state the type of polynomial.

a) $-2v - 2v^5 - 8 + 2v^5 + 7v$

$-2+2=0$

$= 5v - 8$

Binomial

b) $9m^2 - 5m^6 + 4 - 3m^2 + 4 - 7m^6$

$= -12m^6 + 6m^2 + 8$

Trinomial

c) $1.75x^5 - 0.6x^4 - 1.6x^4 + 0.85x^5$

$= 2.6x^5 - 2.2x^4$

Binomial

Success Criteria:

- I can correctly define the following terms: expression, variable, coefficient, constant, like term, unlike term, monomial, binomial, trinomial, polynomial, and degree
- I can group like terms within algebraic expressions
- I can identify the degree and type of various polynomials