MTH1W

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 it is made up of terms separated by + and − signs

ex: $2x+7$, $3x^2y-4xy-5$

Variables: - Are the letters used a placeholders for numbers
- "unknown"

Coefficient: - the number and sign infront of the variable.

$2x \Rightarrow$ 2 x's

$14xy - 3w + 7x + 5$

Constant: a number without a variable.

Like terms: - a term is one item from an expression.

- terms are made up of a coefficient (+/− #), variables, and exponents

- Like terms are terms with the exact same variable and exponent combination.

examples: $3xy$ and $5xy$ Like terms

$4x^2y$ and $7x^2y$ Like terms

$5x^2y$ and $3xy^2$

$5xxy$ $3xyy$

Unlike terms.

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. This process is called collecting like terms.

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

$-5 - 12 = -17$

$= -17y + 10x + 8$

More examples:

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

$= -4 - 3r^2 + 2r^1$

$= -3r^2 + 2r^1 - 4r^0$

b) $-4k^3 - 8k^2 + 4 + 7k^4 - 1k^3 - 8k^2 - 1$

$= -5k^3 - 16k^2 + 3 + 7k^4$

$= 7k^4 - 5k^3 - 16k^2 + 3$

c) $7a^2b^2 + 2a^4 - 8a^3b^3 - 4a^2b - 2a^4 - 2a^3b^3 + 8a^2b^2$

$= 15a^2b^2 - 10a^3b^3 - 4a^2b$

Now for a super duper big example:

d) $-8x - x^2y^2 - 8x^3y^5 + 3x^3y + 2x^3y + 6x + 2x^2y^2 + 2xy - 2x^2y^2 + 5x^3y^4 + 3xy + 5x$

$= 3x - x^2y^2 - 8x^3y^5 + 5x^3y + 5xy + 5x^3y^4$

There's more! Did you ask, "what term should I write first?" If you did, good thinking! There is a definite order to writing out expressions. It is called descending order.

Descending order is: writing out the expression starting with the term with the highest exponent, then working your way down.

Note: We only do this on single variable expressions.

Now go back to the above examples and put them in descending order.

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

$= 5v-8$

Binomial

b) $3xy-4x^2y+8x^4y+6xy-7x^2y-7x^4y$

no descending order.

$= 9xy-11x^2y+x^4y$

Trinomial

★ When adding and subtracting, the exponents do not change.

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