Grade Level/Course: Grade 6
Lesson/Unit Plan Name: Algebraic Expressions – Identifying Parts and Seeing Entities
Rationale/Lesson Abstract: This lesson focuses on providing students with a solid understanding of how to identify parts of algebraic expressions for the first time within the new common core standards. It will also focus on viewing parts of expressions as single entities and why this is so important. Finally, it will focus on how to question students and use precise math language to increase their level of understanding.
Timeframe: One to two days.
Common Core Standard(s): **6.EE.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression* $2(8+7)$ *as a product of two factors; view* $(8+7)$ *as both a single entity and a sum of two terms.***

Instructional Resources/Materials:

Activity/Lesson:

Identifying Parts of an Expression

Example:

First, ask the students about the problem below, "Is this an expression, equation, or inequality?" Use *think/pair/share* to get the students talking to each other about math.

Regardless of what their answer is, ask them "Why?"

$$6x - 4y + x + 8 - 5x - y$$

Come to an agreement, or teach them, that an expression does not have an equal sign with values on both sides. (The problem $6x - 4y + x + 8 - 5x - y =$ is an expression because there is no value on the right side of the equation.) Also, let them know that we simplify or evaluate expressions and that we solve equations and inequalities.

Agree that an equation has an equal sign with values on both sides and that an inequality has one (or more, e.g. $-3 \le x < 8$) inequality symbol(s) with values on both (or all) sides.

Throughout the year, continue to ask students if the given problem is an expression, equation, or inequality.

Second, using *choral response*, ask the students "How many terms are in this *expression*?"

$$6x - 4y + x + 8 - 5x - y$$

Regardless of their answer, question it. If they say "Six", respond with "six?" If they say "four", respond with "four?" To often as teachers we give the answer to the students with our response to their answer. If we question it, they know that they are wrong and will usually change their answer right away. If we give some sort of indication that they are correct, they now know that they were right, even if they weren't sure when they answered it originally. The idea is to get the students to think for themselves and to be confident with their answers. It's still OK for them to be wrong but we need to stop thinking for them!

If they are having a hard time, a simple way to explain terms is to say that "terms are things we add or subtract".

Third, ask the students, "What is the first term?"

$$6x - 4y + x + 8 - 5x - y$$

Again, question their answers whether right or wrong.

Come to an agreement, or teach them, that the first term is $6x$.

Next, ask the students, "What is the second term?"

Again, question their answers whether right or wrong. Many students will incorrectly say that the second term is $4y$ and not $-4y$. Usually you will get both answers from them. Ultimately, let them know that the second term is $-4y$. (Common Core has students adding and subtracting integers in Grade 7 so for now we just want to focus on getting our students to understand that the sign in front of the term tells us if the term is positive or negative.)

You Try:
Using the expression above, identify the:

Third term: _____ Fourth term: _____ Fifth term: _____ Sixth term: _____

Fourth, ask them what is the coefficient of the first term. Once again, question all answers, right or wrong. Before telling them what is right or wrong, let students know that a coefficient is the number part of a variable term. Then ask them again what is the coefficient of the first term. Now let them know that the correct answer is 6. One of the most common mistakes will be student's including the variable as part of the coefficient.

$$6x - 4y + x + 8 - 5x - y$$

Now, ask them what is the coefficient of the second term. Again question all answers. This time, one of the most common mistakes will be forgetting the negative sign.

You Try:
Using the expression above, identify the coefficient of the:

Third term: _____ Fifth term: _____ Sixth term: _____

Note that the fourth term is just a number and that this is known as a constant term.

For the following parts of expressions, the focus should be on students understanding how these parts are affected now that we are moving from numerical expressions to algebraic expressions.

Sum:

You Try:
Using the first example, $6x - 4y + x + 8 - 5x - y$, this expression is the sum of _____ terms.

If students point out that some of the terms are being subtracted, let them know that in common core grade 7 they will learn that subtraction is the same as adding the opposite. Therefore, all subtraction can be seen as addition.

Factor & Product:

Example:
Using the first example, $6x - 4y + x + 8 - 5x - y$, each term can be seen as a product that can be decomposed into factors.

The first term is a product, $6x$, which can be decomposed into two factors, $6 \bullet x$ or into its fundamental parts, which is the three factors $2 \bullet 3 \bullet x$.

You Try:
Decompose the product $-4y$ into factors two different ways.
(Possible answers $-4 \bullet y$, $-1 \bullet 4 \bullet y$, $-1 \bullet 2 \bullet 2 \bullet y$)

You Try:
Decompose the product $-5x$ into factors two different ways.

You Try:
Decompose the product $-y$ into factors.

You Try:
Decompose 8 into factors two different ways.

Quotient:

Any fraction can be seen as a quotient regardless of whether or not there are variables in the numerator or denominator.
Emphasize representing division using a fraction bar.

Example:

Rewrite the quotient $\frac{3x}{4}$ as an equivalent expression.

It is helpful for students to understand that this expression can also be written as $\frac{3}{4}x$.

Also note that $\frac{3}{4x}$ is not an equivalent quotient.

You Try:

Rewrite the expression $\frac{2}{5}y$ as an equivalent quotient.

Viewing One or More Parts of an Expression as a Single Entity

Example:

Describe the following expression two different ways.

$$2(8+7)$$

"Two multiplied by the quantity of eight and seven"
"The product of two factors. One factor is two. The other factor is the sum of two terms, eight and seven."

Focus on the use of quantity when there are parentheses.

You Try:

Write two different expressions with 2 factors, one of which is a quantity that is a sum of two terms.

Example:
Describe the following expression two different ways.

$$(8 + 7)$$

"The quantity of eight and seven."
"The sum of two terms, eight and seven."

Focus on seeing this expression as one entity/quantity.

You Try:
Write a quantity with a value of 18 as a sum of 2 terms, 3 different ways.

Student's ability to recognize and understand quantities will be helpful as they move on in mathematics.

Some examples of when this will be useful are with the Distributive Property, Factoring Quadratics, Zero Product Property, Completing the Square, and evaluating function values that are quantities.

Assessment:

Grade 6 Selected Response **6.EE.2B**

Which of the following phrases below correctly describes the following expression:

$$2(8+7)$$

Ⓐ **A product of two factors.**

Ⓑ **A product of three factors.**

Ⓒ **Two multiplied by the sum of two terms.**

Ⓓ **Two multiplied by the quantity of eight plus seven.**

Scoring:

2 points: Selected A, C, and D only.
1 point: Selected two of the three correct answers only.
0 points: Any other combination.

Key and Distractor Analysis:
A. Key. 2 is a factor and it is multiplying the quantity factor of 8 and 7.
B. The student probably thinks that the terms 8 and 7 are separate factors.
C. Key. 2 is multiplying the sum of the two terms 8 and 7.
D. Key. 2 is multiplying the quantity of eight plus seven.

Expressions and Equations	**6.EE**

Apply and extend previous understandings of arithmetic to algebraic expressions.

2. Write, read, and evaluate expressions in which letters stand for numbers.

   b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression* $2(8+7)$ *as a product of two factors; view* $(8+7)$ *as both a single entity and a sum of two terms.*