MATH NEWS

Grade 7, Module 3, Topic A

LAFAYETTE PARISH SCHOOL SYSTEM

7th Grade Math

Module 3: Expressions and Equations

Math Parent Letter

This document is created to give parents and students a better understanding of the math concepts found in Eureka Math (© 2013 Common Core, Inc.) that is also posted as the Engage New York material which is taught in the classroom. Module 3 consolidates and expands upon students' understanding of equivalent expressions as they apply the properties of operations to write expressions in both standard form and in factored form. They use linear equations to solve unknown angle problems and other problems presented within context to understand that solving equations is all about the numbers. Students use the number line to understand the properties of inequality. They interpret solutions within the context of problems. They extend their 6th grade study of geometric figures and the relationship between them as they apply their work with expressions and equations to solve problems involving area of a circle and composite area in the plane, as well as volume and surface area of right prisms. Students discover the most famous ratio of all, π.

Focus Area Topic A:

Use Properties of Operations to Generate Equivalent Expressions

Students will generate equivalent expressions. Knowledge of rational number operations from Module 2 is demonstrated as students collect like terms containing both positive and negative integers. An area model is used as a tool for students to rewrite products as sums and sums as products. Students examine situations where more than one form of an expression may be used to represent the same context. Students recognize and use the identity properties and the existence of inverses to efficiently write equivalent expressions in standard form. Students collect like terms with rational number coefficients.

Words to Know:

Expression in Expanded Form – expression that is written as sums of products whose factors are numbers, variables, or variables raised to whole number powers. Also, it may be a single number, variable, or a single product of numbers and/or variables.

Examples: 324; $3x$; $5x+3-40$; $x+2x+3x$

Expression in Factored Form – expression that is a product of two or more expressions.

Coefficient of the Term - The number found by multiplying just the numbers in a term together.
Example: $2 \cdot x \cdot 4$ is $8x$. The number 8 is called the coefficient of the term $8x$.

Focus Area Topic A:

Use Properties of Operations to Generate Equivalent Expressions

Words to Know continued:

Variable - a symbol (letter) that represents a number.

Numerical Expression - a number or any combination of sums, differences, products, or divisions of numbers that evaluates to a number.

Value of a Numerical Expression - the number found by evaluating the expression.

Expression - is a numerical expression, or it is the result of replacing some (or all) of the numbers in a numerical expression with variables.

Equivalent Expressions - expressions that evaluate to the same number for every substitution of numbers.

Term - Each summand of an expression in expanded form. Example: expression $2x+3x+5$ consist of 3 terms: $2x$, $3x$, and 5.

An Expression in Standard Form - An expression in expanded form with all its like terms collected. Example: $2x+3x+5$, the like terms $2x$ and $3x$ must be combined. Standard form = $5x+5$.

Generating Equivalent Expressions

Students write equivalent expressions by finding sums and differences extending the "any order" (commutative property) and "any grouping" (associative property) idea to collect like terms and rewrite algebraic expressions in standard form.

Example:

Find the sum of $-3a+2$ and $5a-3$.

$(-3a+2)+(5a-3)$	Original expression
$-3a+2+5a+(-3)$	Add the opposite (additive inverse)
$-3a+5a+2+(-3)$	Any order, any grouping
$2a+(-1)$	Combined like terms
$2a-1$	Adding the inverse is subtracting

Example:

Subtract: $(3x+5y-4)-(4x+11)$.

$3x+5y+(-4)+(-4x)+(-11)$	Opposite of a sum is the sum of its opposites
$3x+(-4x)+5y+(-4)+(-11)$	Any order, any grouping
$-x+5y+(-15)$	Combining like terms
$-x+5y-15$	Subtraction replaces adding the opposite

Focus Area Topic A:

Use Properties of Operations to Generate Equivalent Expressions

Writing Products as Sums and Sums as Products
Students use an area/rectangular array model and distributive property to write products as sums and sums as products. Students use the fact that the opposite of a number is the same as multiplying by −1 to write the opposite of a sum in standard form.

Example 1:
Find an equivalent expression by modeling with a rectangular array and applying the distributive property $5(8x + 3)$.

	8x	3
5	40x	15

Distribute the factor to all terms. $5(8x + 3)$.

Multiply $5(8x) + 5(3)$
$40x + 15$

To demonstrate that $5(8x + 3)$ and $40x + 15$ are equivalent, substitute a numerical value for x.

$5(8x + 3)$	$40x + 15$
$5(8(2) + 3)$	$40(2) + 15$
$5(16 + 3)$	$80 + 15$
$5(19)$	95
95	

Both equal 95, so the expressions are equal.

Example 2:

Expand the expression from a product to a sum so as to remove grouping symbols using an area model and the repeated use of distributive property:

$$3\,(\boldsymbol{x}+\boldsymbol{2y}+\boldsymbol{5z}).$$

Repeated use of distributive property:

$\boldsymbol{3}(\boldsymbol{x}+\boldsymbol{2y}+\boldsymbol{5z})$

$\boldsymbol{3\cdot x+3\cdot 2y+3\cdot 5z}$

$\boldsymbol{3x+3\cdot 2\cdot y+3\cdot 5\cdot z}$

$\boldsymbol{3x+6y+15z}$

Visually:

	x	2y	5z
3	3x	6y	15z

The expanded expression is $\boldsymbol{3x+6y+15z}$.

Using the Identity and Inverse to Write Equivalent Expressions
Students recognize the identity properties of 0 and 1 and the existence of inverses (opposites and reciprocals) to write equivalent expressions.

Example 1:
Write the sum and then write an equivalent expression by collecting like terms and removing parentheses whenever possible.

$\boldsymbol{-4}$ and $\boldsymbol{4b+4}$
$\boldsymbol{-4+(4b+4)}$
$\boldsymbol{(-4+4)+4b}$ Any order, any grouping
$\boldsymbol{0+4b}$ Additive inverse
$\boldsymbol{4b}$ Additive identity property of zero

Example 2:
Write the product and then write the expression in standard form by removing parentheses and combining like terms. Justify each step.
Write product of the reciprocal of 3 and $\boldsymbol{-6y-3x}$

$\left(\frac{1}{3}\right)\left[-6y + (-3x)\right]$ ***Rewrite subtraction as an addition problem***
$\left(\frac{1}{3}\right)(-6y) + \left(\frac{1}{3}\right)(-3x)$ ***Distributive property***
$-2y - 1x$ ***Multiplicative inverse***
$-2y - x$ ***Multiplicative identity property of one***

Collecting Rational Number Like Terms
Students rewrite rational number expressions by collecting like terms and combining them by repeated use of the distributive property.

Example:
Rewrite the expression in standard form by collecting like terms.

$$\frac{1}{2}a + 2\frac{2}{3}b + \frac{1}{5} - \frac{1}{4}a - 1\frac{1}{2}b + \frac{3}{5} + \frac{3}{4}a - 4 - \frac{4}{5}b$$

Subtraction as adding the inverse gives you….

$$\frac{1}{2}a + 2\frac{2}{3}b + \frac{1}{5} + \left(-\frac{1}{4}a\right) + \left(-1\frac{1}{2}b\right) + \frac{3}{5} + \frac{3}{4}a + (-4) + \left(-\frac{4}{5}b\right)$$

Apply the *any order property* (commutative property.

$$\frac{1}{2}a + \left(-\frac{1}{4}a\right) + \frac{3}{4}a + 2\frac{2}{3}b + \left(-1\frac{1}{2}b\right) + \left(-\frac{4}{5}b\right) + \frac{1}{5} + \frac{3}{5} + (-4)$$

Collect like terms by applying distributive property.

$$\left(\frac{1}{2} + \left(-\frac{1}{4}\right) + \frac{3}{4}\right)a + \left(2\frac{2}{3} + \left(-1\frac{1}{2}\right) + \left(-\frac{4}{5}\right)\right)b + \frac{4}{5} + (-4)$$

Use arithmetic rules for rational numbers.

$$a + \frac{11}{30}b - \frac{16}{5}$$

The expression with eight terms can be rewritten with a minimum of three terms.