MATH NEWS

Grade 7, Module 3, Topic B

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 B:

Solve Problems Using Expressions, Equations, and Inequalities

Students use linear equations and inequalities to solve problems. They continue to use tape diagrams. Students build upon work in Grade 6 with equations to now include multi-step equations and inequalities containing rational numbers. Students solve problems involving consecutive numbers, total cost, age comparisons, distance/rate/time, area and perimeter, and missing angle measures.

Words to Know:

Variable – a symbol (such as a letter) that represents a number.

Equation – a statement of equality between two expressions.

Number Sentence – a statement of equality between two **numerical** expressions.

Solution – a value for the variable that makes an equation a true number sentence.

Adjacent Angles – two angles that share a common side.

Vertical Angles – angle pairs whose sides form two pairs of opposite rays.

Focus Area Topic B:

Solve Problems Using Expressions, Equations, and Inequalities

Words to Know: Continued

Angles on a Line – the sum of the measures of adjacent angles on a line is **180°**.

Angles at a Point – the sum of the measures of adjacent angles at a point is **360°**.

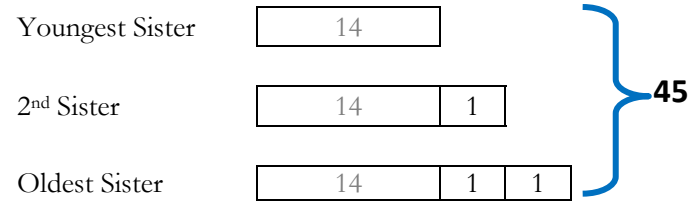
Understanding Equations

Students understand that an equation is a statement of ***equality*** between two expressions. They build an algebraic expression using the context of a word problem and use that expression to write an equation that can be used to solve the word problem.

Example:

The ages of three sisters are consecutive integers. The sum of their ages is 45. Find their ages.

Tape Diagram:



Given the 3 units, each of value 1, we can subtract the 3 units from the tape diagram and 3 from the total 45.

$45 - 3 = 42$

Then, we can divide 42 over the three unknown blocks, resulting in 14.

$42 \div 3 = 14$

Youngest Sister:	**14 years old**
Middle Sister:	**15 years old**
Oldest Sister:	**16 years old**

Algebraically:

If the youngest sister is x years old, describe the ages of the other two sisters in terms of x. Write an expression for the sum of their ages in terms of x, and use that expression to write an equation that can be used to find their ages.

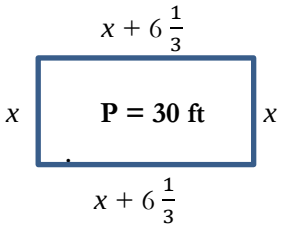
Youngest sister:	x years old
Middle Sister:	$(x + 1)$ years old
Oldest Sister:	$(x + 2)$ years old
Sum of their ages:	$x + (x + 1) + (x + 2)$
Equation:	$x + (x + 1) + (x + 2) = 45$

Solve Problems Using Expressions, Equations, and Inequalities

Using the If-Then Moves in Solving Equations
Students understand and use the addition, subtraction, multiplication, division, and substitution properties of equality to solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$ where p, q, and r are specific rational(fraction) numbers.

Example:
You are designing a rectangular pet pen for your new baby puppy. You have 30 feet of fence barrier. On a whim, you decide that you would like the length to be $6\frac{1}{3}$ feet longer than the width.

Draw and label a diagram to represent the pet pen. Write expressions to represent the width and length of the pet pen.



Width of pen: x ft
Then $\left(x + 6\frac{1}{3}\right)$ ft represents the length of the pen.

Find the dimensions of the pet pen:

Arithmetic:

$$\left(30 - 6\frac{1}{3} - 6\frac{1}{3}\right) \div 4$$
$$17\frac{1}{3} \div 4$$
$$4\frac{1}{3}$$

The width is $4\frac{1}{3}$ ft.
The length is
$4\frac{1}{3} + 6\frac{1}{3} = 10\frac{2}{3}$ ft.

Algebraic

$$x + \left(x + 6\tfrac{1}{3}\right) + x + \left(x + 6\tfrac{1}{3}\right) = 30$$
$$4x + 12\frac{2}{3} = 30$$
$$4x + 12\frac{2}{3} - \mathbf{12\frac{2}{3}} = 30 - \mathbf{12\frac{2}{3}}$$
$$4x = 17\frac{1}{3}$$
$$\left(\frac{1}{4}\right)(4x) = \left(17\frac{1}{3}\right)\left(\frac{1}{4}\right)$$
$$x = 4\frac{1}{3}$$

If-then move:
Subtract $12\frac{2}{3}$ from both sides.

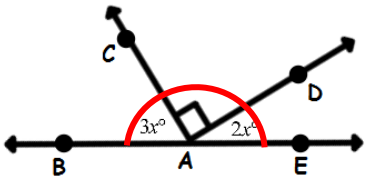
If-then move:
Multiply both sides by $\frac{1}{4}$.

If the perimeter of the pet pen is 30 feet and the length of the pen is $6\frac{1}{3}$ feet longer than the width, ***then*** the width would be $4\frac{1}{3}$ feet, and the length would be $4\frac{1}{3} + 6\frac{1}{3} = 10\frac{2}{3}$ ft.

Angle Problems and Solving Equations
Students use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Example:
In a complete sentence, describe the angle relationship in the diagram.

$\angle BAC$, $\angle CAD$, and $\angle DAE$ are angles on a line and sum to 180°.



Find the measurements of $\angle BAC$ and $\angle DAE$.

$\mathbf{3x} + 90 + \mathbf{2x} = 180$ •*combine like terms*
$\mathbf{5x} + 90 = 180$ •*subtract 90 from both sides*
$5x + 90 - \mathbf{90} = 180 - \mathbf{90}$ •*multiplication property of equality*
$\left(\frac{1}{5}\right)5x = \left(\frac{1}{5}\right)90$
$x = 18$

$m\angle BAC = 3x$ $\quad$ $m\angle DAE = 2x$
$m\angle BAC = 3(18°) = 54°$ $\quad$ $m\angle DAE = 2(18°) = 36°$

Inequalities:

Properties of Inequalities
When both sides of an inequality are added or subtracted by any number, the inequality symbol stays the same and the inequality symbol is said to be preserved. Also, when both sides of an inequality are *multiplied* or *divided* by a **positive** number, the inequality symbol stays the same and the inequality symbol is said to be preserved.

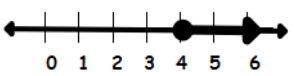
$-4 < 6$ $\quad$ $-4 < 6$
$-4 + 3 < 6 + 3$ $\quad$ $-4(2) < 6(2)$
$-1 < 9$ $\quad$ $-8 < 12$

When both sides of an inequality are *multiplied* or *divided* by a **negative** number, the inequality symbol switches from < to > or from > to <. The inequality symbol is reversed.

$-4 < 6$
$-4(-2) < 6(-2)$
$8 > -12$

Writing, Solving and Graphing Inequalities
Example:
Joe **needs at least $29** to download some songs and movies on his iPod. His mother agrees to pay him at a rate of **$6 an hour** for raking leaves in **addition to his $5** weekly allowance. What is the minimum number of hours Joe must work in one week to have enough money to purchase the songs and movies?

$$6h + 5 \geq 29$$
$$6h + 5 - 5 \geq 29 - 5$$
$$6h + 0 \geq 24$$
$$\left(\frac{1}{6}\right)(6h) \geq \left(\frac{1}{6}\right)24$$
$$h \geq 4$$



Joe needs to rake leaves at least 4 hours to earn $29. Any time over 4 hours earns him extra money.