Dear Family,

The Grade 8 students are beginning to study *Unit 2:  Expressions and Equations*.  Here is a little information about what your student will be learning in this unit.

**What is the Focus of this Unit?**

In Grade 7, students learned to add, subtract, factor and expand linear expressions. In this unit, students will expand on this knowledge and solve equations, with linear expressions on one or both sides of the equation. They may need to combine like terms and apply the distributive property. Students will learn that there may be a single solution, infinite solutions or no solution.

**What are the mathematical practice expectations for my student?**

*Make Sense of Problems and Persevere in Solving Them*. Through the study of linear equations, students have the opportunity to contextualize equation representations of real-life problems and decontextualize real-life situations by writing equation representations. For example, consider the problem where a farmer buys 10 sheep, a $100 heater, and then 5 more sheep to spend a total of $4600. Students may be able to write $10s+100+5s=4600 $to find the price of a single sheep, but students need to be able to make sense of the problem by knowing that $10s$ does not mean ten sheep as they would commonly say. In this case $10s$ represents the number of sheep times the cost of a single sheep yielding the total cost of sheep at that time.

*Reason Abstractly and Quantitatively*. Solving linear equations is at the heart of abstract and quantitative reasoning at Grade 8. The inverse operations process provides the opportunity for students to understand abstractly why we perform specific operations. Many students know that they can subtract sixteen from forty-six as a step in solving $2x+16=46$, but the abstract reasoning comes into play as students recognize that the purpose of subtracting sixteen is to get the additive identity on the left side of the equation thereby bringing them one step closer to isolating the variable. When faced with the similar problem $πx+\frac{1}{3}=4$, students will struggle if they only have an operational and quantitative level of understanding rather than an abstract understanding.

*Construct Viable Arguments and Critique the Reasoning of Others*. Students will construct arguments by creating equations that have one solution, infinite solutions or no solution and then defending their created equations. Students should also realize that there are many viable arguments for why a particular problem has infinite or no solutions. For example, $8x+10=8x $could be justified as having no solution because eliminating the variables leaves a false statement of $10=0$. Alternately, they could justify it as having no solution by imagining a situation where two employees make $8 an hour with one employee getting an extra $10 bonus and arguing that if the employees work the same hours, they will never make the same amount of money due to the bonus.

*Use Appropriate Tools Strategically*. As the capstone standard for solving linear equations, students may take the opportunity to use a CAS (Computer Algebra System), graphing software, data software or other technology tools to explore solving linear equations. The critical piece of using these tools is in deciding when it is appropriate to use that technology.

**How does this look different than what may have been taught in the past before the transition to the New Illinois Learning Standards for Mathematics?**

In this unit, students solve equations that involve rational numbers. In addition to being able to solve equations, students will be able to identify if the equation will have one solution (variables do not cancel out), infinite solutions (both sides of the equation simplify to the same expression), or no solution (variables cancel out and the constants are not equal).

In addition to solving equations, rich tasks, such as computing the number of tiles needed to put a border around a rectangular swimming pool or solving proportional problems as in doubling/halving recipes, help ground the abstract symbolism to life. Instead of just manipulating symbols, students will also have the opportunity to think about what the symbols mean.

For example, students might be asked to explain the number of tiles that will be needed to make borders around pools of various lengths and widths, as in the figure below. Students can write various algebraic models to determine the total number of tiles.

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| rade 6-8  |
|  The "swimming pool" problem |

Letting $w=width, l=length$, and $T=total tiles,$ various equations could be:

$$T=\left(l+2\right)+\left(l+2\right)+ w+w$$

$$T=2l+4+2w$$

$$T=2\left(l+2\right)+ 2w$$

**How will my student apply what he/she learns in the future?**

Solving equations will be used in all future high school math courses. This is an important skill to not only understand how to solve an equation, but also to understand the abstract nature of solving equations.

**How can you help your student at home?**

One of the best things you can do during this unit is to ask your student to explain to you how to use the distributive property and how to simplify like terms. Ask your child to show you a problem that can be represented by more than one algebraic expression. Also, talk to your child about the tasks that they are working on in school.

**What are vocabulary terms that will be addressed?**

Simplify – To remove parenthesis and combine like terms.

Distributive Property – The product of a number and the sum of two numbers is equal to the sum of the two products. For example: 2(3 + 4) = 2•3 + 2•4

Like Terms - Terms that have the same variable to the same power.

Solution - The answer to a problem.

Inverse Operations - The operation that reverses the effect of another operation.

**Student Self-Assessment**

**Grade 8 Unit 2: Real Numbers and Exponents**

0 - I haven’t tried.

1 - I cannot do this yet.

2 - I can do this with some help from my teacher or peers.

3 - I can sometimes do this on my own.

4 - I can do this on my own.

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| **Target:** | **Date** | **Initials** |
| I can simplify linear expressions utilizing the distributive property and collecting like terms. |  |  |
| I can create a multi-step linear equation to represent a real-life situation. |  |  |
| I can solve equations with linear expressions on either or both sides, including equations with one solution, infinitely many solutions and no solutions. |  |  |
| I can give examples of, and identify equations as having one solution, infinitely many solutions, or no solution. |  |  |