

Dear Family,

The next unit in your child's mathematics class this year is ***The Shapes of Algebra: Linear Systems and Inequalities***. This unit was designed to help students capitalize on the strong connections between algebra and geometry in order to extend students' understanding and skill in several aspects of those two key strands in the middle grades curriculum.

UNIT GOALS

In *The Shapes of Algebra*, students will explore the relationship between algebra and geometry. Through this exploration, students will work with equations for lines and curves, and will develop an understanding of how systems of equations and inequalities can help solve problems. Students extend their earlier work in algebra and geometry by making connections between them. For example, students connect the idea of the Pythagorean Theorem to the coordinate equation for a circle, and connect properties of polygons to slopes of lines.

HELPING WITH HOMEWORK

You can help with your child's homework and encourage sound mathematical habits as your child studies this unit by asking questions such as:

- What patterns relate coordinates of points on lines and curves that have been drawn?
- What patterns relate the points whose coordinates satisfy equations that are to be solved?
- Does the problem involve an equation or an inequality?
- Does the problem call for writing and/or solving a system of equations?
- If so, what method would be useful in solving the system?
- Are there some systematic methods that can be used to solve all systems of linear equations?

In your child's notebook, you can find worked-out examples from problems done in class, notes on the mathematics of the unit, and descriptions of the vocabulary words.

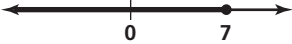
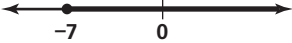
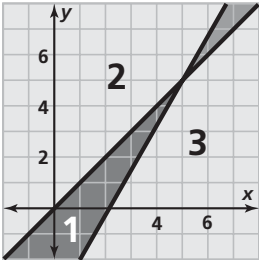
HAVING CONVERSATIONS ABOUT THE MATHEMATICS IN *THE SHAPES OF ALGEBRA*

You can help your child with his or her work for this unit in several ways:

- Talk with your child about the importance of being skillful in algebra.
- Look over your child's homework and make sure that all the questions are answered and that explanations are clear.
- Have your child pick a question that was interesting to him or her and explain it to you.

A few important mathematical ideas that your child will learn in *The Shapes of Algebra* are given on the back. As always, if you have any questions or concerns about this unit or your child's progress in class, please feel free to call.

Sincerely,

Important Concepts	Examples
<p>Linear Inequalities A relation of inequality between two quantities, in which each quantity is a linear expressions, is called a linear inequality.</p>	$3x + 22 < 8x + 7$ or $3x + 4y < 12$
<p>Solving Linear Inequalities Solving an inequality is much like solving linear equations. The rules for operations with inequalities are identical to those for equations, with one exception. When multiplying (or dividing) an inequality by a negative number, the direction of the inequality is reversed.</p>	<p>$5x + 7 \leq 42$ Solving this inequality is similar to solving $5x \leq 35$ $5x + 7 = 42$. The operations (+, -, ×, ÷) $x \leq 7$ are applied to both sides. We usually show this solution on a number line.</p>  <p>$-5x + 7 \leq 42$ Reverse in the direction of the $-5x \leq 35$ inequality sign. $x \geq -7$</p> 
<p>Solving Systems of Linear Equations Solving a system means finding all solutions that satisfy all equations in the system. There are a variety of techniques available for solving systems of two linear equations in two unknowns.</p> <p>GRAPHIC SOLUTION OF SYSTEMS This method involves producing straight-line graphs for each equation and then reading coordinates of intersection points as the solution(s).</p> <p>EQUIVALENT FORM The equations in a system can each be changed to $y = ax + b$ form. For $\begin{cases} y = -2x + 5 \\ y = 3x - 5 \end{cases}$ set the two expressions for y equal to each other. This eliminates a variable and gives $(-2x + 5) = (3x - 5)$. So $5x = 10$, or $x = 2$. Find the corresponding y-value by substituting. $y = -2(2) + 5 = 1$. The solution is $(2, 1)$.</p> <p>SOLVING SYSTEMS BY SUBSTITUTION In the system $\begin{cases} 3x + 5y = 8 \\ 6x + y = 7 \end{cases}$, the second equation can be rewritten as $y = 7 - 6x$. Use this information about y and the first equation, $3x + 5(7 - 6x) = 8$. Now solve this equation with one unknown with methods from earlier work to reveal $x = 1$ and then $y = 7 - 6(1)$ or $y = 1$.</p> <p>SOLVING SYSTEMS BY LINEAR COMBINATION Another method relies on two basic principles:</p> <ol style="list-style-type: none"> 1. Multiplying a linear equation by the same (non-zero) number does not change the set of solutions. 2. The solution is unchanged if one of the equations is replaced by a new equation formed by adding the two original equations. <p>For example: $\begin{cases} 3x + 5y = 8 \\ 6x + y = 7 \end{cases}$ is equivalent to $\begin{cases} -6x - 10y = -16 \\ 6x + y = 7 \end{cases}$ $-9y = -9$, by adding the two equations. You can see that $y = 1$ and that $x = 1$.</p>	
<p>Solving Systems of Linear Inequalities Systems of inequalities tend to have infinite solution sets as well. The solution to a system of distinct, non-disjoint linear <i>inequalities</i> is the intersection of two half-planes, which contain infinitely many points.</p>	<p>In general, there are four regions suggested by a system of linear inequalities such as $\begin{cases} y < y \\ y > x - 5 \end{cases}$.</p>  <p>Region 1 contains the solutions to the system. Points in Regions 2 and 3 satisfy one, but not both of the inequalities. Region 4 satisfies neither inequality.</p>

On the **CMP Parent Web Site**, you can learn more about the mathematical goals of each unit, see an illustrated vocabulary list, and examine solutions of selected ACE problems. <http://PHSchool.com/cmp2parents>