Dear Family,

The first unit in your child's mathematics class this year is ***Thinking With Mathematical Models: Linear and Inverse Variation***. In previous mathematics work, your child has studied some of the basic concepts of algebra. In this unit, we will be exploring a variety of situations that can be represented with different mathematical models.

UNIT GOALS

This first unit in eighth grade has been designed to review and extend student understanding and skill in work with linear functions and to introduce concepts associated with non-linear functions.

When algebraic expressions are used to represent patterns in data, the resulting functions are called *mathematical models* of the relationships. The functions can then be used to write and solve equations that provide estimates of answers to questions about the relationships. One of the central goals of this unit is to develop student understanding and skill in this aspect of the modeling process.

HELPING WITH HOMEWORK

The overall goal of *Connected Mathematics* is to help students develop sound mathematical habits. As your child studies this unit, you can help with homework, and at the same time encourage sound mathematical habits by asking questions such as:

- What are the key variables in this selection?
- What is the pattern relating the variables that are involved? Is it linear?
- What kind of equation will express the relationship among variables?
- How can the equation relating variables be used to answer questions about the relationship?

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 *THINKING WITH MATHEMATICAL MODELS*

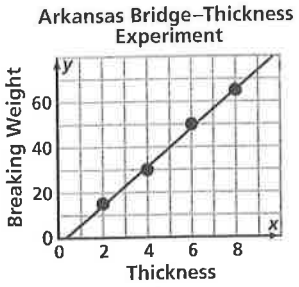
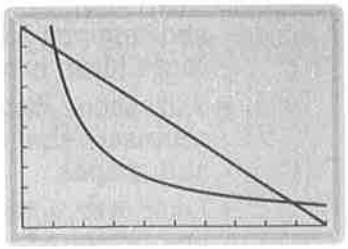
You can help your child in several ways:

- Have your child share his or her mathematics notebook with you, showing you what has been recorded. Ask your child to explain why these ideas are important.
- Talk about situations in which data might be collected to help represent the situations with mathematical models such as tables and graphs.
- Look over your child's homework and make sure that all questions are answered and that explanations are clear.

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

Sincerely,

JBauer

Important Concepts	Examples
Mathematical Models An equation or a graph that describes, at least approximately, the relationship between two variables is a mathematical model. A mathematical model may allow you to make reasonable guesses for values between and beyond the known data points.	**Modeling Bridge Thickness and Strength** 1. Collect data by simulating how much weight a bridge can hold with various layers of thickness. 2. Plot the data and draw a line to model the pattern of the data. 3. Find an equation to model the data. For example, $y = 8x$ (since 0 thickness should suggest 0 strength). 4. Use the equation $y = 8x$ to predict the breaking weights for other bridges: $\frac{\text{thickness in layers}}{\text{strength in penny load}}$ $\frac{3.5}{28}$ $\frac{7}{56}$ $\frac{10}{80}$ 
Linear Relationships In previous units, students learned how to recognize, represent symbolically, and analyze linear relationships. Many questions about linear relationships can be answered by solving equations of the form $c = mx + b$. The problems in this unit are designed to promote review and extension of these skills.	The **rate of change** of y in the equation $y = mx + b$ is the **slope** of its graph. In particular, m, the **coefficient** of x, indicates that constant ratio: $\frac{\text{change in } y}{\text{change in } x}$. The constant term b indicates the ***y*-intercept** $(0, b)$ of the graph. $5x - 3 = 7x - 2$ may be solved • by graphing (or making tables for) $y = 5x - 3$ and $y = 7x - 2$ and looking for a common solution. • by using Properties of Equality. $5x - 3 = 7x - 2$ $-3 = 2x - 2$ (subtract $5x$ from each side) $-1 = 2x$ (add 2 to each side) $-\frac{1}{2} = x$ (divide each side by 2)
Direct Variation Direct variation models are those that can be expressed with equations in the form $y = kx$. In a table of data, students may notice $\frac{y}{x} = k$. This is the same relationship as $y = kx$.	This is a special case of linear relationship in which the y-intercept is equal to zero.
Inverse Variation Inverse variation models are those that can be expressed with equations in the form $y = \frac{k}{x}$. It is important to realize that inverse variation gives a non-linear pattern of change. In a table of data, students may notice the pattern $xy = k$, where k is a constant. This is the same relationship as $y = \frac{k}{x}$.	Dividing by an increasing variable has a different effect than does subtracting an increasing variable. This fact is revealed by contrasting graphs of $y = 10 - x$ (the line) and $y = \frac{10}{x}$ (the curve). Notice that there is no solution for y when $x = 0$ in $y = \frac{10}{x}$. 

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**