Dear Family,

The final Unit in your child's mathematics class this year is ***Function Junction***. It is the final Unit of the *Connected Mathematics Program*. This Unit explores some of the more abstract ideas in algebra.

Unit Goals

Students learn to use formal language and notation associated with the concept of function. Students also learn properties of arithmetic and geometric sequences.

Students also focus on connections between algebraic expressions for functions whose graphs are related by translating and stretching. Translating and stretching of graphs connects to their previous work in *Stretching and Shrinking* and *Butterflies, Pinwheels, and Wallpaper*. In this Unit, students formalize their understandings of transformations symbolically.

The study of quadratic functions from *Frogs, Fleas, and Painted Cubes* is extended to include completing the square, the Quadratic Formula, and complex numbers. Students also engage in the analysis of polynomial functions and operations with polynomial expressions.

Homework and Having Conversations About the Mathematics

In your child's notebook, you can find worked-out examples, notes on the mathematics of the Unit, and descriptions of the vocabulary words. You can help with homework and encourage sound mathematical habits during this Unit by asking questions such as:

- *What are the variables in this situation, and how are they related?*
- *Is there a familiar type of function that could be used to model the relationship between variables, or is something new required?*
- *How are algebraic expressions and graphs of the relationship between variables connected to each other?*
- *How can the algebraic expression for a function be written in a different but equivalent form?*
- *How might different but equivalent forms be helpful in sketching or analyzing graphs or in solving equations?*

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

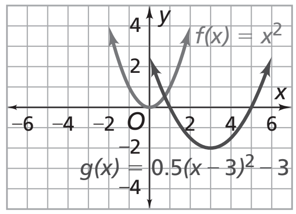
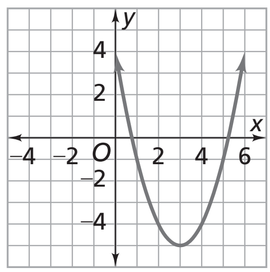
- Talk with your child about the situations that are presented and how to analyze them.
- Ask your child to show you a problem that can be solved by more than one strategy. Have your child demonstrate his/her different strategies and explain how each is useful.
- Look over your child's homework and make sure that all questions are answered and all explanations are clear.

Common Core State Standards

While all of the Standards for Mathematical Practice are developed and used by students throughout the curriculum, students spend significant time *reasoning abstractly and quantitatively* and *looking for and making use of structure*. As the culminating Unit in Algebra I, *Function Junction* engages students in seeking structure in expressions as well as building and interpreting functions.

A few important mathematical ideas that your child will learn in *Function Junction* are on the next page. 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
Functions Formal language and notation associated with the concept of function are introduced, with special attention given to step, piecewise, and polynomial functions.	A taxi cab owner charges his clients a fare based on the following rule: \$5.00 for a distance of up to one mile and \$2.00 for each additional mile or part of a mile. This rule is an example of a step function.
Sequences An arithmetic sequence is a sequence of numbers that has a constant rate of change. A geometric sequence is a sequence of numbers that has a constant factor. These sequences can be treated as linear and geometric functions, respectively, and students learn how to express them with rules in both recursive and closed forms.	An example of an arithmetic sequence would be: $s(n) = 1, 4, 7, 10, 13, \ldots$ An example of a geometric sequence would be: $g(n) = 1, 3, 9, 27, 81, \ldots$
Translating and Stretching Functions Students have previously worked with transformational geometry. In this Unit, students develop the connections between expressions for functions whose graphs are related by translation and one-dimensional stretching/shrinking. Students learn how to determine characteristics of graphs by looking at different forms of the equation.	Stretching the graph of $f(x) = x^2$ toward the x-axis by a factor of 0.5, and then translating the graph down two units and to the right three units results in the following graph, whose equation is $g(x) = 0.5(x - 3)^2 - 2$. 
Completing the Square Skill and understanding in the use of completing the square is developed to transform quadratic expressions to equivalent vertex forms.	To put the function $f(x) = x^2 + 4x - 4$ into vertex form, a student could complete the square and obtain $f(x) = (x + 2)^2 - 8$. Often the vertex form gives us information about the graph of a function that is easier to see than when the function is written in standard form.
Quadratic Formula The Quadratic Formula is used for solving quadratic equations in the form $ax^2 + bx + c = 0$. The Quadratic Formula is also used to find complex numbers to provide solutions for cases where no real-number solutions exist.	The Quadratic Formula can be used to determine at which points, if any, the graph of a function will cross or touch the x-axis. 
Polynomial Functions Analysis of polynomial functions and their graphs is extended to the study of the connection between expressions and graph properties, and then to develop operations with polynomial functions.	Some functions, called polynomial functions, have graphs that contain "hills" or "valleys" that may not be maxima or minima. These hills and valleys are called *local maxima* and *local minima*, respectively. One example is the graph of $f(x) = x^3 + x^2 - 6x + 2$.