Advanced Algebra I Honors

I.   Course Description/Overview

This course begins by strengthening the algebra of linear functions as it continues to develop the habits of mind that are useful in the further study of mathematics. The course then goes on to examine basic non-linear functions, such as exponential functions, radical functions, and polynomial functions. Special attention is given to the quadratic function. All functions are examined using the rule of five, which advocates the use of analytical, algebraic, numerical, graphical, and verbal methods of representing problems. Students will be exposed to functions as mechanisms for modeling data and learn how various functions can model and solve real-life problems.

II.   Course Objectives

- Develop habits of mind that are useful in the study of mathematics
- Understand and utilize the key concepts of the algebra of linear functions
- Build intuition about functions and move fluidly among various functional representations
- Develop and apply knowledge of exponential and radical concepts
- Understand the general characteristics of polynomial functions
- Explore quadratic functions and derive the quadratic formula to solve quadratic equations
- Use functions to model and solve real-life situations

III. Course Content

A. *Math in Focus Chapter 7*

Key Concepts/Skills

- Develop the Pythagorean Theorem
- Develop the relationships for special right triangles and volumes of solids
- Simplifying Square Roots

B. Chapters 1 – 4: Strengthening Our Algebra

Key Concepts/Skills

- Identify, describe, and justify arithmetic patterns and apply to real numbers
- Represent rational numbers in different forms
- Build and solve one and two variable equations from a mathematical situation
- Determine the relationship between absolute value and distance
- Graph equations and identify points on a graph that are a solution to an equation
- Determine the intersection point of two graphs and its meaning
- Decide if a situation represents a direct or inverse variation
- Graph equations of key parent functions and identify distinguishing features
- Define rules for translating graphs of equations vertically or horizontally
- Calculate slope given two points and the equation of the function
- Find points on a line when given slope and a point
- Write linear equations and sketch their graph
- Solve systems of linear equations using substitution and elimination
- Determine if two lines are parallel or if they intersect using slope
- Write and solve word problems for systems of equations
- Solve inequalities algebraically and graphically
- Estimate the line of best fit given a data set and use it to answer real-life questions

    C. **Chapter 5: Functions**
        Key Concepts/Skills
- Build a function from a real-life situation
- Determine whether a relationship is a function based on its description or graph
- Make input-output tables and use them to graph a function
- Identify the domain and range of a function
- Determine whether a table represents a linear function
- Fit a linear function to a table where possible
- Describe a recursive rule, calculate its outputs, and find a rule to match a table
- Build and understand a function-machine network
- Use recursion to model and solve a problem related to a real-life situation

    D. **Chapter 6: Exponents and Radicals**
        Key Concepts/ Skills
- Simplify expressions involving integral and fractional exponents
- Explain and apply the basic rules of exponents
- Calculate with positive, zero, and negative exponents
- Distinguish between rational and irrational numbers
- Understand other radicals and calculate using square, cube, and fourth roots
- Express irrational expressions in simplified form
- Investigate the graphs of exponential functions
- Use exponential functions to calculate compound interest
- Explore other real-life situations that involve the exponential model

    E. **Chapter 7: Polynomials**
        Key Concepts/Skills
- Factor expressions by identifying a common factor
- Recognize and provide examples of polynomials
- Define and understand the importance of the terms coefficient and degree
- Expand polynomials and express in general form
- Determine if polynomials written in different forms are equivalent
- Add, subtract, and multiply polynomials
- Apply the Difference of Squares Theorem to polynomial expressions
- Factor quadratic polynomials
- Use factoring to solve equations utilizing the zero product property
- Explore real-life situations that involve the quadratic model

    F. **Chapter 8: Quadratics**
        Key Concepts/Skills
- Develop the quadratic formula.
- Determine the roots of quadratic equations through the use of the quadratic formula
- Construct a quadratic equation given the equation's two roots
- Apply knowledge of quadratics to optimize quadratic functions
- Graph quadratic functions
- Determine the vertex of any quadratic graphically and algebraically
- Explore real-life situations that involve the quadratic model

IV.   **Grading Policy**
Grades in Math are weighted according to the following categories:

- Daily Homework – 15% of the quarter grade
- Other (Graded HW, long term assignments, presentations,etc.) – 15% of the quarter grade
- Quizzes – 30% of the quarter grade
- Unit Tests – 40% of the quarter grade

V.   Homework

Homework is an integral part of this course, and each student is expected to spend a minimum of thirty but <u>NOT</u> more than forty minutes on math homework each night. Because students will (at times) be extending the concepts learned in class, some of the most important learning will occur when students work on homework. Students are encouraged to work with other students in the class or to seek help from a family member. It is expected that there will be some struggles with particular concepts throughout the year; the only requirement is that an attempt is made on each of the problems.

VI.   Resources

- *Math in Focus (http://my.hrw.com)*
- Graphing Calculator
- In-class computer software

VII.   SHMS Math Resource Page

The Math Department at Strath Haven Middle School has created a resource page for students and parents. It can be found at the following address: http://www.wssd.org/190020111792556730/site/default.asp or by going to the MS home page on the district's website, then clicking on "Teacher Pages" and then selecting "Math Student Resources".

Students have access virtual manipulatives, varieties of graph paper (all in PDF form so they can be printed from home), video tutorials, PSSA preperation materials, and much more.

Parents can access material on each of the units their student will be studying this year. There are links to sites about the *CME Algebra I* and how to best support your child as they progress through the year.

VIII.   Placement Policy

During the spring, your student's teacher will place your child into a Math class for the following year. This placement is based on data collected throughout the course of the year in the following four areas:

- Cumulative Unit Test Average
- Cumulative Quarter Average
- PSSA scores (from the previous year)
- Improvement on the Diagnostic Test, which is given to all students four times before placements are made

More detailed information about the specific requirements in each of the four categories can be found on the Math Resources Page under the "Department Policies" tab on the left side of the screen.

In addition, the following is a list of characteristics or qualities that the middle school Math teachers expect to see enriched Math students developing:

- Exceptional computational skills
- Quickly grasps new concepts and skills
- Is an independent thinker
- Displays a high-level of interest in Math
- Makes generalizations and draws logical conclusions
- Demonstrates strong organizational skills