INDIAN HILL EXEMPTED VILLAGE SCHOOL DISTRICT
Mathematics Curriculum - May 2009
High School – Algebra II Concepts & Applications

Main Idea: How can linear equations be used to represent relationships between real-life quantities?
How are exponents helpful in working with numbers and variables?

Skills & Objectives:
- Identify and justify whether properties (closure, identity, inverse, commutative and associative) hold for a given set and operations; e.g., even integers and multiplication.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Define function with ordered pairs in which each domain element is assigned exactly one range element.
- Write and use equivalent forms of equations and inequalities in problem situations; e.g., changing a linear equation to the slope-intercept form.
- Find linear equations that represent lines that pass through a given set of ordered pairs, and find linear equations that represent lines parallel or perpendicular to a given line through a specific point.
- Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs.
- Estimate the solutions for problem situations involving square and cube roots.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Describe the relationship between slope and the graph of a direct variation and inverse variation.
- Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.
- Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.
- Recognize and explain that the slopes of parallel lines are equal and the slopes of perpendicular lines are negative reciprocals.

Main Idea: How can polynomials help solve nonlinear equations?
How can factoring help solve polynomial equations?

Skills & Objectives:
- Describe problem situations (linear, quadratic and exponential) by using tabular, graphical and symbolic representations.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only).
- Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula and with technology.
- Describe and compare characteristics of the following families of functions: square root, cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.
- Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.

Main Idea: **What real-world behavior can be modeled by quadratic and exponential functions?**
How can functions be used to solve real-world problems?

Skills & Objectives:
- Estimate the solutions for problem situations involving square and cube roots.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Define function with ordered pairs in which each domain element is assigned exactly one range element.
- Describe problem situations (linear, quadratic and exponential) by using tabular, graphical and symbolic representations.
- Use formulas to solve problems involving exponential growth and decay.
- Demonstrate the relationship among zeros of a function, roots of equations, and solutions of equations graphically and in words.
- Describe and compare characteristics of the following families of functions: linear, quadratic and exponential functions; e.g., general shape, number of roots, domain, range, rate of change, maximum or minimum.
- Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula and with technology.
- Define function formally and with f(x) notation.
- Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.
- Use algebraic representations and functions to describe and generalize geometric properties and relationships.
- Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.

Main Idea: **How are situations in which a quantity falls within a range of values solved?**
How are inequalities different than equations?

Skills & Objectives:
- Write and use equivalent forms of equations and inequalities in problem situations; e.g., changing a linear equation to the slope-intercept form.

Main Idea: **How can systems of equations be used to represent situations in which there are many conditions that must be met?**
What methods are best for solving systems of equations?

Skills & Objectives:
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Solve and interpret the meaning of 2 by 2 systems of linear equations graphically, by substitution and by elimination, with and without technology.
- Solve systems of linear inequalities.
- Solve real-world problems that can be modeled, using systems of linear equations and inequalities.

Main Idea: **How can radical expressions be used to solve problems involving irrational numbers?**

Skills and Objectives:
- Connect physical, verbal and symbolic representations of irrational numbers; e.g., construct [square root of 2] as a hypotenuse or on a number line.
- Explain the meaning of the nth root.
- Solve simple linear and nonlinear equations and inequalities having square roots as coefficients and solutions.
- Solve equations and inequalities having rational expressions as coefficients and solutions.

Main Idea: How can an equation in which both the numerator and the denominator are polynomials be solved?

Skills & Objectives:

- Describe and compare characteristics of the following families of functions: square root, cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.
- Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.
- Describe and compare the characteristics of the following families of functions: quadratics with complex roots, polynomials of any degree, logarithms, and rational functions; e.g., general shape, number of roots, domain and range, asymptotic behavior.
- Identify the maximum and minimum points of polynomial, rational and trigonometric functions graphically and with technology.
- Model and solve problems involving direct and inverse variation using proportional reasoning.

Main Idea: How can probability and statistics be used to model and solve real-world problems?

Skills & Objectives:
- Describe, create and analyze a sample space and use it to calculate probability.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data.
- Make inferences about relationships in bivariate data, and recognize the difference between evidence of relationship (correlation) and causation.
- Describe characteristics and limitations of sampling methods, and analyze the effects of random versus biased sampling; e.g., determine and justify whether the sample is likely to be representative of the population.
- Use counting techniques and the Fundamental Counting principle to determine the total number of possible outcomes for mathematical situations.
- Identify situations involving independent and dependent events, and explain differences between, and common misconceptions about probabilities associated with those events.
- Use theoretical and experimental probability, including simulations or random numbers, to estimate probabilities and to solve problems dealing with uncertainty; e.g., compound events, independent events, simple dependent events.
- Represent and analyze bivariate data using appropriate graphical displays (scatterplots, parallel box-and-whisker plots, histograms with more than one set of data, tables, charts, spreadsheets) with and without technology.
- Identify outliers on a data display; e.g., use the interquartile range to identify outliers on a box-and-whisker plot.
- Provide examples and explain how a statistic may or may not be an attribute of the entire population; e.g., intentional or unintentional bias may be present.
- Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other.
- Explain how a small error in measurement may lead to a large error in calculated results.
- Calculate relative error.
- Explain the difference between absolute error and relative error in measurement.
- Explain how a small error in measurement may lead to a large error in calculated results.