

**INDIAN HILL EXEMPTED VILLAGE SCHOOL DISTRICT**  
**Mathematics Curriculum - May 2009**  
**High School – Algebra 1**

**Main Idea: Expressions, Equations, and Functions. Properties of Real Numbers**

**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.
- Compare, order, and determine equivalent forms for rational and irrational numbers.
- Demonstrate fluency in computations using real numbers.
- Estimate the solutions for problem situations involving square and cube roots.
- Convert rates within the same measurement system; e.g., miles per hour to feet per second; kilometers per hour to meters per second.
- Use unit analysis to check computations involving measurement.
- 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  $n$ th root.
- Approximate the  $n$ th root of a given number greater than zero between consecutive integers when  $n$  is an integer; e.g., the 4<sup>th</sup> root of 50 is between 2 and 3.

**Main Ideas: Solving Linear Equations – Variation - Graphing Equations and Functions Calculating Slope.**

**Skills & Objectives:**

- 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.
- 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.
- Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.
- Model and solve problems involving direct and inverse variation using proportional reasoning.
- Describe the relationship between slope and the graph of a direct variation and inverse variation.
- 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.
- Use algebraic representations and functions to describe and generalize geometric properties and relationships.
- 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.
- Recognize and explain that the slopes of parallel lines are equal and the slopes of perpendicular lines are negative reciprocals.

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**Main Idea: Writing Linear Equations. Solving and Graphing Linear Inequalities**

***Skills & Objectives:***

- 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.
- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- 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.
- Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.
- Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare 'accurate to the nearest foot' when measuring the height of a person versus when measuring the height of a mountain.

**Main Idea: Solving Systems of Equations and Inequalities**

***Skills & Objectives:***

- 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.
- 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: Exponents and Exponential Functions**

***Skills & Objectives:***

- 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.
- 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.

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**Main Idea: Polynomials and Factoring**

***Skills & Objectives:***

- 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.
- Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only).
- Simplify rational expressions by eliminating common factors and applying properties of integer exponents.
- 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.

**Main Idea: Quadratic Equations and Factoring**

***Skills & Objectives:***

- 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.
- Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only).
- Simplify rational expressions by eliminating common factors and applying properties of integer exponents.
- 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.
- Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs.

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**Main Idea: Simplify Rational Expressions and Solve Radical Equations**

***Skills & Objectives:***

- Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
- Simplify rational expressions by eliminating common factors and applying properties of integer exponents.
- 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.

**Main Idea: Probability and Data Analysis**

***Skills & Objectives:***

- Describe, create and analyze a sample space and use it to calculate probability.
- Classify data as univariate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data.
- Create a scatterplot for a set of bivariate data, sketch the line of best fit, and interpret the slope of the line of best fit.
- Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers.
- 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.
- Display bivariate data where at least one variable is categorical.
- Identify outliers on a data display; e.g., use the interquartile range to identify outliers on a box-and-whisker plot.
- Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatterplots, parallel box-and-whisker plots, and measures of center and spread.
- Describe measures of center and the range verbally, graphically and algebraically.
- 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.