**HAZLETON AREA SCHOOL DISTRICT**



Math Curriculum

Algebra 1 Grade 8

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| **Topic 1:** | **The Real Number System**  **A.1.1.1.1 Properties of Real Number** |
| **Weeks:** | 2 Weeks |
| **PA Standards: ￼** | CC.2.1.8. E.1 Distinguish between rational and irrational numbers using their properties.  CC.2.1.8. E.4 Estimate irrational numbers by comparing them to rational numbers.  CC.2.1. HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.  CC.2.2. HS.D.1Interpret the structure of expressions to represent a quantity in terms of its context.  CC.2.2. HS.D.2Write expressions in equivalent forms to solve problems. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | **Eligible Content** | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 2 Weeks | ***The Real Number System***   * Real Numbers * Rational Numbers * Irrational Numbers   ***Simplifying and Ordering Real Numbers***   * Simplifying Rational and Irrational Numbers to Decimal Form * Order and Compare Rational and Irrational Numbers * Working with Roots and Radicals * Simplify Square Roots | M08.A-N.1.1.1 Compare and/or order any real numbers (rational and irrational may be mixed).  M08.A-N.1.1.2 Simplify square roots (e.g., √24 = 2√6).  M08.A-N.1.1.3- Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). Example: √5 is between 2 and 3 but closer to 2.  M08.A-N.1.1.4 - Use rational approximations of irrational numbers to compare and order irrational numbers.  M08.A-N.1.1.5- Locate/identify rational and irrational numbers at their approximate locations on a number line.  A1.1.1.1.1.1 - Compare and/or order any real numbers (rational and irrational may be mixed).  A1.1.1.1.2- Simplify square roots (e.g., √24 = 2√6).  A1.1.1.2.1- Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths). | * Develop a logical argument to explain the difference between a rational and irrational number. * Cite evidence as to whether a rational number terminates or repeats by showing the decimal expansion. * Classify a number as either rational or irrational and illustrate whether the decimal is terminating or repeating. * Compare estimates of irrational numbers to rational numbers. * Convert and simplify terminating and repeating decimals into rational numbers without use of a calculator. * Use estimates of irrational numbers to compare and order irrational and rational numbers. * Compute perfect square and cube roots without use of a calculator. * Construct number lines to plot rational and irrational numbers. * Draw conclusions about the order of rational and irrational numbers. * Interpret expressions that represent a rational or irrational number. * Investigate and develop methods to simplify square roots. | Complex Fraction  Fraction  Identity Property of Zero  Integer  Whole Number  Rational Number  Irrational Number  Repeating Decimal  Terminating Decimal  Perfect Square  Number Line  Real number  Composite  Prime  Natural number  Complex Number  Number line  Estimation Strategy  Root  Cube Root |
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| **Topic 2** | **Exponents/Volume**  **A.1.1.1.2 Simplifying Expressions** |
| **Weeks: ￼** | 3 Weeks |
| **PA Standards: ￼** | CC.2.3.8. A.1 Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems.  CC.2.2.8. B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions.  CC.2.1. HS.F.1Apply and extend the properties of exponents to solve problems with rational exponents.  CC.2.2. HS.D.1Interpret the structure of expressions to represent a quantity in terms of its context.  CC.2.2. HS.D.2Write expressions in equivalent forms to solve problems. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | **Eligible Content** | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 3 weeks | ***Exponents***   * Laws of Exponents * Apply and Interpret Using Scientific Notation * Find and Apply Volume of Cones, Cylinders, and Spheres | M08.B-E.1.1.1- Estimate exceptionally large or exceedingly small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another. Example: Estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9 and determine that the world population is more than 20 times larger than the United States’ population.  M08.B-E.1.1.2- Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of exceptionally large or exceedingly small quantities (e.g., use millimeters per year for seafloor spreading).  M08.B-E.1.1.3 Simplify/evaluate expressions involving properties/laws of exponents, roots and/or absolute value to solve problems (exponents should be integers from -10 to 10).  M08.C-G.3.1.1- Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. Formulas will be provided. | * Apply properties of exponents to create equivalent expressions without use of a calculator. * Perform operations involving scientific notation to interpret extreme quantities. * Distinguish the appropriate law of exponents and apply laws to algebraic, radical, and rational expressions. * Calculate the volume of cones, cylinders, and spheres to solve real world problems. | Exponent  Scientific Notation Negative exponent  Power  Power of a power  Powers of products  Exponential expression  Exponential equation  Base  Power  Surface Area |

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| **Module 1** | **Operations and Linear Equations & Inequalities** |
| **A.1.1.1** | **Operations with Real Numbers & Expressions** |
| **Topic:3** | **A.1.1.1.2 Simplifying Expressions**  **A.1.1.1.5 Polynomials** |
| **Weeks: ￼** | 4 Weeks |
| **PA Standards** | CC.2.2. HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.  CC.2.2. HS.D.4 Understand the relationship between zeros and factors of polynomials to generalize about functions and their graphs.  CC.2.2. HS.D.5 Use polynomial identities to solve problems.  CC.2.1. HS.F.1Apply and extend the properties of exponents to solve problems with rational exponents.  CC.2.2. HS.D.1Interpret the structure of expressions to represent a quantity in terms of its context.  CC.2.2. HS.D.2Write expressions in equivalent forms to solve problems. |
| **Math Practice Standards** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | **Eligible Content** | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 2 Weeks | ***Simplifying Expressions***   * Find Greatest Common Factor and Least Common Multiple * Operations of Real Numbers (Including factoring a monomial out of a simple polynomial) | A1.1.1.1.2- Simplify square roots (e.g., √24 = 2√6).  A1.1.1.2.1- Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials. | * Compare multiple prime factorizations to determine the GCF and LCM. * Interpret expressions that represent a rational or irrational quantity including factors and coefficients. * Use factoring concepts to solve non-routine problems. | Greatest Common Factor  Least Common Multiple |
| 2 Weeks | ***Polynomials***   * Addition and Subtraction of Polynomials * Multiplication of Polynomials. * Simplify and Factor Polynomial Expressions * Simplify and Reduce | A1.1.1.5.1- Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.  A1.1.1.5.2 - Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form ax2 + bx + c where a is equal to 1 after factoring out all monomial factors.  A1.1.1.5.3- Simplify/reduce a rational algebraic expression. | * Apply concepts of sums and differences to polynomial expressions. * Connect the inverse relationship between factoring and multiplying. * Connect concepts of sums and differences to construct products of polynomial expressions. * Collect and display the simplification of rational algebraic expressions. | Monomial  Degree  Polynomial  Leading Coefficient  Binomial  Trinomial  Equivalent expression  Variable  Expression  Distributive property  Term  Coefficient  Constant term  Like terms  Simplest Form  Simplify  Rational Expression |

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| **Topic 4:** | **Solving Linear Equations**  A.1.1.2.1 Equations  A.1.1.3.1 Linear Inequalities |
| **Weeks: ￼3** | 3 Weeks |
| **PA Standards: ￼** | CC.2.2.8. B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.  CC.2.2. HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.  CC.2.2. HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.  CC.2.2. HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.  CC.2.2. HS.D.9 Use reasoning to solve equations and justify the solution method.  CC.2.2. HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.  CC.2.4. HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | Eligible Content | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
|  | ***Solving Linear Equations***   * Use of Algebraic Expressions * Solve a Linear Equation (One-Step w/ One Variable) * Solve a Linear Equation (Two-Steps or More w/ One Variable) * Applications of Linear Equations   ***Linear Inequalities***   * Solve/Graph Linear Inequalities (One-Step w/ One Variable) * Solve/Graph a Linear Inequality (Two-Steps or More w/ One Variable) * Solve/Graph Inequalities with Variables on Both Sides (On a Number Line) * Solve/Graph Compound Inequalities (On a Number Line) * Interpret Inequalities | M08.B-E.3.1.1- Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).  M08.B-E.3.1.22 Identify or graph the solution set to a linear inequality on a number line.  A1.1.2.1.1- Write, solve and/or apply a linear equation (including problem situations).  A1.1.2.1.2- Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only).  A1.1.2.1.3 - Interpret solutions to problems in the context of the problem situation (linear equations only).  A1.1.3.1.1- Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).  A1.1.3.1.2- Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. | Formulate an expression using real-life problem situations. All students will investigate diverse ways to set up an algebraic expression.  Create, solve, and classify linear equations including combining like terms or the distributive property by number of solution (1, infinite or none).  Create, solve, and classify linear equations or inequalities including combining like terms and the distributive property by number of solution (1, infinite or none).  Create equations that can be solved in one step utilizing inverse operations to validate the results.  Develop a logical argument to interpret the validity of steps to solve a multi-step equation.  Create and apply concepts to solve linear equations of real-life problems. All students will analyze and synthesize the solutions to such problems.  Apply concepts of number properties to solve linear inequalities. All students will analyze the solution set.  Develop a logical argument to interpret the validity of steps to solve a multi-step linear inequality.  Formulate linear inequalities and graphically represent the solution set to a real-world situation.  Apply concepts of solving linear inequalities to connect compound inequalities.  Create and apply concepts to solve systems of inequalities of real-life problems. All students will analyze and synthesize the solutions to such problems. | Additive Inverse  Associative Property  Commutative Property  Multiplicative Inverse  Like Terms  Properties of Equality  Properties of Inequality  Coefficient  Equivalent equations  Reciprocal Equation  Linear equation  Inequality Linear inequality  Graph of an Inequality  Equivalent Inequalities  Solution of an Inequality Constraints  Compound Inequalities |

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| **Topic 5:** | **Graphing, Comparing and Interpreting Proportional Relationships** |
| **Weeks: ￼** | 3 Weeks |
| **PA Standards: ￼** | CC.2.2.8. B.2 Understand the connections between proportional relationships, lines, and linear equations.  CC.2.3.8. A.3 Understand and apply the Pythagorean Theorem to solve problems. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | Eligible Content | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 3 Weeks | ***Graphing, Comparing and Interpreting Proportional Relationships***   * Solving Proportions * Representing a Unit Rate as the Slope of the Graph * Graphing Proportions * Comparing and Interpreting Proportional Relationships in Different Forms * Using the Slope, Derive the Equation y=mx + b * Use proportions to solve similar triangles. * Compare the Slope of Corresponding Sides of Similar Triangles on a Coordinate Plane * Use of Pythagorean Theorem and its Converse Applications of the Pythagorean Theorem and it's Converse | M08.B-E.2.1.1 - Write, solve and/or apply a linear equation (including problem situations).  M08.B-E.2.1.2 Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only).  M08.B-E.2.1.3- Interpret solutions to problems in the context of the problem situation (linear equations only).  M08.C-G.2.1.1 - Apply the converse of the Pythagorean theorem to show a triangle is a right triangle.  M08.C-G.2.1.2 Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Figures provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.)  M08.C-G.2.1.3- Apply the Pythagorean theorem to find the distance between two points in a coordinate system. | * Calculate the solution to a proportion. * Interpret unit rate as the slope of a graph. * Construct a graph using a constant rate of change from a linear equation. * Interpret and draw conclusions about different proportional relationships based upon their constant rates of change. * Formulate a linear equation given proportional data. * Construct a proportion to solve similar triangles. * Cite evidence explaining why the corresponding sides of similar triangles have congruent slopes. * Use the Pythagorean Theorem to determine if the given sides of a triangle create a right triangle. * Apply the Pythagorean Theorem to real world situations to find missing sides of a right triangle and the distance between two points. | Proportion  Unit Rate  Scale Factor  Coordinate Plane  Ordered Pair  Origin  Quadrant  X-Axis  Y-Axis  Similar Figures  Converse  Pythagorean Theorem  Altitude  Hypotenuse  Legs  Slant Height |

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| **Topic 6: ￼** | **Graphing Linear Equations**  A.1.2.2.1 Graph Linear Equations  A1.1.3.2 Graph Linear Inequalities |
| **Weeks: ￼** | 3 Weeks |
| **PA Standards: ￼** | CC.2.2.8. B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.  CC.2.2. HS.C.5Construct and compare linear, quadratic, and exponential models to solve problems.  CC.2.2. HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.  CC.2.2. HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.  CC.2.2. HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.  CC.2.4. HS.B.4 Recognize and evaluate random processes underlying statistical experiments. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | **Eligible Content** | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 3 Weeks | ***Graphing Linear Equations***   * Find Slope and Rate of Change * Graph Using Intercepts and Slope-Intercept and Point-Slope Forms. * Standard Form * Interpret Functions Using Equations, Tables, and Graphs.   ***Graph Linear Inequalities***   * Graph Linear Inequalities in Two Variables * Write and Interpret Linear Inequalities   **Solve Linear Inequalities by Graphing**   * **Scatterplots** * Line of Best Fit * Use and Interpret the Slope and Intercept of the Line of Best Fit (linear regression line, trend line, linear model) * Frequency and Relative Frequency * Analyze Data and Make Predictions from Graphical Representations | M08.B-E.3.1.1 Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).  M08.B-E.3.1.2 Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.  A1.2.2.1.1 - Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association.  A1.2.2.1.2- For scatter plots that suggest a linear association, identify a line of best fit by judging the closeness of the data points to the line.  A1.2.2.1.3 - Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.  A1.1.3.2.1- Draw, find and/or write an equation for a line of best fit for a scatter plot.  A1.1.3.2.2- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association. | * Create graphs of linear equations with 1, infinite, or no solution. * Use concepts to solve real-life problems connecting the relationship between the rate of change and its graphical representation. * Calculate and graph the x- and y-intercepts for any linear equation. All students will apply concepts of slope and point to create a graphical illustration on a Cartesian Plane. * Investigate the relationship between standard form with slope and the y-intercept of the linear expression. * Use graphs, tables, or equations to solve real-world problems of linear functions. * Create linear inequalities graphically. * Analyze and investigate the graph of linear inequalities to draw conclusions from an experiment.   Scatterplot   * Construct and interpret scatterplots to determine the relationship between the quantities. * Relate the line of best fit to patterns within the data points. * Draw conclusions about data using the slope and intercept of the line of best fit.   Construct scatterplots to formulate conclusions and predictions using the frequency and relative frequency. | Slope  Rate  Rise  Run  Rate of change  Undefined Slope  Zero Slope  Standard form  Slope-intercept form  Point-slope form  Linear Function Inequality  Linear inequality  Graph of an Inequality  Equivalent Inequalities  Solution of an Inequality  Constraints  Scatterplot  Correlation  Outlier  Dependent Variable  Independent Variable |

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| **Topic 7: ￼** | **Solving Systems of Linear Equations**  A.1.1.2.2 Systems of Equations |
| **Weeks: ￼** | 4 Weeks |
| PA Standards: ￼ | CC.2.2.8. B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.  CC.2.2. HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | **Eligible Content** | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 4 Weeks | ***Solving Systems of Linear Equations***   * Understand the Solution to a Systems of Equations * Estimate Solutions by Graphing * Solve a System of Two Linear Equations Algebraically * Apply Systems of Equations to Real World Situations | M08.B-E.3.1.3- Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs because points of intersection satisfy both equations simultaneously.  M08.B-E.3.1.4- Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. Example: 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.  M08.B-E.3.1.5-Solve real-world and mathematical problems leading to two linear equations in two variables. Example: Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.  A1.1.2.2.1- Write and/or solve a system of linear equations (including problem situations) using graphing, substitution and/or elimination (limit systems to 2 linear equations)  A1.1.2.2.2-Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only).  A1.1.3.2.1 - Analyze and solve linear equations and pairs of simultaneous linear equations.  A1.1.3.2.2- Interpret solutions to problems in the context of the problem situation (systems of 2 linear equations only). | * Recognize the point of intersection of two linear graphs as a solution to a system of equations. * Construct and interpret linear graphs to estimate the solution to a system of equations. * Assess a system of equations to determine and use the best method for solving the system. * Create a system of equations to model a real-world situation. * Create, analyze, and synthesize graphs of linear systems of equations and cite evidence for one solution, no solution, or infinite solutions. * Apply concepts of substitution to solve a system of equations. * Apply concepts and prove that the elimination method, substitution method, and graphing method validate the same results. * Create and apply concepts to solve systems of equations to real life problems. All students will analyze and synthesize the solutions to such problems. * Synthesize systems of linear inequalities graphically to prove whether an ordered pair is a solution. | Solution to a System  Elimination Method  Substitution Method System of Linear Equations  Linear Combination |

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| **Topic 8: ￼** | **Functions**  A.1.2.1.1 Functions |
| **Weeks: ￼** | 1 ½ Weeks |
| **PA Standards: ￼** | CC.2.2.8. C.1 Define, evaluate, and compare functions.  CC.2.2.8. C.2 Use concepts of functions to model relationships between quantities.  CC.2.2. HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.  CC.2.2. HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.  CC.2.2. HS.C.3 Write functions or sequences that model relationships between two quantities.  CC.2.2. HS.C.6 Interpret functions in terms of the situations they model. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | Eligible Content | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 1 ½ Weeks | ***Functions***   * Define and Understand a Function * Represent Functions Algebraically, Graphically and Numerically * Compare Properties of Two Functions * Compare Linear and Non-Linear Functions * Model Relationships Using Functions * Rate of Change and Initial Value of a Function * Analyze the Relationship Between Quantities from a Graph * Relating Patterns/Graphs to Events * Identify Domain or Range * Determine if Relation is a Function | M08.B-F.1.1.1 - Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.  M08.B-F.1.1.2- Determine if a relation is a function given a set of points or a graph.  M08.B-F.1.1.3- Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).  M08.B-F.2.1.1- Create, interpret and/or use the equation, graph, or table of a linear function.  M08.B-F.2.1.2- Translate from one representation of a linear function to another (graph, table, and equation).  A1.2.1.1.1- Write, solve and/or apply a linear equation (including problem situations).  A1.2.1.1.2- Use and/or identify an algebraic property to justify any step in an equation solving process (linear equations only).  A1.2.1.1.3- Interpret solutions to problems in the context of the problem situation (linear equations only). | * Recognize or illustrate if a relation is also a function by assessing domain and range. * Create various representations of functions using tables, graphs, or verbal descriptions. * Compare two functions represented in diverse ways by analyzing their intercepts and rates of change. * Compare and classify functions as linear or non-linear based on tables, graphs, equations, or verbal situations. * Construct a table or graph to model the relationship between two quantities. * Draw conclusions about rate of change and the initial value of a function based on data from a table or graph. * Analyze graphs demonstrating a relationship between quantities to determine whether the function is increasing or decreasing, minimum, maximum, and rate of change. * Design a mathematical model that represents linear or quadratic functions given a set of data or graphical representation. * Identify the domain and range given a set of points on a graph either continuous or discontinuous. * Analyze relations or patterns to distinguish the difference between functions and non-functions. | Domain  Range  Relation Rate of Change Pattern  Arithmetic Sequence  Geometric Sequence  Relation  Mapping  Function  Independent Variable  Dependent Variable  Vertical Line Test  F(x) composite  function equations |

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| **Topic 9: ￼** | **Geometry**  **A.2.1.1Transformations** |
| **Weeks: ￼** | 4 Weeks |
| **PA Standards: ￼** | CC.2.3.8. A.2 Understand and apply congruence, similarity, and geometric transformations using various tools. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | Eligible Content | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 4 Weeks | ***Geometry***   * Define and Understand Rotations, Reflections, Translations and Dilations (transformations) * Similar and Congruent Figures Applying Rotations, Reflections, and Translations * Determine the Effects of Transformations on a Two-Dimensional Object | M08.C-G.1.1.1- Identify and apply properties of rotations, reflections, and translations. Example: Angle measures are preserved in rotations, reflections, and translations.  M08.C-G.1.1.2- Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them.  M08.C-G.1.1.3 - Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.  M08.C-G.1.1.4- Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them. | * Identify transformations including rotations, reflections, translations, and dilations. * Apply concepts of rotations, reflections, translations, and dilations to find similarity or congruence between two figures. * Differentiate between transformations to construct congruent and similar figures on a coordinate plane. | Dilation  Midline  Reflection  Rotation  Similarity Transformation  Translation  Congruent  Similar |

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| **Topic 10: ￼** | **Statistics and Probability**  A.1.2.3 Probability and Data Analysis |
| **Weeks: ￼** | 3 Weeks |
| **PA Standards: ￼** | CC.2.4.8. B.1 Analyze and/or interpret bivariate data displayed in multiple representations.  CC.2.4.8. B.2 Understand that patterns of association can be seen in bivariate data utilizing frequencies.  CC.2.4. HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.  CC.2.4. HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.  CC.2.4. HS.B.3 Analyze linear models to make interpretations based on the data.  CC.2.4. HS.B.4 Recognize and evaluate random processes underlying statistical experiments.  CC.2.4. HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.  CC.2.4. HS.B.6 Use the concepts of independence and conditional probability to interpret data.  CC.2.4. HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.  CC.2.1. HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. |
| **Math Practice Standards:** | (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure; (8) Look for and make sense of regularity in repeated reasoning. |

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| **Weeks** | **Topic** | Eligible Content | **Concepts and Competencies**  **The learner will:** | **Tier 2 & 3 Vocabulary** |
| 1 1/2  Week | ***Statistics***   * Use Measures of Central Tendency * Analyze the Dispersion of Data * Analyze Data and Make Predictions from Non-Graphical Representations | A.1.2.3.1- Analyze and interpret bivariate data displayed in multiple representations.  A.1.2.3.2- Understand that patterns of association can be seen in bivariate data utilizing frequencies. | * Calculate the measures of central tendency and the range of a set of data. * Interpret data, design an appropriate representation of displayed data, and make predictions based on the distribution. * Analyze the measure of dispersion from a graphical representation or a set of data. * Draw conclusions from a data display to solve real-world problems. | Mean  Median  Mode  Range  Measures of Central Tendency Box-and-Whisker Plot  Stem-and-Leaf Plot  Bar Graph  Line Graph  Circle Graph / Pie Chart  Frequency  Histogram  Interquartile Range  Measure of Dispersion  Outlier  Quartile |
| ½ Week | ***Two-way Table***   * Construct and Use a Two-Way Table | M08.D-S.1.2.1- Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe associations between the two variables. | * Construct a two-way table and analyze the relative frequencies calculated from the data to find relationships. |  |
| 1  Week | ***Probability***   * Find and Apply Probabilities | A.1.2.3.3- Analyze and/or interpret bivariate data displayed in multiple representations. | * Calculate probabilities of compound events and make predictions based on calculations using the given events. | Probability  Odds  Outcome  Sample Space  Population  Theoretical Probability  Experimental Probability  Compound Event  Dependent Events  Fundamental Counting Principle  Probability of a Compound Event  Simple Event  Independent Events  Mutually Exclusive Events |