**HAZLETON AREA SCHOOL DISTRICT**



Math Curriculum

GRADE 8

Foundations of Algebra

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| **Topic 1:** | The Real Number System |
| **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. |
| **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 reasonings 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
 | 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. | * 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.
 | Complex FractionFractionIdentity Property of ZeroIntegerWhole NumberRational NumberIrrational NumberRepeating DecimalTerminating DecimalPerfect SquareNumber LineSquare Roots Cube Roots |

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| **Topic 2:**  | Exponents/Volume |
| **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. |
| **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 reasonings 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/Volume**** Laws of Exponents
* Working with Roots and Radicals

***Apply and Interpret Using Scientific Notation**** Find the Volume of Cones, Cylinders, and Sphere and Apply
 | **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.CG.3.1.1 Calculate the volume of cones, cylinders, and spheres. | * Apply properties of exponents to create equivalent expressions without use of a calculator.
* Compute perfect square and cube roots without use of a calculator.
* Perform operations involving scientific notation to interpret extreme quantities.
* Calculate the volume of cones, cylinders, and spheres to solve real world problems.
 | ExponentPerfect SquareCube RootScientific NotationVolume of Cone,Cylinder, and Sphere |

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| **Topic 3:** | Solving Linear 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.1 Interpret the structure of expressions to represent a quantity in terms of its content. |
| **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 reasonings 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 Linear Equations**** Use of Algebraic Expressions
* Write and Solve Linear Equations
* Solving Multi-Step Linear Equations
 | 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. | * Formulate an expression using real-life problem situations. All students will investigate different ways to set up an algebraic expression.
* Create, solve and classify linear equations including combining like terms or the distributive property by number of solutions (1, infinite or none).
* Create, solve and classify linear equations or inequalities including combining like terms and the distributive property by number of solutions (1, infinite or none
 | Additive InverseAssociative PropertyCommutative PropertyMultiplicative Inverse Like Terms Properties of EqualityProperties of InequalityCoefficient  |

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| **Topic 4:** | Graphing Linear Equations; Graphing, Comparing and Interpreting Proportional Relationships; Pythagorean Theorem/Converse |
| **Weeks:** | 5 Weeks |
| **PA Standards:** | CC.2.2.8. B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.CC.2.2.8. B.2 understand the connections between proportional relationships, lines, and linear equations.CC.2.3.8. A.2 Understand and apply congruence, similarity.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 reasonings 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** |
| 5 Weeks | ***Graphing Linear Equations**** Graphing Linear Equations

***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 and the Equation

y=mx + b* Use proportions to solve similar triangles.
* Compare the Slope of Corresponding Sides of Similar Triangles on a Coordinate Plane

***Geometry**** Explain and Prove the Pythagorean Theorem and its Converse
* Applications of the Pythagorean Theorem and it's Converse
* Use the Slope and Intercept of the Line of Best Fit.
 | 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.B-E.3.1.1 Apply the converse of the Pythagorean theorem to show a triangle is a right triangle.M08.B-E.3.1.2 Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.  | * Create and interpret graphs of linear equations.
* Calculate the solution to a proportion.
* Interpret unit rate as the slope of a graph.
* 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.
 | SlopeSlope-Intercept FormStandard FormProportionUnit RateScale FactorCoordinate PlaneOrdered PairOriginQuadrantX-AxisY-AxisSimilar FiguresScatter PlotLine of Best FitCorrelationsPythagorean Theorem ConverseLinear RegressionOutlierDependent VariableIndependent Variable |

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| **Topic 5:**  | Solving Systems of Linear Equations; Graphing Linear Equations; Graphing, Comparing and Interpreting Proportional Relationships |
| **Weeks:** | 3 Weeks |
| **PA Standards:** | CC.2.2.8. B.3 Analyze and solve linear equations and pairs of simultaneous linear equations. |
| **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 reasonings 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 | **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.M08.B-E.3.1.5 Solve real-world and mathematical problems leading to two linear equations in two variables | * 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.
* Identify Parallel and Perpendicular lines
 | Solution to a System Elimination Method Substitution MethodParallel LinesPerpendicular Lines |

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| **Topic 6:**  | Geometry/Transformations |
| **Weeks:**  | 4 Weeks |
| **PA Standards:**  | CC.2.2.8. A.2 Understand and apply 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 reasonings 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.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.
 | DilationMidpointReflectionRotationTransformatioTranslationSimilar FiguresCongruent |

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| **Topic 7:**  | Functions |
| **Weeks:** | 1.5 Weeks |
| **PA Standards:** | CC.2.3.8. C.1 Define, evaluate, and compare functions.CC.2.2.8. C.2 Use concepts of functions to model relationships between quantities. |
| **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 reasonings 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** |
| 1.5 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
 | 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). | * 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 different 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.
 | DomainRange RelationRater of Change |

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| **Topic 8:**  | Statistics and Probability |
| **Weeks:**  | 2 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. |
| **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 reasonings 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 | ***Statistics and Probability**** 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.
 | outlier |