DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Honors Algebra I

Curriculum Writing Committee:
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Grade Level: 8

Date of Board Approval: ___June 2025_____

DELAWARE VALLEY SCHOOL DISTRICT

Course Weighting

	Marking Period 1	Marking Period 2	Marking Period 3	Marking Period 4
Tests	45% 3 Tests	45% 4 Tests	45% 3 Tests	45% 2 Tests
Quizzes	45% 4 Quizzes	45% 3 Quizzes	45% 4 Quizzes	45% 4 Quizzes
Homework/ Participation	10%	10%	10%	10%
Total	100%	100%	100%	100%

Curriculum Map

Overview:

This Honors Algebra course provides a rigorous foundation in algebraic concepts, preparing students for advanced study in mathematics and science. All content is aligned to ensure success on the Algebra 1 Keystone and Math 8 PSSA exam, with an emphasis on deeper conceptual understanding, critical thinking, and problem-solving.

Students will explore the theoretical and applied aspects of algebra and geometry, with a focus on challenging problem-solving techniques and real-world applications. Topics include operations and properties of real numbers, linear equations and inequalities, systems of equations and inequalities, functions (linear, quadratic, and exponential), properties of exponents and radicals, polynomials, transformational geometry, and triangle relationships.

This honors-level course moves at an accelerated pace, incorporates more complex problem sets, and encourages higher-order reasoning skills. All topics are aligned to the Pennsylvania mathematical standards for grade 8 and designed to prepare students for advanced coursework in algebra and beyond.

Time/Credit for the Course: Full academic year, 180 days, 1 period per day

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Goals:

Marking Period 1 (45 days) – Students will be able to understand the following:

Unit 1: Expressions and Number Sense- 23 Days

- Simplifying numerical expressions using the order of operations
- Constructing and evaluating algebraic expressions
- Properties of numbers
- Simplifying and estimating square and cube roots
- Classifying, graphing, comparing and ordering real numbers
- Identifying and using properties of real numbers
- Simplifying variable expressions by combining like terms
- Simplifying variable expressions by using the distributive property
- Estimating values to build number sense and develop problem solving

Unit 2: Solving Equations and Proportions- 15 Days

- Solving equations: one step, two step, multi-step, and variables on both sides
- Solving and identifying equations with special solutions
- Solving literal equations
- Constructing equations from real world applications and interpreting their solutions
- Solving equations with square roots and cube roots
- Solving ratios and proportions
- Identifying similar figures and determining measures of unknown measurements
- Calculating percentages

Unit 3A: Solving and Graphing Inequalities- 7 Days

- Solving linear inequalities: one step, two step, multi-step, and variables on both sides.
  solutions
- Solving and identifying inequalities with all real numbers or no solutions
- Constructing inequalities from real world applications and interpreting their solutions
- Graphing inequalities on a number line
- Writing inequalities from graphs
- Benchmark exam

Marking Period 2 (45 days) – Students will be able to understand the following:

Unit 3B: Solving and Graphing Inequalities- 5 Days

- Solving compound inequalities and graphing their solutions on a number line
- Constructing compound inequalities from real world applications and interpreting their solutions
- Solving absolute value equations and inequalities and graphing their solutions on a number line

Unit 4: Data and Probability - 10 Days

- Finding measures of central tendency (mean, median, mode)
- Identifying measures of spread: range and interquartile range
- Constructing a box plot using the 5 number summary
- Interpreting categorical data: pie charts and bar graphs
- Interpreting two-way tables
- Interpreting quantitative data: dot plots, histograms, and box plots
- Determining theoretical and experimental probabilities
- Finding probabilities for independent and dependent events

Unit 5: Linear Relationships and Scatter Plots - 15 Days

- Relationships detailed using tables, equations, and graphs
- Solving proportional relationships
- Finding the rate of change/slope from a table, graph, two points, or a word problem
- Graphing linear functions using a table and/or intercepts
- Graphing in slope intercept form, point slope and standard form
- Converting equations from point slope form and standard form to slope intercept form
- Writing equations in point slope or slope intercept form from real life applications
- Finding intercepts when equations are in standard form
- Interpreting scatterplots - identify a correlation, predicting a value and following a trend
- Making a scatter plot and draw the line of best fit
- Writing the equation of the line of best fit by using point slope form
- Predicting a value using the line of best fit

Unit 6: Systems of Equations- 15 Days

- Solving a system of linear equations by graphing
- Solving a system of linear equations using substitution
- Solving a system of linear equations using elimination
- Constructing a system of linear equations from a real-life application and interpreting its solution
- Graphing a system of linear inequalities and interpreting its solution set
- Constructing a system of linear inequalities from a real-life application. Interpret its solution set
- Benchmark exam

Marking Period 3 (45 days) – Students will be able to understand the following:

Unit 7: Functions- 6 Days

- Representing relations in various forms
- Representing functions in tables, graphs, coordinates, and real-world applications
- Interpreting the domain and range from various forms
- Determining if a relation is a function
- Determining if a function is linear or nonlinear

- Comparing the rate of change of two functions
- Using function notation to evaluate expressions
- Constructing functions using function notation from real world applications
- Interpreting the solutions of a function in the given context

Unit 8: Pythagorean Theorem- 5 Days

- Determining if two figures are congruent or similar by transformations
- Finding the missing measurement of a right triangle
- Determining if side measurements form a right triangle
- Finding the distance between two points on the coordinate plane

Unit 9: Exponents- 7 Days

- Understanding zero and negative exponents
- Writing numbers in scientific and standard notation
- Adding, subtracting, multiplying, and dividing standard notation
- Writing and evaluating exponents
- Multiplying and dividing monomials
- Investigating powers of monomials
- Converting positive and negative exponents

Unit 10: Polynomial Expressions and Factoring- 17 Days

- Finding GCF and LCM for sets of monomials
- Classifying polynomials by degree and number of terms
- Add/subtracting polynomial expressions
- Multiplying and dividing polynomial expressions
- Factoring polynomials including GCF (where a=1)
- Writing radicals in simplest radical form
- Simplifying rational expressions by factoring
- Solving radical equations and interpreting their solution
- Analyzing and determining a linear pattern

Unit 11A: Geometry- 10 Days

- Finding the volume of a cylinder
- Finding the volume of a cone
- Finding the volume of a sphere

Marking Period 4 - 45 Day

Unit 11B: Geometry- 5 Days

- Graphing geometric translations on the coordinate plane
- Graphing geometric reflections across the y- and x-axis
- Graphing geometric rotations on the coordinate plane
- Graphing and describe dilations

PSSA Review ***(5 days)*** *and EXAM* ***(2 days)***

Unit 12A: Rational Expressions- 5 Days

- Simplifying rational expressions
- Multiplying and dividing rational expressions

KEYSTONE Review ***(10 days)*** *and EXAM* ***(2 days)***

Unit 12B: Additional Algebraic Concepts- 16 Days

- Adding and subtracting rational expressions
- Creating algebraic equations and expressions to represent the characteristics of a geometric figure
- Solving equations involving radical operations
- Factoring polynomial expressions representing the area of a quadrilateral to determine dimensions of the quadrilateral

Big Ideas:

Big Idea #1: Mathematical relationships among numbers can be represented, compared, and communicated.
Big Idea #2: Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.
Big Idea #3: Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.
Big Idea #4: Patterns exhibit relationships that can be extended, described, and generalized.
Big Idea #5: Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.
Big Idea #6: Data can be modeled and used to make inferences.
Big Idea # 7: Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization.

Primary Textbooks and Supplemental Resources:

Primary Textbooks:

- Glencoe Algebra 1
  Textbook ISBN #: 978-0-07-898515-7
  Textbook Publisher & Year of Publication: 2018 McGraw-Hill Education
- Prentice Hall Algebra 1
  Textbook ISBN #: 978-0-13-368919-8
  Textbook Publisher & Year of Publication: Pearson 2018

Supplemental Resources:

- Teacher created worksheets with Kuta Software
- IXL
- Desmos
- PDE PSSA Item Samplers for Grade 8
- PDE Algebra Keystone Samplers
- TI 84 Graphing calculator
- Geometers Sketchpad

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Curriculum Plan

Unit 1: Expressions and Number Sense **Time Range in Days: 23 Days**

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.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.
- **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.

Anchors Addressed:

- **M08.A-N.1.1** Apply concepts of rational and irrational numbers.
- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- **A1.1.1.3** Use exponents, roots and/or absolute value to solve problems.
- **A1.1.1.4** Use estimation strategies in problem-solving situations.

Eligible Content:

- **M08.A-N.1.1.1** Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths).
- **M08.A-N.1.1.2** Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths).
- **M08.A-N.1.1.3** Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). Example: $\sqrt{5}$ 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** Compare and/or order any real numbers (rational and irrational may be mixed).
- **A1.1.1.1.2** Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$).
- **A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots and/or absolute value to solve problems (exponents should be integers from -10 to 10).
- **A1.1.1.4.1** Use estimation to solve problems.

Objectives:

1. Students will be able to construct algebraic expressions given a word phrase or by identifying a pattern. (DOK – Level One)
2. Students will be able to evaluate expressions by applying the order of operations which includes grouping symbols and exponents. (DOK – Level One)

3. Students will be able to classify, graph and compare real numbers which includes square roots. (DOK – Level Two)
4. Students will be able to represent and use numbers and expressions in equivalent forms. (DOK – Level Two)
5. Students apply number theory concepts to show relationships between real numbers in problem-solving settings. (DOK – Level Three)
6. Students will be able to identify and apply properties of real numbers. (DOK – Level Two)
7. Students will be able to create their own examples of properties of real numbers. (DOK- Level Four)
8. Students will be able to calculate the sum, difference, product, and quotient of real numbers. (DOK – Level One)
9. Students will be able to use tables, equations, and graphs to describe relationships. (DOK – Level Two)
10. Students will be able to justify why a terminating or repeating decimal can be written as a ratio of two numbers (DOK- Level 2)
11. Students will be able to create algebraic expressions based on real world situations. (DOK – Level Four)
12. Students will be able to analyze and critique the validity of others' reasoning when writing equivalent expressions using properties of numbers. (DOK- Level Three)
13. Students will be able to design and analyze an estimation strategy to place real numbers on an accurate location on a number line or to solve a real-world problem involving both rational and irrational numbers. (DOK- Level Four)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of the real number system, including operations with and properties of real numbers, as well as other pre-algebra skills (simplifying and/or evaluating algebraic expressions).
- Engage students through use of personal whiteboards to simplify expressions.
- Engage students through use of vertical whiteboard surfaces in the room to model examples of properties.
- Use online manipulatives to provide students additional support with combining like terms (i.e. IXL or https://mathsbot.com/manipulatives/tiles).
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation with integer operations and finding equivalent expressions.
- Engage students with collaborative working groups will be used to practice interpreting and communicating math ideas with peers.
- Students will review core lesson vocabulary in both written and verbal form (integer, term, distribute, simplify, expression, equivalent, rational number, repeating decimal, terminating decimal, square root, perfect square, radical sign, cube root, perfect cube, irrational number, real number) through

classroom discussion and practice exercises.

- Use Glencoe or Pearson textbook activities to build student fluency simplifying expressions and number sense.
- Provide students a real-world dataset (such as distances between cities or scientific measurements) to analyze and estimate unknown values using rational approximations of irrational numbers. Engage students in a collaborative discussion on estimation strategies used to order numbers or place them on a number line.
- Engage students with Number Talk activities can be used for students to build computational fluency and practice detailing strategies used to compute an expression.
- Provide students with algebraic expressions (via worksheet, scattered around the room, or projected on the Smartboard) that have been simplified incorrectly. Have students work in collaborative groups to identify errors, justify their reasoning, and present corrections to their peers.
- Practice Keystone Constructed Response Questions relating to this topic.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 1 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

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Unit 2: Solving Equations and Proportions **Time Range in Days: 15 Days**

Standards Addressed:

- **CC.2.2.8.B.3** Analyze and solve linear equations and pairs of simultaneous linear equations.
- **CC.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.

Anchors Addressed:

- **M08.B-E.3.1** Write, solve, graph, and interpret linear equations in one or two variables, using various methods.
- **A1.1.2.1** Write, solve and/or graph linear equations and inequalities using various methods.
- **M08.B-E.1.1** Represent and use expressions and equations to solve problems involving radicals and integer exponents.

Eligible Content:

- **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.
- **A1.1.2.1.1** 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).
- **M08.B-E.1.1.2** Use square root and cube root symbols to represent solutions to equations of form x^2=p and x^3=p, where p is a positive rational number. Evaluate square roots of perfect squares (up to and including 12^2) and cube roots of perfect cubes (up to and including 5^3 without a calculator. Example if x^2=25, then $x = \pm\sqrt{25}$.

Objectives:

1. Students will be able to solve equations (one-step in one variable, two-step in one variable, multi-step in one variable which includes equations with variables on both sides, identities and equations with no solution, and literal equations). (DOK – Level Two)
2. Students will be able to reason and critique what a solution represents in context. (DOK - Level Three)
3. Students will be able to create algebraic equations based on real world situations. (DOK – Level Four)
4. Students will be able to write, graph, and identify solutions of equations. (DOK – Level Two)

5. Students will be able to critique the solutions to equations and justify their responses. (DOK - Level Four)
6. Students will be able to solve literal equations for a specified variable using algebraic manipulation (DOK-Level Two)
7. Students will be able to rearrange formulas used in real-world contexts to isolate a desired variable (DOK-Level Two)
8. Students will be able to utilize a strategy solve proportions involving variables and linear expressions (DOK- Level Two)
9. Students will be able to create and solve proportions to model and solve real-world scenarios (DOK- Level Three)
10. Students will be able to solve for missing dimensions of similar figures using proportions and determine if two figures are similar. (DOK- Level One)
11. Students will be able to calculate percentages, including finding the percentage of a number, the whole given a part and a percentage, and percentage increase or decrease (DOK- Level One)
12. Students will be able to apply percentages to solve real-world problems, such as discounts, tax, and interest. (DOK- Level Two)
13. Students will be able to justify the steps taken to solve a linear equation by applying appropriate algebraic properties. (DOK- Level Three)
14. Students will be able to develop a mathematical argument to explain the number of solutions for a given linear equation. (DOK- Level Four)

Core Activities and Corresponding Instructional Methods:

1. Develop students' prerequisite knowledge from pre-algebra and fundamental understanding of solving equations by use of:
    - "Hanger" models to visually interpret equations.
    - Skill specific IXL activities or teacher created worksheets
    - The use of personal whiteboards
    - Collaborative assignments with students
2. Collaborative working groups will be used to practice interpreting solutions and communicating strategies for solving equations with peers.
3. Engage students through use of vertical or personal whiteboards in the room to analyze and solve equations.
4. Explicitly teach and practice content-specific vocabulary in both written and verbal form (inverse operation, coefficient, equivalent, two-step equation, variable, no solution, infinitely many, reciprocal, rational, distribute) through classroom discussion and practice exercises.
5. Provide students with different forms of linear equations (e.g., one solution, no solution, infinitely many solutions). Have them analyze each equation and construct a mathematical argument explaining why it has the given number of solutions, using

properties of equality and counterexamples if needed.

6. Engage students in a collaborative, structured debate where groups present arguments justifying why a given equation has one, none, or infinitely many solutions.
7. Incorporate PDE created CRQ's and writing prompts to practice articulating a mathematical process for solving equations.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments- example problems from textbook, Kuta worksheets or IXL assignments for each section.
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes
- **Summative:**
  - Common Assessment Chapter 2A Test
  - Common Assessment Chapter 2B Test
    - Assessments include both Multiple Choice and Constructed Response Questions

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Unit 3: Solving and Graphing Inequalities **Time Range in Days: 12 Days**

Standards:

- **CC.2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situation they model.

Anchors Addressed:

- **A1.1.3.1** Write, solve and/or graph linear inequalities using various methods.

Eligible Content:

- **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
- **A1.1.3.1.2** Identify or graph the solution set to a linear inequality on a number line.
- **A1.1.3.1.3** Interpret solutions to problems in the context of the problem situation (limit to linear inequalities).

Objectives:

1. Students will be able to write and solve one-step, two-step, and multi-step inequalities. (DOK – Level One)
2. Students will be able to graph the solution set of a linear inequality on a number line. (DOK – Level One)
3. Students will be able to solve and graph compound inequalities, including conjunctions (“and”) and disjunctions (“or”). (DOK – Level Two)
4. Students will be able to solve absolute value inequalities and represent their solution sets graphically. (DOK – Level Two)
5. Students will be able to explain when and why to reverse the inequality symbol when solving inequalities. (DOK – Level Two)
6. Students will be able to interpret the meaning of inequality solutions in real-world contexts. (DOK – Level Three)
7. Students will be able to write and solve inequalities that model real-world scenarios. (DOK – Level Three)
8. Students will be able to compare and justify different solution methods for solving inequalities. (DOK – Level Three)
9. Students will be able to analyze and correct errors in solving inequalities. (DOK – Level Three)
10. Students will be able to construct a mathematical argument to explain the relationship between the solution set of a linear inequality and its graphical representation, including justification for boundary points and shading direction. (DOK- Level Four)

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Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of solving and graphing equations, number line representation, and inequality symbols to support understanding of linear inequalities through a warm-up activity and class discussion.
- Use personal whiteboards to practice solving and graphing inequalities, allowing for immediate feedback and corrections.
- Engage students through use of vertical whiteboard surfaces in the room to model examples of solving inequalities, graphing solution sets, and writing compound inequalities.
- Use online graphing tools (i.e., Desmos, GeoGebra, IXL) to provide students additional support in visualizing inequality solutions on a number line and coordinate plane.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation with practice problems tailored to solving, graphing, and interpreting inequalities.
- Create collaborative working groups to complete a worksheet-based activity to practice interpreting and communicating solutions to linear inequalities and compound inequalities with peers.
- Students will take notes and verbally review vocabulary words (inequality, solution set, compound inequality, conjunction, disjunction, boundary point, open circle, closed circle, test point, absolute value inequality) through classroom discussion and practice exercises.
- Use Glencoe or Pearson textbook activities for solving and graphing inequalities to build student fluency and for homework assignments.
- Using algebraic inequalities that the student have solved (i.e. from a homework assignment, textbook resources, or KutaWorksheet), have students collaborate with peers to determine specific real numbers that fall in the solution set for the inequality.
- Engage students with Number Talk activities to strengthen their reasoning skills, such as justifying when to reverse the inequality sign and explaining the meaning of solution sets.
- Use PDE Keystone Constructed Response Questions on creating an algebraic inequality and interpreting its solution set.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork

- Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
- Warm-up activities
- PSSA and Keystone Item Sample Constructed Response Questions
- Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 3 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

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Unit 4: Data and Probability **Time Range in Days: 10 Days**

Standards:

- **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.7** Apply the rules of probability to compute probabilities of compound events in a uniform probability model.

Anchors Addressed:

- **M08.D-S.1.2** Understand that patterns of association can be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.
- **A1.2.3.1** Use measures of dispersion to describe a set of data.
- **A1.2.3.2** Use data displays in problem solving settings and/or to make predictions.
- **A1.2.3.3** Apply probability to practical situations.

Eligible Content:

- **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 possible associations between the two variables. Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores?
- **A1.2.3.1.1** Calculate and/or interpret the range, quartiles and interquartile range of data.
- **A1.2.3.2.1** Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations.
- **A1.2.3.2.2** Analyze data, make predictions, and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations).
- **A1.2.3.3.1** Find probabilities for compound events (e.g., find probability of red and blue, find probability of red or blue) and represent as a fraction, decimal or percent).

Objectives:

1. Students will be able to construct and interpret two-way tables summarizing data on two categorical variables. (DOK – Level One)
2. Students will be able to calculate relative frequencies for rows and columns in a two-way table to describe associations between variables. (DOK – Level Two)
3. Students will be able to calculate and interpret the range, quartiles, and interquartile range of a dataset. (DOK – Level One)
4. Students will be able to analyze box-and-whisker plots, stem-and-leaf plots, and two-way tables describe data distributions. (DOK – Level Two)
5. Students will be able to use measures of central tendency (mean, median, mode) and variability to make predictions based on displayed data. (DOK – Level Two)

6. Students will be able to create and interpret circle graphs, line graphs, and bar graphs to represent data and draw conclusions. (DOK – Level Two)
7. Students will be able to analyze data, make predictions, and answer questions based on multiple data representations. (DOK – Level Three)
8. Students will be able to calculate probabilities of compound events and represent them as fractions, decimals, or percentages. (DOK – Level One)
9. Students will be able to make and interpret categorical charts (pie and bar graphs). (DOK - Level Two)
10. Students will be able to construct and interpret a two-way table from data on two categorical variables, analyzing relative frequencies to determine whether an association exists between the variables or the probabilities of an event occurring. (DOK – Level Three)
11. Students will be able to justify conclusions about relationships between two categorical variables by interpreting row and column percentages in a two-way table. (DOK – Level Three)
12. Students will be able to compare and contrast theoretical and experimental probability using real-world examples. (DOK – Level Two)
13. Students will be able to justify predictions based on probability models and statistical data. (DOK – Level Three)
14. Students will be able to create their own real-world problems involving probability and analyze possible outcomes. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of data collection, measures of central tendency, and probability concepts to support understanding of new topics through warm-up activity.
- Use personal whiteboards to calculate and interpret measures of central tendency, range, and interquartile range.
- Use teacher created worksheets/activity to allow students to model and analyze graphical representations of data, including box plots and scatter plots.
- Online statistical tools (i.e., Desmos, GeoGebra, or the National Library of Virtual Manipulatives) can be used to provide students with additional support in visualizing and analyzing data.
- Provide students with real-world data (e.g., sports team statistics, weather patterns, or class test scores). Have them calculate the mean, median, and mode, then use these measures to predict future trends (e.g., "What score is most likely on the next test?").
- Engage students in an activity where students examine datasets in different formats (box plot, stem-and-leaf plot, two-way table). Then allow students to interpret the data and answer guiding questions about trends, spread, and relationships. Students can share analysis in written or verbal form in small groups or via a classroom discussion.

- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for targeted practice on data analysis, probability, and graphical representations.
- Organize students into collaborative working groups to interpret two-way tables, analyze associations between categorical variables, and discuss probability scenarios.
- Students will review core lesson vocabulary in both written and verbal form (mean, median, mode, range, quartiles, interquartile range, outlier, two-way table, relative frequency, compound event, theoretical probability, experimental probability) through notetaking, classroom discussion and practice exercises.
- Give students a pre-made two-way table with missing row and column percentages (using a textbook resource, PDE item sampler or teacher created worksheet). Have them work in small groups to complete the table, interpret the percentages, and write a justification for whether there is a relationship between the two variables.
- Use Glencoe and Pearson textbook activities for data analysis and probability to build student fluency.
- Engage students with Number Talk activities to encourage discussions on probability, understanding "likeliness" and conversion to percents.
- Use PDE Keystone Constructed Response Questions on analyzing and interpreting data, measures of variability, and probability concepts.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 4 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 5: Linear Relationships and Scatter Plots **Time Range in Days: 15 Days**

Standards:

- **CC.2.2.8.B.2** Understand the connections between proportional relationships, lines, and linear equations.
- **CC.2.2.8.C.2** Use concepts of functions to model relationships between quantities.
- **CC.2.4.8.B.1** Analyze and/or interpret bivariate data displayed in multiple representations.
- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.
- **CC.2.1.HS.F.5** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Anchors Addressed:

- **M08.B-E.2.1** Analyze and describe linear relationships between two variables, using slope.
- **M08.B-F.2.1** Represent or interpret functional relationships between quantities using tables, graphs, and descriptions.
- **A1.2.1.2** Interpret and/or use linear functions and their equations, graphs or tables.
- **A1.2.2.1** Describe, compute and/or use the rate of change (slope) of a line.
- **A1.2.2.2** Analyze and/or interpret data on a scatter plot.
- **A1.2.3.2** Use data displays in problem solving settings and/or to make predictions.
- **M08.D-S.1.1** Analyze and interpret bivariate data displayed in multiple representations.

Eligible Content:

- **M08.B-E.2.1.1** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
- **M08.B-E.2.1.2** Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
- **M08.B-E.2.1.3** Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
- **M08.B-F.2.1.1** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.
- **M08.D-S.1.1.1** 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.
- **M08.D-S.1.1.2** 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.
- **M08.D-S.1.1.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. Example: In a linear

model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

- **A1.2.1.2.1** Create, interpret and/or use the equation, graph or table of a linear function.
- **A1.2.1.2.2** Translate from one representation of a linear function to another (graph, table and equation).
- **A1.2.2.1.1** Identify, describe and/or use constant rates of change.
- **A1.2.2.1.2** Apply the concept of linear rate of change (slope) to solve problems.
- **A1.2.2.1.3** Write or identify a linear equation when given the graph of the line, 2 points on the line, or the slope and a point on a line(Linear equation may be in point-slope, standard and/or slope-intercept form).
- **A1.2.2.1.4** Determine the slope and/or y-intercept represented by a linear equation or graph.
- **A1.2.2.2.1** Draw, find and/or write an equation for a line of best fit for a scatter plot.
- **A1.2.3.2.3** Make predictions using the equations or graphs of best-fit lines of scatter plots.

Objectives:

1. Students will be able to graph proportional relationships and interpret the unit rate as the slope of the graph. (DOK – Level One)
2. Students will be able to compare two proportional relationships represented in different ways (graphs, tables, equations). (DOK – Level Two)
3. Students will be able to determine the rate of change and initial value of a linear function from a table, graph, or verbal description. (DOK – Level Two)
4. Students will be able to interpret the meaning of slope and y-intercept in real-world contexts. (DOK – Level Three)
5. Students will be able to write the equation of a line when given two points, a point and the slope, or a graph of the line. (DOK – Level Three)
6. Students will be able to use similar right triangles to justify why slope remains consistent between any two points on a non-vertical line and explain this concept in their own words. (DOK – Level Three)
7. Students will be able to derive equations of lines (e.g., $y = mx$, $y = mx + b$) from real-world data, interpreting the meaning of slope and y-intercept in the context of the scenario. (DOK – Level Four)
8. Students will be able to translate between different representations of a linear function (graphs, tables, and equations). (DOK – Level Two)
9. Students will be able to apply the concept of slope as a rate of change to solve problems in real-world situations. (DOK – Level Three)
10. Students will be able to construct and interpret scatter plots for bivariate data to analyze patterns of association between two variables. (DOK – Level Two)
11. Students will be able to describe relationships in scatter plots, outliers, positive and negative correlations, and linear vs. nonlinear associations. (DOK – Level Two)
12. Students will be able to identify and draw a line of best fit. (DOK – Level Two)

13. Students will be able to write an equation for a line of best fit and use it to make interpolations or extrapolations. (DOK- Level Three)
14. Students will be able to create and justify their own real-world examples of linear relationships and interpret trends in data. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of coordinate planes, graphing ordered pairs, and proportional relationships through a warm-up discussion and problem-solving exercises.
- Engage students through use of personal whiteboards to plot points, identify slopes, and graph linear equations in real-time.
- Engage students through use of vertical whiteboard surfaces in the room to collaboratively graph linear relationships, compare different representations, and analyze scatter plots.
- Use online graphing tools such as Desmos and GeoGebra to provide students with interactive opportunities to explore slope, y-intercepts, and the effects of changing variables in linear equations.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation on identifying slope, graphing equations, and interpreting scatter plots.
- Engage students with collaborative working groups to practice interpreting slope, y-intercepts, and making predictions using best-fit lines on scatter plots.
- Students will review core lesson vocabulary (slope, rate of change, proportional relationship, y-intercept, correlation, best-fit line, outlier, linear equation, function, dependent variable, independent variable) through classroom discussions, vocabulary activities, and practice exercises.
- Use online resources (i.e Desmos, GeoGebra, or Geometers Sketchpad) to explore lines by dynamically placing points and verifying slope consistency with right triangles.
- Provide students with sets of graphs, tables, points, and equations. Their task is to correctly match all representations and explain their reasoning.
- Use Glencoe and Pearson textbook activities for graphing linear functions, analyzing scatter plots, and interpreting best-fit lines to build student fluency.
- Practice Keystone Constructed Response Questions that require students to analyze graphs, calculate slopes, compare functions, and interpret scatter plot data.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments- example problems from textbook, Kuta worksheets or IXL assignments for each section.
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 5 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 6: Systems of Equations **Time Range in Days: 15 Days**

Standards:

- **CC.2.2.8.B.3** Analyze and solve linear equations and pairs of simultaneous linear equations.

Anchors Addressed:

- **M08.B-E.3.1** Write, solve, graph, and interpret linear equations in one or two variables, using various methods.
- **A1.1.2.2** Write, solve and/or graph systems of linear equations using various methods.
- **A1.1.3.2** Write, solve and/or graph systems of linear inequalities using various methods.

Eligible Content:

- **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).

Objectives:

1. Students will learn to solve a system of equations by graphing or by using the substitution or elimination methods. (DOK – Level One)
2. Students will review and practice the graphing techniques for linear functions taught in Pre-Algebra and extend the concept to systems of linear equations and inequalities. Solution techniques include graphing, substitution, and elimination. Emphasis is placed on the solution of a system being the intersection of two lines or planar regions. (DOK – Level One)
3. Students will graph two lines on the same coordinate grid to find the point of intersection. (DOK – Level Two)
4. Students will apply the substitution or elimination method to solve a system. (DOK – Level Two)
5. Students will compare each method and determine which method for solving a system of equations is most efficient. (DOK – Level Three)
6. Students will analyze whether a system has a unique solution, no solutions, or infinitely many solutions. (DOK – Level Two)

7. Students will find solutions to real-world systems of linear equations and inequalities. (DOK – Level Two)
8. Students will design real-world problems that utilize systems of linear equations and inequalities. (DOK – Level Four)
9. Students will be able to analyze systems of equations that have no solution or infinitely many solutions, justify why the system behaves this way, and apply this understanding to create a new system with a desired type of solution. (DOK – Level Four)
10. Students will solve a system of inequalities by recalling prior knowledge from prior lessons and apply their new knowledge to some real-world linear programming-type situations. (DOK – Level One)
11. Students will design real-world problems that utilize systems of linear inequalities. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of solving linear equations, graphing equations in slope-intercept form, and identifying points of intersection through warm-up exercises and class discussions.
- Engage students through use of personal whiteboards to solve systems of equations using graphing, substitution, and elimination methods in real-time.
- Engage students through use of vertical whiteboard surfaces in the room to collaboratively graph systems of equations and inequalities, compare solution methods, and analyze points of intersection.
- Use online graphing tools such as Desmos and GeoGebra to provide students with interactive opportunities to explore solutions to systems of equations and visualize their points of intersection.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation on solving systems by graphing, substitution, and elimination.
- Engage students with collaborative working groups to practice solving and interpreting real-world problems that involve systems of equations and inequalities.
- Students will review core lesson vocabulary (system of equations, solution, substitution, elimination, graphing method, inconsistent system, dependent system, independent system, system of inequalities, solution region, boundary line) through classroom discussions, vocabulary activities, and practice exercises.
- Use Glencoe and Pearson textbook activities to reinforce solving systems of equations and inequalities through a variety of problem types, including word problems and real-world applications.
- Present students with incorrect solutions or explanations of inconsistent and dependent systems. Their task is to analyze the work, find the errors, and write a correct justification.
- Provide students with a system and ask them to modify it so that it results in a

specific type, yet different type of solution (no solution, one solution, or infinitely many solutions).
- Engage students with Number Talk activities focused on estimating solutions to systems, discussing the reasoning behind choosing a solution method, and making connections between algebraic and graphical representations.
- Practice Keystone Constructed Response Questions that require students to write, solve, graph, and interpret systems of equations and inequalities, emphasizing real-world applications and multi-step problem-solving.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 6 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 7: Functions **Time Range in Days: 6 Days**

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.

Anchors Addressed:
- **M08.B-F.1.1** Define, evaluate, and compare functions displayed algebraically, graphically, or numerically in tables or by verbal descriptions.
- **M08.B-F.2.1** Represent or interpret functional relationships between quantities using tables, graphs, and descriptions.
- **A1.2.1.1** Analyze and/or use patterns or relations.
- **A1.2.1.2** Interpret and/or use linear functions and their equations, graphs or tables.

Eligible Content:
- **M08.B-F.1.1.1** Determine whether a relation is a function.
- **M08.B-F.1.1.2** Compare properties of two functions, each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). Example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
- **M08.B-F.1.1.3** Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear.
- **M08.B-F.2.1.2** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally.
- **A1.2.1.1.2** Determine if a relation is a function given a set of points or a graph.
- **A1.2.1.1.3** Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).
- **A1.2.1.2.1** Create, interpret and/or use the equation, graph or table of a linear function.
- **A1.2.1.2.2** Translate from one representation of a linear function to another (graph, table and equation).

Objectives:
1. Students will be able to represent mathematical relationships using graphs, coordinates, or tables. (DOK – Level Two)
2. Students will be able to identify and represent patterns that describe linear functions. (DOK – Level Two)
3. Students will be able to evaluate expressions using function notation. (DOK - Level Two)
4. Students will be able to write equations that represent functions using function notation. (DOK – Level Three)
5. Students will be able to evaluate expressions using function notation. (DOK - Level Two)
6. Students will be able to determine whether a relation is a function, find the domain and range. (DOK – Level One)

7. Students will be able to determine whether a relation is a function by analyzing sets of ordered pairs, tables, mappings, and graphs. (DOK – Level One)
8. Students will be able to compare properties of two functions represented in different ways (algebraically, graphically, in tables, or through verbal descriptions) to determine key characteristics such as rate of change. (DOK – Level Two)
9. Students will be able to interpret the equation $y = mx + b$ as defining a linear function and differentiate between linear and nonlinear functions using equations, graphs, and tables. (DOK – Level Two)
10. Students will be able to describe the functional relationship between two quantities by analyzing graphs to determine whether they are increasing, decreasing, linear, or nonlinear. (DOK – Level Two)
11. Students will be able to analyze patterns and relations to determine whether they represent a function and use this information to make predictions. (DOK – Level Three)
12. Students will be able to create examples of linear and nonlinear functions in various forms and explain how they differ. (DOK – Level Four)
13. Students will generate an equation, table, and graph to represent a linear function from a real-world scenario, and evaluate how changes to the situation would affect the domain and range of the function. (DOK – Level Four)
14. Students will be able to create examples of linear and nonlinear functions in various forms and explain how they differ. (DOK – Level Four)
15. Students will be able to model functions in a real-life application. (DOK- Level Three)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of relations and functions by reviewing ordered pairs, coordinate planes, and input-output relationships through a class discussion and warm-up activity.
- Use teacher created worksheets and classroom discussion to elicit student thinking on determining whether a relation is a function using the vertical line test on various graphs.
- Have students explore domain and range by analyzing graphs, tables, and real-world scenarios using textbook resources or IXL activities.
- Engage students with class discussions that allows them to translate between representations of a function (verbal descriptions, equations, graphs, and tables).
- Analyze patterns and relations of arithmetic sequences to determine whether they represent a function and use this knowledge to make predictions from textbook resources and Keystone Constructed Responses.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation in identifying functions and their properties.

- Review key function vocabulary in both written and verbal form (function, relation, domain, range, linear, nonlinear, input, output, mapping, vertical line test) through classroom discussion and vocabulary exercises.
- Give students a linear function and ask them to modify it to make it nonlinear. They must explain how the change affects the function's properties, domain and range.
- Provide students with different function representations (i.e. equations, tables, and graphs). Have them categorize each as linear or nonlinear and justify their reasoning.
- Engage students with Keystone Constructed Response Questions related to functions to reinforce problem-solving skills.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 7 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 8: Pythagorean Theorem **Time Range in Days: 5 Days**

Standards:

- **CC.2.3.8.A.3** Understand and apply the Pythagorean Theorem to solve problems.

Anchors Addressed:

- **M08.C-G.2.1** Solve problems involving right triangles by applying the Pythagorean theorem.

Eligible Content:

- **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.

Objectives:

1. Students will be able to apply the Pythagorean Theorem to determine unknown side lengths in right triangles for both real-world and mathematical problems, including two-dimensional and three-dimensional contexts. (DOK – Level Two)
2. Students will be able to apply the converse of the Pythagorean Theorem to verify whether a given triangle is a right triangle. (DOK – Level Two)
3. Students will construct and defend a method for finding the distance between two points on a coordinate plane using the Pythagorean Theorem, explaining how the coordinate plane forms a right triangle. (DOK – Level Four)
4. Students will derive the equation for the distance between two points using their knowledge of slope and the Pythagorean Theorem. (DOK- Level Four)
5. Students will be able to use the Pythagorean Theorem to find the distance between two points in a coordinate plane. (DOK – Level Two)

Core Activities and Corresponding Instructional Methods:

- Use guided notes for students to organize right triangle vocabulary related to the Pythagorean Theorem. (i.e. Pythagorean Theorem formula, hypotenuse, leg, square)
- Use personal whiteboards and teacher created worksheets to practice identifying the parts of a right triangle and using the Pythagorean Theorem to answer questions involving right triangles.
- Engage students in a class activity using teacher created worksheets or PSSA sample materials to apply the Pythagorean Theorem to real-world scenarios and multi-step problems.

- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation in squaring rational numbers, identifying legs and hypotenuses of a right triangle, and identifying if three side lengths are those of a right triangle.
- Students will work in groups to apply their algebraic properties to derive the formula for distance between two points from the Pythagorean Theorem.
- Use textbook activities, teacher created worksheets, or IXL to allow students to practice applying the Pythagorean Theorem to calculate distances between two points.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 8 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 9: Exponents **Time Range in Days: 7 Days**

Standards:

- **CC.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.

Anchors Addressed:

- **M08.B-E.1.1** Represent and use expressions and equations to solve problems involving radicals and integer exponents.

Eligible Content:

- **M08.B-E.1.1.1** Apply one or more properties of integer exponents to generate equivalent numerical expressions without a calculator (with final answers expressed in exponential form with positive exponents). Properties will be provided. Example: 3^12 x 3^-15 = 3^-3 = 1/(3^3)
- **M08.B-E.1.1.3** Estimate very large or very 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.1.1.4** 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 very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7 × 10^9).

Objectives:

1. Students will be able to apply the properties of integer exponents (product rule, quotient rule, power rule, zero exponent rule, and negative exponent rule) to generate equivalent numerical expressions. (DOK – Level One)
2. Students will be able to simplify expressions involving integer exponents and express final answers with positive exponents. (DOK – Level One)
3. Students will be able to compare and estimate very large or very small quantities by expressing numbers in scientific notation. (DOK – Level Two)
4. Students will be able to determine the value of *a* (an exponent) that allows a variable expression simplify to a given expression (DOK- Level Three)
5. Students will be able to determine how many times larger or smaller one number is than another using exponent properties. (DOK – Level Two)
6. Students will be able to convert numbers between standard notation and scientific notation. (DOK – Level One)
7. Students will be able to perform operations (addition, subtraction, multiplication, and division) with numbers expressed in scientific notation and express the final answer in appropriate form. (DOK – Level Two)

8. Students will be able to solve real-world problems involving scientific notation by selecting appropriate units of measurement for very large or very small values. (DOK – Level Three)
9. Students will be able to interpret results in scientific notation generated by calculators and other technology. (DOK – Level One)
10. Students will be able to analyze and apply exponent rules and scientific notation to solve contextual problems in fields such as astronomy, biology, and physics. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of exponents, including multiplication and division of powers, the meaning of exponents, and place value concepts related to scientific notation.
- Engage students through the use of personal whiteboards to practice simplifying expressions using exponent rules.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation to practice exponent properties at their own pace.
- Engage students with collaborative working groups to solve real-world exponent problems, such as comparing large numbers in scientific notation or evaluating exponential growth.
- Students will review core lesson vocabulary (base, exponent, power, product rule, quotient rule, power rule, zero exponent, negative exponent, standard notation, scientific notation) in both written and verbal form through classroom discussions and practice exercises.
- Use Glencoe or Pearson textbook activities for exponent rules and scientific notation to reinforce fluency in simplifying expressions and converting between standard and scientific notation.
- Engage students with Number Talk activities to build computational fluency, including mental math exercises that explore patterns in exponent operations.
- Assign and grade PDE Keystone Constructed Response Questions related to exponents and scientific notation to prepare students for standardized assessments.
- Provide error analysis activities where students identify and correct common mistakes in exponent operations and scientific notation conversions.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques

- Group activities and classwork
- Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
- Warm-up activities
- PSSA and Keystone Item Sample Constructed Response Questions
- Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 9 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 10 Polynomial Expressions and Factoring **Time Range in Days: 17 Days**

Standards:

- **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.2** Write expressions in equivalent forms to solve problems.
- **CC.2.1.8.E.1** Distinguish between rational and irrational numbers using their properties.
- **CC.2.2.8.C.1** Define, evaluate, and compare functions.

Anchors Addressed:

- **A1.1.1.2** Apply number theory concepts to show relationships between real numbers in problem solving settings.
- **A1.1.1.5** Simplify expressions involving polynomials.
- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- **A1.2.1.1** Analyze and/or use patterns or relations.

Eligible Content:

- **A1.1.1.2.1** Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- **A1.1.1.5.1** Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial).
- **A1.1.1.5.2** Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is equal to 1 after factoring out all monomial factors).
- **A1.2.1.1.1** Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
- **A1.1.1.5.3** Simplify/reduce a rational algebraic expression.

Objectives:

1. Students will be able to determine the greatest common factor (GCF) and least common multiple (LCM) of sets of monomials. (DOK – Level One)
2. Students will be able to classify polynomials by degree and number of terms. (DOK – Level One)
3. Students will be able to add and subtract polynomial expressions and simplify the result. (DOK – Level Two)
4. Students will be able to multiply polynomial expressions using the distributive property and/or area models. (DOK – Level Two)
5. Students will be able to factor polynomials by identifying the greatest common factor (GCF) and rewriting the expression as a product of its factors. (DOK – Level Two)
6. Students will be able to factor trinomials, including those with a GCF. (DOK – Level Two)
7. Students will be able to factor quadratic trinomials where the leading coefficient is 1. (DOK – Level Two)

8. Students will evaluate and explain various methods for factoring algebraic expressions, including the difference of squares and trinomials, and justify their factoring approach based on the structure of the polynomial expression. (DOK – Level Four)
9. Students will be able to factor the difference of squares and apply factoring to simplify expressions. (DOK – Level Two)
10. Students will be able to simplify square roots, including non-perfect squares, and express them in simplest radical form. (DOK – Level Two)
11. Students will be able to solve radical equations, interpret their solutions, and check for extraneous solutions. (DOK – Level Three)
12. Students will be able to apply polynomial and radical operations to real-world and mathematical contexts, interpreting their results in problem situations. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of exponent rules, properties of real numbers, and operations with algebraic expressions to build a foundation for polynomial operations.
- Engage students through use of personal whiteboards to classify polynomials, identify the degree, and practice polynomial operations.
- Students will review core lesson vocabulary in both written and verbal form (polynomial, monomial, binomial, trinomial, degree, term, coefficient, leading coefficient, greatest common factor, difference of squares, trinomial, factorization) through classroom discussion and practice exercises.
- Use Glencoe or Pearson textbook activities for simplifying polynomial expressions.
- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation in factoring monomials, binomials, and trinomials using various methods.
- Practice Keystone Constructed Response Questions related to polynomial operations and factoring.
- Provide real-world applications of polynomials by incorporating problem-solving scenarios that involve polynomial area models and algebraic modeling.
- Use error analysis activities where students analyze incorrect polynomial operations or factoring attempts and explain mistakes in small groups.
- Use whiteboard activities or teacher created worksheets to have students solve radical equations and simplify radical expressions.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observations
    - Teacher prepared diagnostic test
    - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 10 Test
    - Assessment includes both Multiple Choice and Constructed Response Questions

DELAWARE VALLEY SCHOOL DISTRICT

Unit 11: Geometry **Time Range in Days: 15 Days**

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.2.3.8.A.2** Understand and apply congruence, similarity, and geometric transformations using various tools.

Anchors Addressed:

- **M08.C-G.3.1** Apply volume formulas of cones, cylinders, and spheres.
- **M08.C-G.1.1** Apply properties of geometric transformations to verify congruence or similarity.

Eligible Content:

- **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.
- **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.

Objectives:

1. Students will be able to apply volume formulas for cones, cylinders, and spheres to solve real-world and mathematical problems. (DOK – Level One)
2. Students will be able to identify and apply properties of transformations, including rotations, reflections, translations, and dilations, to determine congruence and similarity of figures. (DOK – Level One)
3. Students will be able to describe a sequence of transformations that demonstrates the congruence or similarity between two given figures. (DOK – Level Two)
4. Students will be able to analyze the effects of transformations on two-dimensional figures and determine if the image and preimage are similar or congruent. (DOK – Level Two)
5. Students will be able to interpret and justify solutions involving transformations, congruence, and similarity in mathematical and real-world applications. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:

- Expose students' prior knowledge of geometric transformations, volume, and triangle relations via warm-up activity involving basic geometric concepts and polygon parts.

- Use supplemental resources (i.e. IXL, Desmos, GeoGebra, or KutaSoftware) for differentiation and remediation on topics such as volume formulas, identifying parts of a circle or prism, and transformations.
- Explicitly teach vocabulary (i.e., translation, rotation, reflection, dilation, transformation, congruence, similarity, volume, radius, diameter) and practice vocabulary in classroom discussions and homework assignments.
- Create collaborative working groups to analyze the effects of transformations, find the volume of compound figures and/or perform error analysis on topic-specific geometry questions.
- Use guided notes for students to organize and retain formulas and properties related to transformations and volume.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 11 Test
    - Assessment includes both Multiple Choice and PSSA-Style Constructed Response Questions

PSSA Review and Exam ***Time Range in Days: 7 Days***

Keystone Review and Exam ***Time Range in Days: 12 Days***

DELAWARE VALLEY SCHOOL DISTRICT

Unit 12: Rational Expressions & Added Algebraic Concepts Time Range in Days: 21 Days

Standards:

- **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.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms.

Anchors Addressed:

- **A1.1.1.1** Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, and exponents).
- **A1.1.1.2** Apply number theory concepts to show relationships between real numbers in problem solving settings.
- **A1.1.1.5** Simplify expressions involving polynomials.

Eligible Content:

- **A1.1.1.1.2** Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$).
- **A1.2.1.1.1** Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
- **A1.1.1.2.1** Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- **A2.1.2.2.2** Simplify rational algebraic expressions.
- **A1.1.1.5.1** Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial).
- **A1.1.1.5.2** Factor algebraic expressions, including difference of squares and trinomials (trinomials 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.

Objectives:

1. Students will be able to use prime factorization to identify greatest common factors and least common multiples of numbers and algebraic expressions. (DOK – Level Two)
2. Students will be able to simplify rational expressions by factoring the numerator and denominator and identifying restrictions on the variable. (DOK – Level Two)
3. Students will be able to add and subtract polynomial expressions and rational expressions to provide an answer in simplest form. (DOK – Level Two)
4. Students will be able to simplify algebraic expressions by combining like terms and applying properties of exponents. (DOK – Level Two)
5. Students will critique and refine strategies for simplifying rational algebraic expressions, identifying errors in flawed solutions and justifying their corrections in the context of problem-solving situations. (DOK – Level Three)

6. Students will be able to simplify and reduce rational algebraic expressions. (DOK – Level Two)

Core Activities and Corresponding Instructional Methods:

- Provide guided practice simplifying square roots, including non-perfect squares, using both numerical and algebraic examples, with teacher modeling and peer collaboration.
- Use supplemental resources (i.e. IXL, GeoGebra, KutaSoftware) for targeted practice and remediation on simplifying radicals and converting numbers between forms.
- Incorporate error analysis activities where students identify and correct mistakes in number conversions or radical simplification.
- Integrate real-world contexts by exploring examples of numbers in different forms, such as discounts (percents), scientific data (decimals and exponents), and geometry (square roots).
- Engage students with interactive activities, like using personal whiteboards, to classify polynomials by degree and number of terms, then practice basic operations.
- Introduce and model polynomial operations (addition, subtraction, multiplication) using area models and the distributive property.
- Use Glencoe or Pearson textbook activities for polynomial operations and simplifying rational expressions.
- Incorporate online resources (i.e. IXL, Desmos, KutaSoftware) to differentiate instruction for students needing more support or challenge in polynomial operations and simplifying rational expressions.
- Facilitate small group error analysis where students evaluate incorrect polynomial operations and simplifications, then discuss and correct the mistakes.
- Engage students in error analysis activities where they critique incorrect factoring setups or radical equation solutions related to geometric contexts.
- Engage students in Keystone review using PDE sample items and eligible content.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observations
  - Teacher prepared diagnostic test
  - Pennsylvania CDT/Firefly Diagnostic Assessment

- **Formative:**
  - Teacher observations and questioning techniques
  - Group activities and classwork
  - Homework assignments (e.g., problems from textbook, Kuta worksheets or IXL assignments for each section)
  - Warm-up activities
  - PSSA and Keystone Item Sample Constructed Response Questions
  - Teacher prepared quizzes

- **Summative:**
  - Common Assessment Chapter 12 Test
    - Assessment include both Multiple Choice and Constructed Response Questions