DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Pre-Algebra

Curriculum Writing Committee: Joy Sohn

Grade Level 9

Date of Board Approval: _____2023_____

Course Weighting: Pre-algebra

Quizzes	90%
Classwork	10%
Total	100%

Curriculum Map

Overview:

This course is designed for students who are proficient in arithmetic skills but are not ready for Algebra 1. This will allow more time to develop both conceptual and procedural understanding of topics for successful completion of Algebra 1. The topics covered include properties of real numbers, solving equations and inequalities, graphing linear functions, writing linear equations, graphing and writing linear inequalities, and data analysis.

Time/Credit for the Course:

2 SEMESTERS, 1 CREDIT, 180 days, meeting 1 period per day.

Goals:

Marking Period One: Overview based on 45 days

Unit One Foundations for Algebra – 45 days

Understanding of

- Simplifying numerical expressions using the order of operations
- Constructing and evaluating algebraic expressions
- Classifying, graphing, and comparing real numbers
- Properties of real numbers
- Operations with real numbers
- Least common multiple and Greatest Common Factor

Marking Period Two: Overview based on 45 days

Unit Two Solving Equations

Understanding of

- Ratios and Proportions
- Percentages
- Solving one-step, two-step, and multi-step equations, including fractions as a coefficient of the variable to reinforce multiplying by the reciprocal.
- Real world applications involving percentages and/or equations

Marking Period Three: Overview based on 45 days

Unit Three Inequalities, Compound Inequalities, and Relations vs. Functions

Understanding of

- Solving inequalities and compound inequalities
- Keystone constructed response questions involving solving equations and inequalities
- Relations and functions

Marking Period Four: Overview based on 45 days

Unit Four Linear Functions, Data Analysis and Probability

Understanding of

- Linear functions (graphically and algebraically)
- Measures of central tendency and variability (excluding standard deviation)
- Theoretical and experimental probabilities, including mutually exclusive and overlapping events as well as independent and dependent events

Big Ideas:

Big Idea # 1:
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.

Essential Questions:
- How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems?

Concepts:
- Functions and multiple representations

Competencies:
- Use algebraic properties and processes in mathematical situations and apply them to solve real world problems.

Big Idea #2:
There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations.

Essential Questions:
- How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems?

Concepts:
- Functions and multiple representations
- Algebraic properties and processes

Competencies:
- Use algebraic properties and processes in mathematical situations and apply them to solve real world problems.
- Write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities.

Big Idea #3:
Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations.

Essential Questions:
- How do you decide which functional representation to choose when modeling a real-world situation, and how would you explain your solution to the problem?

Concepts:
- Functions and multiple representations

Competencies:
- Represent functions (linear) in multiple ways, including tables, algebraic rules, graphs, and contextual situations and make connections among these representations. Choose the

appropriate functional representation to model a real-world situation and solve problems relating to that situation.

Big Idea #4:
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

Essential Questions:

- How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities?
- How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques?

Concepts:

- Linear relationships: Equation and inequalities in one and two variables

Competencies:

- Write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities.

Big Idea #5:
Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data.

Essential Questions:

- How can we use univariate and bivariate data to analyze relationships and make predictions?

Concepts:

- Analysis of one and two variable (univariate and bivariate) data

Competencies:

- Display, analyze, and make predictions using univariate and bivariate data.

Textbook and Supplemental Resources:

Name of Textbook: Reveal Algebra 1

Textbook ISBN #: 978-0-07695907-5

Textbook Publisher & Year of Publication: McGraw Hill 2020

Curriculum Textbook is utilized in: Algebra 1

Supplemental Resources:

- Kuta Software: Prealgebra & Algebra 1
- TI-84 Plus Graphing calculator
- TI-SmartView for the Smartboard
- Smart notebook gallery essentials
- Websites such as Quizizz, Blooket, Quizlet, Delta Math, IXL

Curriculum Plan

UNIT 1: Foundations for Algebra **Time Range in Days: 45**

Standard(s): PA Core State Standards for Mathematics
https://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:
CC.2.2.HS.D.1 CC.2.2.HS.D.2 CC.2.1.HS.F.2

Anchors:

- 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.
- A1.1.1.3 Use exponents, roots, and/or absolute values to solve problems.
- A1.1.1.5 Simplify expressions involving polynomials.

Eligible Content:

- Compare and/or order any real numbers.
- Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.
- Add, subtract, and/or multiply polynomial expressions (express answers in simplest form).

Objectives:

1. Students will be able to construct algebraic expressions given a word phrase or by identifying a pattern. (DOK – Level Two)
2. Students will be able to evaluate expressions by applying the order of operations which includes grouping symbols and exponents. (DOK – Level Three)
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 compare and order any real numbers. (DOK – Level One)
5. Students will be able to simplify square roots. (DOK – Level Two)
6. Students will be able to identify and apply properties of real numbers. (DOK – Level Two)
7. Students will be able to calculate the sum, difference, product, and quotient of real numbers. (DOK – Level One)

8. Students will be able to use tables, equations and graphs to describe relationships. (DOK – Level Two)
9. Students will find the Greatest Common Factor and the Least Common Multiple for sets of monomials. (DOK – Level Two).

Core Activities and Corresponding Instructional Methods:

1. Expose students' prior knowledge of the real number system, including operations with and properties of real numbers, as well as other arithmetic skills (simplifying and/or evaluating algebraic expressions).
   a. Diagnostic assessment, questioning.
   b. Cooperative learning groups
   c. Direct instruction as needed using Smart Technology and online textbook and resources, manipulatives (such as Algebra Tiles), Venn Diagrams
   d. Guided practice
   e. Online resource materials (listed below)
2. Build math language/vocabulary.
   a. Teachers will use appropriate language to identify algebraic terms and processes.
   b. Writing activities incorporating appropriate math language

Assessments:

Diagnostic:

- Teacher prepared weekly quizzes
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities

Summative:

- Cumulative Weekly Quizzes (Consists of both Multiple Choice, Free Response Questions, and Constructed Response Questions)

UNIT 2: Solving Equations **Time Range in Days: 45**

Standard(s): PA Core State Standards for Mathematics
https://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:
CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.1.HS.F.4

Anchors:
- A1.1.1.4 Use estimation strategies in problem-solving situations.
- A1.1.2.1 Write, solve, and/or graph linear equations using various methods.

Eligible Content:
- Use estimation to solve problems.
- Write, solve, and/or apply a linear equation (including problem situations).
- Use and/or identify an algebraic property to justify any step in an equation-solving process
- Interpret solutions to problems in the context of the problem situation.

Objectives:
1. Students will be able to compare quantities using ratios and unit rates as well as be able to convert units and rates (unit analysis). (DOK – Level Four)
2. Students will be able to solve proportions and use these concepts to solve non-routine problems. (DOK – Level Three)
3. 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 Three)
4. Students will be able to use estimation to solve problems. (DOK – Level
5. Students will be able to write, graph, and identify solutions of equations. (DOK – Level Two)
6. Students will be able to create equations based on real world situations. (DOK – Level Three)
7. Students will be able to interpret solutions to problems in the context of the linear function problem situation. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:
1. Develop students' skills in solving equations, inequalities (including absolute value), and compound inequalities.
   a. Direct instruction using Smart Technology and online textbook and resources.
   b. Guided practice
   c. Cooperative learning groups
2. Develop students' ability to solve problems by applying algebraic processes.
   a. Guided practice
   b. Cooperative learning groups

3. Develop students' ability to solve real world problems by applying their understanding of solving one-step, two-step, or multi-step equations.
   a. Guided practice
   b. Cooperative learning groups

Assessments:

Diagnostic:

- Teacher prepared weekly quizzes
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities

Summative:

- Cumulative Weekly Quizzes (Consists of both Multiple Choice, Free Response Questions, and Constructed Response Questions)

UNIT 3: Inequalities, Compound Inequalities, and Relations vs. Functions **Time Range in Days: 45**

Standard(s): PA Core State Standards for Mathematics
https://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.1.HS.F.2	CC.2.1.HS.F.4	CC.2.2.HS.D.8	CC.2.2.HS.D.9
CC.2.2.HS.D.10	CC.2.2.HS.C.2	CC.2.2.HS.C.3	

Anchors:

- 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.
- A1.1.1.3 Use exponents, roots, and/or absolute values to solve problems.
- A1.1.1.4 Use estimation strategies in problem-solving situations.
- A1.1.2.1 Write, solve, and/or graph linear equations using various methods.
- A1.1.3.1 Write, solve, and/or graph linear inequalities using various methods.
- 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
- A1.2.2.1 Describe, compute, and/or use the rate of change (slope) of a line.

Eligible Content:

- Compare and/or order any real numbers.
- Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.
- Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.
- Use estimation to solve problems.
- Write, solve, and/or apply a linear equation (including problem situations).
- Use and/or identify an algebraic property to justify any step in an equation-solving process.
- Interpret solutions to problems in the context of the problem situation.
- Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
- Identify or graph the solution set to a linear inequality on a number line.
- Interpret solutions to problems in the context of the problem situation.
- Analyze a set of data for the existence of a pattern and represent the pattern

algebraically and/or graphically.

- Determine whether a relation is a function, given a set of points or a graph.
- Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).
- Create, interpret, and/or use the equation, graph, or table of a linear function.
- Translate from one representation of a linear function to another (i.e., graph, table, and equation).
- Identify, describe, and/or use constant rates of change.
- Apply the concept of linear rate of change (slope) to solve problems.
- Write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line.
- Determine the slope and/or y-intercept represented by a linear equation or graph.

Objectives:

1. Students will be able to write, graph, and identify solutions of inequalities. (DOK – Level Two)
2. Students will be able to solve inequalities, compound inequalities. (DOK – Level Three)
3. Students will be able to create equations and inequalities based on real world situations. (DOK – Level Two)
4. Students will be able to identify the domain and range of a relation, as well as be able to identify if a relation is a function. (DOK – Level One)

Core Activities and Corresponding Instructional Methods:

1. Build math language/vocabulary, specifically *inequalities* and *compound inequalities.*
    a. Teachers will use appropriate language to identify algebraic terms.
    b. Writing activities incorporating appropriate math language
2. Develop students' ability to solve real world problems by applying their understanding of linear functions, systems of linear equations and inequalities.
    a. Guided practice
    b. Cooperative learning groups
3. Build math language/vocabulary, specifically *relation, function, domain, range.*
    a. Teachers will use appropriate language to identify concepts as well as function notation.
    b. Writing activities incorporating appropriate math language

Assessments:

Diagnostic:

- Teacher prepared weekly quizzes
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities

Summative:

- Cumulative Weekly Quizzes (Consists of both Multiple Choice, Free Response Questions, and Constructed Response Questions)

UNIT 4: Linear Functions, Data Analysis and Probability **Time Range in Days: 4**

Standard(s): PA Core State Standards for Mathematics
https://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.2.HS.C.1	CC.2.2.HS.C.2	CC.2.2.HS.C.3	CC.2.2.HS.C.6
CC.2.2.HS.D.7	CC.2.2.HS.D.9	CC.2.2.HS.D.10	CC.2.2.HS.F.4
CC.2.4.HS.B.1	CC.2.4.HS.B.2	CC.2.4.HS.B.3	CC.2.4.HS.B.5
CC.2.4.HS.B.6	CC.2.4.HS.B.7	CC.2.4.HS.F.3	

Anchors:

- A1.1.1.4 Use estimation strategies in problem-solving situations.
- A1.1.2.1 Write, solve, and/or graph linear equations using various methods.
- A1.1.3.1 Write, solve, and/or graph linear inequalities using various methods.
- 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.
- 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.
- A1.2.3.1 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:

- Use estimation to solve problems.
- Write, solve, and/or apply a linear equation (including problem situations).
- Use and/or identify an algebraic property to justify any step in an equation-solving process.
- Interpret solutions to problems in the context of the problem situation.
- Write or solve compound inequalities and/or graph their solution sets on a number line.
- Identify or graph the solution set to a linear inequality on a number line.
- Interpret solutions to problems in the context of the problem situation.
- Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
- Determine whether a relation is a function, given a set of points or a graph.
- Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).
- Create, interpret, and/or use the equation, graph, or table of a linear function.
- Translate from one representation of a linear function to another (i.e., graph, table, and

equation).
- Identify, describe, and/or use constant rates of change.
- Apply the concept of linear rate of change (slope) to solve problems.
- Write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line.
- Determine the slope and/or y-intercept represented by a linear equation or graph.
- Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.
- Calculate and/or interpret the range, quartiles, and interquartile range of data.
- Estimate or calculate to make predictions based on a circle, line, bar graph, measure of central tendency, or other representation.
- 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).
- Make predictions using the equations or graphs of best-fit lines of scatter plots.
- 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 represent mathematical relationships using graphs. (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 write equations that represent functions. (DOK – Level Three)
4. Students will be able to determine whether a relation is a function, find the domain and range and use function notation. (DOK – Level Two)
5. Students will be able to find rates of change from tables; they will be able to calculate slope. They will also compare the slopes of parallel lines. (DOK – Level Two)
6. Students will be able to write and graph linear functions in slope-intercept form, point-slope form, and standard form. (DOK – Level Two)
7. Students will be able to write an equation of a trend line/line of best fit, as well as use the trend line or line of best fit to make predictions. (DOK – Level Three)
8. Students will be able to use real world situations to create and model functions using trend lines.
9. Students will be able to make and interpret frequency tables and histograms. (DOK – Level Two)
10. Students will be able to determine the mean, median, mode, and range. (DOK – Level Two)
11. Students will be able to create and interpret box-and-whisker plots as well as find quartiles and percentiles. (DOK – Level Three)
12. Students will be able to determine theoretical and experimental probabilities. (DOK – Level Three)

13. Students will be able to find the probabilities of mutually exclusive and overlapping events as well as independent and dependent events. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:

1. Expose students' prior knowledge of the coordinate plane and plotting points. Review graphing a line using a table of values. Identify and represent patterns that form a line.
    a. Diagnostic assessment, questioning.
    b. Cooperative learning groups
    c. Direct instruction as needed using Smart Technology and online textbook and resources.
    d. Guided practice
2. Develop students' skills in graphing linear functions and writing equations of lines in slope-intercept form, point-slope form, and standard form, including the line of best fit being sure to incorporate word problems.
    a. Direct instruction using Smart Technology and online textbook and resources.
    b. Guided practice
    c. Cooperative learning groups
3. Expose students' prior knowledge of frequency tables, histograms, and measures of central tendency (mean, median and mode) as well as the range of a data set.
    a. Diagnostic assessment, questioning.
    b. Cooperative learning groups
    c. Direct instruction as needed using Smart Technology and online textbook and resources
    d. Guided practice
4. Build math language/vocabulary.
    a. Teachers will use appropriate language to discuss data displays and measures of central tendency and variability.
    b. Writing activities incorporating appropriate math language
5. Develop students' skills in creating and interpreting box-and-whisker plots.
    a. Direct instruction using Smart Technology and online textbook and resources.
    b. Guided practice
    c. Cooperative learning groups
5. Develop students' ability to determine theoretical and experimental probabilities, including mutually exclusive and overlapping events as well as independent and dependent events.
    a. Direct instruction using Smart Technology, manipulatives such as dice, cards or marbles, and online textbook and resources.
    b. Guided practice
    c. Cooperative learning groups

Assessments:

Diagnostic:

- Teacher prepared weekly quizzes
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities

Summative:

- Cumulative Weekly Quizzes (Consists of both Multiple Choice, Free Response Questions, and Constructed Response Questions)