PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Algebra I

Grade Level 9, 10

Date of Board Approval: _____2018_____

Planned Instruction

Title of Planned Instruction: Algebra I

Subject Area: Mathematics

Grade(s): 9, 10

Course Description:

This academically demanding course provides a strong foundation in algebra for further study in science and mathematics. The course will cover the theoretical aspects of algebra and realistic applications to real world scenarios. Topics include variables, linear and quadratic equations, systems of equations, and the properties of real numbers.

Time/Credit for the Course: 2 SEMESTERS, 1 CREDIT, 180 days, meeting 1 period per day

Curriculum Writing Committee: Laurie Osczepinski, Sara Walsh

Curriculum Map

1. Marking Period One - Foundations for Algebra, Solving Equations & Inequalities Overview based on 45 days:

Goals:

- Simplifying numerical expressions using the order of operations
- Constructing and evaluating algebraic expressions
- Classifying, graphing, and comparing real numbers
- Properties of real numbers
- Simplify radicals and complete operations with radical expressions
- Solving equations and inequalities, including absolute value equations and inequalities as well as compound inequalities

2. Marking Period Two - Data Analysis and Probability, Linear Functions Overview based on 45 days:

Goals:

- 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
- Relations and functions
- Linear functions (graphically and algebraically)

3. Marking Period Three - Systems of Equations & Inequalities, Exponents, Polynomials Overview based on 45 days:

Goals:

- Systems of linear equations and inequalities
- Real world applications involving linear functions and systems of linear equations and inequalities
- Properties of exponents (integer values from -10 to 10)
- Polynomials (classifying, adding and subtracting)
- Multiplying polynomials (monomials by binomial, two binomials or a binomial by a trinomial)

4. Marking Period Four - Polynomials and Quadratic Functions, Radical and Rational Expressions and Equations Overview based on 45 days:

Goals:

- Factoring polynomials including GCF (where a=1)
- Simplify and complete operations with rational expressions
- Solving quadratic equations by factoring
- Solve equations involving radicals
- Solve rational equations

Curriculum Plan

UNIT 1: Foundations for Algebra, Solving Equations & Inequalities

Marking Period: 1

Standards: Pennsylvania Core State Standards for Mathematics

Standards Addressed: CC.2.1.HS.D.1, CC.2.2.HS.D.2, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC2.1.HS.F.2, CC.2.1.HS.F.4

Anchors Addressed: A1.2.1.1, A.1.1.2, A.1.1.3

Link to Standards in SAS: <u>http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf</u>

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 and inequalities.

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.

Overview: Foundations for Algebra, Solving Equations & Inequalities

Goals: Students will be able to write and solve equations or inequalities using their understanding of operations with and properties of real numbers. Students will apply these skills to solve real-world problems.

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 represent and use numbers in equivalent forms (DOK Level Two)
- 5. Students apply number theory concepts to show relationships between real numbers in problem-solving settings. (DOK Level 3)
- 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 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)
- Students will be able to simplify radicals involving products and quotients. (DOK Level Two)
- Students will be able to write, graph, and identify solutions of inequalities. (DOK Level Two)
- 12. Students will be able to solve inequalities, compound inequalities, and absolute value equations and inequalities. (DOK Level Three)
- 13. Students will be able to create equations and inequalities based on real world situations. (DOK Level Three)

- 1. 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).
 - 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. Online resource materials (listed below)
- 2. Expose students' prior knowledge of irrational numbers as well as perfect squares and the inverse relationship between squaring and taking the square root. Introduce simplifying radicals involving products and quotients.
 - a. Diagnostic assessment, questioning
 - b. Cooperative learning groups
 - c. Direct instruction as needed using Smart Technology and online textbook and resources
 - d. Guided practice
- 3. Build math language/vocabulary.
 - a. Teachers will use appropriate language to identify algebraic terms and processes.
 - b. Writing activities incorporating appropriate math language
- 4. 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

- 5. Develop students' ability to solve problems by applying algebraic processes.
 - a. Guided practice
 - b. Cooperative learning groups

Extensions:

Percent, Ratio, Proportion - Daily Warm Up SAT Practice Problems (Question of the Day) Enrichment Worksheets (Textbook Supplement and Kuta Software) USA Test preparation for Keystone Algebra 1 Assessment

UNIT 2: Data Analysis and Probability, Linear Functions

Marking Period: 2

Standards: Pennsylvania Core State Standards for Mathematics

Standards Addressed: CC.2.4.HS.B.1, DD.2.4.HS.B.5, CC.2.4.HS.B.6, CC.2.4.HS.B.7, CC.2.4.HS.F.3, CC.2.4.HS.B.2, CC.2.4.HS.B.3, 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

Anchors Addressed: A.1.1.2.1 A.1,1.1.3, A1.2.1.1, A1.2.1.2, A1.2.2.1, A1.2.2.2, A1.2.3.1, A1.2.3.2, A1.2.3.3

Link to Standards in SAS:

http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Big Idea #1:

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 variables (univariate and bivariate) data

Competencies:

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

Big Idea #2:

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 #3:

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
- Linear system of equations and inequalities

Competencies:

- Write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities.
- Write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques.

Overview: Data Analysis and Probability and Linear Functions

Goals: Students will be able to describe a data set using statistical measures and/or displays. They will be able to calculate theoretical and experimental probabilities including compound events. Students will be able to represent and describe linear functions in order to model real world situations.

Objectives:

- Students will be able to make and interpret frequency tables and histograms. (DOK Level Two)
- 2. Students will be able to determine the mean, median, mode, and range. (DOK Level Two)
- 3. Students will be able to create and interpret box-and-whisker plots as well as find quartiles and percentiles. (DOK Level Three)
- 4. Students will be able to estimate or calculate to make predictions based on charts, graphs and other representations. (DOK Level Three)
- 5. Students will be able to determine theoretical and experimental probabilities. (DOK Level Three)
- 6. Students will be able to find the probabilities of mutually exclusive and compound events as well as independent and dependent events. (DOK Level Three)
- Students will be able to represent mathematical relationships using graphs. (DOK Level Two)

- 8. Students will be able to identify and represent patterns that describe linear functions. (DOK Level Two)
- 9. Students will be able to write equations that represent functions. (DOK Level Three)
- Students will describe, compute, and use the rate of change (slope) of a line. (DOK Level Two)
- 11. Students will be able to write, solve and graph linear equations using various methods. (DOK Level Two)
- 12. Students will be able to interpret and use linear functions and their equations, graphs, or tables. (DOK Level Three)
- 13. Students will be able to interpret data on a scatterplot. (DOK Level Three)
- 14. Students will be able to determine whether a relation is a function, find the domain and range and use function notation. (DOK Level Two)
- 15. 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)
- 16. Students will be able to write and graph linear functions in slope-intercept form, point-slope form, and standard form. (DOK Level Two)
- 17. 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 Four)
- 18. Students will be able to use real world situations to create and model functions using trend lines.

- 1. 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
- 2. 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
- 3. 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

- 4. 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
- 5. 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
- 6. 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
- 7. 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

Extensions:

Organizing Data using Keystone resources Samples and Surveys Direct Variation Writing Equations of Parallel and Perpendicular Lines Enrichment Worksheets (Textbook Supplement and Kuta Software) USA Test Prep – preparation for Keystone Algebra 1 Assessment Permutations and Combinations SAT Practice Problems (Question of the Day)

UNIT 3: Systems of Equations & Inequalities, Exponents, Polynomials

Marking Period: 3

Standards: Pennsylvania Core State Standards for Mathematics

Standards Addressed:

CC.2.1.HS.F.1, CC.2.1.HS.F.2, CC.2.1.HS.F.3, CC.2.1.HS.F.4, CC.2.1.HS.F.5, CC.2.2.HS.D.1, CC.2.2.HS.D.2, CC.2.2.HS.D.3

Anchors Addressed: A1.1.1.5, A1.1.2.2, A1.1.3.1, A1.1.3.2

Link to Standards in SAS:

http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Big Idea #1:

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 and inequalities.

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:

• Algebraic properties and processes

Competencies:

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

Big Idea #2:

Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

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:

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

Overview: Systems of Equations & Inequalities, Exponents, Polynomials

Goals: Students will use the knowledge of linear functions to solve a system of linear equations algebraically or graphically as well as solve a system of linear inequalities graphically. Students will be able to apply properties of exponents as they multiply and factor polynomials. Students will be able to solve quadratic equations by factoring.

Objectives:

- 1. Students will be able to solve a system of linear equations by graphing, using substitution, or using the elimination method. (DOK Level Two)
- 2. Students will be able to apply their understanding of systems of equations to solve real world problems. (DOK Level Four)
- 3. Students will be able to graph linear inequalities in two variables and use linear inequalities to model real world situations. (DOK Level Three)
- 4. Students will be able to solve a system of linear inequalities by graphing and model real world situations using a system of linear inequalities. (DOK Level Three)
- 5. Students will be able to simplify expressions involving zero and negative exponents (integer values from -10 to 0). (DOK Level Two)
- 6. Students will understand and apply properties of exponents (integer values from -10 to 10 only). (DOK Level Three)
- 7. Students will be able to classify, add and subtract polynomials. (DOK Level Two)
- 8. Students will be able to multiply monomials and binomials, two binomials or a binomial by a trinomial. (DOK Level Two)

- 1. Develop students' skills in solving a system of linear equations both graphically and algebraically as well as a system of linear inequalities (graphically).
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 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. Expose students' prior knowledge of exponents, specifically in scientific notation. Introduce (or review) zero and negative exponents. Guide students to develop the properties of exponents using the definition of an exponent.
 - 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, specifically monomial, binomial, trinomial and polynomial.
 - a. Teachers will use appropriate language to identify algebraic terms.
 - b. Writing activities incorporating appropriate math language
- 5. Develop students' skills in adding and subtracting polynomials followed by multiplying polynomials (two binomials or a binomial by a trinomial).
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups

Extensions:

SAT Practice Problems (Question of the Day)

Enrichment Worksheets - emphasizing word problems (Textbook Supplement and Kuta Software) USA Test Prep – preparation for Keystone Algebra 1 Assessment

UNIT 4: Polynomials and Quadratic Functions Radical M and Rational Expressions and Equations

Marking Period: 4

Standards: Pennsylvania Core State Standards for Mathematics

Standards Addressed:

CC.2.1.HS.F.1, CC.2.1.HS.F.2, CC.2.2.HS.D.6, CC.2.2.HS.D1, CC.2.2.HS.D2, CC.2.2.HS.D3, CC.2.2.HS.D4, CC.2.2.HS.D5

Anchors Addressed: A.1.1.1.5, A.1.1.1.3

Link to Standards in SAS:

http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

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 and inequalities.

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.

Overview: Polynomials and Quadratic Functions Radical and Rational Expressions and Equations

Goals: Students will be able to apply properties of exponents as they multiply and factor polynomials. Students will be able to solve quadratic equations by factoring. Students will be able to simplify and complete operations with radical and rational expressions. They will also be able to solve equations involving radicals or rational equations.

Objectives:

- 1. Students will be able to factor trinomials, including those with a GCF. (DOK Level Two)
- 2. Students will be able to solve quadratic equations by factoring. (DOK Level Four)
- 3. Students will be able to add, subtract, multiply and divide radical expressions. (DOK Level Two)
- 4. Students will be able to solve equations involving radicals. (DOK Level Three)
- 5. Students will be able to simplify rational expressions. (DOK Level Two)
- 6. Students will be able to multiply and divide rational expressions. (DOK Level Two)
- 7. Students will be able to simplify complex fractions. (DOK Level Two)
- 8. Students will be able to add and subtract rational expressions. (DOK Level Two)
- 9. Students will be able to solve rational equations. (DOK Level Three)

- 1. Develop students' ability to factor polynomials, including those with a GCF. Include trinomials where "a" is GCF.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 2. Develop students' ability to solve quadratic equations by factoring.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 3. Develop students' skills in adding, subtracting, multiplying and dividing rational expressions.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups

- 4. Build math language/vocabulary.
 - a. Teachers will use appropriate language to identify algebraic terms and processes.
 - b. Writing activities incorporating appropriate math language
- 5. Develop students' skills in adding, subtracting, multiplying and dividing radical expressions.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 6. Develop students' ability to solve equations involving radicals.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups

7. Expose students' prior knowledge of fractions, including simplifying fractions and operations with fractions. Guide students to simplify rational expressions.

- a. Diagnostic assessment, questioning
- b. Cooperative learning groups
- c. Direct instruction as needed using Smart Technology and online textbook and resources
- d. Guided practice
- 8. Develop students' ability to solve rational equations.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups

Extensions:

Factoring ax² + bx + c when a > 1 Factoring by Grouping Solving Quadratic Equations (by Taking the Square Root) The Quadratic Formula SAT Practice Problems (Question of the Day) Enrichment Worksheets (Textbook Supplement and Kuta Software) USA Test Prep – preparation for Keystone Algebra 1 Assessment

Assessments:

Diagnostic:

Prentice Hall Algebra 1 Support File Teacher prepared pre-test/diagnostic test Teacher questioning and observation Benchmark Assessment - CDT Exam

Formative:

Teacher observations, questions, discussions Homework Teacher prepared assessments (quizzes and chapter tests)

Summative:

Common Assessments: Units 1, 2, 3 and 4 (Public File)

Correctives:

Reteaching and practice worksheets available with textbook Practice worksheets generated through Kuta Software Online Resources listed below

Materials and Resources:

Algebra 1 Common Core by Pearson Education, Inc. (2012) Textbook Online Resources Teacher Generated Worksheets (Kuta Software)

Online resources:

https://quizizz.com/admin https://edpuzzle.com/ www.curriculumpathways.com/portal/mobile/algebra1/start.html https://braingenie.ck12.org https://www.usatestprep.com/home

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Algebra 1 Common Core

Textbook ISBN #: 978-0-13-318548-5

Textbook Publisher & Year of Publication: Pearson Education, Inc., 2012

Curriculum Textbook is utilized in (title of course): Algebra 1

Checklist to Complete and Submit with Curriculum:

- _____ A hard copy of the curriculum using The template entitled "Planned Instruction," available on the district website
- _____ Hard copies of all supplemental resources not available electronically
- _____ The primary textbook form(s)
- _____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document
- A USB/Flash Drive containing a single file that will print the curriculum in its intended sequence from beginning to end and all supplemental resources that are available in electronic format.

Each principal and/or department chair has a schedule of First and Second Readers/Reviewers. Each Reader/Reviewer must sign & date below.

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____