PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Algebra 2

Grade Level: 11, 12

Date of Board Approval: _____2018_____

Planned Instruction

Title of Planned Instruction: Algebra 2

Subject Area: Mathematics

Grade(s): 11,12

Course Description: This course follows Informal Geometry. Topics will include linear functions, systems of equations, quadratic functions, polynomial functions, exponential and logarithmic functions, rational expressions, and probability and statistics.

Time/Credit for the Course: 180 days/ 1 Credit

Curriculum Writing Committee: Jonathan McElhaney and Lori Simonelli

Addendum by: Jenelle Gunderman

Curriculum Map

1. Unit One: Data Analysis, Tools of Algebra, Linear Equations, and Systems of Linear Equations and Inequalities	l (45 days)
Goals and Understanding of:	
 Probability, simulations, theoretical, experimental 	
 Analyzing graphical representations of data 	
 Creating descriptive statistics and appropriate analysis 	
 Properties and classifications of real numbers 	
 Solving equations and inequalities in one variable 	
• Solving absolute value equations and inequalities in one variable	
 Solving systems of equations algebraically and graphically 	
Solving and graphing systems of inequalities	
2. Unit Two: Linear Functions and Quadratic Equations and Function	ons (50 days)
Goals and Understanding of:	
 Absolute value functions and their graphs including translations 	
 Relations and functions 	
 Linear functions (graphically and algebraically) 	
 Applications of linear models 	
 Graphs of quadratic functions 	
 Translating quadratic functions 	
 Solving quadratic equations by factoring, graphing, completing th 	e square, and/or
quadratic formula	
 Real and complex roots of quadratic 	
3. Unit Three: Polynomials and Radical Expressions	(45 days)
Goals and Understanding of:	
Graphs of polynomial functions and polynomial applications	
Operations with polynomial functions	
Roots and radical expressions	
Operations with roots and radical expressions	
 Solving roots and radicals equations 	
4. Unit Four: Exponential & Logarithmic Functions and	(40 days)
Rational Expressions	
Goals and Understanding of:	
 Exponential functions and equations. 	
 Logarithmic functions and equations. 	
 Simplifying rational expressions 	
 Operations with rational expressions 	

Curriculum Plan

<u>Unit 1</u>: Data Analysis, Tools of Algebra, Linear Equations, <u>Marking Period</u>: 1 and Systems of Linear Equations and Inequalities

Standards Addressed:

PACS Math: CC.2.4. HS.B.1, CC.2.4. HS.B.2, CC.2.4. HS.B.3, CC.2.4. HS.B.4, CC.2.4. HS.B.5, CC2.1. HS.F.2, CC2.1. HS.F.3, CC2.1. HS.F.4, CC2.2. HS.C.1, CC2.2. HS.C.2, CC2.2. HS.C.3, CC2.2. HS.C.4, CC2.2. HS.C.5, CC2.2. HS.C.6, CC2.2. HS.D.1, CC2.2. HS.D.2, CC2.2. HS.D.7, CC2.2. HS.D.8, CC2.2. HS.D.9, CC2.2. HS.D.10 http://static.pdesas.org/

Anchors: A2.1.1.2, A2.1.2.1, A2.1.3.2.2, A2.2.1.1, A2.2.1.1.1, A2.2.1.1.3, A2.2.3.1, A2.2.3.1.1, A2.2.3.1.2, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3 https://www.education.pa.gov/

Big Idea #1: Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.

Essential Questions:

- In what ways are the mathematical attributes of objects or processes measured, calculated and/or interpreted?
- How does the type of data influence the choice of display?
- How can data be organized and represented to provide insight into the relationship between quantities?

Concepts:

• Data

Competencies:

- Summarize, represent, and interpret single-variable data (including standard deviation) and two-variable data.
- Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

Big Idea #2: Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.

Essential Questions:

• How can expressions, equations and inequalities be used to quantify, solve, model, and/or analyze mathematical situations?

Concepts:

• Equations and Inequalities

Competencies:

- Create and/or solve equations (including literal, polynomial, rational, radical, exponential, and logarithmic) both algebraically and graphically.
- Use and/or explain reasoning while solving equations, and justify the solution method.

Overview: Data Analysis, Tools of Algebra, Linear Equations and Systems of Linear Equations and Inequalities

Goals: Students will be able to analyze data in various forms, comparing types of graphical representations, as well as applying statistical measures of center and spread. Students will be able to write and solve equations using their understanding of operations with and properties of real numbers. Students will apply these skills to solve real-world problems. Students will also be able to solve a system of equations/inequalities algebraically or by graphing.

Objectives:

- 1. Students will be able to use probability for independent, dependent or compound events to predict outcomes. (DOK Level Two)
- 2. Students will be able to find conditional probabilities. (DOK Level Two).
- 3. Students will be able to use combinations, permutations, and the fundamental counting principle to solve problems. (DOK Level Two)
- Students will be able to use odds to find probability and/or use probability to find odds. (DOK – Level One)
- 5. Students will be able to make a probability distribution. (DOK Level One)
- 6. Students will be able to calculate measures of central tendency. (DOK Level One)
- 7. Students will be able to create, analyze, and frame descriptive statistics in the context of real world situations (DOK Four)
- 8. Students will be able to draw and interpret a box-and-whisker plot and/or a stem-and leaf plot. (DOK Level Two)
- 9. Students will be able to use standard deviation in real-world situations to evaluate and predict. (DOK Level Three, DOK Level Four)
- 10. Students will be able to use the standard normal curve for prediction. (DOK Level Three)
- 11. Students will be able to classify, graph and order real numbers. (DOK Level Two)
- 12. Students will be able to identify and apply properties of real numbers (DOK Level Two, DOK Level Four)
- 13. Students will be able to evaluate and/or simplify algebraic expressions by applying the order of operations. (DOK Level Two)
- 14. Students will be able to solve equations and inequalities with one variable and graph solutions on a number line. (DOK Level Two)
- Students will be able to write and solve compound inequalities, absolute value equations and inequalities as well as graph solutions on a number line (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 and interpret equations involving direct variation. (DOK Level Two)
- 18. Students will be able to graph linear and absolute value inequalities. (DOK Level Two)
- 19. Students will be able to write and solve linear equations that model real-world data. (DOK Level Three)
- 20. Students will be able to write an equation of a trend line and line of best fit as well as use the trend line or line of best fit to make predictions. (DOK Level Four)
- 21. Students will be able to solve a system of linear equations by graphing, using substitution, or using the elimination method. (DOK Level Two)
- 22. Students will be able to apply their understanding of systems of equations to solve real world problems. (DOK Level Four)

- 1. Build students' problem-solving skills regarding constructed response questions and develop math literacy from algebraic word problems.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Keystone based constructed response questions and SAT based data analysis questions
 - d. Cooperative learning groups
- 2. Expose students' prior knowledge of probability (calculating the probability of simple and compound events) and statistics (mean, median, mode). Contrast probability and odds.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Guided practice
 - d. Cooperative learning groups
- 3. Develop students' skills in using combinations, permutations, and the fundamental counting principle to solve problems.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 4. Develop students' ability to predict based on measures of central tendency and dispersion. Analyze visual displays of data sets such as box-and-whisker plots and stem and-leaf plots.
 - a. Guided practice
 - b. Cooperative learning groups
- 4. Expose students' prior knowledge of the real number system, including operations with and properties of real numbers, as well as other Algebra 1 skills (simplifying and/or evaluating algebraic expressions, solving equations and inequalities).

- a. Diagnostic assessment, questioning
- b. Direct instruction as needed using Smart Technology and online textbook and resources, Venn Diagrams
- c. Guided practice
- d. Cooperative learning groups
- 5. Develop students' skills in solving absolute value equations and inequalities, compound inequalities and solving problems by applying algebraic processes.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 6. Expose students' prior knowledge of graphing linear functions and writing equations of lines in slope-intercept form, point-slope form, and standard form, including the line of best fit.
 - a. Diagnostic assessment, questioning
 - b. Cooperative learning groups
 - c. Direct instruction as needed using Smart Technology and online textbook and resources
 - d. Guided practice

Assessments:

Diagnostic:

Glencoe Algebra 2 Support File Teacher prepared pre-test/diagnostic test Teacher questioning and observation Keystone Algebra I exam

Formative:

Teacher observations, questions, discussions

Homework

Teacher prepared assessments (quizzes and chapter tests)

Summative:

Common Assessment for Unit 1

Unit 2: Linear Functions and Quadratic Equations and Functions

Marking Period: 2

Standards Addressed:

PACS Math: CC2.1.HS.F.3, CC2.1.HS.F.4, CC2.1.HS.F.6, CC.2.2.HS.C.1, CC2.2.HS.C.2, CC2.2.HS.C.3, CC2.2.HS.C.4, CC2.2.HS.C.5, CC2.2.HS.C.6, CC2.2.HS.D.1, CC2.2.HS.D.2, CC2.2.HS.D.7 http://static.pdesas.org/

Anchor(s): A2.1.1.1.1, A2.1.1.1.2, A2.1.1.2.1, A2.1.1.2.2, A2.1.2.2.1, A2.1.3.1.1, A2.1.3.2.2, A2.2.1.1.4, A2.2.2.1.1, A2.2.2.1.1, A2.2.2.1.3, A2.2.2.1.4, A2.2.2.2.1 https://www.education.pa.gov/

Big Idea #1: Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.

Essential Questions:

- How are relationships represented mathematically?
- How can patterns be used to describe relationships in mathematical situations?

Concepts:

• Functions

Competencies:

- Use the concept and notation of function to interpret and apply them in terms of their context.
- Interpret functions in terms of the situations they model.
- Create and/or analyze functions using multiple representations (graph, table, and equation).
- Create new functions from existing functions (transformations and/or inverses of functions).

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real-world situations.

Essential Question:

• How do you explain the benefits of multiple methods of representing quadratic functions (tables, graphs, equations, and contextual situations)?

Concept:

• Algebraic properties, processes and representations

Competencies:

• Represent linear functions in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated polynomial equation to each representation.

Big Idea #3: Absolute value functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real-world situations.

Essential Question:

• How do absolute value equations and their graphs and/or tables help us interpret events that occur in the world around us?

Concept:

• Absolute value functions and equations

Competencies:

• Represent an absolute value function in multiple ways, including table, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated absolute value equation to each representation.

Big Idea # 4: Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.

Essential Question:

• How can you extend algebraic properties and processes to quadratic, exponential and polynomial expressions and equations and then apply them to solve real world problems?

Concept:

• Algebraic properties, processes and representations

Competencies:

• Extend algebraic properties and processes to quadratic, exponential and polynomial expressions and equations and to matrices, and apply them to solve real world problems.

Overview: Linear Functions and Equations and Quadratic and Functions

Goals: Students will be able to represent and describe linear functions in order to model real world situations. Students will be able to graph quadratic functions, identifying properties of the graph, and solve quadratic equations using various algebraic methods. Students will be able to connect the graph of a quadratic function with its solution.

Objectives:

- 1. Students will be able to determine whether a relation is a function, find the domain, range, and use function notation. (DOK Level One)
- 2. Students will be able to analyze the graph of a linear or absolute value function: identify domain, range, degree. (DOK Level Three)
- 3. Students will be able to apply their understanding of linear functions to solve real world applications. (DOK Level Four)
- 4. Students will be able to identify quadratic functions and graphs, including the properties of a parabola such as the maximum or minimum values. (DOK Level Two)
- 5. Students will be able to graph quadratic functions from standard form or vertex form.

(DOK – Level Two)

- Students will be able to solve a quadratic equation by graphing (identifying the xintercepts), factoring, completing the square, or using the quadratic formula. (DOK – Level Three)
- 7. Students will be able to apply their understanding of quadratic functions to solve real world applications. (DOK Level Four)
- 8. Students will be able to simplify, add, subtract and multiply complex numbers. (DOK Level Two)

- 1. Build students' problem-solving skills regarding constructed response questions and develop math literacy from algebraic word problems.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Keystone based constructed response questions and SAT based data analysis questions
 - d. Cooperative learning groups
- 2. Develop students' ability to solve real world problems by applying their understanding of linear functions.
 - a. Guided practice
 - b. Cooperative learning groups
- 3. Expose students' prior knowledge of functions and graphing in the coordinate plane, guiding students to graph quadratic functions. Investigate the properties of quadratic functions.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources, Venn Diagrams
 - c. Guided practice
 - d. Cooperative learning groups
- 4. Build math language/vocabulary including *relation, function, domain, range.*
 - a. Teachers will use appropriate language to identify algebraic terms and processes.
 - b. During class discussions and investigations, teachers will encourage and guide students to use appropriate math terminology.
 - c. Writing activities incorporating appropriate math language
- 5. Develop students' skills in solving quadratic functions by graphing, factoring, completing the square, and using the quadratic formula
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Graphing activity using TI-Smartview, guiding students to find the appropriate
 - c. window to view the graph and identifying properties of the graph
 - d. Guided practice
 - e. Cooperative learning groups
- 6. Develop students' ability to solve real world problems involving quadratic functions.

- a. Direct instruction using Smart Technology and online textbook and resources.
- b. Guided practice
- c. Cooperative learning groups

Assessments:

Diagnostic:

Glencoe Algebra 2 Support File Teacher prepared pre-test/diagnostic test Teacher questioning and observation Keystone Algebra I exam

Formative:

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

Summative:

Common Assessment for Unit 2

Unit 3: Polynomial Functions and Radical Expressions

Marking Period: 3

Standards Addressed:

PACS Math: CC2.1.HS.C.1, CC2.1.HS.C.2, CC2.2.HS.C.3, CC2.1.HS.C.6, CC2.2.HS.D.3, CC2.2.HS.D.4, CC2.2.HS.D.5, CC2.1.HS.D.3, CC2.1.HS.D.5, CC2.2.HS.D.9, CC2.1.HS.F.1, CC2.1.HS.F.2, CC2.1.HS.F.4, CC2.1.HS.F.7 http://static.pdesas.org/

Anchor(s): A2.1.2.1.1, A2.1.2.1.2, A2.1.2.1.3, A2.1.2.2.1, A2.1.3.1.2, A2.2.1.1.4, A2.2.2.1.1, A2.2.2.1.3, A2.2.2.1.4 https://www.education.pa.gov/

Big Idea #1: Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.

Essential Questions:

• How are relationships represented mathematically?

Concepts:

• Polynomial and Rational Expressions

Competencies:

- Perform arithmetic operations on polynomials.
- Understand the relationship between zeros and factors of polynomials.
- Simplify/factor expressions involving polynomials.

Big Idea #2: Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.

Essential Questions:

• How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?

Concepts:

• Equations and Inequalities

Competencies:

• Create and/or solve equations (including literal, polynomial, rational, radical, exponential, and logarithmic) both algebraically and graphically.

Overview: Polynomial Functions and Radical Expressions

Goals: Students will be able to connect the graph of a polynomial function with its solution. Students will also perform operations on polynomials. Students will be able to simplify radical expressions, perform operations with radicals, as well as solve radical equations.

Objectives:

1. Students will be able to classify polynomials and determine their degree. (DOK – Level

One)

- 2. Students will be able to add, subtract, multiply and divide (long division and synthetic division) polynomials. (DOK Level Two)
- 3. Students will be able to solve a polynomial equation by factoring (using the sum or difference of cubes formula) or by graphing. (DOK Level Two)
- Students will be able to identify the real zeros of a polynomial function (graphing, using the factor theorem and/or remainder theorem) and their multiplicity. (DOK – Level Three)
- 5. Students will be able to construct a polynomial function with specified zeros (DOK Level Three)
- 6. Students will be able to simplify radical expressions including rationalizing the denominators. (DOK Level Two)
- 7. Students will be able to add, subtract, multiply, and divide radicals. (DOK Level Two)
- 8. Students will be able to solve a radical equation using algebraic properties or by Graphing calculator. (DOK Level Two)

- 1. Build students' problem-solving skills regarding constructed response questions and develop math literacy from algebraic word problems.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Keystone based constructed response questions and SAT based data analysis questions
 - d. Cooperative learning groups
- 2. Develop students' skills in adding, subtracting, multiplying and dividing polynomials as well as solving polynomials by graphing or factoring.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 3. Develop students' ability to solve real world problems by applying their understanding of polynomials and its zeros.
 - a. Guided practice
 - b. Cooperative learning groups
- 4. Expose students' prior knowledge of radicals and properties of exponents, guiding students to make a connection between them.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Guided practice
 - d. Cooperative learning groups
- 5. Build math language/vocabulary.
 - a. Teachers will use appropriate language to identify algebraic terms and

processes.

- b. During class discussions and investigations, teachers will encourage and guide students to use appropriate math terminology.
- c. Writing activities incorporating appropriate math language

Assessments:

Diagnostic:

Glencoe Algebra 2 Support File Teacher prepared pre-test/diagnostic test Teacher questioning and observation Keystone Algebra I exam

Formative:

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

Summative:

Common Assessment for Unit 3

UNIT 4: Exponential & Logarithmic Functions and Rational Expressions Marking Period: 4

Standard(s):

PACS Math: CC.2.2.HS.C.1, CC.2.2.HS.C.5, CC.2.2.HS.C.6, CC.2.2.HS.D.1, CC2.1.HS.D.6, CC.2.1.HS.F.2, CC.2.1.HS.F.3, CC.2.1.HS.F.4, CC.2.1.HS.F.5 http://static.pdesas.org/

Anchor(s): A2.1.2.1.4, A2.1.2.2.2, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.2.2.1.2, A2.2.2.1.4 https://www.education.pa.gov/

Big Idea #1: Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

Essential Question:

• How can you extend algebraic properties and processes to exponential expressions and equations and then apply them to solve real world problems?

Concept:

• Exponential functions and equations

Competencies:

- Extend algebraic properties and processes to exponential expressions and equations and apply them to solve real world problems.
- Represent an exponential function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated exponential or equation to each representation.

Big Idea #2: Mathematical relationships among numbers can be represented, compared, and communicated.

Essential Questions:

• How are relationships represented mathematically?

Concepts:

• Polynomial and Rational Expressions

Competencies:

• Rewrite rational expressions.

Overview: Exponential & Logarithmic Functions and Rational Expressions

Goals: Students will be able to solve an exponential function and logarithmic function. Students will be able to complete operations with rational functions and solve rational equations.

Objectives:

- 1. Students will be able to model exponential growth or decay and make predictions based on the model. (DOK Level Four)
- 2. Students will be able to graph exponential and logarithmic functions. (DOK Level Two)
- 3. Students will be able to write and evaluate logarithmic expressions. (DOK Level Two)
- 4. Students will be able to use the properties of logarithms. (DOK Level Two)
- Students will be able to solve exponential and logarithmic equations. (DOK Level Three)
- 6. Students will be able to evaluate natural logarithmic expressions and solve equations using natural logarithms. (DOK Level Two, DOK Level Three)
- 7. Students will be able to simplify rational expressions. (DOK Level Two)
- 8. Students will be able to perform operations with rational expressions. (DOK Level Two)
- 9. Students will be able to simplify complex fractions. (DOK Level Two)

- 1. Build students' problem-solving skills regarding constructed response questions and develop math literacy from algebraic word problems.
 - a. Diagnostic assessment, questioning
 - b. Direct instruction as needed using Smart Technology and online textbook and resources
 - c. Keystone based constructed response questions and SAT based data-analysis questions
 - d. Cooperative learning groups
- 2. Build math language/vocabulary.
 - a. Teachers will use appropriate language to identify algebraic terms and processes.
 - b. During class discussions and investigations, teachers will encourage and guide students to use appropriate math terminology.
 - c. Writing activities incorporating appropriate math language
- 3. Develop students' skills in evaluating logarithmic expressions using properties of logarithms as well as solving exponential and logarithmic equations.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups
- 4. Develop students' ability to solve real world problems, specifically problems involving exponential growth or decay.
 - a. Guided practice
 - b. Cooperative learning groups
- 5. Develop students' skills in simplifying rational equations.
 - a. Direct instruction using Smart Technology and online textbook and resources.
 - b. Guided practice
 - c. Cooperative learning groups

Assessments:

Diagnostic: Glencoe Algebra 2 Support File Teacher prepared pre-test/diagnostic test Teacher questioning and observation Keystone Algebra I exam

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

Summative: Common Assessment for Unit 4

Extensions:

Worksheets prepared from Kuta Software and online resources Glencoe enrichment worksheets SAT question bank from Collegeboard and Khan Academy

Correctives:

Glencoe Resources: Study Guide, Intervention and Study Notebook Remediation practice worksheets prepared from Kuta software and online resources More extensive direct instruction

Materials and Resources:

Glencoe Algebra 2 Glencoe teacher/student resources Prentice Hall Algebra 2 Kuta Software and Teacher Generated Worksheets Graphing Calculator TI Smart View Software Teacher developed SAT question bank Websites such as those from Collegeboard and Khan Academy Geometer's Sketchpad Smart Notebook Gallery Essentials

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Glencoe Algebra 2

Textbook ISBN #: 978-0-07-903990-3

Textbook Publisher & Year of Publication: McGraw-Hill Education, 2018

Curriculum Textbook is utilized in (title of course): Algebra 2

Checklist to Complete and Submit:

(Scan and email)

	Copy of the curriculum using the template entitled "Planned Instruction," available on the district website.	
	The primary textbook form(s).	
	The appropriate payment form, in compliance with the maxim hours noted on the first page of this document.	um curriculum writing
-	ncipal and/or department chair has a schedule of First and Sec Reviewers. Each Reader/Reviewer must sign & date below.	ond
First Rea	ader/Reviewer Printed Name	
First Rea	ader/Reviewer Signature	Date
Second	Reader/Reviewer Printed Name	-
Second	Reader/Reviewer Signature	Date