DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Honors Algebra 2 and Trigonometry

Grade Level: 10

Date of Board Approval: _____2019_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: Honors Algebra 2 and Trigonometry

Subject Area: Mathematics   **Grade(s): 10**

Course Description:
This rigorous course is designed to continue the study and application of algebraic principles from Algebra 1 and extended in Geometry. Students will be challenged with abstract problems and applications as they study and apply linear and quadratic functions, logarithmic functions, circular trigonometry and trigonometric relationships, matrices, and functions involving real and complex solutions. Students will learn to model real world situations using the mathematics studied in the course. Material will be covered more deeply and at a faster pace than in the Algebra 2 and Trigonometry course.

Time/Credit for the Course: Full Year, 1 credit

Curriculum Writing Committee: Lori Simonelli-Yost, Sara Walsh, Susan West

Gradebook for Honors Algebra 2 and Trigonometry

Marking Periods	Quiz	Test	Graded Assignment	Homework/ Participation	Total Points
MP1 points	115	200	40	25	380
MP2 points	115	325	50	25	515
MP3 points	198	150	15	25	388
MP4 points	60	380	25	25	495
Total points	488	1055	130	100	1773
Total Percentages	28%	60%	7%	6%	100%

Curriculum Map

1. **Marking Period One: Fundamentals of Algebra 1, Linear Functions, Systems of Equations**

   Overview based on 45 days:
   Goals:
   - Properties of real numbers
   - Solving equations and inequalities in one variable
   - Solving absolute value equations and inequalities in one variable
   - Relations and functions
   - Transformations of functions
   - Linear functions (graphically and algebraically)
   - Applications of linear models
   - Absolute value and piece-wise functions
   - Solving systems of equations algebraically and graphically
   - Solving and graphing systems of inequalities

2. **Marking Period Two: Introduction to Matrices, Quadratic Functions**

   Overview based on 45 days:
   Goals:
   - Matrices both with and without a graphing calculator (operations, inverses, and matrix solutions with linear systems)
   - Solving systems of equations using augmented matrices, matrix inverses, or Cramer's Rule
   - Graphs of quadratic functions, including transformations
   - Solving quadratic equations by graphing, factoring, taking the square root, completing the square, and/or quadratic formula
   - Real and complex roots of quadratic functions
   - Applications of quadratic functions

3. **Marking Period Three: Radicals, Exponential, Logarithmic, and Polynomial Functions**
   Overview based on 45 days:
   Goals:
   - Expressions involving rational exponents
   - Roots and radical expressions
   - Operations on radical expressions
   - Solving radical equations
   - Function operations, including composition of functions
   - Inverse relations and functions
   - Graphs of exponential functions and logarithmic functions
   - Properties of logarithms
   - Solving exponential and logarithmic equations
   - Applications of exponential and logarithmic functions
   - Operations with polynomials
   - Pascal's triangle and binomial expansion
   - Real and complex roots of polynomial functions

4. **Marking Period Four: Rational Functions, Trigonometric Functions, Data Analysis**
   Overview based on 45 days:
   Goals:
   - Simplifying rational expressions
   - Operations on rational expressions
   - Solving rational equations
   - Graphs of rational functions
   - Distance and midpoint formulas
   - Describing circles algebraically and graphically
   - Measuring angles in degrees and radians
   - Trigonometric functions and the Unit Circle
   - Applications of Trigonometry
   - Analyzing the graphs of trigonometric functions
   - Calculating probability (both simple and compound probability)
   - Analyzing data using measures of center and spread

Curriculum Plan

<u>**Unit 1:**</u> **Fundamentals of Algebra 1, Linear Functions,**   <u>**Marking Period 1**</u>
              Systems of Equations

Standard(s):
PACS Math: CC.2.1.HS.F.2, CC.2.1.HS.F.3, CC.2.1.HS.F.4, CC.2.2.HS.C.1, CC.2.2.HS.C.2, CC.2.2.HS.C.3, CC.2.2.HS.C.5, CC.2.2.HS.C.6, CC.2.2.HS.D.1, CC.2.2.HS.D.2, CC.2.2.HS.D.6, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10, CC.2.4.HS.B.2, CC.2.4.HS.B.3
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Anchor(s): 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
http://www.education.pa.gov/Documents/K-12/Assessment%20and%20Accountability/Keystone%20Exams/Keystone%20Exams%20AA-EC%20woSample%20Items/Keystone%20Content%20Module%20Standard%20Blueprint--Algebra%20II.pdf

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

> **Essential Questions:**
>> How are relationships represented mathematically?
>>
>> 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.

Big Idea #2: Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.

> **Essential Questions:**
>> How can expressions, equations and inequalities be used to quantify, solve, model, and/or analyze mathematical situations?

Concepts: Functions

Competencies:

Use the concept and notation of function to interpret and apply them in terms of their context.

Create and/or analyze functions using multiple representations (graph, table, and equation).

Interpret functions in terms of the situations they model.

Overview: Review Fundamentals of Algebra 1, Linear Functions, Systems of Linear Equations

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. Students will be able to determine if a relation is a function either algebraically or graphically. Students will be able to analyze the graph of a function, identifying specific characteristics of the graph and be able to describe and graph the transformation of a function. Students will be able to represent and describe linear functions in order to model real world situations. They will use this knowledge to solve a system of linear equations using any of the following methods: graphing, substitution method, or elimination method.

Objectives:

1. Students will be able to identify and apply properties of real numbers. (DOK – Level One)
2. Students will be able to apply the order of operations to simplify numerical expressions and to simplify and/or evaluate algebraic expressions. (DOK – Level Two)
3. Students will be able to solve algebraic equations or inequalities in one variable, including compound inequalities, graphing the solution on a number line when required. (DOK – Level Two)
4. Students will be able to solve absolute value equations and inequalities, graphing the solution on a number line when required. (DOK – Level Two)
5. Students will be able to graph an equation by plotting points on a coordinate plane, correctly identifying/labeling both axes, the origin, and the appropriate quadrant. (DOK – Level Two)
6. Students will be able to use graphing calculators to graph equations as they begin to explore the features of a graphing calculator. (DOK – Level Two)
7. Students will be able to interpret story graphs and to sketch the graph given a real-world situation with two related variables. (DOK – Level Two)

8. Students will be able to solve linear equations or rational equations (multiplying by the common denominator), recognizing equations with no solution or equations classified as identities. (DOK – Level Three)
9. Students will be able to apply their skills to develop mathematical models to solve real-world problems. (DOK – Level Four)
10. Students will be able to solve a literal equation for the designated variable, i.e. solve for one variable in terms of another. (DOK – Level Two)
11. Students will be able to identify the domain and/or range of a relation and to determine whether a given relation is a function. (DOK – Level Three)
12. Students will be able to evaluate a function. (DOK – Level Two)
13. Students will be able to analyze the graph of a function by identifying the intercepts, zeros and maximum (or minimum) values of the function, determining where the function is increasing, decreasing, or constant, and whether the function is even or odd. (DOK – Level Four)
14. Students will be able to graph piece-wise functions and to write the equation of a piece-wise function given the graph. (DOK – Level Two)
15. Students will be able to determine the slope of a line given the graph, a linear equation in any form, or two points. (DOK – Level Two)
16. Students will be able to graph a linear equation in two variables or linear inequality in two variables from any form (slope-intercept form, point-slope form, or standard form). (DOK – Level Two)
17. Students will be able to write the equation of a line in slope-intercept form, point-slope form, or standard form given the graph, a point and the slope, or two points. (DOK – Level Two)
18. Students will be able to produce and use the line of best fit given a scatterplot. They will also be able to use graphing calculators to graph the data and produce the regression equation. (DOK – Level Two)
19. Students will be able to write the equations of lines that are parallel or perpendicular to a given line and to determine whether two given lines are parallel, perpendicular, or neither. (DOK – Level Two)
20. Students will be able to determine whether a linear system of equations is consistent or inconsistent, dependent or independent. (DOK – Level Two)
21. Students will be able to solve a system of linear equations both graphically and algebraically (substitution or elimination method). (DOK – Level Two)
22. Students will be able to solve a system of linear inequalities by graphing. (DOK – Level Two)
23. Students will be able to model a real-world situation using linear programming by developing an objective function and its constraints, graphing the feasible region, and finding the points of intersection of these constraints which will be the maximum and minimum values of the objective function. (DOK – Level Four)

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Core Activities and Corresponding Instructional Methods:

1. Expose students' prior knowledge of properties of real numbers, as well as other fundamental Algebra 1 skills (simplifying and/or evaluating algebraic expressions, solving equations, inequalities, including absolute value equations and inequalities).
   a. Diagnostic assessment, questioning
   b. Direct instruction as needed using Smart Technology and online textbook and resources
   c. Guided practice
   d. Cooperative learning groups

2. 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

3. 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

4. Build students' ability to analyze graphs of functions, specifically by identifying significant points on the graph and through transformation of the function.
   a. Direct instruction using Smart Technology and online textbook and resources.
   b. Guided practice using the TI-84 graphing calculator, Desmos, Geometer's Sketchpad
   c. Cooperative learning groups

5. 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

6. Develop students' skills in solving a system of linear equations by graphing, using the substitution method, or using the elimination method.
    a. Direct instruction using Smart Technology, online textbook, and resources.
    b. Guided practice
    c. Cooperative learning groups

7. Develop students' ability to solve real world problems by applying their understanding of linear functions, systems of linear equations, and systems of linear inequalities.
    a. Guided practice
    b. Cooperative learning groups

Assessments:

- o **Diagnostic:**
  Teacher prepared pre-test/diagnostic test
  Teacher questioning and observation
  Keystone Algebra 1 Exam

- o **Formative:**
  Teacher observations, questions, discussions
  Homework
  Teacher prepared assessments (quizzes and tests)

- o **Summative:**
  Common Assessment for Unit 1

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Unit 2: Introduction to Matrices, Quadratic Functions   **Marking Period 2**

Standard(s):
PACS Math: CC.2.1.HS.F.3, CC.2.1.HS.F.4, CC.2.1.HS.F.6, CC.2.1.HS.F.7, CC.2.2.HS.C.1, CC.2.2.HS.C.2, CC.2.2.HS.C.3, CC.2.2.HS.C.4, CC.2.2.HS.C.5, CC.2.2.HS.C.6, CC.2.2.HS.D.1, CC.2.2.HS.D.2, CC.2.2.HS.D.4, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.9, CC.2.2.HS.D.10
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

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, A2.2.2.1.3, A2.2.2.1.4, A2.2.2.2.1
http://www.education.pa.gov/Documents/K-12/Assessment%20and%20Accountability/Keystone%20Exams/Keystone%20Exams%20AA-EC%20woSample%20Items/Keystone%20Content%20Module%20Standard%20Blueprint--Algebra%20II.pdf

Big Idea #1: 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?
> >
> > How is mathematics used to quantify, compare, represent, and model numbers?
> >
> > How are relationships represented mathematically?

> **Concepts:** Equations and Inequalities
> > Complex Number System

> **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.
> >
> > Represent and/or use imaginary numbers in equivalent forms.
> >
> > Simplify/evaluate expressions involving imaginary numbers.
> >
> > Perform arithmetic operations and apply to complex numbers.

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Overview: Introduction to Matrices, Quadratic Functions

Goals: Students will solve a system of linear equations using three additional methods: augmented matrices, matrix inverses, or Cramer's Rule. Students will also be able to complete operations with matrices, find the matrix inverse, and solve matrix equations. 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 apply their knowledge of quadratic functions to solve real-world problems.

Objectives:

1. Students will be able to use an augmented matrix to solve a system of equations in more than two variables, including systems with no solution or systems with infinite solutions. (DOK – Level Three)
2. Students will be able to determine the dimension (order) of a matrix and the element in a specified row and column and to recognize the zero matrix, the identity matrix, and square matrices. (DOK – Level One)
3. Students will be able to complete operations with matrices (addition, scalar multiplication, and multiplication). (DOK – Level Two)
4. Students will be able to find the multiplicative inverse of a matrix using row operations to transform the given matrix to the identity matrix. (DOK – Level Two)
5. Students will be able to find the determinant of a 2×2 matrix. (DOK – Level One)
6. Students will be able to solve matrix equations. (DOK – Level Two)
7. Students will be able to solve a linear system using matrix inverses or Cramer's Rule. (DOK – Level Two)
8. Students will be able to use graphing calculators to complete operations with matrices, find the determinant or inverse, and solve systems using matrices. (DOK – Level Two)
9. Students will be able to mathematically model a real-world situation using a system of linear equations and to solve that problem using any of the following methods: graphing, substitution, elimination, augmented matrices, matrix inverses, or Cramer's Rule. (DOK – Level Four)
10. Students will be able to graph a quadratic function in standard form or vertex form without a calculator (identifying the vertex, orientation, axis of symmetry, intercepts, and maximum or minimum values). (DOK – Level Three)
11. Students will be able to use the graphing calculator to identify key features of a quadratic function. (DOK – Level Two)
12. Students will be able to identify specific transformations (horizontal shift, vertical shift, stretch or compression) of a quadratic function with or without a graphing calculator. (DOK – Level Two)

13. Students will be able to factor quadratic equations (greatest common factor, factor by grouping, trinomials including those with a leading coefficient other than one, recognizing special cases such as the difference of two perfect squares or perfect square trinomials). (DOK – Level Three)
14. Students will be able to solve a quadratic equation by factoring or by taking the square root of both sides. (DOK – Level Three)
15. Students will be able to simplify radicals (specifically square roots), rationalizing the denominator when necessary. (DOK – Level Two)
16. Students will be able to simplify, add, subtract, multiply, and divide complex numbers, using the complex conjugate when required. (DOK – Level Two)
17. Students will be able to solve quadratic equations by completing the square or using the quadratic formula. (DOK – Level Three)
18. Students will be able to use the discriminant to describe the type of solutions (real or imaginary, rational or irrational) of a quadratic equation. (DOK – Level Two)
19. Students will be able to write the quadratic equation in vertex form given points on the graph, the vertex, or the x-intercepts. (DOK – Level Four)
20. Students will be able to convert from vertex form to standard form as well as from standard form to vertex form of a quadratic function by completing the square. (DOK – Level Three)
21. Students will be able to write the quadratic equation given three points on the function using a system of equations and matrices. (DOK – Level Four)
22. Students will be able to apply their understanding of quadratic functions to model real-world situations and solve word problems. (DOK – Level Four)

Core Activities and Corresponding Instructional Methods:

1. Develop students' skills and understanding of matrices both with and without a calculator (operations with matrices, determinant, inverses, matrix equations, and matrix solutions to linear systems which includes Cramer's Rule).
    a. Direct instruction using Smart Technology, online textbook, and resources.
    b. Guided practice
    c. Cooperative learning groups

2. 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

3. Build math language/vocabulary (vertex, axis of symmetry, degree, zeros/roots, etc.).
    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

4. Develop students' skills in solving quadratic functions by graphing, factoring, taking the square root, 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 window to view the graph and identifying properties of the graph
    c. Guided practice
    d. Cooperative learning groups

5. 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

6. Expose students' prior knowledge of the real number system and introduce the complex number system. Guide students to perform operations with complex numbers.
    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:

- o **Diagnostic:**
  Teacher prepared pre-test/diagnostic test
  Teacher questioning and observation
  Keystone Algebra 1 Exam

- o **Formative:**
  Teacher observations, questions, discussions
  Homework
  Teacher prepared assessments (quizzes and tests)

- o **Summative:**
  Common Assessment for Unit 2

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Unit 3: Radicals, Exponential, Logarithmic,   **Marking Period 3**
and Polynomial Functions

Standard(s):
PACS Math: CC.2.1.HS.F.1, CC.2.1.HS.F.2, CC.2.1.HS.F.4, CC.2.1.HS.F.7, CC.2.2.HS.C.1,
CC.2.2.HS.C.2, CC.2.2.HS.C.3, CC.2.2.HS.C.4, CC.2.2.HS.C.5, CC.2.2.HS.C.6, CC.2.2.HS.D.3,
CC.2.2.HS.D.4, CC.2.2.HS.D.5, CC.2.2.HS.D.10
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20Pr
eK-12%20March%202014.pdf

Anchor(s): A2.1.2.1.1, A2.1.2.1.2, A2.1.2.1.3, A2.1.2.1.4, A2.1.2.2, A2.1.3.1.2, A2.1.3.1.3,
A2.1.3.1.4, A2.2.1.1.4, A2.2.2.1.1, A2.2.2.1.2, A2.2.2.1.3, A2.2.2.1.4
http://www.education.pa.gov/Documents/K-
12/Assessment%20and%20Accountability/Keystone%20Exams/Keystone%20Exams%20AA-
EC%20woSample%20Items/Keystone%20Content%20Module%20Standard%20Blueprint--
Algebra%20II.pdf

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

Essential Questions:
How are relationships represented mathematically?

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 exponents, roots, and/or absolute values to represent equivalent forms or to solve
problems.

Big Idea #2: 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?

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Concepts: Functions

Competencies:

Interpret functions in terms of the situations they model.

Create and/or analyze functions using multiple representations (graph, table, and equation).

Create a function and/or sequence that model a relationship between two quantities.

Overview: Radicals, Exponential, Logarithmic, and Polynomial Functions

Goals: Students will be able to evaluate and simplify expressions with rational exponents and radicals, complete operations with rational exponents and radical expressions, and solve equations involving rational exponents or radicals. Students will also be able to graph exponential and logarithmic functions, evaluate exponential or logarithmic expressions, and solve exponential or logarithmic equations using properties of logarithms when required. Students will also complete operations with polynomials and analyze the graph of a polynomial.

Objectives:

1. Students will be able to evaluate and simplify expressions involving exponents. (DOK – Level One)
2. Students will be able to apply the properties of exponents to fractional exponents to simplify or evaluate numerical and algebraic expressions. (DOK – Level Three)
3. Students will be able to connect fractional exponents to radicals. (DOK – Level Two)
4. Students will be able to simplify, add, subtract, multiply, and/or divide radicals with higher indexes including rationalizing the denominator when required. (DOK – Level Two)
5. Students will be able to solve equations involving radicals or rational exponents, checking for extraneous solutions. (DOK – Level Three)
6. Students will be able to apply function operations, including composition of functions. (DOK – Level Two)
7. Students will be able to find the inverse of a function and to verify the inverse by composing with the original function. (DOK – Level Three)
8. Students will be able to graph exponential functions using special characteristics of the graph, including domain, range, and asymptotes. (DOK – Level Two)
9. Students will be able to compare and contrast functions involving exponential growth and exponential decay. (DOK – Level Two)

10. Students will be able to identify specific transformations (reflection, horizontal shift, vertical shift) of an exponential function with or without a graphing calculator. (DOK – Level Two)
11. Students will be able to solve an exponential equation by finding a common base or common exponent. (DOK – Level Three)
12. Students will be able to rewrite exponential expressions (including expressions involving the natural base "e") as logarithms and vice versa. (DOK – Level Two)
13. Students will be able to evaluate logarithms both with and without a calculator. (DOK – Level Two)
14. Students will be able to apply the properties of logarithms to expand or condense an expression. (DOK – Level Two)
15. Students will be able to solve an exponential equation (including equations involving the natural base "e") using logarithms. (DOK – Level Three)
16. Students will be able to solve a logarithmic equation by rewriting as an exponential equation (using properties when needed). (DOK – Level Three)
17. Students will be able to derive and apply the change-of base formula. (DOK – Level Three)
18. Students will be able to use exponential (or logarithmic) models to solve real-world problems such as compound interest, exponential growth, and radioactive decay. (DOK – Level Four)
19. Students will be able to determine the degree and type of polynomial. (DOK – Level One)
20. Students will be able to add, subtract, and multiply polynomials. (DOK – Level Two)
21. Students will be able to use Pascal's Triangle to expand binomials. (DOK – Level Two)
22. Students will be able to use graphing calculators to identify specific characteristics of the graph of a polynomial such as domain, range, zeros, maximum and/or minimum values. (DOK – Level Three)
23. Students will be able to divide polynomials using long division or synthetic division. (DOK – Level Two)
24. Students will be able to factor polynomials completely, including the sum or difference of two cubes. (DOK – Level Two)
25. Students will be able to find all zeros (including complex zeros) of a polynomial using the Factor Theorem, Remainder Theorem, Rational Zero Theorem, dividing the polynomial, factoring the polynomial or using the quadratic formula. (DOK – Level Three)

Core Activities and Corresponding Instructional Methods:

1. 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
2. Build math language/vocabulary (index, rationalizing the denominator, etc.)
   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 adding, subtracting, multiplying and dividing radical expressions and expressions with rational exponents as well as solving radical equations or equations involving rational exponents.
   a. Direct instruction using Smart Technology and online textbook and resources
   b. Guided practice
   c. Cooperative learning groups
4. Expose students' prior knowledge of functions and notation, guiding students to add, subtract, multiply and divide functions as well as find the composition of two functions.
   a. Questioning
   b. Direct instruction as needed using Smart Technology and online textbook and resources
   c. Guided practice
   d. Cooperative learning groups
5. 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
6. Develop students' ability to solve real world problems, specifically problems involving exponential growth or decay.
   a. Guided practice
   b. Cooperative learning groups
7. Expose students' prior knowledge of polynomials (Algebra 1 content). Develop students' skills in adding, subtracting, multiplying and dividing polynomials.

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

8. Develop students' skills in solving polynomials by graphing or factoring.
    a. Direct instruction using Smart Technology and online textbook and resources
    b. Guided practice
    c. Cooperative learning groups

9. Develop students' ability to solve real world problems by applying their understanding of polynomials and its zeros.
    a. Guided practice
    b. Cooperative learning groups

Assessments:

- **Diagnostic:**
  Teacher prepared pre-test/diagnostic test
  Teacher questioning and observation
  Keystone Algebra 1 Exam

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

- **Summative:**
  Common Assessment for Unit 3

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Unit 4: **Rational Functions, Trigonometric Functions, Data Analysis**   **Marking Period 4**

Standard(s):
PACS Math: CC.2.2.HS.C.2, CC.2.2.HS.C.7, CC.2.2.HS.C.8, CC.2.2.HS.D.6, CC.2.2.HS.D.7, CC.2.2.HS.D.8, CC.2.2.HS.D.10, CC.2.3.HS.A.7, CC.2.4.HS.B.6, CC.2.4.HS.B.7
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Anchor(s): A2.1.2.2.2, A2.1.3.1.2, A2.2.3.2.1, A2.2.3.2.2, A2.2.3.2.3
http://www.education.pa.gov/Documents/K-12/Assessment%20and%20Accountability/Keystone%20Exams/Keystone%20Exams%20AA-EC%20woSample%20Items/Keystone%20Content%20Module%20Standard%20Blueprint--Algebra%20II.pdf

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

   Concepts: Functions

   Competencies:

   Using the unit circle, extend the domain of trigonometric functions to all real numbers.

   Use trigonometric functions to model periodic phenomena.

Big Idea #2: Data can be modeled and used to make inferences.

   Essential Questions:

   How can data be organized and represented to provide insight into the relationship between quantities?

   How can probability and data analysis be used to make predictions?

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   Concepts: Data

   Probability

Competencies:

Summarize, represent, and interpret single-variable data (including standard deviation) and two-variable data.

Apply the rules of probability to compute probabilities of compound events.

Calculate probability and/or odds.

Use combinations, permutations, and the fundamental counting principle to solve problems involving probability.

Overview: Rational Functions, Trigonometric Functions, Data Analysis

Goals: Students will be able to complete operations with rational expressions and to solve rational equations. Students will be able to convert from degree measure to radian measure of an angle and to determine the coordinates of special angles on the unit circle. Students will be able to use trigonometry to solve real-world problems. They will also be able to calculate simple and compound probability and to analyze data using measures of center and spread.

Objectives:

1. Students will be able to use graphing calculators to identify specific characteristics such as domain, range, and asymptotes of rational functions. (DOK – Level Two)
2. Students will be able to describe transformations of a rational function. (DOK – Level Three)
3. Students will be able to simplify rational expressions by factoring, stating restrictions on the domain. (DOK – Level Two)
4. Students will be able to multiply, divide, add and/or subtract rational expressions. (DOK – Level Two)
5. Students will be able to simplify complex fractions. (DOK – Level Two)
6. Students will be able to solve rational equations, checking for extraneous solutions. (DOK – Level Three)
7. Students will be able to apply their knowledge of rational functions to solve real-world problems. (DOK – Level Four)
8. Students will be able to derive and apply the distance formula and the midpoint formula. (DOK – Level Three)
9. Students will be able to produce the equation for a circle given the graph, the center and a point on the circle, or the endpoints of a diameter of the circle. (DOK – Level Four)
10. Students will be able to complete the square to convert the equation of a circle from general form to standard form. (DOK – Level Four)
11. Students will be able to represent the sine, cosine, tangent, cosecant, secant, or cotangent of an angle given the sides of a right triangle. (DOK – Level Two)

12. Students will be able to find the unknown side of a special right triangle (45°-45°-90° or 30°-60°-90°). (DOK – Level Two)

13. Students will be able to solve a right triangle (find all angles and side lengths). (DOK – Level Four)

14. Students will be able to solve problems involving the angle of elevation (or depression) using trigonometry. (DOK – Level Two)

15. Students will be able to describe angles in both degrees and radians in a circle (standard position, positive angles, negative angles, coterminal angles, quadrantal angles). (DOK – Level Two)

16. Students will be able to determine the six trigonometric functions for any angle within the circle (in terms of x, y, and r) or for any point in the coordinate plane by constructing a perpendicular segment to the x-axis. (DOK – Level Four)

17. Students will be able to use the unit circle to determine exact values for the six trigonometric functions at special angles (30°, 45°, 60°, 90° in all four quadrants). (DOK – Level Two)

18. Students will be able to determine the appropriate angle given the exact trigonometric value. (DOK – Level Three)

19. Students will be able to use a calculator to approximate the value of the six trigonometric functions given any angle and to identify the angle in both radians and degrees given the trigonometric value. (DOK – Level Two)

20. Students will be able to solve equations involving trigonometric functions. (DOK – Level Two)

21. Students will be able to recognize the graphs of each of the trigonometric functions. (DOK – Level One)

22. Students will be able to use the values from the unit circle to produce a sine wave and cosine wave. (DOK – Level Two)

23. Students will be able to identify one cycle of a periodic function as well as the period and amplitude of the function. (DOK – Level One)

24. Students will be able to specify the sample space for a random experiment and calculate the probability that a given event will occur. (DOK – Level Two)

25. Students will be able to determine when to use factorials, the fundamental counting principle, a permutation, or combination of n elements to find the total number of possible outcomes of an experiment. (DOK – Level Three)

26. Students will be able to calculate the probability of mutually exclusive events and of dependent and independent events. (DOK – Level Two)

27. Students will be able to calculate, compare, and interpret mean, median, mode, range, and standard deviation for quantitative variables. (DOK – Level Three)

28. Students will be able to identify a set of data that is normally distributed. (DOK – Level One)

Core Activities and Corresponding Instructional Methods:

1. Expose students' prior knowledge of rational numbers, guiding students to add, subtract, multiply and divide rational expressions.
   a. Questioning
   b. Direct instruction as needed using Smart Technology and online textbook and resources
   c. Guided practice
   d. Cooperative learning groups
2. Develop students' skills in solving rational equations.
   a. Direct instruction using Smart Technology and online textbook and resources
   b. Guided practice
   c. Cooperative learning groups
3. Build math language/vocabulary including *amplitude, period, cycle, radian.*
   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
4. Develop students' skills in converting between degrees and radians. Guide students to find the exact value of the coordinates for specified angles on the unit circle.
   a. Direct instruction using Smart Technology and online textbook and resources
   b. Guided practice
   c. Cooperative learning groups
5. Develop students' ability to find trigonometric values for specific angle measures, using the unit circle.
   a. Guided practice
   b. Cooperative learning groups
6. Build math language/vocabulary used in Data Analysis including *sample space*, *mutually exclusive events*, *dependent versus independent events*, *factorial*, and *outlier.*
   a. Teachers will use appropriate language to describe concepts and processes used in probability and statistics.
   b. During class discussions and investigations, teachers will encourage and guide students to use appropriate math terminology.
   c. Writing activities incorporating appropriate math language

7. Develop students' skills in calculating the probability of both simple and compound events, using factorials, fundamental counting principle, permutations, or combinations when needed to determine the number of total possible outcomes.
    a. Direct instruction as needed using Smart Technology and online textbook and resources
    b. Guided practice
    c. Cooperative learning groups
8. Develop students' ability to analyze the characteristics of a data set using measures of center and spread, including data that is normally distributed.
    a. Direct instruction as needed using Smart Technology and online textbook and resources
    b. Guided practice
    c. Cooperative learning groups

Assessments:

- o **Diagnostic:**
  Teacher prepared pre-test/diagnostic test
  Teacher questioning and observation
  Keystone Algebra 1 Exam
- o **Formative:**
  Teacher observations, questions, discussions
  Homework
  Teacher prepared assessments (quizzes and tests)
- o **Summative:**
  Common Assessment for Unit 4
  Cumulative Final Assessment

Extensions:
Worksheets prepared from Kuta Software and online resources
Enrichment exercises and applications from Algebra and Trigonometry by Paul A. Foerster
SAT question bank from Collegeboard and Khan Academy

Correctives:
Blitzer Resources: Review Exercises, Mid-Chapter Check Point, Summary and Review
Remediation practice worksheets prepared from Kuta software and online resources
More extensive direct instruction

Materials and Resources:

Blitzer Algebra & Trigonometry

Blitzer online teacher/student resources

Algebra and Trigonometry by Paul A. Foerster

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: <u>Algebra and Trigonometry, 5th Edition</u>

Textbook ISBN #: 978-0-13-310116-4

Textbook Publisher &Year of Publication: Pearson Education, Inc., 2014

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

DELAWARE VALLEY SCHOOL DISTRICT

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 maximum curriculum writing hours noted on the first page of this document.**

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 Printed Name_____

First Reader/Reviewer Signature_____ Date_____

Second Reader/Reviewer Printed Name_____

Second Reader/Reviewer Signature _____ Date_____