Wayne
Township Public Schools

Mathematics
Grade 12
College Algebra

Dr. Mark Toback, Superintendent
Committee: Jacob Cavins and Scott Wisniewski
Compliance Update Complete June 2022

This curriculum may be modified through varying techniques, strategies, and materials as per an individual student's Individualized Educational Plan (IEP)

Approved by the Wayne Township Board of Education at the regular meeting held on November 15, 2018.

NEW JERSEY STUDENT LEARNING STANDARDS FOR MATHEMATICS

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning , strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately) and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1 Make sense of problems and persevere in solving them.

Mathematically proficient students:

- explain to themselves the meaning of a problem and looking for entry points to its solution.
- analyze givens, constraints, relationships, and goals.
- make conjectures about the form and meaning of the solution attempt.
- consider analogous problems, and try special cases and simpler forms of the original problem.
- monitor and evaluate their progress and change course if necessary.
- transform algebraic expressions or change the viewing window on their graphing calculator to get information.
- explain correspondences between equations, verbal descriptions, tables, and graphs.
- draw diagrams of important features and relationships, graph data, and search for regularity or trends.
- use concrete objects or pictures to help conceptualize and solve a problem.
- check their answers to problems using a different method.
- ask themselves, "Does this make sense?"
- understand the approaches of others to solving complex problems.

2. Reason abstractly and quantitatively.

Mathematically proficient students:

- make sense of quantities and their relationships in problem situations.

✓ *decontextualize* (abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents and

✓ *contextualize* (pause as needed during the manipulation process in order to probe into the referents for the symbols involved).

- use quantitative reasoning that entails creating a coherent representation of quantities, not just how to compute them
- know and flexibly use different properties of operations and objects.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students:

- understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- make conjectures and build a logical progression of statements to explore the truth of their conjectures.
- analyze situations by breaking them into cases
- recognize and use counterexamples.
- justify their conclusions, communicate them to others, and respond to the arguments of others.
- reason inductively about data, making plausible arguments that take into account the context
- compare the effectiveness of plausible arguments
- distinguish correct logic or reasoning from that which is flawed
- ✓ elementary students construct arguments using objects, drawings, diagrams, and actions..
- ✓ later students learn to determine domains to which an argument applies.
- listen or read the arguments of others, decide whether they make sense, and ask useful questions

4 Model with mathematics.

Mathematically proficient students:

- apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
- ✓ In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community.
- ✓ By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
- simplify a complicated situation, realizing that these may need revision later.
- identify important quantities in a practical situation
- map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- analyze those relationships mathematically to draw conclusions.
- interpret their mathematical results in the context of the situation.
- reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students

- consider available tools when solving a mathematical problem.
- are familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools
- detect possible errors by using estimations and other mathematical knowledge.
- know that technology can enable them to visualize the results of varying assumptions, and explore consequences.
- identify relevant mathematical resources and use them to pose or solve problems.
- use technological tools to explore and deepen their understanding of concepts.

6 Attend to precision.

Mathematically proficient students:

- try to communicate precisely to others.
- use clear definitions in discussion with others and in their own reasoning.
- state the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
- specify units of measure and label axes to clarify the correspondence with quantities in a problem.
- calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the context.

✓ In the elementary grades, students give carefully formulated explanations to each other.

✓ In high school, students have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students:

- look closely to discern a pattern or structure.

✓ Young students might notice that three and seven more is the same amount as seven and three more.

✓ Later, students will see 7 x 8 equals the well-remembered 7 x 5 + 7 x 3, in preparation for the distributive property.

✓ In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 x 7 and the 9 as 2 + 7.

- step back for an overview and can shift perspective.
- see complicated things, such as some algebraic expressions, as single objects or composed of several objects.

8 **Look for and express regularity in repeated reasoning.**

Mathematically proficient students:

- notice if calculations are repeated
- look both for general methods and for shortcuts.
- maintain oversight of the process, while attending to the details.
- continually evaluate the reasonableness of intermediate results.

Wayne School District
Curriculum Format

Content Area/ Grade Level/ Course:	Systems/ Functions / Logarithms Grade 12 College Algebra
Unit Plan Title:	Essentials of Algebra
Time Frame	6 months

Anchor Standards/Domain* ***i.e: ELA: reading, writing i.e.: Math: Algebra**

- **Algebra – Creating Equations – A.CED.A. 1 , 2, 3, 4**
- **Algebra- Seeing Structure in Expressions- A.SSE.A.1, 2,**
- **Algebra- Polynomial and Rational Expressions- A.APR.A.1 and A.APR.B.2, 3**
- **Functions – Interpreting Functions – F.IF.B. 4, 5, 6, and F.IF.C.7, 8, 9**
- **Functions – Building Functions F.BF.A.1, and F.BF.B. 3, 4, 5**
- **Functions – Linear, Quadratic, and Exponential Models – F.LE.A.4**
- **Number and Quantity- Complex Number System- N.CN.A.1, 2, and N.CN.C.7**

Unit Overview

This unit is both a review and continuation of Algebra 2 topics.

The beginning of this unit is a review of linear combinations. Systems with two equations in two variables can be solved by graphing, substitution method, or linear combination method. Systems of higher dimensions can be solved by using technology. Systems are often used to model real world problems that require more than one variable.

The majority of this unit focuses on functions: quadratic, polynomial, rational, and exponential. Students will connect multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students will identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations.

They will extend their work with exponential functions to recognize, evaluate, and graph exponential and logarithmic functions. Students will be apple to apply exponent rules, find the inverse of an exponential and logarithmic function, and solve exponential equations. Students will make a connection of properties of exponents and properties of logs to evaluate, rewrite, and expand, or condense logarithmic expressions. The unit will conclude with students using inverses and properties of logs to help solve exponential and logarithmic equations and use exponential growth models, exponential decay models, Gaussian models, logistic models, and logarithmic models to solve real-life problems

Standard Number(s) ***i.e: Math: F.LE.A.4** **i.e.: NJSLSA.R4.**

- A-CED.A.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*

- A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A-CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- A-CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
- F-IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★
- F-IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★
- F-IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★
- F.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

  7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

  7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

- F.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

- F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

- F.BF.A.1 Write a function that describes a relationship between two quantities.

  1b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential and relate these functions to the model.

- F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment

with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

- F.BF.B.4 Find inverse functions.
    a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) = 2x^3 for x>0 or f(x) = (x+1)/(x-1) for x ≠1.
- F.BF.B.5 (+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents

- F.LE.A.4 Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
- N.CN.A.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
- N.CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
- N.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions.
- A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
    a. Interpret parts of an expression, such as terms, factors, and coefficients.
    b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
- A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$
- A.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial *p(x)* and a number *a*, the remainder on division by *x-a* is *p(a)*, so *p(a)*=0 *only if (x-a)* is a factor of *p(x)*.
- A.APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial

- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and
- support different interpretations of real-world phenomena.
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among
- different elements of data collected from a phenomenon or process.
- 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original
- and existing algorithms.
- 9.1.12.PB.2: Prioritize financial decisions by considering alternatives and possible consequences.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12 prof.CR3.a)
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- RST.9-10.3./RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Intended Outcomes - {Essential Questions}

- How do you solve a system of linear equations graphically and algebraically?
- How do you represent the solution to a system of linear inequalities?
- How can factoring, using square roots, completing the square, and quadratic formula be used to solve quadratic equations with complex solutions?
- How do you perform operations on polynomials and solve polynomial equations?
- How can we apply the fundamental theorem of Algebra?
- How do you identify an “even” or “odd” function, algebraically and graphically?
- How can we sketch a polynomial function using its end behavior and zeros?
- How can you use polynomial expressions to solve real-life problems?
- How do we evaluate and graph exponential and logarithmic functions with base a?
- How do you evaluate and graph exponential and logarithmic functions with base e?
- How do you use properties of logarithms to evaluate, rewrite, expand or condense logarithms?
- How do you solve exponential and logarithmic equations?
- How do you use exponential growth and decay functions to model and solve real-life problems?

Enduring Understandings

- Systems of equations, polynomial equations, rational equations, exponential equations, and logarthmic equations, can be used to solve real word problems. The solution to a system of equations is the point of intersection of their graphs.
- Graph and give example of the parent graphs of a linear, quadratic, inverse, exponential, and logarithmic function.
- The possibilities of asymptotes for a rational function.
- Based on a table, identify the type of function that is graphed.
- Manipulate an equation or formula.
- Students should understand that problems can be solved in more than one way.
- Students should be able to reason mathematically.
- Students should be able to think critically and solve real world problems.
- Students should be able to work collaboratively as well as think independently.
- Students should be able to move from concrete thinking to more abstract thinking.
- Students should be able to communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

,

In this unit plan, the following 21st Century themes and skills are addressed.

Check all that apply. 21st Century Themes		*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.* 21st Century Skills	
x	**Global Awareness**	E, T, A	**Creativity and Innovation**
x	**Environmental Literacy**	E, T, A	**Critical Thinking and Problem Solving**
x	**Health Literacy**	E, T, A	**Communication**
	Civic Literacy	E, T, A	**Collaboration**
x	**Financial, Economic, Business, and Entrepreneurial Literacy**		

Student Learning Targets/Objectives (Students will know/Students will understand)

Students will be able to

- Solve systems algebraically, graphically, and answer real world problems dealing with optimization
- Use the discriminant to determine the nature of the roots of quadratic equations
- Solve quadratic equations using different methods and answer real world problems aglebraically and graphically
- Determine the roots of polynomial equations
- Apply the fundamental theorem of algebra
- Apply the remainder and factor theorems to find factors of polynomials
- Graph polynomial functions by finding all zeros, finding the multiplicity of the x-intercepts, and stating

the end behavior
- Simplify and Solve Rational Equations
- Simplify and evaluate expressions with rational exponents
- Solve radical equations and equations with rational expoents
- Find inverse functions of linear, polynomial, rational, exponential, and logarithmic functions
- Solve exponential equations
- Simplify simple logarithmic functions
- Use properties of logarithms to evaluate, condense and expand
- Solve logarithmic equations both not involving and involving properties
- Feel prepared for the SAT
- Feel prepared for their college placement exam

Assessments (Pre, Formative, Summative, Other) ***Denote required common assessments with an ****

- Warm ups (Do nows)
- Class assignments
- Quizzes
- Tests
- Practice tests (for SAT and College Placement exam)
- Final Exam *

Teaching and Learning Activities

Activities

Linear Programming- Activity A
http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=143

System of Equations (2-variable)

You are taking a test in which items of type A are worth 10 points and items of type B are worth 15 points. It takes 3 minutes to answer each item of type A and 6 minutes for each item of type B. The total time allowed is 60 minutes, and you may not answer more than 16 questions. Assuming all your answers are correct, how many items of each type should you answer to get the highest score?

System of equations (3-variable)- Example Optimization Word Problem

Bob builds tool sheds. He uses 10 sheets of dry wall and 15 studs for a small shed and 15 sheets of dry wall and 45 studs for a large shed. He has available 60 sheets of dry wall and 135 studs. If Bob makes $390 profit on a small shed and $520 on a large shed, how many of each type of building should Bob build to maximize his profit?

Use software (ie. Desmos)or graphing calculators to model transformations with functions to help students make connections between the various representations

Graphing functions:

Sketch

$y = \frac{1}{2}(x+2)^2 - 1,\ y = 2\sqrt{x-1} + 3,\ y = -(x+1)^3 + 1,\ y = \sqrt[3]{x+1} + 2$

	relating each with its parent function $y = f(x)$ and its transformation to $y = af(x - h) + k$. Inverse functions: Find the inverse of $y = \sqrt{x - 1}$, $x \geq 1$. Be sure to indicate any domain restrictions on the inverse to guarantee is a function. ($y = x^2 + 1, x \geq 0$) Exponential Growth- Example of Compounded Interest Word Problem You deposit $1000 in an account that pays 8% annual interest. Find the balance after 1 year if the interest is compounded with the given frequency. a. annually b. Quarterly c. Daily
Differentiation Strategies	• Time: Extra time for assigned tasks, adjust length of assignment, timeline with due dates for reports and projects, communication system between home and school and provide lecture notes/outline • Small group or one-to-one remediation when necessary • Allow the use of technological support (calculators) when possible • Provide alternate assessments • Incorporate manipulatives to enhance understanding of abstract concepts • Use graphic organizers or guided notes when possible • Ensure understanding of math vocabulary by having students define and give examples of math terms
Honors	N/A

Resources

- College Prep Algebra (Larson Textbook)
- Algebra 2 (McDougall Textbook)
- http://explorelearning.com
- http://education.ti.com
- http://illustrativemathematics.org/standards/hs
- www.khanacademy.com
- Dan Meyers - 3 Act

Content Area/ Grade Level/ Course:	Trigonometric Functions Grade 12 College Algebra
Unit Plan Title:	Precalc
Time Frame	3 months

Anchor Standards/Domain* ***i.e: ELA: reading, writing i.e.: Math: Algebra**

Functions- Trigonometric Functions- F.TF.A. 1, 2, 3, 4 and F.TF.B.5

Unit Overview

This unit is an extension of the students geometry class and gives students knowledge to prepare them for higher level math classes. This unit focues on the properties of trigonometric functions and how they relate to the unit circle. They will use right triangles and Pythagorean Theorem to find measures on the unit circle. Students will understand difference between radians and degrees and also be able to interpret and identify various concepts such as period, amplitude and midline.

Standard Number(s) ***** **i.e: Math: F.LE.A.4 i.e.: NJSLSA.R4.**

- F-TF.A.1: Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- F-TF.A.2: Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- F-TF.A.3: Use special triangles to determine geometrically the values of sine, cosine, and tangent for $\pi/3\ \pi/3$, $\pi/4,\ \pi/4,$ and $\pi/6\ \pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x, \pi + x,\ \pi - x, \pi + x,$ and $2\pi - x\ 2\pi - x$ in terms of their values for $x\ x$, where $x\ x$ is a real number
- F-TF.A.4: Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
- F-TF.B.5: Choose trigonometric functions for model periodic phenomena with specific amplitude, frequency, and midline.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and
- support different interpretations of real-world phenomena.
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among
- different elements of data collected from a phenomenon or process.
- 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original
- and existing algorithms.

- 9.1.12.PB.2: Prioritize financial decisions by considering alternatives and possible consequences.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12 prof.CR3.a)
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- RST.9-10.3./RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Intended Outcomes - {Essential Questions}

- What are the units that can be used to measure angles?
- What is one radian?
- How are the values of the trigonometric functions on the unit circle derived?
- How can the trigonometric functions of acute angles be evaluated?
- How do reference angles allow us to evaluate angles of any measure?
- How do sketches and transformations of sine and cosine graphs relate to their parent functions and graphs?
- How are the graphs of sine and cosine used to derive the graphs of the other four trigonometric functions?

Enduring Understandings

- Describe an angle and convert between degree and radian measures
- Identify a unit circle and its relationship to real numbers
- Evaluate trigonometric functions of any angle
- Use fundamental trigonometric identities
- Sketch graphs of trigonometric functions
- Students should understand that problems can be solved in more than one way.
- Students should be able to reason mathematically.
- Students should be able to think critically and solve real world problems.
- Students should be able to work collaboratively as well as think independently.
- Students should be able to move from concrete thinking to more abstract thinking.
- Students should be able to communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

,

In this unit plan, the following 21st Century themes and skills are addressed.

Check all that apply. 21st Century Themes		*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.* 21st Century Skills	
x	**Global Awareness**	E, T, A	**Creativity and Innovation**
x	**Environmental Literacy**	E, T, A	**Critical Thinking and Problem Solving**
x	**Health Literacy**	E, T, A	**Communication**
	Civic Literacy	E, T, A	**Collaboration**
x	**Financial, Economic, Business, and Entrepreneurial Literacy**		

Student Learning Targets/Objectives (Students will know/Students will understand)

- Change from radian to degree measure and vice versa
- Find angles that are coterminal with another angle
- Find the reference angle for a given angle
- Find the value of the six trigonometric functions of an angle in standard position given a point on its terminal side
- Find exact values for the six trigonometric function of special angles
- Find decimal approximations for the values of the six trigonometric functions of any angle
- Solve right triangles using trigonometry
-

Assessments (Pre, Formative, Summative, Other) ***Denote required common assessments with an ****

- Warm ups (Do nows)
- Class assignments

- Quizzes
- Tests
- Practice tests (for SAT and College Placement exam)
- Final Exam *

Teaching and Learning Activities	

Activities	• Students will be involved in a variety of investigations and group problem-solving situations, which provide hands-on and active learning activities.
	  ○ Connect the trig identities to the Pythagorean Theorem, cutting out right triangles and fitting them to the unit circle, working hands on with the triangles
	• Students will be engaged through the use of manipulatives, calculators, and computers to enhance learning.
	  ○ Use software that models tides and periodicity, real world examples such as Ferris Wheels videos showing motion with graphing simultaneously (several websites offer this visual).
	• Students will be encouraged to become active learners by challenging them to use prior knowledge and experience in new and increasingly more difficult situations. Individual work, small group, and whole-class instruction will provide opportunities for students to exchange ideas and develop the ability to communicate and reason mathematically.
	  ○ Have students construct unit circles to discover their properties including radians.

Differentiation Strategies	• Time: Extra time for assigned tasks, adjust length of assignment, timeline with due dates for reports and projects, communication system between home and school and provide lecture notes/outline • Small group or one-to-one remediation when necessary • Allow the use of technological support (calculators) when possible • Provide alternate assessments • Incorporate manipulatives to enhance understanding of abstract concepts • Use graphic organizers or guided notes when possible • Ensure understanding of math vocabulary by having students define and give examples of math terms
Honors	N/A

Resources

- College Prep Algebra (Larson Textbook)
- Algebra 2 (McDougall Textbook)
- Tigonometry (McDougall Text book)
- Pre- Calculus
- http://explorelearning.com
- http://education.ti.com
- http://illustrativemathematics.org/standards/hs
- www.khanacademy.com
- Dan Meyers - 3 Act

Content Area/ Grade Level/ Course:	Probability and Statistics Grade 12 College Algebra
Unit Plan Title:	Probability and Statistics
Time Frame	1 month (if time permits)

Anchor Standards/Domain* ***i.e: ELA: reading, writing i.e.: Math: Algebra**

- Statistics- Interpreting Categorical and Quantitative Data- A.1 and B.6
- Probability- Conditional rules- A.1,2, and 3

Unit Overview

The puropose of this unit is to prepare students for a college statistics class. This unit gives the beginning ideas of data interpretation and simple probability. The students will interpret and graph data, summarize the data, and draw conclusions. They will take this concept of interpreting data and use this knowledge to answer probability quesions. They will make a conjecture, preform experiments, draw a conclusion and justify why their conclusion is sensible.

Standard Number(s) ***** **i.e: Math: F.LE.A.4 i.e.: NJSLSA.R4.**

S-ID. A1- Summarize, represent, and interpret data on a single count or measurement variable

- Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID. B.6 Summarize, represent, and interpret data on two categorical and quantitative variables

- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and

exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology. c. Fit a linear function for a scatter plot that suggests a linear association

S-CP. A1- Understand independence and conditional probability and use them to interpret data

- Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

S-CP. A2- Understand independence and conditional probability and use them to interpret data

- Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S-CP. A3- Understand independence and conditional probability and use them to interpret data

- Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and
- support different interpretations of real-world phenomena.
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among
- different elements of data collected from a phenomenon or process.
- 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original
- and existing algorithms.
- 9.1.12.PB.2: Prioritize financial decisions by considering alternatives and possible consequences.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12 prof.CR3.a)
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- RST.9-10.3./RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Intended Outcomes - {Essential Questions}

- What is statistics and how is data categorized?
- What are the ways in which data can be organized into tables and/or graphs, and which are more useful in certain instances?
- How can you predict an outcome for a linear model?
- What is experimental vs theoretical probability?

Enduring Understandings

- Create and interpret graphical displays of data, including dotplots, stem-and-leaf plots, and histograms.
- Examine graphs of data for outliers, and explain the outlier(s) within the context of the data.
- Use regression lines to make predictions, and identify the limitations of the predictions.
- Understand difference between theoretical and experimental probability.
- Students should understand that problems can be solved in more than one way.
- Students should be able to reason mathematically.
- Students should be able to think critically and solve real world problems.
- Students should be able to work collaboratively as well as think independently.
- Students should be able to move from concrete thinking to more abstract thinking.
- Students should be able to communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

,

In this unit plan, the following 21st Century themes and skills are addressed.

Check all that apply. 21st Century Themes		*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.* 21st Century Skills	
x	**Global Awareness**	E, T, A	**Creativity and Innovation**
x	**Environmental Literacy**	E, T, A	**Critical Thinking and Problem Solving**
x	**Health Literacy**	E, T, A	**Communication**
	Civic Literacy	E, T, A	**Collaboration**
x	**Financial, Economic, Business, and Entrepreneurial Literacy**		

Student Learning Targets/Objectives (Students will know/Students will understand)

Students will be able to :

- Categorize data as qualitative or quantitative
- Students will decide which statistical graph best fits a given set of data.
- fit a linear function for a scatter plot that suggests a linear association
- distinguish between correlation and causation
- guess the shape of the distribution of a variable by knowing something about the data
-

Assessments (Pre, Formative, Summative, Other) ***Denote required common assessments with an ****

- Warm ups (Do nows)
- Class assignments
- Quizzes
- Tests
- Practice tests (for SAT and College Placement exam)
- Final Exam *

Teaching and Learning Activities

Activities	• Students will be involved in a variety of investigations and group problem-solving situations, which provide hands-on and active learning activities. • Students will be engaged through the use of manipulatives, calculators, and computers to enhance learning.
Differentiation Strategies	• Time: Extra time for assigned tasks, adjust length of assignment, timeline with due dates for reports and projects, communication system between home and school and provide lecture notes/outline • Small group or one-to-one remediation when necessary • Allow the use of technological support (calculators) when possible • Provide alternate assessments • Incorporate manipulatives to enhance understanding of abstract concepts • Use graphic organizers or guided notes when possible • Ensure understanding of math vocabulary by having students define and give examples of math terms
Honors	

Resources

- College Prep Algebra (Larson Textbook)
- Algebra 2 (McDougall Textbook)
- Pre-Calculus (McDougall Text book)
- http://explorelearning.com
- http://education.ti.com
- http://illustrativemathematics.org/standards/hs
- www.khanacademy.com
- Dan Meyers - 3 Act