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| Created on: | July 16, 2015 |
| Created by:  | Kellie Keiser, Central; Juliet Pender, Plumsted; Michele Colon, Vo-Tech; Robin Kelly, Vo-Tech |
| Revised on: |  |
| Revised by: |  |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM** |
| **Content Area:** Mathematics |
| **Course Title:** Precalculus | **Grade Level:** High School |
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|  | Right Triangle Trig and Laws |  | 3-4 weeks |  |
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|  | Trigonometry  |  | 3 weeks |  |
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|  | Graphs of Trig Functions |  | 3-4 weeks |  |
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|  | Analytic Trigonometry |  | 5-6 weeks |  |
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|  | Sequences, Series, and Probability |  | 3 weeks |  |
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|  | Exponential and Logarithmic Functions |  | 5 weeks |  |
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|  | Polynomial and Rational Functions |  | 6 weeks |  |
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|  | Analytic Geometry |  | 4 weeks |  |
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The following Standards for Mathematical Practice and select Common Core Content Standards should be covered throughout the various units of the curriculum.

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| Standards for Mathematical Practices |
| MP.1 | Make sense of problems and persevere in solving them. | * Find meaning in problems
* Look for entry points
* Analyze, conjecture and plan solution pathways
* Monitor and adjust
* Verify answers
* Ask themselves the question: “Does this make sense?”
 |
| MP.2 | Reason abstractly and quantitatively. | * Make sense of quantities and their relationships in problems
* Learn to contextualize and decontextualize
* Create coherent representations of problems
 |
| MP.3 | Construct viable arguments and critique the reasoning of others. | * Understand and use information to construct arguments
* Make and explore the truth of conjectures
* Recognize and use counterexamples
* Justify conclusions and respond to arguments of others
 |
| MP.4 | Model with Mathematics. | * Apply mathematics to problems in everyday life
* Make assumptions and approximations
* Identify quantities in a practical situation
* Interpret results in the context of the situation and reflect on whether the results make sense
 |
| MP.5 | Use appropriate tools strategically. | * Consider the available tools when solving problems
* Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools)
* Make sound decisions of which of these tools might be helpful
 |
| MP.6 | Attend to precision. | * Communicate precisely to others
* Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes
* Calculate accurately and efficiently
 |
| MP.7 | Look for and make use of structure. | * Discern patterns and structures
* Can step back for an overview and shift perspective
* See complicated things as single objects or as being composed of several objects
 |
| MP.8 | Look for and express regularity in repeated reasoning. | * Notice if calculations are repeated and look both for general methods and shortcuts
* In solving problems, maintain oversight of the process while attending to detail
* Evaluate the reasonableness of their immediate results

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| Technology Goals for Precalculus:   |
| Students will be able to use a graphing calculator to graph a function, set the window range, find the zeros of a function, find the extrema of a function, analyze the graph to determine domain and range, analyze and interpret tables of data, create scatter plots and use the regression feature including calculating the correlation coefficient, calculate measures of center and measures of variation, solve a system by finding the point of intersection, evaluate a logarithm, evaluate an exponential expression, matrix operations, calculate trigonometric and inverse trigonometric functions.   |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Right Triangle Trig and Laws |
| **Domain:** Geometry—Similarity Right Triangles and Trig G-SRT |
| **Unit Summary** In this unit, students will learn right triangle trigonometric ratios and their applications to finding unknown distances and angle measures along with the law of sine and cosines and their applications to measurement of unknown distance and angles. Also, students will find areas of oblique triangles. |
| **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology. |
| **21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| G-SRT -6 | Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. |
| G-SRT-8 | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. |
| **Number** | **Common Core Standard for Introduction** |
| G-SRT-9 | (+)Derive the formula *A* = 1/2 *ab* sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. |
| G-SRT-10 | (+) Prove the Laws of Sines and Cosines and use them to solve problems. |
| G-SRT-11 | (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). |
| **Unit Essential Questions*** What is trigonometry?
* What are sine, cosine and tangent ratios and how are they used for right and oblique triangles?
 | **Unit Enduring Understandings***Students will understand that…** They can use trigonometric ratios for solving right triangles
* The Law of Sines and Cosines can be used to solve oblique triangles
* The area of an oblique triangle can be calculated without knowing the height of the triangle.
 |
| **Unit Objectives***Students will know…** Sine, cosine and tangent ratios for right triangles
* The laws of sine and cosine
* The area formula for oblique triangles is 1/2bc Sin A and Heron’s formula
 | **Unit Objectives***Students will be able to…** Apply sine, cosine and tangent ratios to find missing sides and angles in right triangles
* Utilize the law of sine and cosine to solve oblique triangles
* Employ area formulas derived from the laws of sine and cosine to find the area of oblique triangles.
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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Evidence of Learning** |
| **Formative Assessments** |
| * Observation
* Homework
* Class participation
* Whiteboards/communicators
* Think-Pair-Share
 | * DO-NOW
* Notebook
* Writing prompts
* Exit passes
* Self-assessment
 |
| **Summative Assessments*** Chapter/Unit Test
* Quizzes
* Presentations
* Unit Projects
* Mid-Term and Final Exams
 |
| **Modifications (ELLs, Special Education, Gifted and Talented)*** Teacher tutoring
* Peer tutoring
* Cooperative learning groups
* Modified assignments
* Alternative assessments
* Group investigation
* Differentiated instruction
* Native language texts and native language to English dictionary
* **Follow all IEP modifications/504 plan**
 |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).* Graphing Calculator
* Microsoft Excel/PowerPoint
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| **Teacher Notes:** |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Trigonometry |
| **Domain:** Functions-Trigonometric Functions F-TF |
| **Unit Summary** In this unit, topics covered will include the six trigonometric functions and their relationship not only to each other but also their connection to the unit circle. Also, evaluation of trigonometric functions of any angle along with modeling and solving real life problems will be covered.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| F-TF-1 | Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. |
| F-TF-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. |
| **Number** | **Common Core Standard for Introduction** |
| F-TF-3 | (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosines, and tangent for *x*, π + *x*, and 2π – *x* in terms of their values for *x*, where *x* is any real number. |
| F-TF-4 | (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. |
| **Unit Essential Questions*** How can you apply the trigonometric ratios to understanding a wide variety of physical phenomena including orbits, sound waves, rotations and vibrations?
* How does trigonometry deal with relationships among sides and angles and triangles to develop astronomy, navigation and surveying?
 | **Unit Enduring Understandings***Students will understand that…** Their exists a relationship between degree and radian relationship
* The unit circle can be utilized in many ways
* Trigonometric functions are periodic around the unit circle and can each be evaluated for any angle
 |
| **Unit Objectives***Students will know…** How to convert between degrees and radians
* How to identify a unit circle and its relationship to real numbers
* How to evaluate trigonometric functions of any angle
 | **Unit Objectives***Students will be able to…** Evaluate trigonometric functions for any angle on the unit circle.
* Utilize radian measurement for all calculations in decimal and pi form.
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* Think-Pair-Share
 | * DO-NOW
* Notebook
* Writing prompts
* Exit passes
* Self-assessment
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| **Summative Assessments*** Chapter/Unit Test
* Quizzes
* Presentations
* Unit Projects
* Mid-Term and Final Exams
 |
| **Modifications (ELLs, Special Education, Gifted and Talented)*** Teacher tutoring
* Peer tutoring
* Cooperative learning groups
* Modified assignments
* Alternative assessments
* Group investigation
* Differentiated instruction
* Native language texts and native language to English dictionary
* **Follow all IEP modifications/504 plan**
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| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).* Graphing Calculator
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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Graphs of Trigonometric Functions |
| **Domain:** Functions-Trigonometric Functions F-TF |
| **Unit Summary** This unit will include sketching the 6 trigonometric functions and their translations on the coordinate plane. Also covered will be the topic of graphing and evaluating the inverse trigonometric functions and the applications to many fields of the graphs of trig functions.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| F-TF-5 | Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. |
| **Number** | **Common Core Standard for Introduction** |
| F-TF-6 | (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. |
| F-TF-7 | (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. |
| **Unit Essential Questions*** How do we use graphing to model real-life data?
* What equations can be used to represent patterns observed from graphing?
 | **Unit Enduring Understandings***Students will understand that…** Graphs translate horizontal and vertical
* Graphs are periodic
* Inverse functions and their application to graphing
* Restricting domains
 |
| **Unit Objectives***Students will know…** How to translate a graph
* The effects of period and amplitude
* The domain and range for all 6 trig functions
* How to graph the intercepts of trig functions with the x-axis
* How to find the quarters in a sine and cosine graph
* That cosecant and secant are reciprocal graphs of sine and cosine.
 | **Unit Objectives***Students will be able to…** Graph trigonometric functions on a coordinate plane and use the rules for translations and stretching/shrinking the graph
* Employ trigonometric graphs to model real-life data
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| **Teacher Notes:** |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Analytic Trigonometry |
| **Domain:** Functions-Trigonometric Functions F-TF |
| **Unit Summary** This unit will include using fundamental trigonometric identities to evaluate and simplify functions, verifying trigonometric identities, using general algebraic techniques to solve trigonometric equations, and use various formulas to expand the knowledge base for the known angles in the unit circle.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| F-TF-8 | Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. |
| **Number** | **Common Core Standard for Introduction** |
| F-TF-9 | (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. |
| **Unit Essential Questions*** How can we use identities in related physics applications?
* How do past and new mathematical techniques assist in solving trigonometric equations?
 | **Unit Enduring Understandings***Students will understand that…** Fundamental Identities can assist them in simplifying many problems
* Strategies for verifying will aid in the process of solving equations
* Double, half, sum and difference and power reducing formulas will help in future math courses
 |
| **Unit Objectives***Students will know…** How to verify trigonometric identities.
* How to solve trigonometric equations using algebraic techniques.
* How to use formulas to rewrite and evaluate trig functions.
 | **Unit Objectives***Students will be able to…** Understand the importance of the fundamental identities in solving, simplifying, verifying and evaluating trig expressions and equations.
* Develop reasoning skills.
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| **Teacher Notes:** |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Sequences, Series, and Probability |
| **Domain:** Statistics-Conditional Probability and Rules of Probability S-CP Functions-Linear, Quadratic, and Exponential F-LE |
| **Unit Summary** In this unit, students will study the area of probability by counting the possible outcomes and determining the probability of multiple events. They will learn how to represent and evaluate series and sequences including summation notation, factorial notation, modeling and solving real-life applications.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| S-CP-1 | 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-2 | 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-3 | 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*. |
| S-CP-5 | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.  |
| S-CP-6 | Find the conditional probability of *A* given *B* as the fraction of *B*’s outcomes that also belong to *A,* and interpret the answer in terms of the model. |
| S-CP-7 | Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. |
| **Number** | **Common Core Standard for Introduction** |
| S-CP-8 | Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. |
| S-CP-9 | 2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). |
| F-LE-2 | Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). |
| **Unit Essential Questions*** How is probability related to real world events?
* How do independent and dependent events differ and what is their impact on compound probability calculations?
* What is the likelihood of something occurring?
* How are sequences and series used to describe algebraic patterns and relate them to real life situations?
 | **Unit Enduring Understandings***Students will understand that…** Probability can be determined using either real data from an experiment or theoretical calculations.
* Determining if ‘order matters’ is significant in calculating the probability of an event.
* Evaluating series and sequences is relevant in everyday reasoning.
 |
| **Unit Objectives***Students will know…** How to calculate experimental probability given trial data.
* How to calculate theoretical probability.
* How to calculate probability of independent events using union and intersection.
* How to evaluate and use combinations and permutations.
* How to write and evaluate sequences and series including summation notation and factorial notation.
 | **Unit Objectives***Students will be able to…** Calculate the theoretical and experimental probability provided events are independent or dependent. Also, utilize complementary events.
* Determine the impact of order in an experiment and utilize calculations for permutations and combinations.
* Write the nth term of a sequence and evaluate multiple forms of a sequence and series.
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| **Teacher Notes:** |
| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Exponential and Logarithmic Functions |
| **Domain:** Functions-Linear, Quadratic and Exponential Models/ Interpreting Functions F-LE Functions-Interpreting Functions F-IF |
| **Unit Summary** In this unit, students will study the graphs of exponential and logarithmic functions and how they model real-life situations. They will learn the properties of logarithms and how to solve exponential and logarithmic equations. They will also learn of the many applications of these functions.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| F-LE-1 | Distinguish between situations that can be modeled with linear functions and with exponential functions.a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. |
| F-LE-2 | Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). |
| F-LE-3 | Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. |
| F-LE-4 | 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. |
| F-LE-5 | Interpret the parameters in a linear or exponential function in terms of a context. |
| F-IF-7e | Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. |
| **Unit Essential Questions*** How can scientist use exponential functions to predict natural occurring phenomena?
* How do logarithmic functions present themselves in scientific applications?
 | **Unit Enduring Understandings***Students will understand that…** All data is not linear and many situations in economics, finance and science are represented with exponential and logarithmic curves.
* Many real life events can be modeled by mathematical growth or decay models.
 |
| **Unit Objectives***Students will know…** How to graph exponential and logarithmic functions and e
* How to simplify and evaluate logarithms using the properties.
* How to solve exponential and logarithmic equations.
* How to model real-life problems in a variety of content areas with exponential and logarithmic functions.
 | **Unit Objectives***Students will be able to…** Explain why the graphs of exponentials and logarithms do not cross an axis or asymptote.
* Examine a real-life situation and determine if an exponential or logarithmic model can be used.
* Solve exponential and logarithmic equations to evaluate a moment real-life situation.
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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Evidence of Learning** |
| **Formative Assessments** |
| * Observation
* Homework
* Class participation
* Whiteboards/communicators
* Think-Pair-Share
 | * DO-NOW
* Notebook
* Writing prompts
* Exit passes
* Self-assessment
 |
| **Summative Assessments*** Chapter/Unit Test
* Quizzes
* Presentations
* Unit Projects
* Mid-Term and Final Exams
 |
| **Modifications (ELLs, Special Education, Gifted and Talented)*** Teacher tutoring
* Peer tutoring
* Cooperative learning groups
* Modified assignments
* Alternative assessments
* Group investigation
* Differentiated instruction
* Native language texts and native language to English dictionary
* **Follow all IEP modifications/504 plan**
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| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).* Graphing Calculator
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| **Teacher Notes:** |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Summary:** Polynomial and Rational Functions |
| **Domain:** Algebra-Arithmetic with Polynomials and Rational Expressions A-APR Algebra-Seeing Structure in Expressions A-SSE Functions-Interpreting Functions F-IF |
| **Unit Summary** In this unit, students learn to analyze and graph polynomial and rational functions. Students will learn polynomial division and factoring to find real and complex roots. Students will find asymptotes, intercepts and holes of rational functions.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| A-APR-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-SSE-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. *For example, interpret P*(1+*r*)n *as the product* *of P and a factor not depending on P.* |
| A-SSE-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-SSE-3 | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.1. Factor a quadratic expression to reveal the zeros of the function it defines.
 |
| F-IF-7 | c. Graph polynomial functions, identifying zeros when suitablefactorizations are available, and showing end behavior. |
| F-IF-8 | a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. |
| **Number** | **Common Core Standard for Introduction** |
| F-IF-7 | d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. |
| **Unit Essential Questions*** How do you recognize, evaluate and graph polynomial and rational functions?
* What are the various methods one can use to find all the zeros of a polynomial?
* How to use complex numbers to model and solve real-life problems in electronics?
* How to use polynomials to maximize profitability?
 | **Unit Enduring Understandings***Students will understand that…** Analyzing zeros of polynomials relate directly to the graph of that polynomial.
* Looking at real life applications of quadratics and polynomials will enhance their understanding that the world is often not linear.
 |
| **Unit Objectives***Students will know…** How to graph quadratic and polynomial functions.
* How to divide polynomials.
* How to factor polynomials.
* How to find all the zeros of a polynomial.
* How to model real-life problems in a variety of content areas with quadratic and polynomial functions.
 | **Unit Objectives***Students will be able to…** Explain the relevance of the maximum and minimum values of quadratic and polynomial graphs
* Analyze real-life situation and determine if a quadratic or polynomial model can be used.
* Calculate the zeros of a polynomial utilizing a variety of different methods.
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| **Teacher Notes:** |

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| **OCEAN COUNTY MATHEMATICS CURRICULUM****Unit Overview**  |
| **Content Area:** Mathematics  **Grade:** High School |
| **Unit Title:** Analytic Geometry |
| **Domain:** Geometry-Expressing Geometry Properties with Equations G-GPE |
| **Unit Summary** In this unit, students learn to identify and graph conic sections including parabolas, ellipses, circles and hyperbolas. Students learn conics are used to model many real-life situations in construction, planetary science and navigation.**Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.**21st century themes:** The unit will integrate the 21st Century Life and Career standards:CRP2. Apply appropriate academic and technical skills.CRP4. Communicate clearly and effectively and with reasonCRP6. Demonstrate creativity and innovation.CRP7. Employ valid and reliable research strategies.CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.CRP11. Use technology to enhance productivity. |
| **Learning Targets** |
| **Content Standards** |
| **Number** |  **Common Core Standard for Mastery** |
| G-GPE-1 | Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. |
| G-GPE-2 | Derive the equation of a parabola given a focus and directrix. |
| **Number** | **Common Core Standard for Introduction** |
| G-GPE-3 | Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. |
| **Unit Essential Questions*** What is a conic section and how do you use conic sections to model real-life situations?
 | **Unit Enduring Understandings***Students will understand that…** Conic sections have many real-life applications and model many natural phenomenon.
* Looking at real life applications of conics will enhance their idea that the world is not linear.
 |
| **Unit Objectives***Students will know…** How to graph parabola with the vertex, axis of symmetry, directrix and focus.
* How to graph an ellipse including the foci, center, major axis and minor axis.
* How to graph a circle with center and radius.
* How to graph a hyperbola including the foci, vertex and asymptotes.
* How to model real-life problems in a variety of content areas with conics.
 | **Unit Objectives***Students will be able to…** Explain the purpose of the key characteristics of each graph of a conic.
* Analyze a real-life situation and determine if a conic can be used to model that situation.
* Give many areas in science and construction where conics are used.
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