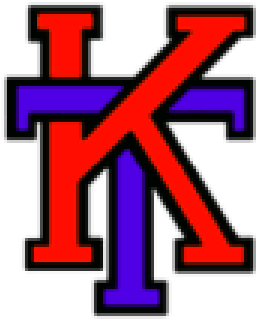
Pre-Calculus & Honors

Elective

Keansburg High School

5 Credits

Full Year



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Statement of Purpose

The Pre-Calculus course continues the studies of functions and graphs, polynomials functions, exponential and logarithmic functions, conic sections, sequences and series, counting principles and probability. The course also introduces new topic areas, including rational functions, trigonometry and limits.

Summary of the Course

The course provides students with the foundation necessary for the rigors of future mathematics courses, including Calculus. This course also helps to prepare students for the SAT Subject Test Mathematics Level 2. This course covers Pre-Calculus topics, including problem-solving in most units. Since portions of Pre-Calculus are at college-level, some of its topics extend beyond the K-12 Mathematics standards. For those topics within scope, there is alignment with the New Jersey Core Curriculum Content Standards.

Pre-Calculus is designed to increase and deepen the understanding of different types of functions, rules, and procedures that were learned in Algebra 2. Students will explore diverse families of functions and how they can be applied to solve real-world problems. The course aid students in the development of the skills to analyze these families of functions to learn about their properties. Students will also explore the topic of Trigonometry and its applications. All of these topics will help to prepare students to take Calculus or other higher-level mathematics. Student's will also fosters academic excellence and responsible citizenship in a positive, safe and respectful environment in order to develop productive contributors to society.

By the end of the year all students will be able to:

- Employ current technology to investigate, create, communicate and produce
- Apply a variety of problem-solving strategies
- Obtain, evaluate, analyze, and apply data
- Read critically and write effectively in mathematics

In order to demonstrate a cohesive and complete implementation plan the following practices will be implemented within the classroom throughout the year:

1. The use of various formative assessments will be used in order to provide an ongoing method of determining the current level of understanding the students have of the material presented.
2. Homework, when assigned will be relevant and reflective of the current teaching taking place in the classroom.
3. Organizational strategies will be in place that allow the students the ability to take the information gained in the classroom and put in in terms that are relevant to them.
4. Instruction will be differentiated to allow students the best opportunity to learn.
5. Assessments will be varied and assess topics of instruction delivered in class.
6. Modifications to the curriculum will be included that address students with Individualized Educational Plans (IEP), English Language Learners (ELL), and those requiring other modifications (504 plans).
7. For those students who are classified as Gifted and Talented, there will be differentiated anchor activities that foster project based learning.

Pacing Guide

Unit	Timeframe	Title of Unit
	# of Blocks/Weeks	
	18 Days	Review of Algebra Skills
1	25 Days	Functions and Graphs
2	25 Days	Polynomial and Rational Functions
3	15 Days	Exponential and Logarithmic Functions
4	35 Days	Trigonometry and Solving Triangles
5	16 Days	Analytic Trigonometry
6	20 Days	Matrices and Systems
7	15 Days	Conic Sections

Review of Algebra Skills

Summary of the Unit: Algebraic concepts are built from basic set properties which can be applied to various sets of numbers. The basic laws of integer exponents can be extended to rational exponents. Rational exponents can be used to rewrite radical expressions. Polynomials can be rewritten in factored form. Quadratic equations and inequalities can always be solved, even if the quadratic is not factorable. More complex equations require techniques that remove the variable from its construct (e.g., radical, fraction or absolute value symbol). Polynomial and rational inequalities are solved by finding critical values and testing intervals.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): How are different sets of numbers (natural numbers, real numbers, integers, etc.) related? What is the meaning of a rational exponent? a negative exponent? How can radical forms be converted exponential forms and vice-versa? What transformations produce equivalent equations and inequalities? How can solutions to linear inequalities be graphically represented on a number line? What is the meaning of absolute value? How can linear equations and inequalities be applied to the solution of word problems?

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #1
Quizzes

Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	**Suggested Timeline per topic**	**General Objectives**	**Instructional Activities**	**New Jersey Student Learning Standards/ NGSS, etc.**
Exponents and Radicals	1 block	Students will be able to: Simplify expressions with exponents and radicals. Use exponential notation. Multiply, divide, add, or subtract radical expressions. Find special products including sum and difference of same terms, square and cube of a binomial.	Group students to review laws of integer and rational exponents. Students will work with a partner in order to complete a differentiated scavenger hunt around the room. Problems have been tired to meet students readiness, while also getting them up and out of their seats. Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	N.RN.1,2
Polynomials: Special Products and Factoring	2 blocks	Students will be able to:	Have students summarize in words how to solve a quadratic equation using complete the square.	REI.4b Solve quadratic equations by inspection (e.g., for), taking

		Factor polynomials with a common factor. Identify and factor special types of polynomials including trinomial square, difference of squares, and sum or difference of cubes. Solve equations using factoring, square root principle, completing the square, and quadratic formula.	Have students develop a chart summarizing the meaning of the discriminant (value / number of solutions / type of solutions). Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as for real numbers and . F.IF.8a 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.
Fractional Expressions	1 block	Students will be able to: Reduce, multiply, divide, subtract, and combine rational expressions. Simplify compound fractions.	Worksheets to identify the Least Common Multiple or Denominator (LCM / LCD) Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	A.APR.6 Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the more complicated examples, a computer algebra system. A.APR.7 (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the more complicated examples, a computer algebra system.

Solving Equations and Inequalities	1 block	Students will be able to: Solve equations involving radicals and absolute value. Solve inequalities and give the answers in interval notation. Identify and avoid common algebraic errors.	Worksheets to convert interval notation to inequality notation. Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	A.CED.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.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.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. A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.4 Solve quadratic equations by inspection (e.g., for), taking square

				roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as for real numbers and . A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations and intersect are the solutions of the equation ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, 504, English Language Learners, Bilingual, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Modifications will be made on an individual student basis, as needed. Modifications will be selected from the following list and indicated in weekly lesson plans based on the following:

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows)

on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

1=Brief responses 2=Advance notice of testing 3=Assistive augmentative devices 4=Class subject notes 5=Cooperative learning 6=Encourage self-monitoring 7=Encourage student accountability 8=Have student repeat directions 9=Homework/Classwork modified as needed 10=Individual instruction 11=Material format adaptations 12=Modify spelling list 13=Peer assistance 14=Provide additional time 15=Provide good oral models 16=Preferential seating 17=Reduced assignments 18=Re-test after learned concepts 19=Structured monitored setting 20=Supplemental materials 21=Use oral and printed directions 22=Use highlighter 23=Use positive reinforcement 24=Use tracking sheet 25=Use visual prompts or cues 26=Utilize peer models 27=Word banks

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for “can do’s” as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

English Language Learners will be provided interventions that will include but not be limited to: hard-copy on notes and other assignments for use with translating software including Google Translate, extra time on assignments and assessments as needed.

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring

will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Additionally resources and extension activities will be posted on Google Classroom in order to encourage students to reflect of their learning and expand on their knowledge.
All students will be capable of operating a Ti-84 Plus graphing calculator.
All students will be able to operate Desmos.com and Geogebra, when needed, in order to visualize pre-calculus concepts.

Interdisciplinary Connections, Career Ready Practices, & 21st Century Connections:

The primary focus of this course is to allow students to connect concepts learned in the classroom to activities and situations in the real world. Applications to english, art and science will be made through a variety of projects and explorations.

ELA:
W.AW.6.1 Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

L.SS.11-12.1. Demonstrate command of the system and structure of the English language when writing or speaking.

Climate Change Example: Students may rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations. (A.CED.A.4)

Career Readiness, Life Literacies, and Key Skills Practices
CRP1. Act as a responsible and contributing citizen and employee. **(Do Now/Homework)**
CRP2. Apply appropriate academic and technical skills. **(Guided practice)**
CRP4. Communicate clearly and effectively and with reason. **(Independent Practice/Group Work)**
CRP6. Demonstrate creativity and innovation. **(Guided/Independent Practice/Group Work)**

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. **(Guided/Independent Practice)**
CRP9. Model integrity, ethical leadership and effective management. **(Do Now/Homework)**
CRP11. Use technology to enhance productivity. **(Guided/Independent Practice)**
CRP12. Work productively in teams while using cultural global competence **(Group Work)**

9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.
9.4.12.IML.5 Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)

Unit 1: Functions and Graphs

Summary of the Unit: Functions are an important topic in the study of mathematics. Functions may be defined and described in various ways one of which is a two-dimensional graph generated from a table of input/output values. Two functions can be combined to produce functions that are more complex. Such combinations impact the graph, domain, and range of the functions. Functions can be inverted to create new functions. Linear functions and those involving variation can be used to model real world problems.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): What is the equation of a line given partial information? What are some key characteristics of the graph of a quadratic function and how are they related to the coefficients of the equation? What techniques and methods can be used to find the roots of higher degree polynomial functions? What is the Fundamental Theorem of Algebra? How do you determine the end-behavior of polynomial graphs? How do you detect the degree of a polynomial? How is a rational function graphed? How are the domains of rational functions determined? How are graphing calculators used to visualize and verify results?

Summative Assessments
Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #1

Roller Coaster Assessment:
Students will work as a class in order to analyze a graph representing the side view of a roller coaster. Students will focus on where the roller coaster increases and decreases, how steep it is, and where it changes direction.
Once students feel comfortable connecting their knowledge to the real world application, they will create a roller coaster of their own. Students will also need to discuss the height and width of the roller coaster, in addition to the specifics discussed in the class example.
A holistic rubric will be used in order to review and grade student learning.

Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	**Suggested Timeline per topic**	**General Objectives**	**Instructional Activities**	**New Jersey Student Learning Standards/ NGSS, etc.**

Function Characteristics	5 block	Students will be able to: Determine the domain, range and zeros of a function, and sketch the graph. Identify extrema, critical points, and inflection points. Identify intervals of of increasing, decreasing, and concavity. Calculate the rate of change. Determine the symmetry and end behavior of the function.	Use graphing calculators to visualize functions. Pair students to analyze graphs to identify intervals of increase, decrease, and zeros. Students will complete a choice board, differentiated based on Bloom's taxonomy, on vocabulary for this unit. Students will work as a class in order to take interactive notes on domain & range. Students will glue various graphs into their notebook and use a marker to identify the x and y-values that are not part of the graph. By eliminating excess numbers, students will have an easier time identifying the numbers that exist in the domain and range. Students will work in learning teams in order to solve a real world word problem requiring the use of the fundamental theorem of algebra. Problems will be assigned based on student interest. One group member will be responsible for solving the problem. Once group member will be responsible for explaining the meaning of the answer, and the third group member will be responsible for creating the final product and checking all of the work for accuracy. Students will play end behavior “Simon Says” in order to kinesthetically demonstrate their understanding of the topic. Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If is a function and x is an element of its domain, then denotes the output of f corresponding to the input x. The graph of is the graph of the equation . F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F.IF.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. F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F.IF 6 6Calculate 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. N.Q. 1, 2, 3 1.Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. 2.Define appropriate quantities for the purpose of descriptive modeling. 3.Choose a level of accuracy appropriate to limitations on

				measurement when reporting quantities.
Functions and Graphs of Functions	3 blocks	Students will be able to: Depict parent functions verbally, algebraically, and graphically. Explore standard transformations (stretches, shifts, and reflections) on standard graphs.	Have students graphically show the addition, subtraction and composition of functions. Start with a basic function like y = |x| and working in pairs write equations that stretch, shrink, translate and reflect the function. Students will work with a partner in order to come up with a way to remember each of the parent functions. They will share their ideas with the class. As a class we will choose one "nickname" for each function in order to help us remember. Students will participated in a lesson differentiated by process, choice and learning modality. Their choices will be as follows: - Students will watch a pre-selected variety of YouTube videos and take notes on the topic. They will then work individually to complete a few practice problems. - Students will read the section in the textbook and take notes. Students will then work in partners in order to complete practice problems. - Students will work with the teacher in order to take interactive notes and complete practice problems. - Students will work individually on a selection of practice problems with an additional choice of anchor activities. Honors Extension: In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.IF. 7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). F.BF. 1, 3, 4, 5 1.Write a function that describes a relationship between two quantities. a.Determine an explicit expression, a recursive process, or steps for calculation from a context. b.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. c.(+) Compose functions. For example, if is the temperature in the atmosphere as a function of height, and is the height of a weather balloon as a function of time, then is the temperature at the location of the weather balloon as a function of time. 2.Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

				B. Build new functions from existing functions 3.Identify the effect on the graph of replacing by , , , and 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. 4.Find inverse functions. a. Solve an equation of the form for a simple function f that has an inverse and write an expression for the inverse. For example, or for . b.(+) Verify by composition that one function is the inverse of another. c.(+) Read values of an inverse function from a graph or a table, given that the function has an inverse. d.(+) Produce an invertible function from a non-invertible function by restricting the domain. 5.(+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents. F.TF. 1, 2, 3, 5 A.SSE. 3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. A.SSE. 4 (+) Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

				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 A.APR.2Know and apply the Remainder Theorem: For a polynomial and a number , the remainder on division by is , so if and only if is a factor of . A.APR.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. A.APR.4 (+)Prove polynomial identities and use them to describe numerical relationships. A.REI. 11 Explain why the x-coordinates of the points where the graphs of the equations and intersect are the solutions of the equation ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic
Combinations of Functions	2 blocks	Students will be able to: Write the equation and identify the domain of the composite of two functions.	Students will work as a class in order to grasp the understanding of a piecewise function. The class will work together in order to generate written steps on graphing piecewise functions. Working in groups of three or four, students will create piecewise functions and switch graphs. Each student will graph the function their classmate gave to them.	F.BF.5 (+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents.

		Test for one-to-one functions. Students will be able to graph and interpret absolute value and piecewise functions.	Students will be given a graphical display of a piecewise function. They will work in small groups in order to match the graphs to their functions. (Different groups will be given different matching materials based in their learning styles.) Students will work as a class to determine the difference between composing functions and decomposing functions. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	
Inverse Functions	1 block	Students will be able to: Find the equation and sketch the graph of the inverse of a function.	Visualize inverse functions by graphing. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF.1,2,3 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, 504, English Language Learners, Bilingual, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Modifications will be made on an individual student basis, as needed. Modifications will be selected from the following list and indicated in weekly lesson plans based on the following:

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1=Brief responses 2=Advance notice of testing 3=Assistive augmentative devices 4=Class subject notes 5=Cooperative learning 6=Encourage self-monitoring 7=Encourage student accountability 8=Have student repeat directions 9=Homework/Classwork modified as needed 10=Individual instruction 11=Material format adaptations 12=Modify spelling list 13=Peer assistance 14=Provide additional time 15=Provide good oral models 16=Preferential seating 17=Reduced assignments 18=Re-test after learned concepts 19=Structured monitored setting 20=Supplemental materials 21=Use oral and printed directions 22=Use highlighter 23=Use positive reinforcement 24=Use tracking sheet 25=Use visual prompts or cues 26=Utilize peer models 27=Word banks

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

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Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

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All students will be capable of operating a Ti-84 Plus graphing calculator.
All students will be able to operate Desmos.com and Geogebra, when needed, in order to visualize pre-calculus concepts.

Interdisciplinary Connections, Career Ready Practices, & 21st Century Connections:

The primary focus of this course is to allow students to connect concepts learned in the classroom to activities and situations in the real world. Applications to english, art and science will be made through a variety of projects and explorations.

ELA:
W.AW.6.1 Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

L.SS.11-12.1. Demonstrate command of the system and structure of the English language when writing or speaking.

21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

CRP1. Act as a responsible and contributing citizen and employee. **(Do Now/Homework)**
CRP2. Apply appropriate academic and technical skills. **(Guided practice)**
CRP4. Communicate clearly and effectively and with reason. **(Independent Practice/Group Work)**
CRP6. Demonstrate creativity and innovation. **(Guided/Independent Practice/Group Work)**
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. **(Guided/Independent Practice)**
CRP9. Model integrity, ethical leadership and effective management. **(Do Now/Homework)**
CRP11. Use technology to enhance productivity. **(Guided/Independent Practice)**
CRP12. Work productively in teams while using cultural global competence **(Group Work)**

9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.
9.4.12.IML.5 Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)

Unit 2: Polynomial and Rational Functions

Summary of the Unit: Quadratic functions produce parabolic curves. Higher level polynomial functions produce smooth curves which cross the x-axis at the function's zeros or roots. Complex numbers extend the real number system to represent the roots of polynomial functions that do not cross the x-axis when the function is graphed. Rational functions include domain issues and their graphs display asymptotic behavior.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Summative Assessments
Alternative Assessments

Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #2
Mario Brothers Assessment:
Students will work in cooperative teams in order to create quadratic equations that model various situations in Mario Brothers.
Students will create equations, determine if specified equations allow Mario to reach his destination.

Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus

Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
Quadratic Functions	2 blocks	Students will be able to: Sketch parabolas. Write equations of quadratic functions in standard form. Use the Intermediate Value Theorem to help locate real roots or zeros.	From graphs or equations have students generate a chart indicating, the graph or equation direction of opening, vertex, max or min, axis of symmetry, intercepts Use graphing calculators to visualize quadratic functions. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Polynomial Functions	4 blocks	Students will be able to: Graph polynomial functions, including their end behavior. Use the Rational Root Theorem to identify potential rational roots and use synthetic division to test those roots. Write polynomial equations given the roots. Use the Fundamental Theorem of Algebra to	Students will be introduced to their interactive technology project, in which students will research and create a 21st century presentation on a graph of a polynomial using the numbers from their birth date. Function aerobics. Game: guess the type and number of roots from the graph of an equation. Use graphing calculators to visualize higher degree polynomial functions. Use graph paper to sketch polynomials functions. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four	A.APR.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. A.APR.C.4(+)Prove polynomial identities and use them to describe numerical relationships. A.APR.6 Rewrite simple rational expressions in different forms; write in the form , where , , , and are polynomials with the degree of less than the degree of using inspection, long division, or, for the

		find zeros of a polynomial function.	of these requirements must be meet with and without the assistance of a graphing calculator.	more complicated examples, a computer algebra system. F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
Rational Functions	4 blocks	Students will be able to: Find the domain and range, vertical and horizontal asymptotes, and sketch the graph of a rational function.	Students will work together in order to better understand asymptotes via and interactive powerpoint. Working in teams, have students identify domain and any asymptotes for a given rational function. Sketch the resulting function and confirm results using a graphing calculator. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, 504, English Language Learners, Bilingual, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

Modifications will be made on an individual student basis, as needed. Modifications will be selected from the following list and indicated in weekly lesson plans based on the following:

Students with Disabilities & 504: Utilize modifications & accommodations delineated in the students' IEP. Work with paraprofessional, Work with a partner, Shorten assignments to focus on mastery or key concepts, Maintain adequate space between desks, Keep workspaces clear of unrelated materials, Provide fewer problems to, attain passing grades, Create a math journal that they can use during class, on assignments and (if teacher allows) on assessments, Provide extra time to complete a task when needed, Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Modifications, alternative assessments, and scaffolding strategies will be used to support this learning. Provide definitions of different graphs / charts with illustrations, Allow tests to be taken in a separate room, Allow students to use a calculator when appropriate, Divide test/exam into small sections of similar questions or problems.

1=Brief responses 2=Advance notice of testing 3=Assistive augmentative devices 4=Class subject notes 5=Cooperative learning 6=Encourage self-monitoring 7=Encourage student accountability 8=Have student repeat directions 9=Homework/Classwork modified as needed 10=Individual

instruction 11=Material format adaptations 12=Modify spelling list 13=Peer assistance 14=Provide additional time 15=Provide good oral models 16=Preferential seating 17=Reduced assignments 18=Re-test after learned concepts 19=Structured monitored setting 20=Supplemental materials 21=Use oral and printed directions 22=Use highlighter 23=Use positive reinforcement 24=Use tracking sheet 25=Use visual prompts or cues 26=Utilize peer models 27=Word banks

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

English Language Learners will be provided interventions that will include but not be limited to: hard-copy on notes and other assignments for use with translating software including Google Translate, extra time on assignments and assessments as needed.

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Additionally resources and extension activities will be posted on Google Classroom in order to encourage students to reflect of their learning and expand on their knowledge.
All students will be capable of operating a Ti-84 Plus graphing calculator.
All students will be able to operate Desmos.com and Geogebra, when needed, in order to visualize pre-calculus concepts.

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Unit 3: Exponential and Logarithmic Functions

Summary of the Unit: Exponential and logarithmic functions are inverses of each other. Properties of exponents and logarithms are closely related and can be used to simplify expressions and solve equations. Many applications can be modeled using exponential or logarithmic functions.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): What is the meaning of rational exponents? What is the equation of an exponential function given partial information? How can population growth, compound interest and radioactive decay be modeled using exponential functions? What is the natural base? What is a logarithm? How are exponential and logarithmic functions related? What basic operations apply to logarithms?

Summative Assessments
Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

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Benchmark #3
Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
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Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
Exponential Functions	4 blocks	Students will be able to: Define and graph exponential functions. Solve exponential equations. Use exponential functions in applications.	Use graphing calculators to visualize exponential functions. Explore compound interest and growth/decay applications. Use a table or chart to explore the value of 'e'.	F.BF.5 (+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents.
Logarithmic Functions	6 blocks	Students will be able to: Define and graph logarithmic functions. Apply the properties of logarithms. Solve logarithmic equations. Use logarithmic functions in applications.	Use graphing calculators to visualize logarithmic functions. Use graph paper to plot logarithmic functions. Use board graphs. Pair students to discuss applications of logarithms. Students will work with a partner in order to play "logarithm war." The game has been tiered for individual students. Throughout the game students will solve differentiated questions in order to determine who will win the "war." <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.BF.5 (+) Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents.

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Suggested Technological Innovations/ Use:

8.1.12.A.2 Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

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CRP6. Demonstrate creativity and innovation. **(Guided/Independent Practice/Group Work)**
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. **(Guided/Independent Practice)**
CRP9. Model integrity, ethical leadership and effective management. **(Do Now/Homework)**
CRP11. Use technology to enhance productivity. **(Guided/Independent Practice)**
CRP12. Work productively in teams while using cultural global competence **(Group Work)**

9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving. **(Guided/Independent Practice)**
9.1.12.C.2 Compare and compute interest and compound interest and develop an amortization table using business tools. **(Guided/Independent Practice)**
9.1.12.C.3 Compute and assess the accumulating effect of interest paid over time when using a variety **(Guided/Independent Practice)**
9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.

Unit 4: Trigonometry and Solving Triangles

Summary of the Unit: Angles can be measured in revolutions, degrees or radians. The six trigonometric functions can be extended to angles of any measure using the circular definition and periodic nature of trigonometric functions. Trigonometric functions can be transformed by translation, reflection or non-rigid stretches or shrinks. Non-rigid transformations result in period or amplitude changes whereas horizontal translations are called phase shifts. Restricting the domains of trigonometric functions allows us to define inverse trigonometric functions. Trigonometry is extended using the Law of Sines and Law of Cosines to solve or find the area of oblique (non right) triangles. Because the sine values for acute and obtuse angles are positive, there can be ambiguity in applying the Law of Sines. Navigation and surveying are common applications of trigonometry.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): How can you convert between degree and radian angle measure? What are the domains, ranges, and periods of the six trigonometric functions? How can standard transformations be applied to trigonometric graphs? What is the unit circle and how is it used to determine the trigonometric values for key angles? What are reference angles? Why do the domains of the trigonometric functions need to be restricted before the

inverse functions can be found? How do you evaluate the compositions of trigonometric functions and their inverses? What cases are insufficient or ambiguous for solving a triangle? When do we use the Law of Sines to solve an oblique triangle? When do we use Law of Cosines? How are these laws applied in navigation and surveying applications? How can we prove the Law of Sines and the Law of Cosines?

Summative Assessments
Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #2
Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
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**Please include resource links in the boxes above.*

Topic/ Selection	**Suggested Timeline per topic**	**General Objectives**	**Instructional Activities**	**New Jersey Student Learning Standards/ NGSS, etc.**
Trigonometric Functions	4 blocks	Students will be able to: Understand angles as a measure of rotation and express in terms of degree and radian measures. Evaluate trigonometric functions using the unit circle, right triangles, and any angle.	Explore in groups the meaning of a radian using pipe cleaners. Introduce the topic of arcs by discussing *great circle* routes that are traveled by airplanes. Use graphing calculator functions or programmed solutions to convert between types of angle measures. Develop trigonometric values from standard triangles and map to the unit circle. Have students summarize in words how to use a reference angle to find an angle's trigonometric value. Have students a create table of key angles in degree and radian, with their corresponding sine and cosine values. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number. TF.A.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. TF.B. 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. 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.
Graphs of Trigonometric Functions	4 blocks	Students will be able to:	Use applet-based, interactive web resources to visualize the sine wave.	F.TF.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and

		Construct graphs of sine, cosine, tangent, cotangent, secant, and cosecant functions. Identify the period, amplitude, domain and range of the six trigonometric functions. Identify whether a given trigonometric function is even or odd. Apply transformations to trigonometric functions, and understand impact on period, amplitude, and other aspects.	Form small groups to discuss restrictions on the domains and ranges of the six trigonometric functions. Create a summary table including this data, along with periodicity, even/odd, and a sketch of the graph. In small groups, sketch graphs of transformed sine, cosine and tangent curves. For each of the six trigonometric functions, construct tables of values to do board graphing of the functions and its inverses. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number. TF.A.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. 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. F.IF.C.7f (+)Graph trigonometric functions, showing period, midline, and amplitude. F.TF.B.5 (+) 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. F.BF. 1c (+) Compose functions. For example, if is the temperature in the atmosphere as a function of height, and is the height of a weather balloon as a function of time, then is the temperature at the location of the weather balloon as a function of time. F.BF. 4.Find inverse functions. b.(+) Verify by composition that one function is the inverse of another. c.(+) Read values of an inverse function from a graph or a table, given that the function has an inverse. d.(+) Produce an invertible function from a non-invertible function by restricting the domain.

Applications of Trigonometry	4 blocks	Students will be able to: Understand the meaning of function and inverse and how to apply them to trigonometric functions. Apply trigonometry to solve real-world problems, including ones involving angle of elevation and angle of depression.	Introduce applications in engineering (e.g., bridge struts). Role play angle of elevation and depression. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF. 1-9 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number. 4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. B. Model periodic phenomena with trigonometric functions 5. (+) Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. 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. 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. C. Prove and apply trigonometric identities 8. (+) Prove the Pythagorean identity and use it to find , or given , or and the quadrant of the angle.

				9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. F.IF.C.7f (+)Graph trigonometric functions, showing period, midline, and amplitude. F.TF.B.5 (+) 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.
Law of Sines and Law of Cosines	3 blocks	Students will be able to: Use the Law of Sines to find the unknown parts of an oblique triangle. Use the Law of Cosines to find the unknown parts of an oblique triangle.	PowerPoint presentations Develop understanding of SSA ambiguous case through a compass/ruler activity. Work in teams to solve navigation problems. Present results to the entire class. Students will work with their collaborative learning groups in order to complete practice problems. (Each member of the group will use a different colored marker in order to identify his or her work.) <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF. 1-9 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number. 4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. B. Model periodic phenomena with trigonometric functions

				5. (+) Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. 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. 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. C. Prove and apply trigonometric identities 8. (+) Prove the Pythagorean identity and use it to find , or given , or and the quadrant of the angle. 9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
Area of a Triangle	2 blocks	Students will be able to: Use trigonometry to find the area of an oblique triangle (SAS and SSS). Use trigonometry to solve navigation and surveying problems.	Work in teams to solve surveying problems. Present results to the entire class. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF. 1-9 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for

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**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

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*Consistent with individual plans, when appropriate.

Modifications will be made on an individual student basis, as needed. Modifications will be selected from the following list and indicated in weekly lesson plans based on the following:

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1=Brief responses 2=Advance notice of testing 3=Assistive augmentative devices 4=Class subject notes 5=Cooperative learning 6=Encourage self-monitoring 7=Encourage student accountability 8=Have student repeat directions 9=Homework/Classwork modified as needed 10=Individual instruction 11=Material format adaptations 12=Modify spelling list 13=Peer assistance 14=Provide additional time 15=Provide good oral models 16=Preferential seating 17=Reduced assignments 18=Re-test after learned concepts 19=Structured monitored setting 20=Supplemental materials 21=Use oral and printed directions 22=Use highlighter 23=Use positive reinforcement 24=Use tracking sheet 25=Use visual prompts or cues 26=Utilize peer models 27=Word banks

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

English Language Learners will be provided interventions that will include but not be limited to: hard-copy on notes and other assignments for use with translating software including Google Translate, extra time on assignments and assessments as needed.

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print

and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Additionally resources and extension activities will be posted on Google Classroom in order to encourage students to reflect of their learning and expand on their knowledge.
All students will be capable of operating a Ti-84 Plus graphing calculator.
All students will be able to operate Desmos.com and Geogebra, when needed, in order to visualize pre-calculus concepts.

Interdisciplinary Connections, Career Ready Practices, & 21st Century Connections:

The primary focus of this course is to allow students to connect concepts learned in the classroom to activities and situations in the real world. Applications to english, art and science will be made through a variety of projects and explorations.

ELA:
W.AW.6.1 Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

L.SS.11-12.1. Demonstrate command of the system and structure of the English language when writing or speaking.

21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

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CRP2. Apply appropriate academic and technical skills. **(Guided practice)**
CRP4. Communicate clearly and effectively and with reason. **(Independent Practice/Group Work)**

CRP6. Demonstrate creativity and innovation. **(Guided/Independent Practice/Group Work)**
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. **(Guided/Independent Practice)**
CRP9. Model integrity, ethical leadership and effective management. **(Do Now/Homework)**
CRP11. Use technology to enhance productivity. **(Guided/Independent Practice)**
CRP12. Work productively in teams while using cultural global competence **(Group Work)**

9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.
9.4.12.IML.5 Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)

Unit 5: Analytic Trigonometry

Summary of the Unit: Fundamental trigonometric identities, sum and difference formulas together with algebraic techniques are used to simplify expressions, prove identities and solve equations. When trigonometric equations are solved an angle measure is the result.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): How can new trigonometric identities be proven using a set of fundamental trigonometric identities or simplifying trigonometric expressions? How can quadratic techniques be used to solve a trigonometric equation? How can trigonometric equations be solved within a specific interval or across all real numbers?

Summative Assessments
Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #3
Quizzes
Test
Problem-solving
Students will write trig equations for a classmate to solve on the whiteboard. After students feel comfortable with the questions they will be challenge to write a "challenge" equation. If no one in the class can solve their equation, but they can, they will receive tickets.

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
Fundamental Trigonometric Identities	3 blocks	Students will be able to: Use Fundamental Trigonometric Identities to simplify trigonometric expressions. Use Fundamental Trigonometric Identities to verify trigonometric identities.	Have students work in groups to verify new identities and present their findings to the entire class. Students will work in small groups in order to solve real world application problems on white boards. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF. 1-9 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent for , and in terms of their values for , where is any real number. 4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. B. Model periodic phenomena with trigonometric functions 5. (+) Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. 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. 7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate

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Sum and Difference Formulas	2 blocks	Students will be able to: Simplify and evaluate expressions using sum, difference, and double angle formulas. Prove identities and solve equations using sum, difference, and double angle formulas.	To discourage common errors, have students work in groups to give examples of why $\tan(x + y) \neq \tan(x) + \tan(y)$, etc. Use formulas to solve more complex trigonometric equations. Visualize solutions to multiple trigonometric inequalities by graphing. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF.9(+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
Solving Trigonometric Equations	4 blocks	Students will be able to: Use Fundamental Trigonometric Identities to solve equations. Use quadratic techniques to solve trigonometric equations.	Group students to review solving polynomial equations. Then make mathematical connections to solving similar trigonometric equations. Students will be shown the problems they are expected to solve. From these problems they will be asked to choose 3 problems they would like the teacher to solve on the board. After watching the teacher solve these three problems the students will work as a group in order to solve the remaining problems. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	F.TF. 1-9 1. (+) Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. 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. 3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for , and and use the unit circle to express the values of sine, cosines, and tangent

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and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

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The primary focus of this course is to allow students to connect concepts learned in the classroom to activities and situations in the real world. Applications to english, art and science will be made through a variety of projects and explorations.

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CRP2. Apply appropriate academic and technical skills. **(Guided practice)**
CRP4. Communicate clearly and effectively and with reason. **(Independent Practice/Group Work)**

CRP6. Demonstrate creativity and innovation. **(Guided/Independent Practice/Group Work)**
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. **(Guided/Independent Practice)**
CRP9. Model integrity, ethical leadership and effective management. **(Do Now/Homework)**
CRP11. Use technology to enhance productivity. **(Guided/Independent Practice)**
CRP12. Work productively in teams while using cultural global competence **(Group Work)**

9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.

Unit 6: Matrices and Systems

Summary of the Unit: The unit opens with an introduction to matrices and matrix notation. Students are guided through the process to describe the dimensions of a matrix and how to identify a specific entry in a matrix. The unit then covers scalar multiplication followed by the process to add/subtract matrices. Students then learn the process to solve for missing values in a given matrix using arithmetic operations. The unit transitions to the constraints and process for multiplying matrices. Students then learn the process for finding the determinant of 2x2 and 3x3 matrices; including Cramer's Rule. This leads to finding the inverse of 2x2 and 3x3 matrices. The unit concludes with the process to solve systems of equations using matrices.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): How can matrices be manipulated/transformed? What constraints must matrices meet in order to be added, subtracted, or multiplied. How are determinants of matrices related to scalar multiplication? How can matrices be used to solve systems of equations?

Summative Assessments

Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

1. Problem-based learning
2. Teacher directed
3. Cooperative groups
4. Technology
5. Participation and discussion
6. Homework
7. Classwork
8. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #4
Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
Introductions to Matrices	1 Day	Students will be able to describe matrices based on their dimensions. Students will be able to utilize matrix notation to describe a matrix and identify specific entries in a matrix.	<u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	A.REI.05(+) Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A.REI.06 Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables. A.REI.07 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. A.REI.08 (+)Represent a system of linear equations as a single matrix equation in a vector variable. A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations and intersect are the solutions of the equation ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where and/or are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

				A.REI.12 Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. N.VM.06 (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. HSN.VM.C.7 (+)Multiply matrices by scalars to produce new matrices, e.g., N.VM.08 (+)Add, subtract, and multiply matrices of appropriate dimensions. N.VM.09 (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. N.VM.10 (+)Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
Scalar Multiplication	1 Day	Students will be able to evaluate scalar multiplication for any given matrix.		HSN.VM.C.7 (+)Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
Matrix Addition and Subtraction	2 Days	Students will be able to add/subtract matrices.		HSN.VM.08(+)Add, subtract, and multiply matrices of appropriate dimensions.

Matrix Multiplication	3 Days	Students will be able to multiply matrices. Students will be able to determine if two matrices can be multiplied. Students will be able to perform multiple arithmetic operations on given matrices.		HSN.VM.08(+)Add, subtract, and multiply matrices of appropriate dimensions. HSN-VM.11(+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
The Determinant of 2x2 and 3x3 Matrices	2 Days	Students will be able to evaluate the determinant of 2x2 and 3x3 matrices. Students will be able to evaluate the determinant of 3x3 matrices using Cramer's Rule.		HSN-VM.9(+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. HSN-VM.10(+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
Finding the Inverse of 2x2 and 3x3 Matrices	2 Days	Students will be able to find the inverse of 2x2 and 3x3 matrices. Students will be able to prove two matrices are inverses by confirming their product results in an identity matrix.		A.REI.09(+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3×3 or greater).
Solving Systems of Equations Using Matrices	3 Days	Students will be able to utilize matrix operations to solve systems of equations. Students will be able to utilize Cramer's rule to		HSA-SSE.1.A Interpret parts of an expression, such as terms, factors, and coefficients. HSA-SSE.2 Use the structure of an expression to identify ways to rewrite it.

		solve systems of equations.		

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1=Brief responses 2=Advance notice of testing 3=Assistive augmentative devices 4=Class subject notes 5=Cooperative learning 6=Encourage self-monitoring 7=Encourage student accountability 8=Have student repeat directions 9=Homework/Classwork modified as needed 10=Individual instruction 11=Material format adaptations 12=Modify spelling list 13=Peer assistance 14=Provide additional time 15=Provide good oral models 16=Preferential seating 17=Reduced assignments 18=Re-test after learned concepts 19=Structured monitored setting 20=Supplemental materials 21=Use oral and printed directions 22=Use highlighter 23=Use positive reinforcement 24=Use tracking sheet 25=Use visual prompts or cues 26=Utilize peer models 27=Word banks

English Language Learners: Teaching modeling, Peer modeling, Word walls, Give directions in small steps and in as few words as possible, Provide visual aids, Group similar problems together, Repeat directions when necessary, Provide a vocabulary list with definitions. Students will be supported according to the recommendations for "can do's" as outlined by WIDA - https://www.wida.us/standards/CAN_DOs/

English Language Learners will be provided interventions that will include but not be limited to: hard-copy on notes and other assignments for use with translating software including Google Translate, extra time on assignments and assessments as needed.

Bilingual: Repetition, simplify language (use shorter phrases), visual word banks, limited use of idioms, metaphors and words with multiple meanings, use of cognates. Use realia (concrete objects), dramatization (gestures, facial expressions, intonation), built on students background knowledge (topics/examples students can relate to), texts that reflect their experiences, extended time, provide samples (teacher and students created), model, pair with with partner.

Gifted Students: Inquiry based instruction, Independent study, Higher order thinking skills, Adjusting the pace of the lessons, Real world scenarios, Student driven instruction, Allow students to complete an independent project as an alternative test.

RTI: Use visual demonstrations, illustrations and models, Give directions / instructions verbally and in simple written format, Peer support, Increased one – on – one time, Teachers may modify instructions by modeling what the student is expected to do, Instructions may be printed out in large print and hung up for the students to see during the time of the lesson, Review behavior expectations and make adjustments, Create a math journal that they can use during class, on assignments. Formative and summative data will be used to monitor student success. Student work and progress monitoring will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. More time will be made available with a teacher to support students in reaching the standards.

Suggested Technological Innovations/ Use:

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Additionally resources and extension activities will be posted on Google Classroom in order to encourage students to reflect of their learning and expand on their knowledge.
All students will be capable of operating a Ti-84 Plus graphing calculator.
All students will be able to operate Desmos.com and Geogebra, when needed, in order to visualize pre-calculus concepts.

Interdisciplinary Connections, Career Ready Practices, & 21st Century Connections:

The primary focus of this course is to allow students to connect concepts learned in the classroom to activities and situations in the real world. Applications to English, art and science will be made through a variety of projects and explorations.

ELA:

W.AW.6.1 Write arguments on discipline-specific content (e.g. social studies, science, math, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

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21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

CRP1. Act as a responsible and contributing citizen and employee. **(Do Now/Homework)**
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9.1.12.A.3 Analyze the relationship between various careers and personal learning goals.
9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it including educational training requirements costs and possible debt.

Unit 7: Conic Sections

Summary of the Unit: Four quadratic relations are created by the intersection of a plane and cone. These "conic sections" are the parabola, the circle, the ellipse, and the hyperbola. The characteristics and concepts of conic sections can be applied to many real life applications.

Assessment and/ or Summative Criteria to Demonstrate Mastery of the Unit:

Essential Question(s): How are parabolas, circles, ellipses, and hyperbolas described using equations? What are some key characteristics of the graphs of the four conic sections? How can equations of conic sections be written given partial information? How are systems of linear-quadratic equations and systems of quadratic-quadratic equations solved and what are the possible solutions?

Summative Assessments

Alternative Assessments
Formative Assessments

Performance Tasks: Activities to provide evidence for student learning of content and cognitive skills.

9. Problem-based learning
10. Teacher directed
11. Cooperative groups
12. Technology
13. Participation and discussion
14. Homework
15. Classwork
16. Authentic Assessments

Other Evidence of Mastery (Summative): Student proficiency (for a specific unit or multiple units) is defined for the individual at 70% or better; for the class: 85% of the students attain the established minimum standard; an exemplar or rubric should be referenced and included in the Evaluation Section.

Benchmark #4
Quizzes
Test
Problem-solving

Honors Extension:
Oral/verbal Presentation

Instructional Materials:

Teacher Generated Materials
Graphing Calculator Ti-84 Plus
Carter, J. A. (2014). *Glencoe precalculus*. Bothall, WA: McGraw-Hill Education.

**Please include resource links in the boxes above.*

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	New Jersey Student Learning Standards/ NGSS, etc.
Introduction to Conic Sections	4 blocks	Students will be able to: Identify and graph equations of parabolas, circles, ellipses, and hyperbolas. Write equations for circles, parabolas, ellipses, and hyperbolas. Identify conic type from expanded equations.	PowerPoint presentations. Sketch ellipse using string. Use wax paper folding to create a parabola. Apply conics vis-à-vis real life. applications such as camera lenses. The class will work together in order to build 3D replications of the four different cross sections. Before students are given notes on how the conic sections are created, they will be given time to visually explore. Students will work in collaborative groups in order to complete an art project on conics sections. <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	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. G.GPE.A.2 (+)Derive the equation of a parabola given a focus and directrix.
Systems of Second-Degree Equations	3 blocks	Students will be able to: Solve simple quadratic systems graphically (Supplemental Material). Solve quadratic systems by substitution or using linear combination (Supplemental Material).	Solve quadratic-quadratic systems by graphing on coordinate plane <u>Honors Extension:</u> In preparation for Calculus, all honors students will be required to express the topic verbally, numerically, graphically, and orally. All four of these requirements must be meet with and without the assistance of a graphing calculator.	

**The suggested timeline per topic should total the number of days in the Pacing Guide for each unit.*

Suggested Modifications for Special Education, 504, English Language Learners, Bilingual, RTI and Gifted Students:
*Consistent with individual plans, when appropriate.

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