FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

OFFICE OF CURRICULUM AND INSTRUCTION

SCIENCE AND ENGINEERING

HONORS MATHEMATICS 1A

Grade Level: 9

Credits: 2.5

BOARD OF EDUCATION ADOPTION DATE:

AUGUST 30, 2010

SUPPORTING RESOURCES AVAILABLE IN DISTRICT RESOURCE SHARING
APPENDIX A: ACCOMMODATIONS AND MODIFICATIONS
APPENDIX B: ASSESSMENT EVIDENCE
APPENDIX C: INTERDISCIPLINARY CONNECTIONS

FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

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Course Philosophy

In the spirit of academic rigor and excellence, this curriculum will provide our youth with a solid understanding of mathematics and the world around them. That is, students will learn to value mathematics, recognize recurring themes across mathematical domains, strengthen mathematical proficiency through problem solving, inquiry, and discovery, and learn to communicate and reason mathematically; and create mathematical representations through the use of technology. Algebraic and geometric concepts and skills will be extended in preparation for further advanced study of mathematics. Enrichment opportunities provide the students with experiences not usually encountered in the regular school curriculum. The Science and Engineering curriculum must go beyond specific day to day instructional objectives; it must embrace a general concern for lifelong learning.

Course Description

The Honors Mathematics I A course provides the mathematically talented students with an extended study of algebra topics including functions and the real number system, complex numbers, exponential and logarithmic functions, sequence and series, and trigonometry. Graphing, problem solving, and analysis are stressed. The use of technology is infused to gather, analyze, and communicate mathematical information as a tool for mathematical analysis and a way to study the real world. . The curriculum focuses on the terminology, skills and ideas students must master as a preparation for the sophomore level study of functions. The underlying theory as well as application will be stressed. Students will explore new topics and solve problems in other disciplines through discovery, investigation, and through the utilization of calculators, computers, and appropriate software.

Freehold Regional High School District
Curriculum Map

Science and Engineering
Honors Mathematics IA

Relevant Standards[1]	Enduring Understandings	Essential Questions	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
4.1A Number sense is an intuitive feel for numbers and a common sense approach to using them. It involves an understanding of how different types of numbers are related to each other and how each can best be used to describe a particular situation.	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.	How do mathematical ideas interconnect and build on one another to produce a coherent whole?	Algebra 1 Anticipatory Set	Algebra 1 Unit quizzes Using white boards & Smartboard during guided practice Review methods for graphing calculator	Unit Test with multiple choice and open-ended
4.1B Numerical operations are an essential part of the mathematics curriculum. Students must be able to select and apply various computational methods, including mental math, pencil and paper techniques and use of calculators.	There are multiple algorithms for finding a solution.	What makes a computational strategy both effective and efficient? How do mathematical representations reflect the needs of society?			
4.1C Estimation is a process that is used constantly by mathematically capable adults. With the increasing use of calculators, it is extremely important to be able to determine whether a computed answer is reasonable.	Context is critical when using estimation.	How can we decide when to use an exact answer and when to use an estimate?			
4.2C Modeling functions on a coordinate plane is essential to gain an understanding of how functions behave under various transformations.	Coordinate geometry can be used to represent and verify geometric/algebraic relationships.	How can we best represent and verify geometric/algebraic relationships?			
4.2E (Honors Only) Students need to understand relationship between the ratios of sides of a triangle in order to solve problems from various contexts.	Geometric relations provide a means to make sense of a variety of phenomena.	How do geometric relationships help to solve problems and/or make sense of phenomena?			
4.3.A Algebra provides the language through which we communicate the patterns in mathematics. Students should have the opportunities to analyze, extend and create a variety of patterns and to use pattern-based thinking to understand and represent.	The symbolic language of algebra and generalized patterns in mathematics are used to communicate and understand Mathematics.	How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?			
4.3.B The function concept is one of the most fundamental unifying ideas of modern mathematics. Students form rules, display information in a table or chart, and write equations that express the relationships they have observed.	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The concepts are fundamental ideas in Mathematics.	How are patterns of change related to the behavior of functions?			

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[1] Including computer / information literacy, cross content work place readiness standards, and other relevant content area standards

Relevant Standards[1]	Enduring Understandings	Essential Questions	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
4.3.C Algebra is used to model real situations. It requires the ability to represent data in tables, pictures graphs, equations or inequalities, and rules. Modeling includes using functions to describe the relationship between two variables, such as the height of a pitched ball over time.	Mathematical models can be used to describe and quantify physical relationships.	How can we use mathematical models to describe physical relationships?	Anticipatory Set

Daily hw quizzes | Using white boards & Smartboard during guided practice

Unit quizzes

Cryptography project

Review methods for graphing calculator | Unit Test with multiple choice and open-ended |
4.3.D Techniques for manipulating algebraic expressions remain important, especially for students who may continue their study of mathematics in a calculus program. Utilization of algebraic procedures includes understanding and applying properties of number and operations, using symbols and variables appropriately.	Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.	What makes an algebraic algorithm both effective and efficient?			
4.4.A In today's information-based world, students need to be able to read, understand and interpret data in order to make informed decisions. Students should increasingly be expected to analyze and make inferences from data as well as inferences made by others.	The result of a statistical investigation can be used to support or refute an argument.	How can the collection, organization, interpretation, and display of data be used to answer questions?			
4.4B The fundamental concepts of probability can interpret weather forecasts, avoid unfair games of chance and make informed decisions about medical treatments where success rate is provided in terms of percentages.	Probability quantifies the likelihood that something will happen and will enable us to make predictions and informed decisions.	How can experimental and theoretical probabilities be used to make predictions or draw conclusions?			
4.4C Development of strategies for listing and counting should extend to finding combinations in complex situations, such as finding the number of three-person delegations that can be selected from a class.	Algorithms can effectively and efficiently be used to quantify and interpret discrete information.	What counting strategy works best?			
4.4D Students should use matrices to represent and solve networking problems from real-world contexts and use algebraic representations to find optimal solutions to given problems.	Optimization is finding the best solution within given constraints.	How can algorithmic thinking be used to solve problems?			
4.5A Problem posing and problem solving involves examining situations that arise in mathematics and other disciplines and in common experiences.	Mathematics can be learned through problem solving, inquiry, and discovery.	How can inquiry and discovery infuse the power and usefulness of mathematics?			
4.5B Communication of mathematical ideas involves students' sharing their mathematical understandings in oral and written form.	Use communication to organize and clarify mathematical thinking.	How can clear and concise organization and higher-level thinking enhance the mathematics student?			
4.5C Making connections involves seeing relationships between different topics, and drawing on those relationships in future study.	Students can translate readily between fractions and decimals, or between algebra and geometry.	How can connections in mathematics be helpful in the sciences, social sciences, and the arts?			
4.5D Mathematical reasoning is the critical skill that enables a student to make use of all other mathematical skills.	Mathematical reasoning teaches students that mathematics makes sense and can be understood.	How can students use their ability to reason to conquer a wide array of mathematical problems?			
4.5E Representations refer to the use of physical objects, drawings, charts, graphs, and symbols to represent mathematical concepts and problem situations.	Using representations, students will be better able to solve problems.	What type of alternate perspectives can be used to tackle the solution to a problem?			
4.5F Calculators and computers need to be used along with other mathematical tools in both instructional and assessment activities.	Tools should be used to enhance understanding of mathematics.	How can the use of technology enhance the learning environment?			

Unit Title	Unit Understandings	Recommended Duration
Unit 1: Basic Concepts of Algebra	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways. Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. • Students will understand that linear equations can be used to solve real world problems.	0.5 weeks
Unit 2: Inequalities	A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways. Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. • Students will understand the properties of absolute value equations and inequalities.	0.5 weeks
Unit 3: Linear Equations and Functions	There are multiple algorithms for finding a solution. Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole. The symbolic language of algebra and generalization of patterns in mathematics are used to communicate and understand mathematics. • Students will understand how to graph ordered pairs, relations, functions, linear equations and inequalities in two variables, piecewise functions, and absolute value functions. • Students will understand how to write equations of lines and apply their relevance to real-world contexts. • Students will understand slope as a rate of change and apply it to use in real-world contexts. • Students will understand that systems of linear equations can be used to solve real world problems. • Students will understand that not all systems of linear equations will have one solution.	1 week
Unit 4: Matrices and Determinants	Optimization is finding the best solution within given constraints. • Students will understand how to perform all operations on matrices. • Students will understand that matrices can be used to solve many real world problems. • Students will understand how to use matrices to organize data and then conquer everyday problems.	1.25 weeks
Unit 5: Products and Factors of Polynomials	There are multiple algorithms for finding a solution. • Students will understand the terms associated with polynomials, and the laws of exponents used to find products of polynomials. • Students will understand how least common multiple and greatest common factor are used to develop the methods of factoring polynomials. • Students will develop methods for solving polynomial equations, inequalities, and word problems.	1.25 weeks
Unit 6: Rational Expressions	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship concepts are fundamental ideas in Mathematics. • Students will understand how to simplify and perform operations with rational functions. • Students will understand how to graph rational functions and solve rational equations. • Students will understand how to use various models and rational models in real-life situations.	1.5 weeks
Unit 7: Sequences and Series	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship concepts are fundamental ideas in Mathematics. • Students will understand the characteristics of a pattern and be able to write rules for those patterns. • Students will use their understanding of patterns to solve real-world problems.	1 week

Unit Title	Unit Understandings	Recommended Duration
Unit 8: Probability and Statistics	Probability quantifies the likelihood that something will happen and will enable us to make predictions and informed decisions. Context is critical when using estimation. The result of statistical investigation can be used to support or refute an argument. • Students will understand how to count the number of ways an event can happen. • Students will understand how to calculate and use probabilities in real-world contexts. • Students will understand how to how to use the binomial expansion.	1.5 weeks
Unit 9: Irrational and Complex Numbers	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship concepts are fundamental ideas in Mathematics. A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways. • Students will understand how to use rational exponents and nth roots of numbers. • Students will understand how to perform operations involving radicals and complex numbers. • Students will understand how to solve radical equations.	1 week
Unit 10: Quadratic Functions	Coordinate geometry can be used to represent and verify geometric\algebraic relationships. • Students will understand that the quadratic function will be used to solve real world problems. • Students will understand that not all quadratic equations will have real number solutions.	1.5 weeks
Unit 11: Polynomials and Polynomial Functions	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The functions and relationship concepts are fundamental ideas in Mathematics. • Students will understand how to analyze graphs of a polynomial function. • Students will understand how to incorporate their knowledge of polynomial functions into real-life situations. • Students will understand direct, inverse and joint variation.	1.5 weeks
Unit 12: Exponential and Logarithmic Functions	Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship concepts are fundamental ideas in Mathematics. Mathematical models can be used to describe and quantify physical relationships. • Students will understand that exponential functions can be used to model real world problems. • Students will understand that exponential and logarithmic functions are inverses of each other.	1.5 weeks
Unit 13: Triangle Trigonometry OPTIONAL	Coordinate geometry can be used to represent and verify geometric\algebraic relationships. Geometric relations provide a means to make sense of a variety of phenomena. • Students will understand how to apply the Pythagorean Identity and the six trigonometric functions to real world problems. • Students will understand how trigonometric ratios are developed from right triangles.	1.5 weeks
Unit 14: Trigonometric Graphs; Identities OPTIONAL	Coordinate geometry can be used to represent and verify geometric\algebraic relationships. Geometric relations provide a means to make sense of a variety of phenomena. • Students will understand radian measure for measuring angles. • Students will understand the periodicity and symmetry in graphing trigonometric functions. • Students will understand algebraic manipulation of trigonometric identities.	1.5 weeks

Freehold Regional High School District
Science and Engineering
Honors Mathematics IA

Unit #1: Basic Concepts of Algebra

Enduring Understandings: A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.
　　　　　　　　　Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
Essential Questions: How do mathematical ideas interconnect and build on one another to produce a coherent whole?
　　　　　　　　　What makes an algebraic algorithm both effective and efficient?
Unit Goal: Students will understand that linear equations can be used to solve real world problems.
Duration of Unit: 0.5 week
NJCCCS: 4.1A,B, 4.3C, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• What does absolute value mean? • What are the steps in solving a word problem? • How can equations be used to model real life phenomena?	• Evaluate expressions. • Evaluate absolute value problems. • Solve equations with one variable. • Set up and solve word problems.	• Worksheets and sample problems to analyze step by step solutions to problems • Textbook ancillaries • Teacher driven worksheets • Smartboard	• Use guided and independent practice in solving word problems. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities.	• Do Nows to reinforce previous knowledge • Closure questions • Test
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

Freehold Regional High School District
Science and Engineering
Honors Mathematics IA

Unit #2: Inequalities

Enduring Understandings: A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.
Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
Essential Questions: How do mathematical ideas interconnect and build on one another to produce a coherent whole?
What makes an algebraic algorithm both effective and efficient?
Unit Goal: Students will understand the properties of absolute value equations and inequalities.
Duration of Unit: 0.5 week
NJCCCS: 4.1A,B, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How does solving a linear inequality differ from solving a linear equation? • What is the difference between a disjunction and conjunction inequality? • What are the steps in solving an absolute value equation and absolute value inequality? • How can absolute value equations and inequalities be represented graphically? • How can inequalities and absolute values be used to model real life phenomena?	• Solve disjunction and conjunction inequalities. • Solve absolute value equations and inequalities. • Graphically represent absolute value equations and inequalities.	• Worksheets and sample problems to analyze step by step solutions to problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in solving word problems. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities.	• Do Nows to reinforce previous knowledge • Use white boards to show immediate feedback on questions • Closure question • Test
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Honors Mathematics IA

Unit #3: Linear Equations and Functions

Enduring Understandings: There are multiple algorithms for finding a mathematical solution.
Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
The symbolic language of algebra and generalization of patterns in mathematics are used to communicate and understand mathematics.

Essential Questions: What makes a computational strategy both effective and efficient?
How do mathematical representations reflect the needs of society?
What makes an algebraic algorithm both effective and efficient?
How can patterns, relations, and functions be used as tools to best describe and explain real-life situations?

Unit Goals: Students will understand how to graph relations, functions, linear equations and inequalities in two variables, piecewise functions, and absolute value functions.
Students will understand how to write equations of lines and apply their relevance to real-world contexts.
Students will understand slope as a rate of change and apply it to use in real-world contexts.
Students will understand that systems of linear equations can be used to solve real world problems.
Students will understand that not all systems of linear equations will have one solution.

Duration of Unit: 1.5 weeks
NJCCCS: 4.1B, 4.2C, 4.3C, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• What is the difference between a relation and a function and how can they be represented graphically? • What is slope and how can it be applied to linear equations? • How can intercepts be used to represent linear equations graphically? • How many different forms of lines are there and how does one know which one to use? • How can linear equations be used to approximate a given set of data? • How can linear inequalities in two variables be modeled graphically? • How can systems of equations and inequalities be used to solve problems? • What is the difference between functions and relations and how can each be represented algebraically and graphically? • How can linear equations be used to model real-world situations?	• Properties of relations and functions and their graphs • Slope as a rate of change including parallel and perpendicular lines • Quick graphs of linear equations using intercepts and slope • Writing equations of lines in slope-intercept, standard and point slope forms • Correlation and best-fitting lines using graphing calculators • Linear inequalities of two variables • Linear programming to find maximum and minimum values • Piecewise functions • Absolute value functions	• Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in solving quadratic equations. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to explore linear equations, absolute value functions, piecewise functions, linear regressions. • Use cooperative learning activities (see "Linear Regression Activity"). • Use white boards to show immediate feedback on questions. • Use written analysis of algebraic work versus graphing calculator work. Compare & contrast.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Test • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

Freehold Regional High School District
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Unit #4: Matrices and Determinants

Enduring Understanding: Optimization is finding the best solution within given constraints.
Essential Question: How can algorithmic thinking be used to solve problems?
Unit Goals: Students will understand how to perform all operations on matrices.
　　　　　Students will understand that matrices can be used to solve many real world problems.
　　　　　Students will understand how to use matrices to organize data and then conquer everyday problems.
Duration of Unit: 1.25 weeks
NJCCCS: 4.1B, 4.3A-D, 4.4D, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How do you determine the dimensions of a matrix? • How can you decide if multiplying two matrices is feasible? • Can you apply the methods used to find the determinant to find the area of a triangle? • How do you use inverse matrices to solve a system of equations? • How do you use augmented matrices to solve systems of linear equations in three variables? • How to use matrices to solve real world networking problems. • How can matrices be used to tackle real life situations?	• Add, subtract and multiply matrices by a scalar. • Multiply two matrices. • Evaluate determinants of 2x2 and 3x3 matrices. • Find and use inverse matrices. • Solve systems using inverse matrices. • Use matrices in real life situations. • Use elementary row operations to get the matrix in triangular form.	• Worksheets and sample problems to analyze step by step solutions to problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in performing operations on matrices. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities. See "Cryptography project". • Use whiteboards to show immediate feedback on questions. • Use graphing calculator to perform operations, find determinants of matrices. Also, solve systems using inverse matrices on graphing calculator. • Use the compare and contrast method of algebraic work versus graphing calculator work. • Use Cramer's rule to solve a system of equations.	• Do Nows to reinforce previous lessons • Closure questions • Notebook checks • Quizzes • Tests • Projects (Cryptography – students make and decode a message) • Rubrics for open-ended questions
Suggestions on how to differentiate in this unit: Use of the graphing calculator, white boards, cooperative learning activities, projects, and alternate assessments that will meet the needs of all learners.				

Freehold Regional High School District
Science and Engineering
Honors Mathematics IA

Unit #5: Products and Factors of Polynomials

Enduring Understanding: There are multiple algorithms for finding a solution.
Essential Questions: What makes a computational strategy both effective and efficient?
How do mathematical representations reflect the needs of society?
Unit Goals: Students will understand the terms associated with polynomials, and the laws of exponents used to find products of polynomials.
Students will understand how least common multiple and greatest common factor are used to develop the methods of factoring polynomials.
Students will develop methods for solving polynomial equations, inequalities, and word problems.
Duration of Unit: 1.25 weeks
NJCCCS: 4.1B, 4.3A,D, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How would you combine like terms to simplify polynomials? • How would you use the laws of exponents to multiply polynomials? • How would you use GCF and special products to factor polynomials and quadratic polynomials? • How to use the zero product property to solve quadratic polynomial equations? • How can you extend solving polynomial equations to polynomial inequalities?	• Simplify polynomials by combining like terms. • Use the laws of exponents to multiply polynomials. • Use the distributive property (FOIL) to multiply polynomials. • Factor polynomials using GCF and special products. • Factor quadratic polynomials by listing the possible factors. • Solving polynomial equations using factoring. • Solving polynomial inequalities by factoring and graphing the test areas.	• Worksheets and sample problems to analyze step by step solutions to problems • Textbook ancillaries • Teacher driven worksheets • Smartboard	• Use guided and independent practice in solving word problems. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities.	• Do Nows to reinforce previous knowledge • Use white boards to show immediate feedback on questions • Closure questions • Quizzes • Tests
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Unit #6: Rational Expressions

Enduring Understanding: Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship concepts are fundamental ideas in Mathematics.

Essential Question: How are patterns of change related to the behavior of functions?

Unit Goals: Students will understand how to simplify and perform operations with rational functions.

Students will understand how to graph rational functions and solve rational equations.

Students will understand how to use various models and rational models in real-life situations.

Duration of Unit: 1.5 weeks

NJCCCS: 4.1B, 4.3B-D, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How to simplify rational expressions involving zero and negative exponents? • How do you find vertical and horizontal asymptotes of rational functions? • What are the characteristics of general rational functions? • How does multiplying and dividing rational expressions compare to multiplying and dividing numerical fractions? • How does adding and subtracting rational expressions compare to adding and subtracting numerical fractions? • How do you simplify a complex fraction? • What are the different methods used to solve rational equations? • How do you find vertical and horizontal asymptotes for graphs of rational equations? • How do you perform operations with rational expressions? • What is the importance of checking your answer for rational equations?	• Simplify expressions involving exponents. • Graph rational functions. • Graph general rational functions and state their domain and range. • Multiply and divide rational expressions. • Add and subtract rational expressions. • Simplify complex fractions. • Solve rational equations. • Check answers to equations for extraneous solutions.	• Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard	• Use guided and independent practice in all operations with rational equations, and solving rational equations. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to graph rational equations. • Use cooperative learning activities. • Use white boards to show immediate feedback on questions.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Quizzes • Tests • Projects

Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.

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Unit #7: Sequences and Series

Enduring Understanding: Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The functions and relationship concepts are fundamental ideas in Mathematics.
Essential Question: How are patterns of change related to the behavior of functions?
Unit Goals: Students will understand the characteristics of a pattern and be able to write rules for those patterns.
Students will use their understanding of patterns to solve real-world problems.
Duration of Unit: 1 week
NJCCCS: 4.1A,B, 4.3A-D, 4.4A,C, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How can you find the next term in a pattern? • How can you find the sum of a series by understanding sigma notation? • What is the difference between arithmetic and a geometric sequence? • How do you know when a series is infinite? • How do you apply the formulas to find the next term, the sum or the general rule of a particular sequence? • How would you apply Pascal's triangle? • How can patterns obtain a higher level of thinking in students? • Why are sequences and series an important part of everyday life?	• Use and write sequences. • Use summation notation to write series and find sum of series. • Write rules for arithmetic sequences and find sums of arithmetic series. • Write rules for geometric sequences and find sums of geometric series. • Find sums of infinite geometric series. • Use knowledge of arithmetic, geometric and infinite geometric sequences and series to conquer real-life situations. • Use combinations to determine the coefficient of any term in the binomial expansion.	• Discover relationships among patterns • Worksheets and sample problems to analyze step-by-step solutions to the problem • Textbook ancillaries • Teacher drive worksheets • Smartboard • Graphing calculators	• Use guided and independent practice when writing rules for any pattern including arithmetic and geometric sequences. • Use the board, Smartboard and worksheets to reinforce concepts. • Use the graphing calculator to graph a sequence. • Use cooperative learning activities (ex: find out number of games played in a tournament with "x" amount of teams and then write the rule). • Use white boards to show immediate feedback on questions.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Quizzes • Tests • Projects (students can research how and why particular sequences of DNA are important)
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Unit #8: Probability and Statistics

Enduring Understandings: Probability quantifies the likelihood that something will happen and will enable us to make predictions and informed decisions.
Context is critical when using estimation.
The result of a statistical investigation can be used to support or refute an argument.
Essential Questions: How can experimental and theoretical probabilities be used to make predictions or draw conclusions?
How can we describe when to use an exact answer and when to use an estimate?
How can the collection, organization, interpretation, and display of data be used to answer questions?
Unit Goals: Students will understand how to count the number of ways an event can happen.
Students will understand how to calculate and use probabilities in real-world contexts.
Students will understand how to how to use the binomial expansion.
Duration of Unit: 1.5 weeks
NJCCCS: 4.1B, 4.2C, 4.3C, 4.4B, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• What is a permutation and how can it be used to find probabilities? • What is a combination and how does it differ from a permutation? • What is Pascal's Triangle and what does it have to do with probability? • What is the difference between theoretical and experimental probabilities and how can both be found? • How can the probability of multiple events be found? • What is the difference between independent and dependent events and how can their probabilities be found? • How can binomial probabilities be found and how can binomial distributions be analyzed? • How many different ways can an event happen? • How can probabilities be found and used?	• Permutations with and without repetitions. • Combinations as opposed to permutations; binomial expansion theorem. • Finding theoretical probabilities including card games, dice games and geometric problems. • Compound events, mutually exclusive events, complements. • Finding the probability of independent and dependent events using real-world context. • Finding binomial probabilities and analyzing binomial distributions.	• Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in solving quadratic equations. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to explore linear equations, absolute value functions, piecewise functions, linear regressions. • Use white boards to show immediate feedback on questions • Use written analysis of algebraic work versus graphing calculator work. Compare & contrast.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

Freehold Regional High School District
Science and Engineering
Honors Mathematics IA

Unit #9: Irrational and Complex Numbers

Enduring Understandings: A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.
Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The functions and relationship concepts are fundamental ideas in Mathematics.
Essential Questions: How do mathematical ideas interconnect and build on one another to produce a coherent whole?
How are patterns of change related to the behavior of functions?
Unit Goals: Students will understand how to use rational exponents and nth roots of numbers.
Students will understand how to perform operations involving radicals and complex numbers.
Students will understand how to solve radical equations.
Duration of Unit: 1 week
NJCCCS: 4.1A,B, 4.3B-D, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How can you evaluate nth roots of numbers using both radical notation and rational exponent notation? • How can you use the properties of rational exponents to evaluate and simplify expressions? • How can you simplify radicals using mathematical operations? • What is an extraneous solution? • How do you apply the properties of rational exponents to evaluate and simplify expressions? • What is the importance of checking your answer for a radical equation?	• Represent nth roots using both radical notation and rational exponents. • Simplify and evaluate expressions using properties of rational exponents. • Simplify radical expressions. • Simplify radical expressions involving the imaginary number i. • Solve equations that contain radicals or rational exponents. • Check answers to equations for extraneous solutions.	• Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard	• Use guided and independent practice in simplifying radical expressions, imaginary numbers and solving radical equations. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities. • Use white boards to show immediate feedback on questions.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

Freehold Regional High School District
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Unit #10: Quadratic Equations and Functions

Enduring Understanding: Coordinate geometry can be used to represent and verify geometric/algebraic relationships.
Essential Question: How can we best represent and verify geometric/algebraic relationships?
Unit Goals: Students will understand that the quadratic function will be used to solve real world problems.
    Students will understand that not all quadratic equations will have real number solutions.
Duration of Unit: 1.5 weeks
NJCCCS: 4.1B, 4.2C, 4.3B,C, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How would you describe the characteristics of a quadratic equation? • How would you describe the characteristics of a quadratic equation? • What are the necessary components needed to graph a quadratic equation? • What observations can you make from the value of the discriminant? • What are the ways to solve a quadratic equation and how would you determine which method to use? • How can quadratic functions be used to model real life phenomena?	• Solve quadratic equations by completing the square. • Solve quadratic equations using the quadratic formula. • Use the discriminant to determine the nature of the roots. • Write quadratic functions given characteristics of their graphs. • Graph quadratic equations in standard and vertex form. • Solve quadratic equations w/complex solutions. • Solve quadratic equations using the quadratic formula.	• Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in solving quadratic equations. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to discover the meaning of the discriminant and real zeros. • Use the graphing calculator to graph quadratic functions. • Use cooperative learning activities.	• Do Nows to reinforce previous lessons • Use white boards to show immediate feedback on questions • Closure questions • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Unit #11: Variations and Polynomial Functions

Enduring Understanding: Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally.

The function and relationship concepts are fundamental ides in Mathematics.

Essential Question: How are patterns of change related to the behavior of functions?

Unit Goals: Students will understand how to analyze graphs of a polynomial function.

Students will understand how to incorporate their knowledge of polynomial functions into real-life situations.

Students will understand direct, inverse, and joint variation.

Duration of Unit: 1.5 weeks

NJCCCS: 4.1C, 4.3B-D, 4.4A, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How to apply direct and indirect variations formulas to word problems. • How can the properties of exponents be used to simplify expressions? • How does the sign of the leading coefficient affect the behavior of a polynomial functions' graph? • What changes occur in the end behavior of an even function versus an odd function? • How can performing operations on polynomial functions be helpful in real-life situations? • How have things stayed the same and how have they changed over the years when using polynomial functions? • What observations can you make from the x-intercepts of a polynomial function? • What relationship does the degree of a polynomial function have with its zeros? • How can using the graphing calculator be helpful in analyzing graphs of polynomial functions? • How can the knowledge of polynomial functions be utilized to exemplify real life occurrences?	• Solve direct and indirect word problems. • Use the properties of exponents. • Evaluate and graph polynomial functions. • Add, subtract and multiply polynomial functions. • Factor and solve polynomial functions. • Apply the remainder and factor theorems. • Find rational zeros using the rational zeros theorem. • Use the fundamental theorem of algebra to write polynomial functions. • Analyze the graphs of polynomial functions.	• Clarify the properties of exponents. • Worksheets and sample problems to analyze step-by-step solutions of the problems. • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in finding rational zeros. • Use Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to estimate the real zeros of a polynomial function. • Use cooperative learning activities. • Use white boards to show immediate feedback on questions. • Use written analysis of algebraic work versus graphing calculator work. Compare and contrast.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Tests • Projects. • Rubrics for open-ended questions.
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Unit #12: Exponential and Logarithmic Functions

Enduring Understandings: Patterns, functions, and relationships can be represented graphically, numerically, symbolically or verbally. The function and relationship
concepts are fundamental ideas in Mathematics.
Mathematical models can be used to describe and quantify physical relationships.
Essential Questions: How are patterns of change related to the behavior of functions?
How can we use mathematical models to describe physical relationships?
Unit Goals: Students will understand that exponential functions can be used to model real world problems.
Students will understand that exponential and logarithmic functions are inverses of each other.
Duration of Unit: 1.5 weeks
NJCCCS: 4.1B, 4.2C, 4.3C, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• What are the characteristics of an exponential function? • What does the graph of an exponential function look like? • How can you apply exponential growth and decay models to real-life applications? • How can you prove that two functions are inverses of each other? • How do the properties of exponents help to evaluate logarithms? • How are logarithmic functions used to solve exponential equations? • How can exponential functions be used to model real life phenomena? • How are the logarithmic functions used to solve equations?	• Graph exponential growth functions. • Use exponential growth functions to model real-life situations. • Graph exponential decay functions • Use exponential decay functions to model real-life situations. • Find the inverse of a function. • Solve composition of functions. • Use the number e as the base of exponential functions. • Evaluate and graph logarithmic functions. • Use properties of logarithms. • Solve exponential and logarithmic equations.	• Sample problems and worksheets to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators • Dry erase boards • Geometer's Sketchpad to illustrate the graph and solutions of an exponential function • Real-life applications/projects	• Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative leaning activities. • Use the graphing calculator to examine exponential and logarithmic graphs. • Use white boards to show immediate feedback on questions. • Use written analysis of algebraic work versus computer work. Compare and contrast.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show student understanding • Notebook checks • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Geometer's Sketchpad, graphing calculators, white boards, cooperative learning activities, and alternate assessments to meet the needs of all learners.				

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Unit #13: Triangle Trigonometry - OPTIONAL

Enduring Understandings: Coordinate geometry can be used to represent and verify geometric/algebraic relationships.

Geometric relations provide a means to make sense of a variety of phenomena.

Essential Questions: How can we best represent and verify geometric/algebraic relationships?

How do geometric relationships help to solve problems and/or make sense of phenomena?

Unit Goals: Students will understand how to apply the Pythagorean Identity and the six trigonometric functions to solve real world problems.

Students will understand how trigonometric ratios are developed from right triangles.

Duration of Unit: 1.5 weeks

NJCCCS: 4.2C,E, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• How would you measure an angle? • How would you determine which trigonometric ratio should be used? • How would you determine when to use one of the reciprocal trigonometric functions? • How would you determine the coordinates of the unit circle? • How would you find the measure of an acute angle in a right triangle? • How would you find the missing side or angle of a right triangle? • How would you find the missing sides and angles of a non-right triangle? • How would you find the area of a non-right triangle? • How can trigonometric functions be used to model real life phenomena? • How do the two special right triangles help us understand the coordinates on the unit circle? • How do the trigonometric ratios help us find an acute angle in a right triangle?	• Determine how far the terminal side is from the initial side. • Understanding ratios and knowing which sides of a right triangle are given. • Understanding ratios and knowing which sides of a right triangle are given. • Understand the ratios of the 45-45-90 & 30-60-90 right triangles. • Identify which sides of a right triangle are given to determine which is the correct trigonometric function to use. • Use the inverse trig key on the calculator to find the angle. • Set up a proportion to find the missing side of a right triangle. • Use the Law of Sines & Cosines. • Identify what is given to determine which of the many formulas to use.	• Use the coordinate plane • Worksheets and samples problems to analyze step-by-step solutions of the problems • Textbook ancillaries • Teacher driven worksheets • Smartboard • Graphing calculators	• Use guided and independent practice in finding the measures of an angle. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use cooperative learning activities. • Use white boards to show immediate feedback on questions. • Use written analysis of algebraic work versus graphing calculator work. Compare & contrast.	• Do Nows to reinforce previous lessons • Closure questions • Use white boards to show immediate feedback on questions • Notebook checks • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				

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Unit #14: Trigonometric Graphs; Identities - OPTIONAL

Enduring Understandings: Coordinate geometry can be used to represent and verify geometric/algebraic relationships.
Geometric relations provide a means to make sense of a variety of phenomena.
Essential Questions: How can we best represent and verify geometric/algebraic relationships?
How do geometric relationships help to solve problems and/or make sense of phenomena?
Unit Goals: Students will understand radian measure for measuring angles.
Students will understand the periodicity and symmetry in graphing trigonometric functions.
Students will understand algebraic manipulation of trigonometric identities.
Duration of Unit: 1.5 weeks
NJCCCS: 4.1B, 4.2E, 4.3A, C, D, 4.5A-F

Guiding / Topical Questions	Content, Themes, Concepts, and Skills	Instructional Resources and Materials	Teaching Strategies	Assessment Strategies
• What is a radian and how is it used to measure angles? • How can periodicity and symmetry be used to graph trigonometric functions? • What algebraic operations are required to solve trigonometric identities? • What are radians and how are they used? • How can sine and cosine functions be used to model real life phenomena?	• To change radians to degrees and degrees to radians. • To graph sine and cosine functions using the amplitude, period, and phase shift. • To use algebra to prove trigonometric identities.	• Worksheets and sample problems to analyze step-by-step solutions of problems. • Textbook ancillaries • Teacher driven worksheets. • Smartboard • Graphing calculators	• Use guided and independent practice. • Use the board, Smartboard, and worksheets to reinforce the concepts. • Use the graphing calculator to discover how the amplitude, period, and phase shift affect the graph of trigonometric functions. • Use cooperative learning activities. • Use white board activities to show immediate feedback on questions.	• Do Nows to reinforce previous lessons • Use white boards to show immediate feedback on questions • Closure questions • Quizzes • Tests • Projects
Suggestions on how to differentiate in this unit: Use of Smartboard graphing calculator, white boards, pre-printed coordinate planes, cooperative learning activities, and alternative assessments to meet the needs of all learners.				