Algebra 2

Grade 11

Prepared by:

Jessica Lee

Superintendent of Schools:

Marie C. Cirasella, Ed.D.

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Algebra 2

Course Description:

High school Algebra II is taught in seven units throughout the school year. This course is designed to be an extension into topics that are taught in Algebra I, as well as an introduction to topics that will aid in transitioning to higher-level math courses. Students in Algebra II will become fluent with a variety of different function families and the ways the same concepts can be threaded through each family. While the foundation remains unchanged, students will look more in depth at how the present family of functions that is being studied affects the formulas and equations. The course also focuses on the use of graphing calculator to facilitate the solving of equations and modeling of real-world problems. The curriculum ends with a look into statistical analysis and probability.

Taking part in this course helps students:

1. To foster an appreciation of mathematics.
2. To observe math in the world around them.
3. To meet the New Jersey Student Learning Standards for New Jersey Public Schools.

Course Sequence:

Unit 1: Quadratic Functions (25 days)
Unit 2: Polynomial Functions (26 days)
Unit 3: Rational Exponent and Radical Functions (22 days)
Unit 4: Exponential and Logarithmic Functions (22 days)
Unit 5: Rational Functions (21 days)
Unit 6: Probability (18 days)
Unit 7: Data Analysis and Statistics (18 days)

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

Pre-requisite:

Algebra I

Unit # 1 - Overview	
Content Area: Algebra 2	
Unit Title: Quadratic Functions	
Grade Level: 10/11	
Core Ideas: Students will work with the family of quadratic functions. The unit will cover working with different forms of the same equation, solving quadratics with a variety of different methods, and comparing graphs and solutions of quadratic equations to that of quadratic inequalities. Students will learn to determine which method is appropriate based on the form of the equation given.	
Unit # 1 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.N-CN.A.2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
NJSLS.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines
NJSLS.F-IF.C.7a	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
NJSLS.A-REI.B.4a	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
NJSLS.A-REI.B.4b	Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x = 49$), 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 $a \pm bi$ for real numbers a and imaginary numbers b
NJSLS.N-CN.C.7	Solve quadratic equations with real coefficients that have complex solutions.
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
MP 7	Look for and make use of structure.
MP 8	Look for and express regularity in repeated reasoning.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and postsecondary plans.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problems
Computer Science and Design Thinking	
8.1.12.CS.2	Model interactions between application software, system software, and hardware
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture
8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

LGBTQ and Disabilities NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ and disabled community, including but not limited to Juliette Bruce, NSF Postdoctoral Fellow at University of California, Berkeley and Stephen Hawking, former Director of Research at the University of Cambridge.
Amistad Law NJSA 18A:35-4.43	Explore African-American mathematicians and scientists, including but not limited to Martha Euphemia Lofton Haynes, the first African-American woman to earn a Ph.D in mathematics , and Elbert Frank Cox, the first African-American man to earn a Ph.D in mathematics in the world.
	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
Holocaust Law NJSA 18A:35-28	Explore Jewish mathematicians using the article *"Jewish Mathematicians Who Changed the Course of History"* from *jewishjournal.com*
AAPI Law NJSA 18A:25-4.44	Explore Asian-American and Pacific Islander mathematicians and scientists, including but not limited to Dr. Peter Tsai, inventor of the N95 respirator and Diana Ma, data scientist and statistician for the Lakers
Companion Standards	
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose and audience.
Interdisciplinary Connection	
6.1.12.HistorySE.14.a	Explore the various ways women, racial and ethnic minorities, the LGBTQ community, and individuals with disabilities have contributed to the American economy, politics and society
6.1.12.HistorySE.14.b	Use a variety of sources from diverse perspective to analyze the social, economic and political contributions of marginalized and underrepresented groups and/or individuals.
CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s): ● How can we use quadratic functions to model real life phenomena? ● Why do we need the different but equivalent forms of	**Unit Enduring Understandings:** ● Quadratic parent function ($y = x^2$) ● Parabola, axis of symmetry, vertex, max./min. ● Real solutions of equations show the zeros of

a quadratic function? ● How can we decide that the quadratic function will be the best fit for a real life situation? ● Can the real number system be extended? ● Why do we need complex numbers? ● How do we use the method of completing the square to transform any quadratic expression? ● How can we solve quadratic equations by taking square roots, completing the square, the Quadratic Formula, and factoring? ● How can we solve quadratic inequalities?	the functions which are the x-intercepts of the graphs. ● Imaginary numbers ($i = \sqrt{-1};\ i^2 = -1$) ● Complex number set includes all real numbers. ● Discriminant determines number and type of solutions.

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials:	**Key Vocabulary:**
https://njctl.org/courses/math/algebra-ii/	quadratic, standard/vertex/intercept forms, axis of symmetry, vertex, factoring, square roots, completing the square, Quadratic Formula, complex number, discriminant

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Quadratics in Standard Form	-Graphing quadratics in standard form (with axis of symmetry and vertex)	Lesson, Application, Review	2 days
Quadratics in Vertex and Intercept Forms	-Graphing quadratics in vertex and intercept forms (with axis of symmetry and vertex)	Lesson, Application, Review	2 days
Factoring Quadratics	-Factoring quadratics completely and solving quadratics by factoring	Lesson, Application, Review	4 days
Square Roots	-Solving quadratics by square roots and simplifying non-perfect radicals	Lesson, Application, Review	2 days
Complex Numbers	-Defining the complex number system and solving quadratics with complex solutions	Lesson, Application, Review	2 days
Completing the Square	-Solving quadratics by completing the square and transforming standard form into vertex form	Lesson, Application, Review	3 days
Quadratic Formula	-Solving quadratics using the Quadratic Formula -Calculating the discriminant to determine type and number of solutions	Lesson, Application, Review	2 days
Quadratic Inequalities	-Graphing quadratic inequalities on a coordinate grid -Solving quadratic inequalities graphically and algebraically	Lesson, Application, Review	3 days

Teacher Notes: 25 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
-Rephrase questions, directions, and explanations	-Allow errors in speaking	-Provide extension activities -Build on students' intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures	-Rephrase questions, directions, and explanations

-Allow extended time on assessments -Consult with Case Managers and follow IEP modifications/accommodations	-Rephrase questions, directions, and explanations -Allow extended time on assessments		-Consult with classroom teacher(s) for specific behavior interventions -Provide extended time to complete tasks (on need basis)	-Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with procedures/504 accommodations

Unit # 2- Overview	
Content Area: Algebra 2	
Unit Title: Polynomial Functions	
Grade Level: 10/11	
Core Ideas: Students will work with the family of polynomial functions. The unit will cover higher-degree polynomials and their characteristics and relating the factoring patterns of quadratics to polynomials. Students will also apply the Remainder, Factor, and Rational Theorems to polynomials to solve for zeros. Graphing calculators will be used for their CALCULATE and GRAPH features to aid the solving process. The Fundamental Theorem of Algebra will be used to further classify polynomials based on the number and type of solutions.	
Unit # 2 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.N-RN.A.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those value, allowing for a notation for radicals in terms of rational exponents.
NJSLS.F-IF.C.7c	Graph functions expressed symbolically and show key feature of the graph, by hand in simple cases and using technology for more complicated cases. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
NJSLS.A-APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials
NJSLS.A-APR.B.2	Know and apply the Remainder Theorem: For a polynomial $p(x)$ and and number a, the remainder on division by $x-a$ is $p(a)$=0 if and only if $(x-a)$ is a factor of $p(x)$.
NJSLS.A-SSE.A.2	Use the structure of an expression to identify different ways to rewrite it.
NJSLS.N-CN.C.9(+)	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
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Career Readiness, Life Literacies, and Key Skills	
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Computer Science and Design Thinking	
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8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

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	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
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CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How can polynomial functions be used to model real life problems? ● How can properties of linear and quadratic functions	● Definition of a polynomial function ● End behavior of polynomial graphs ● Polynomial division (Long and Synthetic)

be generalized to polynomial functions? ● What are some common characteristics of polynomial graphs? ● How do we use the factors of a polynomial to solve a division problem? ● How do we factor a polynomial? ● What is the Fundamental Theorem of Algebra? ● How do the characteristics of quadratics apply to polynomials?	● Algebraic properties of polynomial functions ● Degree of a polynomial tells how many roots it has (including repeated and imaginary)

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials: https://njctl.org/courses/math/algebra-ii/	**Key Vocabulary:** polynomial functions, degree, leading coefficient, end behavior, polynomial division, Remainder Theorem, Factor Theorem, Rational Zero Theorem, Fundamental Theorem of Algebra

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Properties of Exponents	-Simplifying algebraic expressions using the properties of exponents -Applying the properties of exponents to scientific notation	Lesson, Application, Review	2 days
Polynomial Functions	-Identifying the characteristics of polynomials (including their degree, leading coefficient, and constant) -Exploring similarities and differences between even and odd degree polynomials -Graphing polynomials	Lesson, Application, Review	2 days
Add, Subtract, Multiply Polynomials	-Performing addition, subtraction, and multiplication on sets of polynomials to simplify	Lesson, Application, Review	2 days
Factoring Polynomials	-Factoring polynomials completely and solving polynomials by factoring	Lesson, Application, Review	3 days
The Factor and Remainder Theorems	-Dividing polynomials using long division and synthetic division -Using the Remainder Theorem to determine function evaluation -Using the Factor Theorem to identify factors of each polynomial, and subsequently, their zeros	Lesson, Application, Review	3 days
The Rational Zero Theorem	-Using the Rational Zero Theorem to create a list of possible rational zeros -Applying the Factor Theorem to solve polynomials for their rational zeros	Lesson, Application, Review	3 days
The Fundamental Theorem of Algebra	-Applying the Fundamental Theorem of Algebra to obtain all possible zeros for a polynomial -Using Descartes's Rule of Signs to determine the number of positive and negative zeros for each polynomial	Lesson, Application, Review	3 days
Analyzing Graphs of Polynomials	-Exploring relationships between zeros, x-intercepts, factors, and solutions of polynomials	Lesson, Application, Review	2 days

Teacher Notes: 26 total days including assessment days (quizzes, test)				
Additional Resources:				
Differentiation/Modification Strategies				
Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**504 Students**
-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Case Managers and follow IEP modifications/accommodations	-Allow errors in speaking -Rephrase questions, directions, and explanations -Allow extended time on assessments	-Provide extension activities -Build on students' intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures/action plans -Consult with classroom teacher(s) for specific behavior interventions -Provide extended time to complete tasks (on need basis)	-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with procedures/504 accommodations

Unit # 3 - Overview	
Content Area: Algebra 2	
Unit Title: Rational Exponents and Radical Functions	
Grade Level: 10/11	
Core Ideas: Students will work with the family of rational exponent and radical functions. The unit will cover the relationship between rational exponents and radicals, and will extend to the creation of new functions using the function operations and composition. Students will work with graphing square root and cube root functions as well as explore translations of the graphs. The concept of extraneous solutions will be covered when rational exponent and radical equations are solved.	
Unit # 3 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.N-RN.A.1	Explain how the definition of the meaning of the rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
NJSLS.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
NJSLS.F-BF.A.1b	Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations.
NJSLS.F-BF.A.1c	Write a function that describes a relationship between two quantities. c. (+) Compose functions.
NJSLS.F-BF.B.4	Find inverse functions a. Solve an equation of the form f(x)=c for a simple function f that has an inverse and write an expression for the inverse. b. (+) Verify by composition that one function is the inverse of another c. (+) Read values of an inverse function from 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.
NJSLS.F-IF.C.7b	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
NJSLS.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
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Computer Science and Design Thinking	
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CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed

Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):

- How can we use a rational exponent to represent a power involving a radical?
- How can we use the properties of exponents to simplify products and quotients of radicals?
- How can we find the inverse of radical functions?
- How can we solve radical equations?
- How are rational exponent and radical functions and their graphs similar to linear functions? How are they different?
- How can we identify the domain and range of radical functions?

Unit Enduring Understandings:

- Rational exponents are equal to n^{th} roots.
- Properties of exponents
- Extraneous solutions
- Inverses (Not all inverses are functions.)
- Undefined fractions (Denominator cannot be zero.)
- Fraction operations (Addition, Subtraction, Multiplication, Division)
- Operations with polynomials

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials:	**Key Vocabulary:**
https://njctl.org/courses/math/algebra-ii/	nth roots, rational exponents, composite functions, inverse functions, extraneous solutions

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Nth Roots and Rational Exponents	-Converting between rational exponents and radicals -Evaluating rational exponents and radicals	Lesson, Application, Review	3 days
Properties of Rational Exponents	-Simplifying rational exponents and radical expressions -Rationalizing the denominator for radical expressions	Lesson, Application, Review	3 days
Function Operations and Composite Functions	-Creating new functions by adding, subtracting, multiplying and dividing sets of functions -Composing new functions	Lesson, Application, Review	3 days
Inverse Functions	-Finding the inverse of a function by switching the domain and range -Verifying inverses by using the composite functions	Lesson, Application, Review	3 days
Square Root and Cube Root Functions	-Graphing square root and cube root functions -Identifying domain and range of each function	Lesson, Application, Review	2 days
Radical Equations	-Solving rational exponent equations -Solving radical equations -Checking for extraneous solutions	Lesson, Application, Review	3 days

Teacher Notes: 22 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students

-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Case Managers and follow IEP modifications/accommodations	-Allow errors in speaking -Rephrase questions, directions, and explanations -Allow extended time on assessments	-Provide extension activities -Build on students' intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures -Consult with classroom teacher(s) for specific behavior interventions -Provide extended time to complete tasks (on need basis)	-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with procedures/504 accommodations

Unit # 4 - Overview	
Content Area: Algebra 2	
Unit Title: Exponential and Logarithmic Functions	
Grade Level: 10/11	
Core Ideas: Students will work with the family of exponential and logarithmic functions. The unit will cover the inverse relationship between exponential and logarithmic functions. The properties of exponents are extended into the properties logarithms which will be used to condense and expand logarithmic expressions. Sets of data can be represented as either exponential or power functions. Students will determine whether an exponential or power function is more appropriate before writing the functions.	
Unit # 4 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.F-IF.C.7e	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude
NJSLS.F-BF.B.5 (+)	Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents
NJSLS.F-LE.A.4	Understand the inverse relationship between exponents and logarithms.
NJSLS.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, two input-output pairs (include reading these from a table.)
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
MP 7	Look for and make use of structure.
MP 8	Look for and express regularity in repeated reasoning.
Career Readiness, Life Literacies, and Key Skills	
9.1.12.CDM.8	Compare and compute interest and compound interest
9.1.12.PB.6	Describe and calculate interest and fees that are applied to various forms of spending, debt and saving
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and postsecondary plans.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problems
Computer Science and Design Thinking	
8.1.12.CS.2	Model interactions between application software, system software, and hardware
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture
8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
LGBTQ and Disabilities NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ and disabled community, including but not limited to Juliette Bruce, NSF Postdoctoral Fellow at University of California, Berkeley and Stephen Hawking, former Director of Research at the University of Cambridge.

Amistad Law NJSA 18A:35-4.43	Explore African-American mathematicians and scientists, including but not limited to Martha Euphemia Lofton Haynes, the first African-American woman to earn a Ph.D in mathematics , and Elbert Frank Cox, the first African-American man to earn a Ph.D in mathematics in the world.
	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
Holocaust Law NJSA 18A:35-28	Explore Jewish mathematicians using the article *"Jewish Mathematicians Who Changed the Course of History"* from *jewishjournal.com*
AAPI Law NJSA 18A:25-4.44	Explore Asian-American and Pacific Islander mathematicians and scientists, including but not limited to Dr. Peter Tsai, inventor of the N95 respirator and Diana Ma, data scientist and statistician for the Lakers
Companion Standards	
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose and audience.
Interdisciplinary Connection	
6.1.12.HistorySE.14.a	Explore the various ways women, racial and ethnic minorities, the LGBTQ community, and individuals with disabilities have contributed to the American economy, politics and society
6.1.12.HistorySE.14.b	Use a variety of sources from diverse perspective to analyze the social, economic and political contributions of marginalized and underrepresented groups and/or individuals.
CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How can exponential functions be used to model real life problems? ● What are some characteristics of exponential and logarithmic functions?	● Exponential form <-> Logarithmic form ● Exponential and logarithmic graph translations ● Natural base $e$and natural logarithm ln ● Logarithm evaluations ● Logarithm graphs

• What is the relationship between exponential and logarithmic functions? • What is the natural base? • How can the properties of exponents be used to derive the properties of logarithms? • How can we solve exponential and logarithmic equations? • How do we determine whether a set of data fits an exponential pattern or a power pattern?	• Exponential growth and decay models • Compound interest and continuously compounded interest models • Abstract and quantitative reasoning

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials:	**Key Vocabulary:**
https://njctl.org/courses/math/algebra-ii/	exponential growth/decay, compound interest, horizonal asymptote, logarithm, natural base

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Exponential Growth and Decay	-Graphing exponential growth and decay functions -Applying the growth and decay models to real-life problems -Applying the compound interest formula to real-life problems	Lesson, Application, Review	3 days
Natural Base e	-Simplifying natural base expressions -Evaluating natural base expressions -Identifying growth and decay with natural base exponential functions -Graphing natural base exponential functions	Lesson, Application, Review	2 days
Logarithms	-Converting between exponential and logarithmic forms -Evaluating logarithms with and without a calculator -Finding inverses of logarithmic functions -Graphing logarithmic functions	Lesson, Application, Review	3 days
Properties of Logarithms	-Condensing expressions using the properties of logarithms -Expanding expressions using the properties of logarithms	Lesson, Application, Review	3 days
Exponential and Logarithmic Equations	-Solving exponential equations -Solving logarithmic equations -Checking for extraneous solutions	Lesson, Application, Review	3 days
Exponential and Power Functions	-Checking whether sets of data fit an exponential or power function -Writing exponential and power functions given a set of points	Lesson, Application, Review	3 days

Teacher Notes: 22 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Case Managers and follow IEP modifications and accommodations	-Allow errors in speaking -Rephrase questions, directions, and explanations -Allow extended time on assessments	-Provide extension activities -Build on students' intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures/action plans -Consult with classroom teacher(s) for specific behavior interventions -Provide extended time to complete tasks (on need basis)	-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with procedures/504 accommodations

Unit # 5 - Overview	
Content Area: Algebra 2	
Unit Title: Rational Functions	
Grade Level: 10/11	
Core Ideas: Students will work with the family of rational functions. Rational functions are introduced using inverse and joint variation. The unit will cover the relationship between the graph of rational functions and their characteristics (domain, range, holes, asymptotes). Students will also explore how fraction operations are extended to add, subtract, multiply, and divide rational functions. Rational equations will be solved using skills from Algebra 1 (cross-products, and LCD).	
Unit # - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
NJSLS.F-IF-C.7d (+)	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior
NJSLS.A-APR.D.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.
NJSLS.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
NJSLS.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
MP 7	Look for and make use of structure.
MP 8	Look for and express regularity in repeated reasoning.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and postsecondary plans.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problems
Computer Science and Design Thinking	
8.1.12.CS.2	Model interactions between application software, system software, and hardware
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture
8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
LGBTQ and Disabilities NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ and disabled community, including but not limited to Juliette Bruce, NSF Postdoctoral Fellow at University of California, Berkeley and Stephen Hawking, former Director of Research at the University of Cambridge.

Amistad Law NJSA 18A:35-4.43	Explore African-American mathematicians and scientists, including but not limited to Martha Euphemia Lofton Haynes, the first African-American woman to earn a Ph.D in mathematics , and Elbert Frank Cox, the first African-American man to earn a Ph.D in mathematics in the world.
	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
Holocaust Law NJSA 18A:35-28	Explore Jewish mathematicians using the article *"Jewish Mathematicians Who Changed the Course of History"* from *jewishjournal.com*
AAPI Law NJSA 18A:25-4.44	Explore Asian-American and Pacific Islander mathematicians and scientists, including but not limited to Dr. Peter Tsai, inventor of the N95 respirator and Diana Ma, data scientist and statistician for the Lakers
Companion Standards	
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose and audience.
Interdisciplinary Connection	
6.1.12.HistorySE.14.a	Explore the various ways women, racial and ethnic minorities, the LGBTQ community, and individuals with disabilities have contributed to the American economy, politics and society
6.1.12.HistorySE.14.b	Use a variety of sources from diverse perspective to analyze the social, economic and political contributions of marginalized and underrepresented groups and/or individuals.
CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How can rational functions be used to model real-life problems? ● How are inverse variation and rational functions related? ● What do vertical/horizontal asymptotes of rational functions signify?	● Direct variation vs. Inverse variation ● Fraction operations (addition, subtraction, multiplication, division) ● Factoring polynomials ● Local and global behaviors of rational functions

• How do we determine excluded values in a rational function? • How can a rational function be solved? • How are rational functions graphed? • How are the four basic operations applied to rational functions? • How do we compare the different characteristics of rational functions?	• Translations of functions ($y = \frac{a}{x-h} + k$) • Domain, range, holes, asymptotes

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials: https://njctl.org/courses/math/algebra-ii/	**Key Vocabulary:** Rational functions, direct variation, inverse variation, joint variation, slant asymptotes, vertical asymptotes, holes, excluded values

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Inverse and Joint Variation	-Solve direct, inverse, joint variation problems -Use the comparison of two or more units to determine inverse and joint variation	Lesson, Application, Review	2 days
Rational Function Graphs	-Graph simple rational functions -Graph translations of rational functions -Identify domain, range, holes, and asymptotes	Lesson, Application, Review	3 days
Multiply and Divide Rational Functions	-Apply fraction operations to simplify rational expression multiplication and division	Lesson, Application, Review	3 days
Add and Subtract Rational Functions	-Apply fraction operations to simplify rational expression addition and subtraction	Lesson, Application, Review	3 days
Rational Equations	-Solve rational equations using cross-products and LCD -Check for extraneous solutions	Lesson, Application, Review	3 days
Function Characteristics	-Determine whether a function is increasing or decreasing over an interval -Determine whether functions are even or odd -Compare functions in different representations	Lesson, Application, Review	2 days

Teacher Notes: 21 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Case Managers and follow IEP	-Allow errors in speaking -Rephrase questions, directions, and explanations -Allow extended time on assessments	-Provide extension activities -Build on students' intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures/action plans -Consult with classroom teacher(s) for specific behavior interventions	-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with

modifications/accommodations			-Provide extended time to complete tasks (on need basis)	procedures/504 accommodations

Unit # 6 - Overview	
Content Area: Algebra 2	
Unit Title: Probability	
Grade Level: 10/11	
Core Ideas: Students will work on probability and odds of simple events. The unit will cover the differences between mutually exclusive and inclusive events, and independent and dependent events. Students will calculate the probabilities of events, using the Addition Rule or the Multiplication Rule depending on the type of event. Throughout the unit, students will work on finding permutations and combinations, a large part in calculating probability where both are a measure of finding groups of $r$objects out of n. With permutations, the order in which objects are picked determine a different outcome. With combinations, the order in which objects are picked do not matter.	
Unit # 6 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.S-CP.A.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements, of other events ("or", "and", "not")
NJSLS.S-CP.B.9 (+)	Use permutation and combinations to compute probabilities of compound events and solve problems
NJSLS.S-CP.A.2	Understand that two events A and B are independent if the probability of A and B occurring is the product of their probabilities, and use this characterization to determine if they are independent
NJSLS.S-CP.A.3	Understand that the condition probability of A given B as P(A and B) | P(B), and interpret independence of A and B saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B
NJSLS.S-CP.B.7	Apple the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.
NJSLS.S-CP.B.8 (+)	Appy the general Multiplication Rule in a uniform probability model, P(A and B) = P(A) * P(B|A) = P(B) * P(A|B)
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
MP 7	Look for and make use of structure.
MP 8	Look for and express regularity in repeated reasoning.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and postsecondary plans.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problems
Computer Science and Design Thinking	
8.1.12.CS.2	Model interactions between application software, system software, and hardware
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture
8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

LGBTQ and Disabilities NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ and disabled community, including but not limited to Juliette Bruce, NSF Postdoctoral Fellow at University of California, Berkeley and Stephen Hawking, former Director of Research at the University of Cambridge.
Amistad Law NJSA 18A:35-4.43	Explore African-American mathematicians and scientists, including but not limited to Martha Euphemia Lofton Haynes, the first African-American woman to earn a Ph.D in mathematics , and Elbert Frank Cox, the first African-American man to earn a Ph.D in mathematics in the world.
	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
Holocaust Law NJSA 18A:35-28	Explore Jewish mathematicians using the article *"Jewish Mathematicians Who Changed the Course of History"* from *jewishjournal.com*
AAPI Law NJSA 18A:25-4.44	Explore Asian-American and Pacific Islander mathematicians and scientists, including but not limited to Dr. Peter Tsai, inventor of the N95 respirator and Diana Ma, data scientist and statistician for the Lakers
Companion Standards	
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose and audience.
Interdisciplinary Connection	
6.1.12.HistorySE.14.a	Explore the various ways women, racial and ethnic minorities, the LGBTQ community, and individuals with disabilities have contributed to the American economy, politics and society
6.1.12.HistorySE.14.b	Use a variety of sources from diverse perspective to analyze the social, economic and political contributions of marginalized and underrepresented groups and/or individuals.
CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How can we list the possible outcomes in the sample space of an experiment? ● How can we determine whether two events	● Counting Principle of Multiplication ● Permutations ● Combinations

are independent or dependent? • How can we find probabilities of disjoint and overlapping events? • How can a tree diagram help us visualize the number of ways in which two or more events can occur? • How can we determine the frequency of each outcome of an event?	• Mutually exclusive events vs. Inclusive events • Independent events vs. Dependent events • Complementary events

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials:	**Key Vocabulary:**
https://njctl.org/courses/math/algebra-ii/	Probability, permutations, combinations, mutually exclusive, independent, complementary events, theoretical probability, experimental probability

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Probabilities and Odds	-Analyze the difference between probabilities and odds -Calculate simple probability	Lesson, Applications, Review	2 days
Probabilities using Permutations	-Apply the permutation formula (used when order matters) -Find the probabilities of events involving permutations	Lesson, Applications, Review	3 days
Probabilities using Combinations	-Apply the combination formula (used when order does not matter) -Find probabilities of events involving similar triangles	Lesson, Applications, Review	3 days
Disjoint and Overlapping Events	-Determine the difference between disjoint (“or”) and overlapping (“and”) <mutually exclusive vs. inclusive> -Calculate probabilities of disjoint and overlapping events	Lesson, Applications, Review	3 days
Independent and Dependent Events	-Determine the difference between independent and dependent events -Calculate probabilities of independent and dependent events	Lesson, Applications, Review	3 days

Teacher Notes: 18 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Case Managers and follow IEP	-Allow errors in speaking -Rephrase questions, directions, and explanations -Allow extended time on assessments	-Provide extension activities -Build on students’ intrinsic motivations	-Consult with Guidance Counselors and follow I&RS procedures/action plans -Consult with classroom teacher(s) for specific behavior interventions	-Rephrase questions, directions, and explanations -Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with

modifications/accommodations			-Provide extended time to complete tasks (on need basis)	procedures/504 accommodations

Unit # 7 - Overview	
Content Area: Algebra 2	
Unit Title: Data Analysis and Statistics	
Grade Level: 10/11	
Core Ideas: Students will explore the world of statistics through the eyes of a researcher. The unit will cover a review of using combinations to find probability and then move onto various statistical data sets. With each data set, students will determine type of distribution and calculate the measures of central tendency and variation accordingly. Students will also design their own experimental and observational studies, collect data, and draw conclusions from their data, taking into account, any possible bias or margins of error.	
Unit # 7 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
NJSLS.A-APR.C.5 (+)	Know and apply the Binomial Theorem for the expansion of $(x+y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined, for example, by Pascal's Triangle.
NJSLS.S-MD.A.3 (+)	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
NJSLS.S-ID.A.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculator, spreadsheets, and tables to estimate areas under the normal curve.
NJSLS.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
NJSLS.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each
Mathematical Practices	
MP 1	Make sense of problems and persevere in solving them.
MP 2	Reason abstractly and quantitatively.
MP 3	Construct viable arguments and critique the reasoning of others.
MP 4	Model with mathematics.
MP 5	Use appropriate tools strategically.
MP 6	Attend to precision.
MP 7	Look for and make use of structure.
MP 8	Look for and express regularity in repeated reasoning.
Career Readiness, Life Literacies, and Key Skills	
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and postsecondary plans.
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problems
Computer Science and Design Thinking	
8.1.12.CS.2	Model interactions between application software, system software, and hardware
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture
8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
LGBTQ and Disabilities NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ and disabled community, including but not limited to Juliette Bruce, NSF Postdoctoral Fellow at University of California, Berkeley and Stephen Hawking, former Director of Research at the University of Cambridge.

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	Discuss and analyze the movie *Hidden Figures*, the story of female African-American mathematicians and engineers who worked for NASA
Holocaust Law NJSA 18A:35-28	Explore Jewish mathematicians using the article *"Jewish Mathematicians Who Changed the Course of History"* from *jewishjournal.com*
AAPI Law NJSA 18A:25-4.44	Explore Asian-American and Pacific Islander mathematicians and scientists, including but not limited to Dr. Peter Tsai, inventor of the N95 respirator and Diana Ma, data scientist and statistician for the Lakers
Companion Standards	
RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose and audience.
Interdisciplinary Connection	
6.1.12.HistorySE.14.a	Explore the various ways women, racial and ethnic minorities, the LGBTQ community, and individuals with disabilities have contributed to the American economy, politics and society
6.1.12.HistorySE.14.b	Use a variety of sources from diverse perspective to analyze the social, economic and political contributions of marginalized and underrepresented groups and/or individuals.
CASEL 5 SEL Framework	
Self-Awareness	-Demonstrate honesty and integrity -Experience self-efficacy -Develop interests and a sense of purpose
Social Awareness	-Recognize strengths in others -Understand and express gratitude
Self-Management	-Identify and use stress management strategies -Exhibit self-discipline and self-motivation -Use planning and organizational skills
Relationship Skills	-Communicate effectively -Practice teamwork and collaborative problem-solving -Seek or offer support and help when needed
Responsible Decision-Making	-Demonstrate curiosity and open-mindedness -Learn to make a reasoned judgment after analyzing information, data, facts -Recognize how critical thinking skills are useful both inside & outside of school

Unit Essential Question(s):	**Unit Enduring Understandings:**
● In a normal distribution, what percent of data lies within *k* standard deviations of the mean? ● How can we test theoretical probability? ● What are some considerations when undertaking a statistical study?	● Combinations and permutations ● Sample space of an event ● Probability ● Recognize data sets that are normal ● Analyze hypotheses and methods of collecting data

• How can we test a hypothesis about an experiment? • How can we collect data to test a conjecture or draw a conclusion? • How can we collect data that accurately represents a population? • What is a binomial distribution? • How is a binomial distribution related to Pascal's Triangle?	• Different sampling methods (random, self-selected, systematic, convenience) • Bias in sampling and survey questions • *z*-scores • Pascal's Triangle • Measures of Central Tendency and Variation

Evidence of Learning

Formative Assessments: Do Now, Homework, On-spot Checking for Understanding, Teacher Feedback
Summative/Benchmark Assessment(s): Quizzes, Chapter Reviews, Chapter Tests
Alternative Assessments: Portfolios, Online Assignments

Resources/Materials: https://njctl.org/courses/math/algebra-ii/	**Key Vocabulary:** Normal distribution, binomial distribution, standard deviation, measures of central tendency, measures of variation, sampling methods, bias, Pascal's Triangle, Binomial Theorem

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Binomial Theorem	-Use combinations to determine probabilities -Use Pascal's Triangle to find the number of combinations -Apply the Binomial Theorem to binomial expansions	Lesson, Application, Review	3 days
Binomial Distributions	-Construct a probability distribution -Determine whether a probability distribution can be classified as a binomial distribution -Calculate probability of a specific number of success in a binomial distribution	Lesson, Application, Review	3 days
Normal Distributions	-Use the Empirical Rule to determine normality -Calculate area under a normal curve -Calculate the z-score for a standard normal distribution and use it to find probabilities	Lesson, Application, Review	3 days
Conclusions from Samples	-Classify samples (subsets) of population -Recognize bias in sampling -Calculate margin of error for a random sample of size n taken from a large population	Lesson, Application, Review	3 days
Experimental and Observational Studies	-Identify and correct bias in survey questioning -Identify experimental and observational studies -Explore comparative studies and causality -Design experimental and observational studies	Lesson, Application, Review	3 days

Teacher Notes: 18 total days including assessment days (quizzes, test)

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
-Rephrase questions, directions, and explanations	-Allow errors in speaking	-Provide extension activities	-Consult with Guidance Counselors and follow I&RS	-Rephrase questions, directions, and explanations

-Allow extended time on assessments -Consult with Case Managers and follow IEP modifications/accommodations	-Rephrase questions, directions, and explanations -Allow extended time on assessments	-Build on students' intrinsic motivations	procedures/action plans -Consult with classroom teacher(s) for specific behavior interventions -Provide extended time to complete tasks (on need basis)	-Allow extended time on assessments -Consult with Guidance Counselors and 504 Committees to come up with procedures/504 accommodations