Intermediate Algebra

Grade 11

Prepared by:

Rosemary Filev

Superintendent of Schools:

Marie C. Cirasella, Ed.D.

Approved by the Midland Park Board of Education on

August 23, 2022

Born on August 22, 2022

Title: Intermediate Algebra Grade 11

Course Description:

Students come to a second course in Algebra with varying degrees of skill and theoretical understanding of the structure of Algebra. Some review is included to restore speed and to ensure a firm foundation for more advanced concepts, but a mastery of Algebra 1 skills is not only essential for understanding the further development of mathematics, but is mandatory for even minimal success in this course.

Algebraic concepts and skills that were introduced in Algebra 1 and Geometry will be developed and applied to additional real-world scenarios. Students will gain a deeper understanding of functions, especially nonlinear functions, and their applications. Instruction in this course is supported by the use of technology, namely graphing calculators. This course will focus on the big ideas and broad principles of Algebra with assessments that are aligned to intended instructional outcomes.

A deeper understanding of what mathematics is and of its underlying principles is a primary objective of the Intermediate Algebra CP course. Students will gain such an understanding through the development of logical thinking, the making of new connections, and the mastery of algebraic skills. This course is essential to equip students to take their place in a constantly changing environment.

Course Sequence:

Unit 1: Equations, Inequalities, and Problem Solving: 23 days
Unit 2: Graphs and Functions: 24 days
Unit 3: Systems of Linear Equations: 18 days
Unit 4: Probability: 12 days
Unit 5: Exponents, Polynomials, and Polynomial Functions: 25 days
Unit 6: Nonlinear Equations and Functions: 16 days
Unit 7: Radicals, Radical Equations, and Complex Numbers: 24 days
Unit 8: Rational Expressions: 18 days

Pre-requisite: Algebra I and Geometry

Unit # 1 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Equations, Inequalities, and Problem Solving	
Grade Level: 11	
Core Ideas: In this unit, students will learn how to simplify and how to evaluate algebraic expressions and how to solve equations and inequalities algebraically, geometrically, and numerically. Students will use algebraic models and graphical representations to make meaningful connections to solve real world problems.	
Unit #1 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.A.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
NJSLS.A-CED.1	Create equations and inequalities in one variable and use them to solve problems.
NJSLS.A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's Law V = IR to highlight resistance, R.*
NJSLS.A-REI.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
NJSLS.A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
NJSLS.F-BF.1	Write a function that describes a relationship between two quantities.
NJSLS.N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
NJSLS.N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.
NJSLS.N-Q.3	Choose a level of accuracy appropriately to limitations on measurement when reporting quantities.
Career Readiness, Life Literacies, and Key Skills	
NJ.SLS.9.4.2. CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

NJSLS.9.4.1 2.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4. 12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1 .12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

NJSLS.8.1. 12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2. 12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ community, including the origins of Spectra, an organization for LGBTQ mathematicians. Explore mathematicians, scientists, and engineers with disabilities, including American mathematician John Forbes Nash, Jr.
Amistad Law: NJSA 18A 52 16A:88	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	Read and discuss the article on the female mathematicians and scientists who fled the Holocaust for the United States during World War II: *https://www.smithsonianmag.com/history/forgotten-women-scientists who-fled-holocaust-united-states-180967166/*
AAPI Asian Americans and Pacific Islander Law: S4021	Explore Asian American and Pacific Islander mathematicians and scientists, including Dr. Peter Tsai, who invented the N95 respirator.
CASEL-5 SEL Framework	

SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts

Companion Standards	
NJSLS.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST.11-12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST.11- 12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST.11- 12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the

	subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST.1 1- 12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	
NJSLS.6.1.12. HistorySE.14a	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.
NJSLS.HS-PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS-PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS-PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS-PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS-PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS-LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):

- How are expressions, equations, and inequalities utilized to represent real-life phenomena?

Unit Enduring Understandings:

- Real life situations can be modeled using linear equations and inequalities in one variable.
- The proper application of properties is necessary for solving equations and inequalities.
- Proper notation is important to indicate comprehension of content and context.
- Linear equations can have zero, one, or infinitely many solutions.
- Absolute value represents distance from zero on a number line.
- The absolute value of an expression will never be negative.
- Algebraic models and graphical representations are tools that can help us make meaningful connections to solve real world situations.

Evidence of Learning

Formative Assessments:

- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):

- Unit tests

Alternative Assessments:

- Projects

Resources/Materials:	**Key Vocabulary:** absolute value, equivalent, linear

Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	equation, linear inequality, solution

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**
Multi-Step Equations & Inequalities	• Students will be able to solve equations and inequalities algebraically, geometrically, and numerically, with, and without the graphing calculator • Students will be able to express a solution in proper mathematical notation	• Do Now • Guided practice • Independent practice • Graphing activity • Homework • Quiz	5 days
Linear Inequalities	• Students will be able to graph the solution set to a linear inequality	• Do Now • Guided practice • Independent practice • Graphing activity • Homework • Exit ticket	5 days
Literal Equations	• Students will be able to solve a formula for a specified variable and use it to solve problems	• Entry ticket • Guided practice • Independent practice • Homework • Exit ticket	3 days

Applications of Equations and Inequalities	• Students will be able to define the variable and other necessary quantities with respect to the variable, write an equation/inequality, solve and express the solution in literal form for word problems (5 step method) • Students will be able to use a linear model to make predictions	• Do Now • Word problem applications • Guided practice • Independent practice • Homework • Quiz	5 days
Absolute Value Equations	• Students will be able to solve absolute value equations algebraically, geometrically, and numerically with, and without, the graphing calculator • Students will be able to identify the number of solutions for an absolute value equation	• Do Now • Guided practice • Independent practice • Homework • Unit test	5 days
Teacher Notes:			
Additional Resources:			

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students
• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers • Follow IEP	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

accommodation s/modifications	one word			

Unit # 2 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Graphs and Functions	
Grade Level: 11	
Core Ideas: In this unit, students will learn the relationships between linear functions and inequalities and their graphical representations. Students will use equations and inequalities to solve real world problems. The relationships between parallel and perpendicular lines will also be examined.	
Unit #2 – Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.A.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
NJSLS.A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's Law V = IR to highlight resistance, R.*
NJSLS.A-REI.10	Understand that the graph of an equation in two variables if the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
NJSLS.A-REI.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
NJSLS.A-REI.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two

	variables as the intersection of the corresponding half-planes.

NJSLS.F-BF.1	Write a function that describes a relationship between two quantities.
NJSLS.F-IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
NJSLS.F-IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
NJSLS.F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
NJSLS.F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
NJSLS.F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
NJSLS.F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
NJSLS.F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
NJSLS.F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
NJSLS.F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.
NJSLS.S-ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology c. Fit a linear function to a scatter plot that suggests a linear association
NJSLS.S-ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
NJSLS.N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin

	in graphs and data displays
NJSLS.N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.
NJSLS.N-Q.3	Choose a level of accuracy appropriately to limitations on measurement when reporting quantities.
Career Readiness, Life Literacies, and Key Skills	

NJSLS.9.4.12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4.12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1.12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1.12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2.12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ community, including, Ron Buckmire, Professor of Mathematics at Occidental College in Los Angeles and Emily Riehl, Associate Professor of Mathematics at John Hopkins University in Baltimore. Explore mathematicians, scientists, and engineers with disabilities, including Temple Grandin, American scientist, mathematician, and animal behaviorist.
Amistad Law: NJSA 18A 52 16A:88	Explore African-American mathematicians and their contributions to mathematics and science, including Martha Euphemia Loften Haynes, the first black American woman to earn a Ph.D. in mathematics.
Holocaust Law: NJSA 18A: 35 - 28	Read and discuss an article on the great mathematician, Abraham A. Fraenkel, and the challenges he and his Jewish colleagues faced under the rise of the Nazis in Germany: *tabletmag.com/sections/arts-letters/articles/hitlers-math*

AAPI Asian Americans and Pacific Islander Law: S4021	Utilize articles from pbs.org to research AAPI history in science and math saluting STEM pioneers: *articles.bento-live.pbs.org/articles/2020/05/aapi-history-spotlight-saluting-stem-pioneers/*
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL	• Recognize how critical thinking skills are useful both inside & outside of schools

Framework: Responsible Decision Making	• Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts
Companion Standards	
NJSLS.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST.11-12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.

NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST. 11- 12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST. 11- 12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11- 12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connections	
NJSLS.6.1.12. HistorySE.14a	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.
NJSLS.HS-PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS-PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS-PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS-PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS-PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS-LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):

- What is the relationship between the geometric, algebraic, numeric, and literal interpretations of linear equations and inequalities?
- To what extent can representing data model the real world and be used to make predictions?
- How are functions used to represent real-life phenomena?

Unit Enduring Understandings:

- There is a seamless relationship between a function and its graph.
- Multiple mathematical notations exist to represent relations.
- Multiple mathematical approaches and strategies can be used to reach a desired outcome
- Every function has a specific domain and range. • Algebraic functions can be used to model a relation. • All functions are relations, but not all relations are functions.
- For a relation to be a function, each element in the domain corresponds to exactly one element in the range.
- Each function has its own unique graph with identifiable characteristics.

	• Equations or inequalities can be used to solve real world problems by defining a variable(s) to represent an unknown value(s) and using the given information in the problem to write an equation. • Slope is a rate of change between two points.

Evidence of Learning

Formative Assessments:
- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):
- Unit tests

Alternative Assessments:
- Projects

Resources/Materials: Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	**Key Vocabulary:** Function, mapping diagram, slope, ordered pair, horizontal shift, vertical shift

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Solutions to Equations & Inequalities	• Students will be able to determine whether an ordered pair of numbers is a solution to an equation/inequality of two variables.	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	2 days
Graphing Linear Functions	• Students will be able to graph linear equations in two variables using various methods (i.e., x-y chart, slope-intercept form, x and y intercepts, and graphing calculator • Students will be able to graph nonlinear equations in two	• Do Now • Guided practice • Independent practice • Graphing activity • Homework • Quiz	5 days

	variables using an x-y chart and graphing calculator		
Graphing Linear Inequalities	• Students will be able to graph linear inequalities in two variables using slope-intercept form and the graphing calculator	• Entry ticket • Guided practice • Independent practice • Graphing activity • Homework • Exit ticket	3 days
Functions	• Students will be able to	• Do Now	5 days

and Function Notation	determine if a relation is a function algebraically, geometrically, or numerically. • Students will be able to state the domain and range of a function • Students will be able to express a function in different ways (i.e. set of ordered pairs, mapping, graph, formula, etc.) • Students will be able to evaluate a function both algebraically and graphically	• Guided practice • Independent practice • Homework • Quiz	
Linear Equations & Slope	• Students will be able to determine the slope of a line both algebraically and graphically • Students will be able to compare and contrast the slopes of lines • Students will be able to write the equation of a line given two points or the slope and a point • Students will be able to write the equation of a line given its graph	• Do Now • Guided practice • Independent practice • Graphing activity • Homework	5 days
Slopes of Parallel & Perpendicular Lines	• Students will be able to write the equation of a parallel or perpendicular line • Students will be able to apply vertical and horizontal shifts on the graph of a parent function	• Do Now • Guided practice • Independent practice • Graphing activity • Homework • Unit test	4 days
Teacher Notes:			
Additional Resources:			

Differentiation/Modification Strategies				
Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**504Students**
• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participatio	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

• Follow IEP accommodations/modifications	n at any level, even one word			

Unit # 3 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Systems of Equations	
Grade Level: 11	
Core Ideas: In this unit, students will learn how to use systems of equations as mathematical models to represent real-life situations**.** Students will also apply various methods for solving while determining if a system has one solution, no solution, or infinitely many solutions.	
Unit #3 - Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	

NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.A.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
NJSLS.A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's Law V = IR to highlight resistance, R.*
NJSLS.A-REI.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
NJSLS.A.REI.6	Solve systems of linear equations exactly and approximately (i.e. with graphs) focusing on pairs of linear equations in two variables.
NJSLS.A-REI.10	Understand that the graph of an equation in two variables if the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
NJSLS.A-REI.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
NJSLS.A-REI.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
NJSLS.F-BF.1	Write a function that describes a relationship between two quantities.
NJSLS.F-IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
NJSLS.F-IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
NJSLS.F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal

	description of the relationship.
NJSLS.F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

NJSLS.F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
NJSLS.F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
NJSLS.F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
NJSLS.F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another
NJSLS.F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.
NJSLS.S-ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
NJSLS.N-Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
NJSLS.N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.
NJSLS.N-Q.3	Choose a level of accuracy appropriately to limitations on measurement when reporting quantities.
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4.12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4.12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1.	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

12. DA.5	
NJSLS.8.1. 12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2. 12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience

Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Research celebrated mathematicians in the LGBTQ community at: *york.ac.uk/maths/acelebrationofmathematicians/celbratedlgbtqmathematicians* Explore mathematicians, scientists, and engineers with disabilities, including theoretical physicist, Stephen Hawking.
Amistad Law: NJSA 18A 52 16A:88	Research celebrated black mathematicians using: *Jfynet.org/5086/general/celebrating-black-mathematicians-during-black-history-month/*
Holocaust Law: NJSA 18A: 35 - 28	Research Jewish mathematicians using the article "*Jewish Mathematicians Who Changed the Course of History"* using *jewishjournal.com*.
AAPI Asian Americans and Pacific Islander Law: S4021	Research celebrated mathematicians in the AAPI community using *njpf.org/blog/math/math-monday celebrating-aapi-mathematicians/*
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities

SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts
Companion Standards	
NJSLS.RST. 11 -12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST. 11 -12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST.	Write arguments focused on discipline-specific content.

11-12.1	
NJSLS.WHST. 11-12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	
NJSLS.6.1.12.HistorySE.14a	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.
NJSLS.HS	Use a model to predict the relationships between systems or between components of a system.

PS1-1	
NJSLS.HS PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Evidence of Learning

Formative Assessments:

- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):

- Unit tests

Alternative Assessments:

- Projects

Resources/Materials: Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	**Key Vocabulary:** Consistent system, inconsistent system, dependent equations, independent equations

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Introduction to Systems of Equations	• Determine if a given ordered pair is a solution to a system of equations	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	2 days

Solving Systems of Equations	• Students will be able to solve a system of equations in two variables using graphing (by hand and by the graphing calculator), substitution, and elimination methods • Students will be able to compare and contrast the methods for solving a system of two equations in two variables • Students will be able to determine if a system of equations in two variables is independent or dependent • Students will be able to determine if a system of independent equations is consistent or inconsistent • Students will be able to find the set of all solutions (point, line, plane, no solution) algebraically	• Entry ticket • Guided practice • Independent practice • Graphing activities • Homework • Unit test	14 days
Systems of Equations Applications	• Students will be able to use a system of equations to represent and solve real life problems	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	2 days
Teacher Notes:			
Additional Resources:			
Differentiation/Modification Strategies			

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

• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even one word	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

• Consult with case managers • Follow IEP accommodations/modifications				

Unit #4 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Probability	
Grade Level: 11	
Core Ideas: In this unit, students will work on probability and odds of simple events. Students will explore the differences between experimental and theoretical probability, independent and dependent events, and how to calculate probability of real-life situations.	
Unit #4 – Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.

NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.S-IC.2	Decide if a specified model is consistent with results from a given data-generating process, e.g. using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*
NJSLS.S-CP.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements or other events ("or", "and", "not").
NJSLS.S-CP.2	Understand that two events, A and B, are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
NJSLS-CP.3	Understand the conditional probability of A, given B, as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
NJSLS-CP.5	– Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example*, *compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*
NJSLS-CP.6	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.
NJSLS-CP.7	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.
NJSLS-CP.8	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
NJSLS-CP.9	Use permutations and combinations to compute probabilities of compound events and solve

	problems.
NJSLS.N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.
NJSLS.N-Q.3	Choose a level of accuracy appropriately to limitations on measurement when reporting quantities.
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4.12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

NJSLS.9.4. 12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1. 12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1. 12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2. 12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Research celebrated mathematicians in the LGBTQ community at: *york.ac.uk/maths/acelebrationofmathematicians/celbratedlgbtqmathematicians* Explore mathematicians, scientists, and engineers with disabilities, including mathematician Solomon Lefschetz, and his work in algebraic geometry.
Amistad Law: NJSA 18A 52 16A:88	Research celebrated black mathematicians using: *Jfynet.org/5086/general/celebrating-black-mathematicians-during-black-history-month/*
Holocaust Law: NJSA 18A: 35 - 28	Research Jewish mathematicians using the article "*Jewish Mathematicians Who Changed the Course of History"* using *jewishjournal.com*.
AAPI Asian Americans and Pacific Islander Law: S4021	Research celebrated mathematicians in the AAPI community using *njpf.org/blog/math/math-monday celebrating-aapi-mathematicians/*
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation

SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL	• Communicate effectively

Framework: Relationship Skills	• Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts
Companion Standards	
NJSLS.RST. 11- 12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST. 11- 12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST. 11 -12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST. 11 -12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11 -12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	

NJSLS.6.1.12. HistorySE.14a	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.
NJSLS.HS-PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS-PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS-PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS-PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS-PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS-LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):

- How is probability used in all aspects of life?
- Why is probability never less than 0 or greater than 1?

Unit Enduring Understandings:

- Probability and statistical models can be used to describe everyday situations involving chance.
- Theoretical probability and experimental probability are different.
- Laws of probability are affected by whether events are independent or dependent.
- Mutually exclusive events impact probability calculations.
- Probability can be expressed using sample spaces in the form of tree diagrams and ordered pairs.

Evidence of Learning

Formative Assessments:

- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):

- Unit tests

Alternative Assessments:

- Projects

Resources/Materials: Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	**Key Vocabulary:** experimental probability, theoretical probability, mutually exclusive

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**
Introduction to Probability	• Students will be able to use proper probability notation	• Do Now • Guided practice • Independent practice • Homework	1 day
Simple and Compound Probability	• Students will be able to find sample space to calculate probability • Students will be able to use the multiplication principle to find the number of outcomes • Students will be able to find the probability of an event or set of events	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	6 days
Independent and Dependent Events	• Students will be able to identify mutually exclusive events • Students will be able to classify events as dependent or independent • Students will be able to use the addition rule and multiplication rule to compute the theoretical probability of an event or set of events • Students will be able to use sample spaces in the form of tree diagrams and ordered pairs to	• Entry ticket • Guided practice • Independent practice • Homework • Unit test	5 days

	solve probability problems • Students will be able to use technology to simulate		

	probability of an event		

Teacher Notes:

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students
• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers • Follow IEP accommodations/modifications	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even one word	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

Unit #5 - Overview

Content Area: Intermediate Algebra

Unit Title: Exponents, Polynomials, and Polynomial Functions

Grade Level: 11

Core Ideas: In this unit, students will work with the family of polynomial functions to understand how polynomials can be used to model real-world phenomena. Students will apply a variety of factoring techniques and methods to solve polynomial equations, to find zeros of functions, and to find the roots of equations.

Unit #5 – Standards

Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$

NJSLS.S-A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expressions. a. Factor a quadratic expression to reveal the zeroes of the function it defines.
NJSLS.A-APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
NJSLS.A-APR.2	Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
NJSLS.A-APR.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
NJSLS.A-APR.4	Prove polynomial identities and use them to describe numerical relationships.
NJSLS.A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
NJSLS.A-REI.4	- Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 and . $a\ b$
NJSLS.F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums symmetries; end behavior; and periodicity.
NJSLS.F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

NJSLS.F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
NJSLS.F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of context.
NJSLS.F-IF.9	–Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
NJSLS.N.Q.1	Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
NJSLS.N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.

NJSLS.N-Q.3	Choose a level of accuracy appropriately to limitations on measurement when reporting quantities.
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4. 12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4. 12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.1 2.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4. 12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1. 12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1. 12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2.	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the

12. EC.3	individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Research STEM professionals in the LGBTQ community at o*STEM,* a non-profit professional association for LGBTQ people in science, technology, engineering and math: *ostem.org/page/about-ostem* Explore mathematicians, scientists, and engineers with disabilities, including French topologist, Bernard Morin.
Amistad Law: NJSA 18A 52 16A:88	Research black innovators who have made an impact in science, technology, engineering, and math: *sphero.com/blogs/news/black-leaders-in-stem*
Holocaust Law: NJSA 18A: 35 - 28	Research influential Jewish professionals in STEM by using: *jewishunpacked.com/the-jewish-roots-of-stem/*
AAPI Asian Americans and Pacific Islander Law: S4021	Research AAPI women in STEM professions using: issues.org/realnumbers-asian-women-stem-careers/
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships

SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts
Companion Standards	
NJSLS.RST. 11- 12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST. 11- 12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST. 11 -12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST. 11 -12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11 -12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	
NJSLS.6.1. 12. HistorySE. 14a	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.
NJSLS.HS PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS	Use mathematical representations of phenomena to describe explanations.

PS2-2	
NJSLS.HS PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):	**Unit Enduring Understandings:**
• Why is it important to represent data in different forms? • How can polynomials be used to solve real-world problems?	• While linear equations are important to problem solving, many real-world relationships are modeled by non-linear relationships. • There are different rules for simplifying variable expressions. • There are various ways to simplify an exponential expression. • It is important to distinguish between a polynomial expression, equation, and function. • The graph of a polynomial function is smooth and continuous.

	• There are various factoring techniques. • The quadratic formula can be used to solve any quadratic equation. • A polynomial equation is factorable when the solutions are rational numbers. • Imaginary numbers exist.

Evidence of Learning

Formative Assessments:
- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):
- Unit tests

Alternative Assessments:
- Projects

Resources/Materials: Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	**Key Vocabulary:** non-linear, exponential expression, polynomial function, rational numbers, imaginary numbers

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Simplifying and Evaluating Exponential Expressions	• Students will be able to apply the rules for simplifying exponents (Product Rule, Quotient Rule, and Power Rule) to simplify exponential expressions • Students will be able to use the rules of exponents and definitions to evaluate exponential expressions	• Do Now • Guided practice • Independent practice • Homework • Exit ticket • Quiz	5 days
Operations with Polynomials	• Students will be able to classify polynomials by degree and number of terms • Students will be able to add, subtract, and multiply polynomials	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	5 days
Polynomial Functions and Graphs	• Students will be able to describe characteristics of the graph of a polynomial function using the degree and leading coefficient	• Entry ticket • Guided practice • Independent practice	7 days

	• Students will be able to determine the domain and range of a polynomial function • Students will be able to evaluate a polynomial function	• Homework • Graphing activity	

Factoring Polynomials	• Students will be able to factor out a greatest common factor of a polynomial • Students will be able to factor a trinomial of the form $ax^2 + bx + c$ where $a = 1$ and $a \neq 1$ • Students will be able to factor a binomial in the form of perfect squares • Students will be able to factor a polynomial by "grouping" • Students will be able to solve a quadratic equation using factoring or the quadratic formula • Students will be able to determine if the solution to a quadratic equation is a real or an imaginary number	• Do Now • Guided practice • Independent practice • Homework • Exit ticket • Unit test	8 days

Teacher Notes:

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students
• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even one word	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

• Follow IEP				

accommodations/modifications				

Unit #6 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Nonlinear Equations and Functions (Quadratic and Exponential)	
Grade Level: 11	
Core Ideas: In this unit, students will identify characteristics of quadratics and exponential functions. Multiple modalities will be applied to solve quadratic equations. Students will be able to determine whether a linear, exponential, or quadratic function best models a set of data.	
Unit # 6– Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 – y^4$ *as* $(x^2)^2 – (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 – y^2)(x^2 + y^2)$
NJSLS.S-A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expressions. b. Factor a quadratic expression to reveal the zeroes of the function it defines.
NJSLS.A-APR.1	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
NJSLS.A-APR.3	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication and division by a non-zero rational expression; add, subtract, multiply and divide rational expressions.

NJSLS.A-REI.4	Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 b.
NJSLS.N-CN.1	Know there is a complex number *I* such that $i^2 = -1$, and every complex number has the form $a + bi$ with *a* and *b* real.
NJSLS.N-CN.7	Solve quadratic equations with real coefficients that have complex solutions.
NJSLS.F-IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums symmetries; end behavior; and periodicity.
NJSLS.F-IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example*, *if the function h(n) gives the number of person-hours it takes to assemble n*

	engines in a factory, then the positive integers would be an appropriate domain for the function.
NJSLS.F-IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
NJSLS.F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of context.
NJSLS.F-IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example*, *given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
NJSLS.F-BF.1	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context
NJSLS.F-BF.3	Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

NJSLS.F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
NJSLS.F-LE.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial functions.
NJSLS.F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.
NJSLS.S-ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4.12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4.12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1.12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1.12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2.12.	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the

EC.3	individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Research celebrated mathematicians in the LGBTQ community at: *york.ac.uk/maths/acelebrationofmathematicians/celbratedlgbtqmathematicians* Explore mathematicians, scientists, and engineers with disabilities, including famous scientist

	and mathematician, Albert Einstein.
Amistad Law: NJSA 18A 52 16A:88	Research celebrated black mathematicians using: *Jfynet.org/5086/general/celebrating-black-mathematicians-during-black-history-month/*
Holocaust Law: NJSA 18A: 35 - 28	Research Jewish mathematicians using the article "*Jewish Mathematicians Who Changed the Course of History"* using *jewishjournal.com*.
AAPI Asian Americans and Pacific Islander Law: S4021	Research celebrated mathematicians in the AAPI community using *njpf.org/blog/math/math-monday celebrating-aapi-mathematicians/*
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts
Companion Standards	
NJSLS.RST. 11- 12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST.	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent

11- 12.9	understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST.11	Write arguments focused on discipline-specific content.

-12.1	
NJSLS.WHST. 11 -12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11 -12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	
NJSLS.6.1.12. HistorySE.14a	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.
NJSLS.HS-PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS-PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS-PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS-PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS-PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS-LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):	**Unit Enduring Understandings:**
• If a quadratic equation cannot be factored, does it mean that it cannot be solved? • If real-world phenomena do not grow at a constant rate, then is there an alternative to model the data?	• There are multiple methods to solving quadratic equations, and each has its own advantages. • The graph of a quadratic function is a parabola. • The vertex of a parabola is the point at which the graph intersects the axis of symmetry. • The zeros are the x-intercepts that represent the real solutions to a quadratic equation. • Situations exist in which a quantity grows or decays at a constant percent rate. • The quadratic formula can be used to solve any quadratic equation. • Real world problems can be represented by quadratic equations. • Exponential functions are functions whose equations contain a variable in the exponent.

Evidence of Learning

Formative Assessments:
- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):
- Unit tests

Alternative Assessments:
- Projects

Resources/Materials:	**Key Vocabulary**: asymptotes, axis of symmetry, discriminant, ,quadratic, roots, vertex, zeros
Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software	

Supplemental handouts TI-84 graphing calculators	

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**

Quadratic Functions and Their Graphs	• Students will be able to find the equation of the axis of symmetry and vertex • Students will be able to determine the domain, range, and intercepts of a quadratic function • Students will be able to identify the characteristics of a quadratic function given its equation • Students will be able to solve a quadratic equation by graphing • Students will be able to reflect and translate a parent function vertically and/or horizontally	• Do Now • Guided practice • Independent practice • Homework • Quiz	6 days
Quadratic Formula and Factoring	• Students will be able to solve a quadratic equation by factoring and/or using the quadratic formula	• Entry ticket • Guided practice • Independent practice • Homework • Quiz	5 days
Exponential Functions	• Students will be able evaluate, graph and apply exponential functions • Students will be able to identify horizontal asymptotes • Students will be able to determine the domain and range of exponential functions	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	5 days

Teacher Notes:

Additional Resources:

Differentiation/Modification Strategies

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

• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance

• Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers • Follow IEP accommodations/modifications	to answer questions • Accept participation at any level, even one word	students' interests in completing tasks at their level of engagement	classroom teachers and guidance counselors for specific behavior interventions	counselors

Unit #7 - Overview	
Content Area: Intermediate Algebra	
Unit Title: Rational Exponents, Radicals, and Complex Numbers	
Grade Level: 11	
Core Ideas: In this unit, students will explore the relationship between rational exponents and radicals while performing operations with rational expressions, radical expressions, and complex numbers. Multiple mathematical approaches and strategies will be applied to solve rational exponent and radical equations.	
Unit # 7– Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**

Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$
NJSLS.S-A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expressions. c. Factor a quadratic expression to reveal the zeroes of the function it defines.
NJSLS.A-APR.6	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
NJSLS.A-APR.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication and division by a non-zero rational expression; add, subtract, multiply and divide rational expressions.
NJSLS.A-REI.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
NJSLS.N-RN.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

	For example, we define $5^{\frac{1}{3}}$ *to be the cube root of 5 because we want* $\left(5^{\frac{1}{3}}\right)^3 = 5^{\left(\frac{1}{3}\right)3}$ *to hold, so* $\left(5^{\frac{1}{3}}\right)^3$ *must equal 5.*
NJSLS.N-RN.2	Rewrite expressions involving radials and rational exponents using properties of exponents.
NJSLS.N-CN.1	Know there is a complex number *I* such that $i^2 = -1$, and every complex number has the form $a + bi$ with *a* and *b* real.
NJSLS.N-CN.2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
NJSLS.N-CN.3	Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4.12. C1.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.

NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4.12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1.12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1.12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2.12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Research STEM professionals in the LGBTQ community at o*STEM,* a non-profit professional association for LGBTQ people in science, technology, engineering and math: *ostem.org/page/about-ostem* Explore mathematicians, scientists, and engineers with disabilities, including blind mathematician, Nicholas Saunderson.
Amistad Law: NJSA 18A 52 16A:88	Research black innovators who have made an impact in science, technology, engineering, and math: *sphero.com/blogs/news/black-leaders-in-stem*
Holocaust Law: NJSA 18A: 35 - 28	Research influential Jewish professionals in STEM by using: *jewishunpacked.com/the-jewish-roots-of stem/*
AAPI Asian Americans and Pacific Islander Law: S4021	Research AAPI women in STEM professions using: issues.org/realnumbers-asian-women-stem-careers/
CASEL-5 SEL Framework	
SEL Framework:	• Integrate personal and social identities

Self Awareness	• Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision Making	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts

Companion Standards	
NJSLS.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST.11-12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST.11- 12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST.11- 12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST.	Draw evidence from informational texts to support analysis, reflection, and research.

11- 12.9	
Interdisciplinary Connection	
NJSLS.6.1.12. HistorySE.14a	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.
NJSLS.HS-PS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HS-PS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HS-PS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HS-PS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HS-PS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HS-LS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):	**Unit Enduring Understandings:**
• How are radicals and rational exponents related? • How can algorithms be extended to analyze radical and rational exponential functions?	• A relationship exists between radicals and rational exponents. • The algorithm used to simplify square roots applies to all radicals. • Radical and rational exponential equations can be manipulated into a more recognizable form to be solved. • Multiple mathematical approaches and strategies can be used to reach a desired outcome. • The original expression determines whether absolute value is needed. • Absolute value is necessary in simplifying even index radicals when there is no information give to guarantee the root is positive. • Negative radicands in square roots must be simplified using imaginary numbers before operations are performed. • Radicals can be expressed with rational exponents. • Extraneous solutions can exist in radical equations. • Real world problems can be represented by radical equations.

Evidence of Learning

Formative Assessments:

- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):

- Unit tests

Alternative Assessments:

- Projects

Resources/Materials:	**Key Vocabulary:** complex numbers**,** radical, radicand, rational exponent, rationalize
Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**
Radicals and Radical Functions	• Students will be able to distinguish between all real roots and principal roots	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	2 days
Rational	• Students will be able to simplify		

Exponents	radical/rational exponent expressions • Students will be able to convert between radical expressions and rational exponents	• Entry ticket • Guided practice • Independent practice • Homework • Quiz	5 days
Performing Operations with Radical Expressions	• Students will be able to perform operations involving radical/rational exponent expressions, including complex numbers	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	7 days

Rationalizing the Denominator	• Students will be able to rationalize the denominator of an expression, including complex numbers	• Entry ticket • Guided practice • Independent practice • Homework • Exit Ticket	3 days
Solving Radical Equations	• Students will be able to solve a radical equation/rational exponent equation and check for extraneous solutions • Students will be able to simplify negative square roots and powers of *i*	• Do Now • Guided practice • Independent practice • Homework • Unit test	7 days

Teacher Notes:

Additional Resources:

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers • Follow IEP accommodations/modificat	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even one word	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors

ions				

Unit #8- Overview	
Content Area: Intermediate Algebra	
Unit Title: Rational Expressions	
Grade Level: 11	
Core Ideas: In this unit, students will work with the family of rational expressions. This unit will cover the relationship between rational exponents and radicals, and will allow students to understand how rational functions can be used to model real world situations.	
Unit #8 – Standards	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS):	
NJSLS.A SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
NJSLS.A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$
NJSLS.S-A-SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expressions. d. Factor a quadratic expression to reveal the zeroes of the function it defines.
NJSLS.A-APR.6	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
NJSLS.A-APR.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication and division by a non-zero rational expression; add, subtract, multiply and divide rational expressions.
NJSLS.A-REI.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
NJSLS.A-REI.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

NJSLS.F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
NJSLS.F-IF.9	–Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
Career Readiness, Life Literacies, and Key Skills	
NJSLS.9.4.12.	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

C1.1	
NJSLS.9.4.12. CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
NJSLS.9.4.12.I ML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.
NJSLS.9.4.12. TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.
NJSLS.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 problem.
Computer Science and Design Thinking	
NJSLS.8.1.12. DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
NJSLS.8.1.12. DA.6	Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
NJSLS.8.2.12. EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience
Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
LGBTQ and Disabilities Law: NJSA 18A:35-4.35	Explore mathematicians in the LGBTQ community, including, Alan Turing, who interpreted the Nazi code correctly during World War II and is hailed as the father of artificial intelligence: *edgemedianetwork.com* Explore mathematicians, scientists, and engineers with disabilities, including Farida Bedwei, a computer scientist with cerebral palsy.
Amistad Law: NJSA 18A 52 16A:88	Explore African-American mathematicians and their contributions to mathematics and science, including, Mark Dean, a famous computer scientist and engineer, credited with developing computer technologies for IBM: *mashupmath.com/blog/famous-african-american-mathematicians*

Holocaust Law: NJSA 18A: 35 - 28	Research influential Jewish professionals in STEM by using: *jewishunpacked.com/the-jewish-roots-of stem/*
AAPI Asian Americans and Pacific Islander Law: S4021	Research AAPI professionals in STEM using: *aapidata.com/blog/the-american-scientist-engineer/*
CASEL-5 SEL Framework	
SEL Framework: Self Awareness	• Integrate personal and social identities • Identify personal, cultural, and linguistic assets • Develop interests and a sense of purpose
SEL Framework: Social Awareness	• Understand the influences of organizations/systems on behavior • Take others' perspectives • Recognize situational demands and opportunities
SEL Framework: Self Management	• Set personal and collective goals • Use planning and organizational skills • Exhibit self-discipline and self-motivation
SEL Framework: Relationship Skills	• Communicate effectively • Practice teamwork and collaborative problem-solving • Develop positive relationships
SEL Framework: Responsible Decision-	• Recognize how critical thinking skills are useful both inside & outside of schools • Evaluate personal, interpersonal, community, and institutional impacts • Learn to make a reasoned judgment after analyzing information, data, facts

Making	
Companion Standards	
NJSLS.RST.11 -12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
NJSLS.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.
NJSLS.RST.11 -12.9	Synthesize information from a range of sources (texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through effective selection, organization, and analysis of content.
NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJSLS.WHST. 11-12.1	Write arguments focused on discipline-specific content.
NJSLS.WHST. 11-12.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
NJSLS.WHST. 11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
Interdisciplinary Connection	
NJSLS.6.1.12.HistorySE.14a	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.
NJSLS.HSPS1-1	Use a model to predict the relationships between systems or between components of a system.
NJSLS.HSPS1-7	Use mathematical representations of phenomena to support claims.
NJSLS.HSPS2-1	Analyze data using tools, technologies, and/or models (computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
NJSLS.HSPS2-2	Use mathematical representations of phenomena to describe explanations.
NJSLS.HSPS4-1	Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.
NJSLS.HSLS2-1	Use mathematical and/or computational representations of phenomena or design solutions to support explanations.

Unit Essential Question(s):	**Unit Enduring Understandings:**
• In what ways can rational functions be used to model real world situations? • How can algorithms be extended to analyze more challenging functions?	• The algorithms used with basic fractions apply to rational expressions. • Not every real number is an element of the domain. • Rational expressions contain variable(s) in the denominator. • There can be restrictions on the variable(s) in a rational expression. • The values that make the denominator equal to zero need to be excluded from the domain. • A fraction within a fraction is known as a complex fraction. • Not every real number is an element of the domain. • Multiplying an equation by a variable may produce an extraneous solution (s).

Evidence of Learning

Formative Assessments:
- Quizzes
- Do Now
- Entry tickets
- Exit tickets
- Homework

Summative/Benchmark Assessment(s):
- Unit tests

Alternative Assessments:
- Projects

Resources/Materials:	**Key Vocabulary:** algorithm, complex fraction, rational expression, Remainder Theorem, restriction
Pearson *Intermediate Algebra* Teacher resources www.pearsonmylabs.com Kuta software Supplemental handouts TI-84 graphing calculators	

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**

Simplifying Rational Expressions, Domain and Range	• Students will be able to determine the domain of a rational expression • Students will be able to write a rational expression as a function using function notation • Students will be able to write a rational expression in simplest form	• Do Now • Guided practice • Independent practice • Homework • Exit ticket	5 days
Operations with Rational Expressions	• Students will be able to add, subtract, multiply, and divide rational expressions • Students will be able to apply the Remainder Theorem • Students will be able to simplify complex fractions utilizing two methods	• Entry Ticket • Guided practice • Independent practice • Homework • Quiz	8 days
Solving Rational Equations	• Students will be able to solve equations containing rational expressions and identify extraneous solutions	• Do Now • Guided practice • Independent practice • Homework • Quiz	5 days
Teacher Notes:			
Additional Resources:			

Differentiation/Modification Strategies				
Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**504Students**

• Allow errors • Rephrase questions, directions, and explanations • Repetition and review of previously learned material • Allow extended time to answer questions • Accept participation at any level, even one word • Consult with case managers • Follow IEP accommodations/modifications	• Assign a buddy, same language or English speaking • Rephrase questions, directions, and explanations • Allow extended time to answer questions • Accept participation at any level, even one word	• Provide extension activities • Build on students' intrinsic motivations • Consult with parents and guidance counselors to accommodate students' interests in completing tasks at their level of engagement	• Provide extended time to complete tasks • Consult with Guidance Counselors and follow I&RS procedures & action plans • Consult with classroom teachers and guidance counselors for specific behavior interventions	• Rephrase questions, directions and explanations when necessary • Follow 504 plan accommodations and modifications • Consult with 504 team and guidance counselors