PUBLIC SCHOOLS OF EDISON TOWNSHIP

OFFICE OF CURRICULUM AND INSTRUCTION

Algebra 1

Length of Course:	Term
Elective/Required:	Required
Schools:	Middle Schools
Eligibility:	Grade 7- 8
Credit Value:	N/A
Date Approved:	August 23, 2022

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Modifications will be made to accommodate IEP mandates for classified students

INTRODUCTION

The New Jersey Student Learning Standards (NJSLS) for Mathematics are intended to provide students with a solid foundation in expressions, equations and inequalities, and connections to modeling and functions. This curriculum guide is standards based which reflects the NJ Student Learning Standards for Mathematics, the Mathematical Practices that are expected to be used in teaching mathematics K-12 are as follows and infused throughout the guide:

- Make sense of problems and persevere in solving them.
- Use appropriate tools strategically.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

New Jersey Student Learning Standards for Mathematics Algebra 1 Overview:

Seeing Structure in Expressions

• Interpret the structure of expressions

• Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Functions

• Perform arithmetic operations on polynomials

• Understand the relationship between zeros and factors of polynomials

• Use polynomial identities to solve problems

• Rewrite rational expressions

Creating Equations

• Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

• Understand solving equations as a process of reasoning and explain the reasoning

• Solve equations and inequalities in one variable

• Solve systems of equations

• Represent and solve equations and inequalities graphically

Interpreting Functions

• Understand the concept of a function and use function notation

• Interpret functions that arise in applications in terms of the context

• Analyze functions using different representations

Building Functions

- Build a function that models a relationship between two quantities
- Build new functions from existing functions

Linear, Quadratic, and Exponential Models

- Construct and compare linear and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model

The purpose of the revision was to further integrate the practice standards as well as incorporate technology in a meaningful way to enhance instruction and learning.

Learning mathematics with understanding is essential to enable students to problem solve. Students learn mathematics by doing not just by listening and memorizing. When mathematical facts are connected, taught in a contextual setting, applied to real world applications and infused with technology, knowledge is more likely retained.

SCOPE & SEQUENCE: Algebra 1

MARKING PERIOD 1	MARKING PERIOD 2
<u>Unit 1:</u> Solving Equations and Inequalities 2.1: Writing Equations 2.2: One Step Equations 2.3: Multistep Equations 2.4: Equations with Variables on Each Side 2.5: Solving Absolute Value Equations 2.8: Literal Equations and Dimensional Analysis 5.3: Solving Multi-Step Inequalities 5.4: Solving Compound Inequalities 5.5: Inequalities Involving Absolute Value **<u>Unit 2:</u> Functions and Relations** 1.6: Relations 1.7: Functions 1.8: Interpreting Graphs of Functions **<u>Unit 3:</u> Linear Functions** 3.1: Graphing Linear Equations 3.2: Solving Linear Equations by Graphing 3.3: Rate of Change and Slope 3.4: Direct Variation 3.5: Arithmetic Sequences as Linear Functions 3.6: Proportional and Nonproportional Relationships	**<u>Unit 4:</u> Linear Equations** 4.1: Graphing Equations in Slope-Intercept Form 4.2: Writing Equations in Slope-Intercept Form 4.3: Writing Equations in Point-Slope Form 4.4: Parallel and Perpendicular Lines **<u>Unit 5:</u> Systems of Equations and Systems of Inequalities** 6.1: Graphing Systems of Equations 6.2: Substitution 6.3-6.4: Elimination 6.5: Applying Systems of Equations 5.6: Graphing Inequalities in Two Variables 6.6: Systems of Inequalities

MARKING PERIOD 3	MARKING PERIOD 4
<u>Unit 6:</u> Exponential Functions and Properties 7.1: Multiplication Property of Exponents 7.2: Division Properties of Exponents 7.3: Rational Exponents 7.5: Exponential Functions 7.6: Growth and Decay **<u>Unit 7:</u> Quadratic Expressions and Equations** 8.1: Adding and Subtracting Polynomials 8.2: Multiplying a Polynomial by a Monomials 8.3: Multiplying Polynomials 8.4: Special Products 8.5: Distributive Property 8.6-8.9: Solving by Factoring **<u>Unit 8:</u> Quadratic Functions** 9.1: Graphing Quadratics 9.2: Solving Quadratics by Graphing 9.3: Transformations of Quadratics 9.4: Completing The Square 9.5: Quadratic Formula	**<u>Unit 9:</u> Square Root Functions and Radical Properties** 10.1: Square Root Functions 10.2: Simplifying Radical Expressions 10.3: Operations with Radical Expressions 10.4: Radical Equations **<u>Unit 10:</u> Rational Functions** 11.1: Inverse Variation 11.2: Rational Functions 11.3: Simplifying Radical Expressions 11.4: Multiplying and Dividing Rational Expressions 11.6: Adding and Subtracting Rational Expressions 11.7: Mixed Expressions and Complex Fractions **<u>(Time Permitting) Unit 11:</u> Special Functions, Trigonometry, and Probability** 4.5: Scatter Plots and Lines of Fit 9.7: Special Functions 10.5: Pythagorean Theorem 10.6: Trigonometric Ratios 12.6: Permutations and Combinations 12.7: Probability of Compound Events

Please note: Instructors will change their pacing and timing as needed to accommodate class periods available.

Unit 1: Solving Equations and Inequalities

Essential Questions	Enduring Understandings
• Why is it important to maintain equality as you solve an equation? • Are equations that appear to be different equivalent? • How do properties of solving linear equations apply to rearranging literal equations? • How do you solve compound equations and inequalities algebraically and graphically? • How do you solve absolute value equations and inequalities algebraically and graphically? • How can you represent and solve a compound inequality?	• Linear equations are solved by using inverse operations, the distributive property, and isolating a variable. • The properties of equality or inequality can be used to justify algebraic reasoning and the resulting solutions. • Linear equations can model ratios, find rates to compare given quantities, and make predictions based on the situations. • Equations can be used to find the solution of given real - world problems. • There are relationships within equations or inequalities that result in special solution situations, including no solution or all real-number solutions. • The properties of equality and inverse operations can be used to transform literal equations into forms most helpful for a given situation. • Compound and absolute inequalities can be rewritten and understood through the intersection or union of the simple inequalities that lie within the compound inequality. • There are cases where there are no solutions or infinitely many solutions with possible restrictions.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
• Create equations and inequalities to represent real-world situations. • Apply properties of equality to solve equations and justify the solution process.	A.CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.3: Represent constraints by	2.1: Writing Equations Quizizz - Translating Equations Quia - Translating Equations 2.2: One Step Equations IXL - One-Step Equations	Students will be formatively assessed through: • Teacher Observations • Do Nows • Exit Slips • Classwork • Extended Learning Activities • Stations • Educational Games

• Apply properties of inequality to solve inequalities and graph their solutions. • Solve literal equations for a given variable. • Transform literal equations to solve real-world problems. • Solve absolute value equations. • Solve compound inequalities and absolute value inequalities. • Identify equations and inequalities that have no solution or infinitely many solutions, including absolute value equations and inequalities.	equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A.REI.A.1: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.CED.A.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.	Math Games - One-Step Equations 2.3: Multistep Equations Math Games - Multi-Step Equations 2.4: Equations with Variables on Each Side Khan Academy - Variables on Both Sides Word Problems - Variables on Both Sides 2.5: Solving Absolute Value Equations Khan Academy - Absolute Value Equations IXL - Absolute Value Equations 2.8: Literal Equations and Dimensional Analysis Khan Academy - Literal Equations IXL - Literal Equations 5.3: Solving Multi-Step Inequalities 5.4: Solving Compound Inequalities Khan Academy - Compound Inequalities Algebra Lab - Compound Inequalities 5.5: Inequalities Involving Absolute Value IXL - Absolute Value Inequalities	Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

Resources: Essential Materials, Supplemental Materials, Links to Best Practices		**Instructional Adjustments:** Modifications, Student Difficulties, Possible Misunderstandings
Algebra 1 Textbook Login http://www.socrative.com/ www.kahoot.it www.shodor.org www.Insidemathematics.org www.xyzsolve.com www.ck12.org www.mathjong.com Pear Deck Socrative Edpuzzle Quizizz Nearpod	**Resources from textbook:** ● Lesson Presentations ● Lesson Videos ● Explore Activities ● Online Practices ● Exit Cards ● Tiered Practices ● Performance Tasks ● Unit Reviews ● Assessments	*Modifications/Student difficulties/Common errors* ● Emphasize note taking strategies ● Use guided notes when necessary ● Revisit and study notebook ● Create vocabulary notecards ● Use tools/manipulatives/models ● Reword application problems ● Use handouts/graphic organizers ● Review peer work and provide feedback ● Complete error analysis process. ● Create a study guide for intervention ● Build a glossary notebook

Unit 2: Functions and Relations

Essential Questions	Enduring Understandings
● How can you represent and describe functions? ● How can functions describe real- world situations? ● What does the domain and range of function represent? How is that applied to real world scenarios?	● Functions are a special type of relation where each value in the domain is paired with exactly one value in the range. ● The vertical line test and mapping diagrams help to determine whether a relation is a function. ● Some functions can be graphed or represented by equations ● Relations and functions can be represented by a table of values, mappings, and graphs to determine the following: o Domain and range o Independent and Dependent Variables o Continuous and discrete functions o Function or relation?

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Represent relations in a variety of methods. ● Interpret graphs of relations. ● Determine whether a relation is a function. ● Identify the domain and range of functions. ● Use function notation to evaluate functions. ● Use function notation to interpret key features such as	F-IF.A.1: 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). F-IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a	1.6: Relations IXL - Domain and Range Khan Academy - Domain and Range 1.7: Functions IXL - Functions Quizizz - Functions 1.8: Interpreting Graphs of Functions Khan Academy - Graphs of Functions	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games Summative assessments include: ● Minor Assessments ● Major Assessments ● Performance Assessments

identifying the value of f(3) given the table of a function and determining x given f(x)=5. • Interpret intercepts and symmetry of graphs of functions. • Interpret extrema and end behavior of graphs of functions.	context.		

Resources: Essential Materials, Supplemental Materials, Links to Best Practices		**Instructional Adjustments:** Modifications, Student Difficulties, Possible Misunderstandings
Algebra 1 Textbook Login http://www.socrative.com/ www.kahoot.it www.shodor.org www.Insidemathematics.org www.xyzsolve.com www.ck12.org www.mathjong.com Pear Deck Socrative Edpuzzle Quizizz Nearpod	**Resources from textbook:** • Lesson Presentations • Lesson Videos • Explore Activities • Online Practices • Exit Cards • Tiered Practices • Performance Tasks • Unit Reviews • Assessments	*Modifications/Student difficulties/Common errors* • Emphasize note taking strategies • Use guided notes when necessary • Revisit and study notebook • Create vocabulary notecards • Use tools/manipulatives/models • Reword application problems • Use handouts/graphic organizers • Review peer work and provide feedback • Complete error analysis process. • Create a study guide for intervention • Build a glossary notebook

Unit 3: Linear Functions

Essential Questions	Enduring Understandings
• How can mathematics help us describe and interpret relationships observed in data and real-world phenomena? • Why is it helpful to have different ways to graph linear functions? What can a linear graph tells you about the relationship that it represents? • What are arithmetic sequences and how are they related to linear functions? • Given limited information, how can you determine the equation of a line? • What are geometric sequences, and how are they related to exponential functions?	• Functions and their varied representations are used to describe, analyze, and interpret real-world and mathematical relationships. • Arithmetic sequences are linear functions which can be represented recursively, explicitly using function notation, and in slope-intercept form. • The numbers in an arithmetic sequence follow a pattern of adding a fixed number from one term to the next. • The domain of an arithmetic sequence is a subset of the integers. • Linear equations represent relationships that involve a constant rate of change.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
• Analyze the key features of linear graphs. • Identify linear equations, intercepts, and zeros. • Graph linear equations. • Use rate of change to solve problems. • Find the slope of a line. • Write and graph direct variation. • Recognize arithmetic sequences.	F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a	3.1: Graphing Linear Equations and 3.2: Solving Linear Equations by Graphing Khan Academy - Standard Form Khan Academy - Intercepts 3.3: Rate of Change and Slope IXL - Rate of Change with Tables IXL - Constant Rate of Change Khan Academy - Linear Equations & Graphs	Students will be formatively assessed through: • Teacher Observations • Do Nows • Exit Slips • Classwork • Extended Learning Activities • Stations • Educational Games Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

• Relate arithmetic sequences to linear functions. • Write an equation for a proportional relationship. • Write an equation for a non proportional relationship.	curve (which could be a line). F-IF.A.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). F-IF.A.2: Understand the concept of a function and use function notation. F-IF.C.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. F-LE.B.5: Interpret the parameters of a linear or exponential function in terms of a context.	Math Games - Find the Slope of a Graph 3.4: Direct Variation IXL - Direct Variation Khan Academy - Direct Variation 3.5: Arithmetic Sequences as Linear Functions Quizizz - Arithmetic Sequences 3.6: Proportional and Nonproportional Relationships IXL - Identify Proportional Relationships From Graphs and Equations	

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www.shodor.org
www.Insidemathematics.org
www.xyzsolve.com
www.ck12.org
www.mathjong.com
Pear Deck
Socrative
Edpuzzle
Quizizz
Nearpod</td><td>Resources from textbook:
Lesson Presentations
Lesson Videos
Explore Activities
Online Practices
Exit Cards
Tiered Practices
Performance Tasks
Unit Reviews
Assessments</td><td>Modifications/Student difficulties/Common errors
Emphasize note taking strategies
Use guided notes when necessary
Revisit and study notebook
Create vocabulary notecards
Use tools/manipulatives/models
Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
Create a study guide for intervention
Build a glossary notebook</td></tr>
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Unit 4: Linear Equations

Essential Questions	Enduring Understandings
● What does the slope of a line represent? ● Compare and contrast the slope of parallel lines and perpendicular lines. ● How can a linear function be used to model real world situations? ● What is the best method to solve a system of linear equations? ● How do you solve a system of linear inequalities? ● What are possible solution sets for systems of equations and inequalities?	● Slope shows the relationship between changing dependent variables over changing independent variables. ● Slope-intercept, point-slope, and standard form are interdependently related and can model real world situations. ● The relationship between two lines can be determined by comparing their slopes and y-intercepts.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Write and graph linear equations in slope-intercept form. ● Model real-world data with equations in slope-intercept form. ● Write slope-intercept form equations using one or two points and a slope. ● Write equations in point-slope form. ● Write linear equations in different forms. ● Write equations of lines using lines that are parallel or perpendicular.	F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. F-BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context. F-BF.A.1b: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. F-LE.B.5: Interpret the parameters of a linear or exponential function in	4.1: Graphing Equations in Slope-Intercept Form Khan Academy - Graphing Slope-Intercept Form IXL - Graphing Slope-Intercept Form Standard Form Khan Academy - Graphing Standard Form Practice - Graphing Standard Form Point-Slope Form IXL - Graphing Linear Equations	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games Summative assessments include: ● Minor Assessments ● Major Assessments ● Performance Assessments

	terms of a context. A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	General Practice - Graphing Linear Equations 4.2: Writing Equations in Slope-Intercept Form IXL - Writing in Slope-Intercept Form from Given Info Khan Academy - Writing in Slope-Intercept Form from Graph 4.3: Writing Equations in Point-Slope Form Quizizz - Writing in Point-Slope Form Khan Academy - Writing in Point-Slope Form 4.4: Parallel and Perpendicular Lines IXL - Parallel and Perpendicular Lines	

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Use guided notes when necessary
Revisit and study notebook
Create vocabulary notecards
Use tools/manipulatives/models
Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
Create a study guide for intervention
Build a glossary notebook</td></tr>
</table>

Unit 5: Systems of Equations and Inequalities

Essential Questions	Enduring Understandings
• How can systems of linear equations and inequalities be used in decision making? • How can you use linear programming to budget resources? • What is the best method to solve a system of linear equations? • How do you solve a system of linear inequalities? • What are possible solution sets for systems of equations and inequalities?	• Systems of equations and inequalities can be used to model and interpret real-world situations that involve decision making. • Systems can be solved using a variety of methods. • A system of equations or inequalities can have one solution, no solution, or an infinite number of solutions. • Linear programming can be used to determine the best way to budget resources. • Linear inequalities can be used to develop linear programming models. • Systems of inequalities can be solved by graphing.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
• Solve systems of linear equations graphically and algebraically. • Solve systems of inequalities graphically. • Strategically convert between various forms for a linear equation, depending on the situation. • Use graphical representations of inequalities to interpret constraints.	A.CED.A.2: Create equations in two or more variables to represent relationships between quantities: graph equations on coordinate axes with labels and scales. A.CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. A.REI.C.5: Prove that, given a system of two equations in two variables,	6.1: Graphing Systems of Equations Algebra-Class.Com - Notes for Graphing Systems of Equations 6.2: Substitution DeltaMath.Com - Substitution Method 6.3-6.4: Elimination IXL - Elimination Method YouTube - Elimination Method Practice - Elimination Method 6.5: Applying Systems of Equations YouTube - Applying Systems WP	Students will be formatively assessed through: • Teacher Observations • Do Nows • Exit Slips • Classwork • Extended Learning Activities • Stations • Educational Games Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

• Use systems of inequalities to represent real-world situations involving constraints. • Interpret and solve systems of inequalities involving constraints. • Graph systems of equations and inequalities	replacing one equation by the sum of that equation and a nonzero multiple of the other produces a system with the same solutions. A.REI.C.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. A.REI.D.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. A.REI.D.12: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding Half-planes. N.Q.A.3: Choose a level of accuracy appropriate to limitations on measures when recording quantities	IXL - Applying Systems WP 5.6: Graphing Inequalities in Two Variables IXL - Graphing Inequalities in Two Variables Khan Academy - Graphing Inequalities in Two Variables 6.6: Systems of Inequalities Khan Academy - Systems of Inequalities WP	

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Emphasize note taking strategies
Use guided notes when necessary
Revisit and study notebook
Create vocabulary notecards
Use tools/manipulatives/models
Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
Create a study guide for intervention
Build a glossary notebook</td></tr>
</table>

Unit 6: Exponential Functions and Properties

Essential Questions	Enduring Understandings
● How can you simplify expressions using exponents? ● How are numbers less than 1 represented with exponents? ● How can you use an exponential function to interpret real-world and mathematical situations? ● How does the structure of an exponential expression reveal the growth or decay behavior of an exponential function?	● Exponents can be extended to include zero and negative exponents. ● Exponent expressions with the same base can be simplified using properties of exponents. ● Properties of exponents allow expressions in which powers raised to a power or quantities raised to a power can be simplified. ● Calculations with numbers in scientific notation follow the properties of exponents. ● Exponential growth and decay models can be used in real world scenarios including finding simple interest. ● Determining the initial value and the growth rate allow you to algebraically represent or interpret an exponential function that models a specific contextual relationship.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Describe how the growth rate and initial value influence an exponential function. ● Graph exponential functions, interpreting the impact of the value of a, b, and c in f(x)=abx+c .	F-BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context. F-BF.A.1b: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a	7.1: Multiplication Property of Exponents Khan Academy - Multiplication Property of Exponents IXL - Multiplication Property of Exponents 7.2: Division Properties of Exponents	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games

• Identify the domain and range of exponential functions. • Calculate the average rate of change of an exponential function from a graph and a table. • Construct exponential functions to model real-world situations. • Describe exponential growth and decay in the context of real-world scenarios. • Identify exponential growth and decay from equations and graphs. • Rewrite exponential functions to interpret the function in context. • Solve exponential equations graphically. • Relate geometric sequences to exponential functions. • Express exponential relationships in a variety of forms: next-now, recursive, implicit ($y=ab^x$), and explicit ($f(x)=ab^x$). • Describe functions using	decaying exponential, and relate these functions to the model. F-BF.B.3: Identify the effect on the graph of replacing f(x) by f(x)+ k, k f(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. S-ID.B.6a: Fit a function to the data; use functions fitted to data to solve problems in the context of the data. F-IF.B.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. F-IF.B.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	MathPlanet.Com - Notes for Division Property of Exponents Khan Academy - Division Property of Exponents 7.3: Rational Exponents Khan Academy - Rational Exponents 7.5: Exponential Functions Khan Academy - Graphs of Exponential Functions Practice - Exponential Functions 7.6: Growth and Decay Khan Academy - Growth and Decay IXL - Growth and Decay Word Problems	Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

multiple representations: verbally, numerically in tables, and algebraically. ● Compare linear and exponential functions.	of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. F-IF.B.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-IF.C.7e: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F-LE.A.2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). A-REI.D.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.		

	A-SSE.B.3.c: Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15t can be rewritten as (1.15112)12t≈1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. A-SSE.A.1.b: Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P. F-IF.C.8b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y=(1.02)t, y=(0.97)t, y=(1.01)12t, y=(1.2)t10, and classify them as representing exponential growth or decay. F-LE.A.1c: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F-LE.B.5: Interpret the parameters in a linear or exponential function in terms of a context.		

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Emphasize note taking strategies
Use guided notes when necessary
Revisit and study notebook
Create vocabulary notecards
Use tools/manipulatives/models
Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
Create a study guide for intervention
Build a glossary notebook</td></tr>
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Unit 7: Quadratic Expressions and Equations

Essential Questions	Enduring Understandings
● How do the properties of integer operations apply to operations on polynomials? ● What is the relationship between multiplying polynomials and factoring polynomials? ● What is the relationship between the factors of a polynomial expression, zeros of a function, and the x-intercepts of a graph? ● How can the characteristics of a polynomial be used to factor the polynomial?	● The properties of polynomial operations are equivalent to properties of integer operations. ● Factoring a polynomial is the process of rewriting a polynomial as a product of its prime factors. ● Factors, zeros and x-intercepts are related. ● The ability to identify special products and greatest common factors is useful for factoring efficiently.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Classify polynomials, identify key features, and write polynomials in a variety of forms. ● Add, subtract, and multiply polynomials. ● Factor polynomials. ● Rewrite polynomials to reveal the contextual interpretation.	A-SSE.A.1: Interpret expressions that represent a quantity in terms of its context. A-APR.A.1: Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. N-RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents. Interpret complicated expressions by viewing one or	8.1: Adding and Subtracting Polynomials IXL - Adding and Subtracting Polynomials Khan Academy - Adding and Subtracting Polynomials 8.2: Multiplying a Polynomial by a Monomials Khan Academy - Multiplying a Polynomial by a Monomials IXL - Multiplying a Polynomial by a Monomial 8.3: Multiplying Polynomials Practice - Multiplying Polynomials	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games Summative assessments include: ● Minor Assessments ● Major Assessments ● Performance Assessments

	more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P. A-SSE.A.2: Use the structure of an expression to identify ways to rewrite it. For example, see x4–y4 as (x2)2– (y2)2, thus recognizing it as a difference of squares that can be factored as (x2– y2)(x2+ y2). A-SSE.B.3a: Factor a quadratic expression to reveal the zeros of the function it defines. A.REI.4A: Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x−p)2=q that has the same solutions. Derive the quadratic formula from this form.	8.4: Special Products Khan Academy - Special Products Practice - Special Products 8.5: Distributive Property Khan Academy - Distributive Property 8.6-8.9: Solving by Factoring YouTube - Factoring a=1 YouTube - Factoring a>1 IXL - Factoring a>1 Khan Academy - Difference of Squares Khan Academy - Difference of Squares PurpleMath.com - Notes Difference of Squares Khan Academy - Perfect Squares PurpleMath.com - Notes Perfect Squares	

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Revisit and study notebook
Create vocabulary notecards
Use tools/manipulatives/models
Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
Create a study guide for intervention
Build a glossary notebook</td></tr>
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Unit 8: Quadratic Functions

Essential Questions	Enduring Understandings
• How can you model and solve real-world problems using quadratic equations? • How does the zero product property empower you to analyze a quadratic equation? • How does completing the square help you analyze a quadratic equation? • How do you use the quadratic formula and its discriminant to analyze problem situations and identify possible types of solutions?	• There are multiple ways to represent and solve quadratic equations. • The value of the discriminant determines the number and types of solutions. • The quadratic formula is derived from the process of completing the square.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
• Use a variety of methods to solve quadratic equations: by graphing, factoring, and completing the square. • Determine if a solution to a quadratic equation is rational or irrational and explain why. • Derive the quadratic formula. • Use the quadratic formula to solve quadratic equations. • Use the discriminant of a quadratic equation to	A-REI.B.4a: Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)2=q$ that as the same solutions. Derive the quadratic formula from this form. A-REI.B.4b: Solve quadratic equations by inspection (e.g., for $x2=49$) 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 $a \pm bi$	9.1: Graphing Quadratics Khan Academy - Graphing Quadratics 9.2: Solving Quadratics by Graphing YouTube - Solving Quadratics by Graphing 9.3: Transformations of Quadratics IXL - Transformations of Quadratics Khan Academy - Transformations of Quadratics 9.4: Completing The Square Khan Academy - Completing the Square	Students will be formatively assessed through: • Teacher Observations • Do Nows • Exit Slips • Classwork • Extended Learning Activities • Stations • Educational Games Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

determine if it has two rational roots, two irrational roots, one root, or no real roots. ● Graph quadratic functions and identify the domain and range. ● Explore the effect of replacing f(x) by f(x)+k or by f(x+k) on the graph of quadratic functions. ● Create a quadratic function that describes a relationship between two quantities. ● Compare linear, quadratic, and exponential functions. ● Transform quadratic functions between standard form and vertex form. ● Identify the graph of a quadratic function, and find the vertex and axis of symmetry of a parabola. ● Interpret key features of quadratic functions in context. ● Determine the zeros of a quadratic function using its graph, and graph a quadratic function using its zeros.	for real numbers a and b. A-APR.B.3: Understand The Relationship Between Zeros And Factors of Polynomials. 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. F-IF.C.8a: Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. F.IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima. A-SSE.B.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. A-CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from	IXL - Completing the Square 9.5: Quadratic Formula Khan Academy - Quadratic Formula	

	linear and quadratic functions, and simple rational and exponential functions. F-IF.B.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. F-IF.B.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. F-IF.C.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima. F-IF.C.7c: Graph polynomial functions, identifying zeros when suitable factorizations are		

	available, and showing end behavior. F-IF.C.8a: Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. F-IF.C.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. F-BF.B.3: Identify the effect on the graph of replacing f(x) by f(x)+k, $k \cdot f(x)$, 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. F-LE.A.3: Observe using graphs and tables that a quantity increasing exponentially		

	eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-BF.A.1c(+): Compose functions. F-BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context. F-BF.A.1b: Combine standard function types using arithmetic operations.		

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Unit 9: Square Root Functions and Radical Properties

Essential Questions	Enduring Understandings
● How can you write different but equivalent forms of an expression that includes radicals or rational exponents? ● How are radical expressions represented? ● Why can't all properties of square roots be used to simplify radical expressions? ● What real world scenarios can be represented with square root functions?	● Rational exponents can be used to represent radicals. ● Radical expressions can be simplified using the multiplication and division properties of square roots. ● Rationalizing the denominator of a radical expression removes the radical from the denominator completely. ● The denominators of some radical expressions can be rationalized by multiplying by conjugates. ● The properties of real numbers can be used to perform operations with radical expressions.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Simplify radical expressions by using the Product Property of Square Roots ● Simplify radical expressions by using the Quotient Property of Square Roots. ● Add and subtract radical expressions. Multiply radical expressions. ● Solve radical equations. ● Solve radical equations with	F.BF.4a: 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*. F.IF.4: For a function that models a	10.1: Square Root Functions Varsity Tutors - Notes on Square Roots CK-12 - Notes on Square Roots 10.2: Simplifying Radical Expressions YouTube - Simplifying Radical Expressions IXL - Simplifying Radical Expressions IXL - Simplifying Radical Expressions 10.3: Operations with Radical Expressions	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games Summative assessments include: ● Minor Assessments ● Major Assessments ● Performance Assessments

extraneous solutions ● Graph and analyze reflections and dilations of radical functions.	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*. A.REI.4: Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2=q$ that has the same solutions. Derive the quadratic formula from this form. A.CED.2: Create equations in two or more variables to represent relationships between quantities: graph equations on coordinate axes with labels and scales.	SoftSchools.com - Notes on Adding with Radical Expressions SoftSchools.com - Notes on Multiplying with Radical Expressions IXL - Operations with Radical Expressions - Mixed Review 10.4: Radical Equations IXL - Radical Equations IXL - Radical Equations	

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Reword application problems
Use handouts/graphic organizers
Review peer work and provide feedback
Complete error analysis process.
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Unit 10: Rational Functions

Essential Questions	Enduring Understandings
● Compare and contrast rational expressions to fractional expressions. ● How can you identify an asymptote algebraically? ● How can you check that you have simplified a rational expression correctly? ● What are extraneous solutions?	● Inverse variation can be represented by the equation y=k/x, where k represents a constant known as the constant of variation or constant of proportionality. ● The product rule for inverse variations can be used to write an equation and solve real-world problems. ● A rational function is nonlinear. ● Any variable that results in a denominator of zero in a rational function is excluded from the domain of the function. ● An asymptote is a line that the graph of a function approaches. ● A rational expression is an algebraic fraction whose numerator and denominator are polynomials. ● A rational expression is in simplest form when the numerator and denominator have no common factors except 1. ● To multiply and divide rational expressions, you use the same rules as multiplying or dividing fractions. ● To add or subtract rational expressions with uncommon denominators you must find the least common denominator. ● A rational equation contains one or more rational expressions. ● Solutions that are excluded from the solution set are called extraneous.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Identify and use inverse variations. ● Graph inverse variation. ● Identify excluded values.	A.CED.2: Create equations in two or more variables to represent relationships between quantities: graph equations on coordinate axes with labels and scales.	11.1: Inverse Variation Khan Academy - Inverse Variation 11.2: Rational Functions Khan Academy - Graphs of Rational Functions	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities

• Identify and use asymptotes to graph rational functions. • Identify values excluded from the domain of rational expressions. • Multiply rational expressions. • Divide rational expressions. • Add and subtract rational expressions with like denominators. • Add and subtract rational expressions with unlike denominators. • Simplify mixed expressions. • Simplify complex fractions.	A.CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	IXL - Rational Functions 11.3: Simplifying Radical Expressions Khan Academy - Reducing Rational Expressions Quizizz - Simplifying Radical Expressions 11.4: Multiplying and Dividing Rational Expressions Khan Academy - Multiplying and Dividing Rational Expressions IXL - Multiplying and Dividing Rational Expressions 11.6: Adding and Subtracting Rational Expressions Khan Academy - Adding and Subtracting Rational Numbers Khan Academy - Adding Fractions as Rational Expressions IXL - Adding and Subtracting Rational Expressions 11.7: Mixed Expressions and Complex Fractions Khan Academy - Simplifying Complex Fractions	• Stations • Educational Games Summative assessments include: • Minor Assessments • Major Assessments • Performance Assessments

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Unit 11: Special Functions, Trigonometry, and Probability

Essential Questions	Enduring Understandings
● How are algebraic, numeric, and graphical representations of piecewise functions related? ● How can Pythagorean Theorem help us find missing sides of triangles? ● How can we represent special functions in real world scenarios? ● How can we predict amounts of outcomes using combinations and permutations? ● Which ratio can we use to find the measure of an angle?	● Complex mathematical models, representing real-world phenomena, can be created using special functions. ● Mathematical models can be used to describe real-world relationships that are often nonlinear. ● Combinations and Permutations application with various samples. ● Pythagorean Theorem proves right triangles. ● Trigonometric ratios can be used to determine the angle that a road rises or falls.

Core Content		Instructional Actions	
Objectives	**Alignment to NJSLS**	**Recommended Activities/Strategies**	**Assessment Check Points**
● Write equations of best-fit using linear functions. ● Write equations of median fit lines. ● Identify and graph step functions. ● Identify and graph absolute value and piecewise functions. ● Solve problems by using Pythagorean Theorem. ● Determine whether a triangle	S.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.	4.5: Scatter Plots and Lines of Fit Khan Academy - Estimating Lines of Best Fit 9.7: Special Functions Khan Academy - Evaluating Step Functions 10.5: Pythagorean Theorem YouTube - Pythagorean Theorem IXL - Pythagorean Theorem 10.6: Trigonometric Ratios Khan Academy - Trigonometric Ratios 12.6: Permutations and Combinations	Students will be formatively assessed through: ● Teacher Observations ● Do Nows ● Exit Slips ● Classwork ● Extended Learning Activities ● Stations ● Educational Games Summative assessments include: ● Minor Assessments ● Major Assessments ● Performance Assessments

is right. ● Find trigonometric ratios of angles. ● Use trigonometry to solve triangles. ● Use permutations and combinations. ● Find probabilities of independent and dependent events. ● Find probabilities of mutually exclusive events.	F-IF.C.7b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. 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. S-ID.B.6a: Fit a function to the data; use functions fitted to data to solve problems in the context of the data.	Khan Academy - Permutations Formula Khan Academy - Combinations Formula 12.7: Probability of Compound Events Khan Academy - Probability of Compound Events	

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