Califon Public School
Curriculum

Subject:	Grade:	Unit #:	Pacing:
Algebra	8th	1	4.5 weeks

Unit Title: Real Numbers and Connections to Algebra

OVERVIEW OF UNIT:

In this unit, students are expanding on their knowledge about real numbers and how they connect to algebra. The first part of the unit looks at how to classify real numbers, understand closure properties of rational numbers, simplify expressions involving radicals and rational exponents, and learn the difference between precision and accuracy. Students will be the second part of this unit by writing, interpreting, and simplifying expressions, recognizing when to expand using the Distributive Property or when to combine like terms. This will provide them with a foundation for writing and solving equations and inequalities later in the unit.

Big Ideas

- Classify real numbers
- Understand the closure properties of rational numbers under addition and multiplication
- Simplify expressions involving radicals and rational exponents
- Learn the difference between precision and accuracy
- Select an appropriate level of precision when reporting quantities
- Create and simplify algebraic expressions
- Solve linear equations in one variable
- Solve literal equations to create new formulas and use the general solutions to find specific solutions
- Solve simple and compound inequalities in one variable and graph the solutions on a number line
- Use linear equations and inequalities in one variable to model and solve real-world problems

Essential Questions

- How do you classify real numbers?
- What are the closure properties of rational numbers under addition and multiplication?
- How can you simplify expressions involving radicals and rational exponents?
- What is the difference between precision and accuracy?
- What is an appropriate level of precision when reporting quantities?
- How do you create and simplify algebraic expressions?
- How do you solve linear equations in one variable?
- How do you solve literal equations to create new formulas and use the general solutions to find specific solutions?
- How do you solve simple and compound inequalities in one variable?
- How do you graph the solutions to simple and compound inequalities on a number line?
- How can you use linear equations and inequalities in one variable to model and solve real-world problems?

Objectives
• Students will be able to identify the structure of the real number system, including a Venn diagram of sets with the real number system. • Students will be able to apply the closure properties of rational numbers under addition and subtraction. • Students will be able to understand rational exponents. • Students will be able to simplify expressions involving radicals and rational exponents. • Students will be able to explain the difference between precision and accuracy. • Students will be able to determine an appropriate level of precision when reporting quantities. • Students will be able to write, interpret, and simplify linear expressions in one variable. • Students will be able to use linear expressions to model real-world situations. • Students will be able to solve linear equations with grouping symbols or with the variable on both sides. • Students will be able to use linear equations to model and solve real-world situations. • Students will be able to rewrite formulas to express a variable in terms of the other variables. • Students will be able to solve literal equations to obtain a general solution for a class of equations. • Students will be able to write and solve linear inequalities in one variable. • Students will be able to represent solutions of linear inequalities on a number line. • Students will be able to use linear equations to model and solve real-world problems. • Students will be able to write and solve compound linear inequalities in one variable using both *and* and *or*. • Students will be able to represent solutions of compound linear inequalities on a number line. • Students will be able to use compound inequalities to model and solve real-world problems.

Assessment	
Formative Assessment: • Homework Assignments • Classwork • Quizzes • Skill Worksheets • Class Discussions **Summative Assessment:** • Module Test • Unit Test • Performance Task	**Benchmark:** • Link It Benchmark Assessment **Alternative:** • Performance Task • Modified Tests (independently developed by teacher) • Projects

Key Vocabulary	
• closure • irrational number • rational number • real number	• expression • like terms • term • equation

- index
- radical expression
- radicand
- accuracy
- precision
- significant digit
- coefficient
- equivalent expression
- equivalent equations
- solution of an equation in one variable
- literal equation
- inequality
- solution of an inequality in one variable
- compound inequality

Resources & Materials

- Textbook (Into Math Algebra)
- All Things Algebra
- Promethean Board
- Calculator
- Teacher-Made Materials
- Guided Notes
- Edpuzzle (www.edpuzzle.com)
- Online Games
- IXL (www.ixl.com/math)
- Khan Academy (www.khanacademy.org)
- HMH Online (https://www.hmhco.com/ui/#/dashboard)
- Desmos (www.desmos.com)
- Online Manipulatives (https://illuminations.nctm.org/)

Technology Infusion

Teacher Technology:

- Chromebook
- Promethean Board
- Edpuzzle
- Google Apps for Education
- Google Classroom

Student Technology:

- Google Classroom
- Chromebook
- IXL/Quizzizz/Blooket/Kahoot
- Edpuzzle

Activities:

- Students will use their Chromebooks to access Google Classroom and Edpuzzle to watch videos about math topics and write out explanations for how practice problems were solved or how the math connects to real-life situations.

- Students will use their Chromebooks to access websites like IXL, Khan Academy, Quizzizz, Blooket, Kahoot, etc. to practice and review the skills learned throughout the unit. They will also track their data to demonstrate progress and growth within specified topics.

Standard	Standard Description
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.

Interdisciplinary Integration

Activities:

- Students will practice using the unit vocabulary as they talk and write about the problems they are solving. Understanding the vocabulary will aid their understanding of the concepts covered in this unit.

Resources:

- Quizlet
- Teacher Vision Cross-Curricular Theme Map - https://www.teachervision.com/teaching-methods/curriculum-planning/7167.html
- Engineering Go For It! - http://teachers.egfi-k12.org/
- US Department of Education STEM - http://www.ed.gov/stem
- What Every Educator Should Know About Using Google by Shell Education
- International Literacy Association Read Write Think - http://www.readwritethink.org/

Standard	Standard Description
NJSLS-ELA W.AW.8.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

21st Century Life Skills Standards

Activities:

- Students will work in groups to collaborate, at times taking leadership roles, to communicate project ideas to the whole class.

Standard	Student Learning Objectives
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

Careers

Activities:

- Students will discuss and then write detailed explanations utilizing appropriate mathematical vocabulary to explain their thought process for obtaining solutions to specific problems

Practice	Description
Use technology to enhance productivity increase collaboration	Students find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and

and communicate effectively.	organizational-of technology applications, and they take actions to prevent or mitigate these risks.
Work productively in teams while using cultural/global competence.	Students positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
Utilize critical thinking to make sense of problems and persevere in solving them.	Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of the problem and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through this when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. Their own actions or the actions of others.

Standards for Mathematical Practice	
MP #	Practice
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.
7	Look for and make use of structure.

Standards	
Standard #	**Standard Description**
N-RN.A.	Extend the properties of exponents to rational exponents.
N-RN.A.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 $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5(^{1/3})^3$ to hold, so $(5^{1/3})^3$ must equal 5.
N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
N-RN.A.3	Simplify radicals, including algebraic radicals (e.g. $\sqrt[3]{54} = 3\sqrt[3]{2}$, simplify $\sqrt{32x^2}$).
N-Q.A.	Reason quantitatively and use units to solve problems.
N-Q.A.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.
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
A-SSE.A	Interpret the structure of expressions
A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)

A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A-SSE.A.1b	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
A-SSE.A.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 $(x^2 - y^2)(x^2 + y^2)$.
A-CED.A	Create equations that describe numbers or relationships
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.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-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.
A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning
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.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
A-REI.B	Solve equations and inequalities in one variable
A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.C	Solve systems of equations
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	Represent and solve equations and inequalities graphically
A-REI.D.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).
F-BF.A	Build a function that models a relationship between two quantities
F-BF.A.1	Write a function that describes a relationship between two quantities
F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.

Differentiation
Students with 504 plans
● Preferential seating

- Guided notes
- Extra time
- Teacher check-ins
- Use graphic organizers
- Redirect attention
- Prioritize tasks
- Small group testing
- Provide modifications & accommodations per individual student's 504 plan

Special Education

- Provide modifications & accommodations as listed in the student's IEP
- Position the student near a helping peer or have quick access to the teacher
- Modify or reduce assignments/tasks
- Reduce the length of the assignment for different modes of delivery
- Increase one-to-one time
- Prioritize tasks
- Use graphic organizers
- Use online resources for skill-building
- Provide teacher notes
- Use collaborative grouping strategies, such as small groups
- NJDOE resources - http://www.state.nj.us/education/specialed/

Response to Intervention (RTI)

- Tiered interventions following the RTI framework
- Effective RTI strategies for teachers - http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/
- Intervention Central - http://www.interventioncentral.org/

English Language Learners (ELL)

- Provide text-to-speech
- Use of a translation dictionary or software
- Provide graphic organizers
- NJDOE resources - http://www.state.nj.us/education/aps/cccs/ELL.htm
- Adapt a Strategy – Adjusting strategies for ESL students - http://www.teachersfirst.com/content/esl/adaptstrat.cfm

Enrichment

- Process should be modified: higher order thinking skills, open-ended thinking, discovery
- Utilize project-based learning for greater depth of knowledge
- Utilize exploratory connections to higher-grade concepts
- Contents should be modified: real-world problems, audiences, deadlines, evaluations, transformations
- Learning environments should be modified: student-centered learning, independence, openness, complexity, and groups should be varied
- NJDOE resources

Califon Public School
Curriculum

Subject:	Grade:	Unit #:	Pacing:
Algebra	8th	2	5 weeks

Unit Title: Linear Functions & Equations

OVERVIEW OF UNIT:

This unit starts off by looking at linear equations in two variables. Students will start by graphing linear equations given in standard form and connecting solutions of the equations to points on the graph. Then they will look at how to calculate, use, and interpret the slope of a line when given any two points on the line. The next part of the unit will expand on functions by looking at function notation and characteristics of linear functions. The unit wraps up by looking at relationships among linear functions by examining how they may be transformed. It wraps up by comparing linear functions and the inverses of linear functions.

Big Ideas

- Connect linear equations in standard form to their graphs
- Identify intercepts for linear equations
- Model with linear equations
- Calculate and interpret slope
- Use slope to graph lines
- Determine if a relation is a function
- Write functions using function notation
- Write linear functions in slope-intercept form and in point-slope form
- Determine whether linear functions are increasing or decreasing
- Determine end behavior, zeros, and extreme values of linear functions
- Recognize transformations as changes to the domain and range values
- Draw connections among transformations in graphs, equations, and verbal descriptions
- Apply transformations to functions and graphs from their verbal descriptions
- Create a new function from an existing one by adding a constant function to it
- Compare linear functions in different forms
- Find and graph inverses of linear functions

Essential Questions

- How do you connect linear equations in standard form to their graphs?
- How can you identify intercepts for linear equations?
- How can you represent linear equations with models?
- How do you calculate slope?
- How do you interpret the slope for real-world situations?
- How is slope used to graph lines?
- How can you determine if a relation is a function?

- How can functions be written using function notation?
- How can you determine whether linear functions are increasing or decreasing?
- How do you determine end behavior, zeros, and extreme values of linear functions?
- How can you recognize transformations as changes to the domain and range values?
- What connections can be drawn among transformations in graphs, equations, and verbal descriptions?
- How are transformations applied to functions and graphs from their verbal descriptions?
- How do you create a new function from an existing one by adding a constant function to it?
- How can linear functions be compared in different forms?
- How do you find and graph the inverses of linear functions?

Objectives

- Students will be able to graph linear equations given in standard form.
- Students will be able to connect solutions of linear equations to points on their graphs.
- Students will be able to calculate, use, and interpret the slope of a line given any two points on the line.
- Students will be able to contrast relations and functions.
- Students will be able to write functions using function notation.
- Students will be able to define, graph, and analyze linear functions.
- Students will be able to identify the slope and y-intercept from equations and tables of values.
- Students will be able to identify the characteristics of linear functions, including end behavior, zeros, extreme values, and whether they are increasing or decreasing.
- Students will be able to write and analyze linear functions to model real-world scenarios.
- Students will be able to identify basic transformations of functions and their corresponding graphs.
- Students will be able to differentiate between the effects of adding a constant or multiplying by a constant on the domains and range of functions.
- Students will be able to identify the linear parent function.
- Students will be able to relate all other linear functions to the linear parent function.
- Students will be able to compare linear functions given in different forms, considering their effective uses and emphases.
- Students will be able to find, graph, and confirm inverse functions.

Assessment

Formative Assessment:

- Homework Assignments
- Classwork
- Quizzes
- Skill Worksheets
- Class Discussions

Summative Assessment:

- Module Test
- Unit Test
- Performance Task

Benchmark:

- Link It Benchmark Assessment

Alternative:

- Performance Task
- Modified Tests (independently developed by teacher)
- Projects

Key Vocabulary	
• linear equation in two variables	• discrete function
• standard form of a linear equation	• linear function
• x-intercept	• slope-intercept form
• y-intercept	• decreasing
• rate of change	• end behavior
• slope	• increasing
• dependent variable	• maximum
• domain	• minimum
• function	• zero
• function rule	• point-slope form
• independent variable	• transformation
• range	• family of functions
• relation	• parent function
• vertical line test	• inverse functions
• continuous function	• inverse of a function

Resources & Materials

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- All Things Algebra
- Promethean Board
- Calculator
- Teacher-Made Materials
- Guided Notes
- Edpuzzle (www.edpuzzle.com)
- Online Games
- IXL (www.ixl.com/math)
- Khan Academy (www.khanacademy.org)
- HMH Online (https://www.hmhco.com/ui/#/dashboard)
- Desmos (www.desmos.com)
- Online Manipulatives (https://illuminations.nctm.org/)

Technology Infusion

Teacher Technology:

- Chromebook
- Promethean Board
- Edpuzzle
- Google Apps for Education
- Google Classroom

Student Technology:

- Google Classroom

- Chromebook
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Activities:

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Resources:

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- Engineering Go For It! - http://teachers.egfi-k12.org/
- US Department of Education STEM - http://www.ed.gov/stem
- What Every Educator Should Know About Using Google by Shell Education
- International Literacy Association Read Write Think - http://www.readwritethink.org/

Standard	Standard Description
NJSLS-ELA W.AW.8.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

21st Century Life Skills Standards

Activities:

- Students will work in groups to collaborate, at times taking leadership roles, to communicate project ideas to the whole class.

Standard	Student Learning Objectives
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

Careers	
Activities: ● Students will discuss and then write detailed explanations utilizing appropriate mathematical vocabulary to explain their thought process for obtaining solutions to specific problems	
Practice	**Description**
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Standards for Mathematical Practice	
MP #	Practice
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
4	Model with mathematics.
7	Look for and make use of structure.

Standards	
Standard #	**Standard Description**
N-Q.A	Reason quantitatively and use units to solve problems.
N-Q.A.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.
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
A-SSE.A	Interpret the structure of expressions
A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)
A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A-CED.A	Create equations that describe numbers or relationships

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.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-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.
A-APR.D	Rewrite rational expressions
A-APR.D.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.
A-REI.B	Solve equations and inequalities in one variable
A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.D	Represent and solve equations and inequalities graphically
A-REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A-REI.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.
F-IF.A	Understand the concept of a function and use function notation
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	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F-IF.B	Interpret functions that arise in applications in terms of the context
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	Analyze functions using different representations
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
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.A	Build a function that models a relationship between two quantities
F-BF.A.1	Write a function that describes a relationship between two quantities.
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-BF.B	Build new functions from existing functions
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.
F-BF.4	Find inverse functions.
F-BF.4a	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠1.
F-BF.B.4b	(+) Verify by composition that one function is the inverse of another.
F-BF.B.4c	(+) Read values of an inverse function from a graph or a table, given that
F-LE.A	Construct and compare linear and exponential models and solve problems
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).
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-LE.B	Interpret expressions for functions in terms of the situation they model
F-LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.
G-CO.A	Experiment with transformations in the plane
G-CO.A.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs

	and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
S-ID.C	Interpret linear models
S-ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Differentiation
Students with 504 plans
• Preferential seating • Guided notes • Extra time • Teacher check-ins • Use graphic organizers • Redirect attention • Prioritize tasks • Small group testing • Provide modifications & accommodations per individual student's 504 plan
Special Education
• Provide modifications & accommodations as listed in the student's IEP • Position the student near a helping peer or have quick access to the teacher • Modify or reduce assignments/tasks • Reduce the length of the assignment for different modes of delivery • Increase one-to-one time • Prioritize tasks • Use graphic organizers • Use online resources for skill-building • Provide teacher notes • Use collaborative grouping strategies, such as small groups • NJDOE resources - http://www.state.nj.us/education/specialed/
Response to Intervention (RTI)
• Tiered interventions following the RTI framework • Effective RTI strategies for teachers - http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/ • Intervention Central - http://www.interventioncentral.org/
English Language Learners (ELL)
• Provide text-to-speech • Use of a translation dictionary or software • Provide graphic organizers • NJDOE resources - http://www.state.nj.us/education/aps/cccs/ELL.htm • Adapt a Strategy – Adjusting strategies for ESL students - http://www.teachersfirst.com/content/esl/adaptstrat.cfm
Enrichment

- Process should be modified: higher order thinking skills, open-ended thinking, discovery
- Utilize project-based learning for greater depth of knowledge
- Utilize exploratory connections to higher-grade concepts
- Contents should be modified: real-world problems, audiences, deadlines, evaluations, transformations
- Learning environments should be modified: student-centered learning, independence, openness, complexity, and groups should be varied
- NJDOE resources

Califon Public School
Curriculum

Subject:	Grade:	Unit #:	Pacing:
Algebra	8th	3	4.5 weeks

Unit Title: Build Linear Functions & Models

OVERVIEW OF UNIT:

In the first part of this unit, students expand their understanding of scatter plots and lines of fit. In Grade 8, students created scatter plots and identified the type of correlation of a data set. They drew trend lines by drawing lines that pass through the middle of the data and used those lines to solve problems. The next part of this unit looks at arithmetic sequences and how to use recursive formulas and explicit formulas to define the sequences. The last part of the unit looks at piecewise-defined functions and how they are used to solve real-world problems. Then the students work on absolute value functions, equations, and inequalities.

Big Ideas

- Estimate correlation coefficients
- Use two points to write a line of fit
- Consider whether there is a causation for the correlation of a data set
- Solve problems using a line of fit by interpolation and extrapolation
- Assess the fit of a function using residuals
- Find the *n*th term in an arithmetic sequence using a recursive rule
- Model a real-world situation using an arithmetic sequence
- Write arithmetic sequences using an explicit or recursive formula
- Identify the domain and range of a sequence and determine whether the sequence is infinite or finite
- Convert between recursive and explicit forms for arithmetic sequences
- Graph piecewise-defined functions
- Model real-world situations using piecewise-defined functions
- Graph absolute value functions
- Use absolute value functions to solve real-world problems
- Solve absolute value equations and inequalities graphically and algebraically

Essential Questions

- How are correlations coefficients estimated?
- How are two points used to write a line of fit?
- How do you determine whether there is a causation for the correlation of a data set?
- How can you solve problems using a line of fit by interpolation and extrapolation?
- How do you assess the fit of a function using residuals?
- Using a recursive rule, how would you find the *n*th term in an arithmetic sequence?
- How would you model a real-world situation using an arithmetic sequence?
- How can an arithmetic sequence be written using an explicit or recursive formula?

- How do you identify the domain and range of a sequence and determine whether the sequence is infinite or finite?
- How can you convert between the recursive and explicit forms of arithmetic sequences?
- How would you graph piecewise-defined functions?
- How can you model real-world situations using piecewise-defined functions?
- How do you graph absolute value functions?
- How are absolute value functions used to solve real-world problems?
- How do you solve absolute value equations and inequalities graphically?
- How do you solve absolute value equations and inequalities algebraically?

Objectives

- Students will be able to make a scatter plot of data.
- Students will be able to determine whether there is a correlation between variables, fit a line to the data, and use a fitted line to make predictions about data that have a strong correlation.
- Students will be able to enter bivariate data into a graphing calculator, use it to find a fitted linear regression line, and determine the strength of and compare lines of fit.
- Students will be able to use the equation of a regression line to solve problems.
- Students will be able to write a recursive rule that models an arithmetic sequence.
- Students will be able to use the recursive rule for an arithmetic sequence to solve real-world problems.
- Students will be able to use function notation and an explicit formula to model real-world relationships and solve problems involving arithmetic sequences.
- Students will be able to write, graph, and use piecewise-defined functions to solve real-world problems.
- Students will be able to evaluate and graph absolute value functions.
- Students will be able to explain how the effects of parameter changes in the function rule affect the graph of the function.
- Students will be able to solve absolute value equations and inequalities both graphically and algebraically.

Assessment

Formative Assessment:

- Homework Assignments
- Classwork
- Quizzes
- Skill Worksheets
- Class Discussions

Summative Assessment:

- Module Test
- Unit Test
- Performance Task

Benchmark:

- Link It Benchmark Assessment

Alternative:

- Performance Task
- Modified Tests (independently developed by teacher)
- Projects

Key Vocabulary	
• bivariate data	• common difference
• correlation	• recursive rule
• correlation coefficient	• sequence
• extrapolation	• term (of the sequence)
• interpolation	• explicit rule
• line of fit	• greatest integer function
• scatter plot	• piecewise-defined function
• least-square lines	• step function
• linear regression	• axis of symmetry
• residual	• vertex of an absolute-value graph
• residual plot	• conjunction
• line of best fit	• disjunction
• arithmetic sequence	• tolerance

Resources & Materials

- Textbook (Into Math Algebra)
- All Things Algebra
- Promethean Board
- Calculator
- Teacher-Made Materials
- Guided Notes
- Edpuzzle (www.edpuzzle.com)
- Online Games
- IXL (www.ixl.com/math)
- Khan Academy (www.khanacademy.org)
- HMH Online (https://www.hmhco.com/ui/#/dashboard)
- Desmos (www.desmos.com)
- Online Manipulatives (https://illuminations.nctm.org/)

Technology Infusion

Teacher Technology:

- Chromebook
- Promethean Board
- Edpuzzle
- Google Apps for Education
- Google Classroom

Student Technology:

- Google Classroom
- Chromebook
- IXL/Quizzizz/Blooket/Kahoot
- Edpuzzle

Activities:

- Students will use their Chromebooks to access Google Classroom and Edpuzzle to watch videos about math topics and write out explanations for how practice problems were solved or how the math connects to real-life situations.
- Students will use their Chromebooks to access websites like IXL, Khan Academy, Quizzizz, Blooket, Kahoot, etc. to practice and review the skills learned throughout the unit. They will also track their data to demonstrate progress and growth within specified topics.

Standard	Standard Description
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.

Interdisciplinary Integration

Activities:

- Students will practice using the unit vocabulary as they talk and write about the problems they are solving. Understanding the vocabulary will aid their understanding of the concepts covered in this unit.

Resources:

- Quizlet
- Teacher Vision Cross-Curricular Theme Map - https://www.teachervision.com/teaching-methods/curriculum-planning/7167.html
- Engineering Go For It! - http://teachers.egfi-k12.org/
- US Department of Education STEM - http://www.ed.gov/stem
- What Every Educator Should Know About Using Google by Shell Education
- International Literacy Association Read Write Think - http://www.readwritethink.org/

Standard	Standard Description
NJSLS-ELA W.AW.8.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

21st Century Life Skills Standards

Activities:

- Students will work in groups to collaborate, at times taking leadership roles, to communicate project ideas to the whole class.

Standard	Student Learning Objectives
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

Careers

Activities:

- Students will discuss and then write detailed explanations utilizing appropriate mathematical vocabulary to explain their thought process for obtaining solutions to specific problems

Practice	Description
Use technology to enhance productivity increase collaboration and communicate effectively.	Students find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
Work productively in teams while using cultural/global competence.	Students positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
Utilize critical thinking to make sense of problems and persevere in solving them.	Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of the problem and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through this when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. Their own actions or the actions of others.

Standards for Mathematical Practice	
MP #	Practice
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning.

Standards	
Standard #	**Standard Description**
N-Q.A.	Reason quantitatively and use units to solve problems.
N-Q.A.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.
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
A-SSE.A	Interpret the structure of expressions
A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)
A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A-SSE.B	Write expressions in equivalent forms to solve problems

A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
A-CED.A	Create equations that describe numbers or relationships
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.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning
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	Solve equations and inequalities in one variable
A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.D	Represent and solve equations and inequalities graphically
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.
F-IF.A	Understand the concept of a function and use function notation
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	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.
F-IF.B	Interpret functions that arise in applications in terms of the context
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.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	Analyze functions using different representations
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
F-IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
F-BF.A	Build a function that models a relationship between two quantities
F-BF.A.1	Write a function that describes a relationship between two quantities.
F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
F-BF.A.1c	(+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.
F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
F-BF.B	Build new functions from existing functions
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.
F-BF.B.4	Find inverse functions.
F-BF.B.4a	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠1.
F-LE.A	Construct and compare linear and exponential models and solve problems
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).
F-LE.B	Interpret expressions for functions in terms of the situation they model
F-LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.
S-ID.A	Summarize, represent, and interpret data on a single count or measurement variable
S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables
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.B.6a	Fit a function to the data (including with the use of technology); 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 and exponential models.
S-ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
S-ID.B.6c	Fit a linear function for a scatter plot that suggests a linear association.
S-ID.C	Interpret linear models
S-ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
S-ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
S-ID.C.9	Distinguish between correlation and causation.

Differentiation
Students with 504 plans
• Preferential seating • Guided notes • Extra time • Teacher check-ins • Use graphic organizers • Redirect attention • Prioritize tasks • Small group testing • Provide modifications & accommodations per individual student's 504 plan
Special Education
• Provide modifications & accommodations as listed in the student's IEP • Position the student near a helping peer or have quick access to the teacher • Modify or reduce assignments/tasks • Reduce the length of the assignment for different modes of delivery • Increase one-to-one time • Prioritize tasks • Use graphic organizers • Use online resources for skill-building • Provide teacher notes • Use collaborative grouping strategies, such as small groups • NJDOE resources - http://www.state.nj.us/education/specialed/
Response to Intervention (RTI)
• Tiered interventions following the RTI framework

- Effective RTI strategies for teachers - http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/
- Intervention Central - http://www.interventioncentral.org/

English Language Learners (ELL)

- Provide text-to-speech
- Use of a translation dictionary or software
- Provide graphic organizers
- NJDOE resources - http://www.state.nj.us/education/aps/cccs/ELL.htm
- Adapt a Strategy – Adjusting strategies for ESL students - http://www.teachersfirst.com/content/esl/adaptstrat.cfm

Enrichment

- Process should be modified: higher order thinking skills, open-ended thinking, discovery
- Utilize project-based learning for greater depth of knowledge
- Utilize exploratory connections to higher-grade concepts
- Contents should be modified: real-world problems, audiences, deadlines, evaluations, transformations
- Learning environments should be modified: student-centered learning, independence, openness, complexity, and groups should be varied
- NJDOE resources

Califon Public School
Curriculum

Subject:	Grade:	Unit #:	Pacing:
Algebra	8th	4	4 weeks

Unit Title: Linear Systems

OVERVIEW OF UNIT:

This unit starts by focusing on systems of linear equations. It looks at solving systems of linear equations using various methods (graphing, substitution, elimination, and multiplication.) Then the unit expands on this information by looking at linear inequalities. The students will learn about how to write and graph linear inequalities and systems of linear inequalities.

Big Ideas

- Solve systems of linear equations graphically, using the substitution method, using the elimination method, and by multiplying
- Use systems of linear equations to represent and solve real-world problems
- Identify when a system of linear equations has one solution, no solution, or infinitely many solutions
- Write, solve, and graph linear inequalities in two variables
- Write and graph a linear inequality to model and solve a real-world problem
- Write, graph, and solve systems of linear inequalities
- Model real-world problems with systems of linear inequalities

Essential Questions

- How can you solve systems of linear equations graphically?
- How can you solve systems of linear equations using the substitution method?
- How can you solve systems of linear equations using the elimination method?
- How can you solve systems of linear equations by using multiplication?
- How can linear equations be used to represent and solve real-world problems?
- How do you identify when a system of linear equations has one solution, no solution, or infinitely many solutions?
- How do you write, solve, and graph linear inequalities in two variables?
- How do you write and graph a linear inequality to model and solve a real-world problem?
- How are real-world problems modeled with systems of linear inequalities?

Objectives

- Students will be able to identify systems of equations by the number of solutions.
- Students will be able to solve systems of equations by graphing.
- Students will be able to apply systems of equations to real-world situations.
- Students will be able to write and solve systems of equations algebraically using the method of substitution.

- Students will be able to interpret the meaning of solutions to systems, including dependent and inconsistent systems.
- Students will be able to write systems of linear equations to model real-world situations.
- Students will be able to solve systems of linear equations by adding or subtracting.
- Students will be able to solve systems of linear equations by multiplying first.
- Students will be able to write and graph linear inequalities in two variables to model and solve real-world problems.
- Students will be able to write and graph systems of linear inequalities to model and solve real-world problems.

Assessment

Formative Assessment:

- Homework Assignments
- Classwork
- Quizzes
- Skill Worksheets
- Class Discussions

Summative Assessment:

- Module Test
- Unit Test
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Benchmark:

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Alternative:

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- Projects

Key Vocabulary

- consistent system
- dependent system
- inconsistent system
- independent system
- solution of a system of equations
- system of equations
- substitution method
- elimination method
- boundary line
- half-plane
- linear inequality in two variables
- solutions of an inequality in two variables
- solution of a system of linear inequalities
- system of linear inequalities

Resources & Materials

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Technology Infusion

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Standard	Standard Description
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.

Interdisciplinary Integration

Activities:

- Students will practice using the unit vocabulary as they talk and write about the problems they are solving. Understanding the vocabulary will aid their understanding of the concepts covered in this unit.

Resources:

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- US Department of Education STEM - http://www.ed.gov/stem
- What Every Educator Should Know About Using Google by Shell Education

● International Literacy Association Read Write Think - http://www.readwritethink.org/

Standard	Standard Description
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21st Century Life Skills Standards	
Activities: ● Students will work in groups to collaborate, at times taking leadership roles, to communicate project ideas to the whole class.	
Standard	**Student Learning Objectives**
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

Careers	
Activities: ● Students will discuss and then write detailed explanations utilizing appropriate mathematical vocabulary to explain their thought process for obtaining solutions to specific problems	
Practice	**Description**
Use technology to enhance productivity increase collaboration and communicate effectively.	Students find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
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Utilize critical thinking to make sense of problems and persevere in solving them.	Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of the problem and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through this when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. Their own actions or the actions of others.

Standards for Mathematical Practice	
MP #	Practice
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.

6	Attend to precision.
7	Look for and make use of structure.

Standards	
Standard #	**Standard Description**
N-Q.A.	Reason quantitatively and use units to solve problems.
N-Q.A.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.
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
A-SSE.A	Interpret the structure of expressions
A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)
A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A-SSE.A.1b	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
A-CED.A	Create equations that describe numbers or relationships
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.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.A	Understand solving equations as a process of reasoning and explain the reasoning
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	Solve equations and inequalities in one variable
A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.C	Solve systems of equations
A-REI.C.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.
A-REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
A-REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

A-REI.D	Represent and solve equations and inequalities graphically
A-REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A-REI.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.
F-IF.C	Analyze functions using different representations
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F-IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
F-BF.A	Build a function that models a relationship between two quantities
F-BF.A.1	Write a function that describes a relationship between two quantities.
F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.

Differentiation
Students with 504 plans
• Preferential seating • Guided notes • Extra time • Teacher check-ins • Use graphic organizers • Redirect attention • Prioritize tasks • Small group testing • Provide modifications & accommodations per individual student's 504 plan
Special Education
• Provide modifications & accommodations as listed in the student's IEP • Position the student near a helping peer or have quick access to the teacher • Modify or reduce assignments/tasks • Reduce the length of the assignment for different modes of delivery • Increase one-to-one time • Prioritize tasks • Use graphic organizers • Use online resources for skill-building • Provide teacher notes

- Use collaborative grouping strategies, such as small groups
- NJDOE resources - http://www.state.nj.us/education/specialed/

Response to Intervention (RTI)

- Tiered interventions following the RTI framework
- Effective RTI strategies for teachers - http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/
- Intervention Central - http://www.interventioncentral.org/

English Language Learners (ELL)

- Provide text-to-speech
- Use of a translation dictionary or software
- Provide graphic organizers
- NJDOE resources - http://www.state.nj.us/education/aps/cccs/ELL.htm
- Adapt a Strategy – Adjusting strategies for ESL students - http://www.teachersfirst.com/content/esl/adaptstrat.cfm

Enrichment

- Process should be modified: higher order thinking skills, open-ended thinking, discovery
- Utilize project-based learning for greater depth of knowledge
- Utilize exploratory connections to higher-grade concepts
- Contents should be modified: real-world problems, audiences, deadlines, evaluations, transformations
- Learning environments should be modified: student-centered learning, independence, openness, complexity, and groups should be varied
- NJDOE resources

Califon Public School
Curriculum

Subject: Algebra	Grade: 8th	Unit #: 5	Pacing: 4 weeks

Unit Title: Exponential Functions & Equations

OVERVIEW OF UNIT:

This unit extends students' knowledge about linear functions where rates of change were constant, and moves into exponential functions. Exponential functions describe situations in which the rate of change depends on the function's current value. This leads into lessons on growth and decay in these scenarios and how to rewrite exponential models. The second half of the unit continues the study of exponential functions and looks at how they may be transformed. Additionally, the unit wraps up by looking at how to compare exponential functions.

Big Ideas

- Analyze characteristics of exponential functions
- Graph exponential functions
- Model with exponential functions
- Write exponential models to find the doubling rate or the half-life
- Describe the effects of transformations on the characteristics of exponential functions
- Transform a transformed exponential function
- Model real-world problems with transformed exponential functions
- Express different forms of exponential functions
- Compare growth and decay rates of exponential functions

Essential Questions

- What are the characteristics of exponential functions?
- How can you analyze these characteristics?
- How do you graph exponential functions?
- How do you model with exponential functions?
- How are exponential models written to find the doubling rate or half-life?
- How would you describe the effects of transformations on the characteristics of exponential functions?
- How do you transform a transformed exponential function?
- How can you model real-world problems with transformed exponential functions?
- How are different forms of exponential functions expressed?
- How would you compare the growth and decay rates of exponential functions?

Objectives

- Students will be able to write, graph, and analyze exponential growth functions.

- Students will be able to write, graph, and analyze exponential decay functions.
- Students will be able to use properties of exponents and graphing to construct exponential growth and decay models.
- Students will be able to interpret exponential functions in the form $f(x) = a(b^x) + k$.
- Students will be able to determine how changing *a, k,* or both can transform the exponential parent functions.
- Students will be able to evaluate different expressions of a function.
- Students will be able to compare growth and decay rates and function values, including initial values.

Assessment

Formative Assessment:

- Homework Assignments
- Classwork
- Quizzes
- Skill Worksheets
- Class Discussions

Summative Assessment:

- Module Test
- Unit Test
- Performance Task

Benchmark:

- Link It Benchmark Assessment

Alternative:

- Performance Task
- Modified Tests (independently developed by teacher)
- Projects

Key Vocabulary

- asymptote
- exponential function
- exponential growth function
- exponential decay function

Resources & Materials

- Textbook (Into Math Algebra)
- All Things Algebra
- Promethean Board
- Calculator
- Teacher-Made Materials
- Guided Notes
- Edpuzzle (www.edpuzzle.com)
- Online Games
- IXL (www.ixl.com/math)
- Khan Academy (www.khanacademy.org)
- HMH Online (https://www.hmhco.com/ui/#/dashboard)
- Desmos (www.desmos.com)
- Online Manipulatives (https://illuminations.nctm.org/)

Technology Infusion

Teacher Technology:

- Chromebook
- Promethean Board
- Edpuzzle
- Google Apps for Education
- Google Classroom

Student Technology:

- Google Classroom
- Chromebook
- IXL/Quizzizz/Blooket/Kahoot
- Edpuzzle

Activities:

- Students will use their Chromebooks to access Google Classroom and Edpuzzle to watch videos about math topics and write out explanations for how practice problems were solved or how the math connects to real-life situations.
- Students will use their Chromebooks to access websites like IXL, Khan Academy, Quizzizz, Blooket, Kahoot, etc. to practice and review the skills learned throughout the unit. They will also track their data to demonstrate progress and growth within specified topics.

Standard	Standard Description
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.

Interdisciplinary Integration

Activities:

- Students will practice using the unit vocabulary as they talk and write about the problems they are solving. Understanding the vocabulary will aid their understanding of the concepts covered in this unit.

Resources:

- Quizlet
- Teacher Vision Cross-Curricular Theme Map - https://www.teachervision.com/teaching-methods/curriculum-planning/7167.html
- Engineering Go For It! - http://teachers.egfi-k12.org/
- US Department of Education STEM - http://www.ed.gov/stem
- What Every Educator Should Know About Using Google by Shell Education
- International Literacy Association Read Write Think - http://www.readwritethink.org/

Standard	Standard Description
NJSLS-ELA W.AW.8.1	Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

21st Century Life Skills Standards	
Activities: ● Students will work in groups to collaborate, at times taking leadership roles, to communicate project ideas to the whole class.	
Standard	**Student Learning Objectives**
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

Careers	
Activities: ● Students will discuss and then write detailed explanations utilizing appropriate mathematical vocabulary to explain their thought process for obtaining solutions to specific problems	
Practice	**Description**
Use technology to enhance productivity increase collaboration and communicate effectively.	Students find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
Work productively in teams while using cultural/global competence.	Students positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
Utilize critical thinking to make sense of problems and persevere in solving them.	Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of the problem and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through this when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. Their own actions or the actions of others.

Standards for Mathematical Practice	
MP #	Practice
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.
5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for and express regularity in repeated reasoning.

Standards	
Standard #	**Standard Description**
N-Q.A.	Reason quantitatively and use units to solve problems.
N-Q.A.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.
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
A-SSE.A	Interpret the structure of expressions
A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)
A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A-SSE.A.1b	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
A-SSE.B	Write expressions in equivalent forms to solve problems
A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
A-CED.A	Create equations that describe numbers or relationships
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.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A-REI.B	Solve equations and inequalities in one variable
A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.B.4	Solve quadratic equations in one variable.
A-REI.B.4b	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.
A-REI.D	Represent and solve equations and inequalities graphically
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.
F-IF.A	Understand the concept of a function and use function notation

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 context.
F-IF.B	Interpret functions that arise in applications in terms of the context
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.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	Analyze functions using different representations
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
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 $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12}t$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.
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.A	Build a function that models a relationship between two quantities
F-BF.A.1	Write a function that describes a relationship between two quantities.
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-BF.B	Build new functions from existing functions
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.
F-LE.A	Construct and compare linear and exponential models and solve problems

F-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
F-LE.A.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
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.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).
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-LE.B	Interpret expressions for functions in terms of the situation they model
F-LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.

Differentiation

Students with 504 plans

- Preferential seating
- Guided notes
- Extra time
- Teacher check-ins
- Use graphic organizers
- Redirect attention
- Prioritize tasks
- Small group testing
- Provide modifications & accommodations per individual student's 504 plan

Special Education

- Provide modifications & accommodations as listed in the student's IEP
- Position the student near a helping peer or have quick access to the teacher
- Modify or reduce assignments/tasks
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- Use collaborative grouping strategies, such as small groups
- NJDOE resources - http://www.state.nj.us/education/specialed/

Response to Intervention (RTI)

- Tiered interventions following the RTI framework
- Effective RTI strategies for teachers - http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/

- Intervention Central - http://www.interventioncentral.org/

English Language Learners (ELL)

- Provide text-to-speech
- Use of a translation dictionary or software
- Provide graphic organizers
- NJDOE resources - http://www.state.nj.us/education/aps/cccs/ELL.htm
- Adapt a Strategy – Adjusting strategies for ESL students - http://www.teachersfirst.com/content/esl/adaptstrat.cfm

Enrichment

- Process should be modified: higher order thinking skills, open-ended thinking, discovery
- Utilize project-based learning for greater depth of knowledge
- Utilize exploratory connections to higher-grade concepts
- Contents should be modified: real-world problems, audiences, deadlines, evaluations, transformations
- Learning environments should be modified: student-centered learning, independence, openness, complexity, and groups should be varied
- NJDOE resources

Califon Public School
Curriculum

Subject: Algebra	Grade: 8th	Unit #: 6	Pacing: 3 weeks

Unit Title: Build Exponential Functions and Models

OVERVIEW OF UNIT:

This unit starts by looking at how to fit exponential functions to data and determining predictions for the real-world data provided. Additionally, work is done to identify when to use linear models and when exponential models are needed. The second portion of the unit looks at geometric sequences in more depth. The students will look at how to define these sequences recursively and explicitly.

Big Ideas

- Model exponential data by hand and with technology
- Use residuals to determine the quality of fit of a model
- Model exponential data using a piecewise-defined function
- Compare linear and exponential relationships
- Choose between linear and exponential models
- Define and identify geometric sequences
- Write and evaluate a recursive formula for a geometric sequence
- Recognize the graph of a geometric sequence
- Express geometric sequences explicitly
- Apply geometric sequences to real-world problems
- Convert between explicit and recursive rules for a geometric sequence

Essential Questions

- How can you model exponential data by hand and with technology?
- How are residuals used to determine the quality of fit of a model?
- How is exponential data modeled using a piecewise-defined function?
- How would you compare linear and exponential relationships?
- How would you choose between linear and exponential models?
- How would you define and identify geometric sequences?
- How do you write and evaluate a recursive formula for a geometric sequence?
- How can you recognize the graph of a geometric sequence?
- How are geometric sequences expressed explicitly?
- How would you apply geometric sequences to real-world problems?
- How do you convert between explicit and recursive rules for a geometric sequence?

Objectives

- Students will be able to fit exponential functions to data and make predictions for real-world data.

- Students will be able to choose between linear and exponential models for given data sets.
- Students will be able to write recursive formulas for geometric sequences.
- Students will be able to write explicit rules for geometric sequences.

Assessment

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Key Vocabulary

- exponential regression
- common ratio
- geometric sequence

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A-SSE.B	Write expressions in equivalent forms to solve problems
A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
A-APR.B	Understand the relationship between zeros and factors of polynomials
A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
A-REI.C	Solve systems of equations
A-REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
S-CP.A	Understand independence and conditional probability and use them to interpret data
S-CP.A.4	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.
S-ID.A	Summarize, represent, and interpret data on a single count or measurement variable
S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
S-ID.A.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables
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.

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