

# Kenilworth Public Schools

## Curriculum Guide

Content Area: Finite

Grade: 11-12

BOE Approved: 8/11/2014

Revision Date: March 2020

Submitted by: Michele Ryan

BOE Revision Approved: N/A

# Finite Grades 11-12 Scope and Sequence

Unit 1- Accuplacer/SAT Prep & Linear Programming	Unit 2- Probability and Statistics	Unit 3- Matrices	Unit 4- Finance & Budget
--	---------------------------------------	---------------------	-----------------------------

Weeks 1-10	Weeks 11-20	Weeks 21-30	Weeks 31-40
------------	-------------	-------------	-------------

<p><i>Unit Description:</i> Review materials for SAT and Accuplacer exams. Maximize return on investment when there are multiple.</p> <p><i>Unit Targets:</i></p> <ul style="list-style-type: none"> <li>• Prepare for Accuplacer/SAT</li> <li>• Solve systems of linear equations</li> <li>• Graph linear inequalities</li> <li>• Perform linear programming, including finding vertices and maximizing and minimizing with multiple constraints</li> </ul>	<p><i>Unit Description:</i> Analyze and calculate probabilities and odds from situations with multiple outcomes.</p> <p><i>Unit Targets:</i></p> <ul style="list-style-type: none"> <li>• Construct Sets and Venn Diagrams</li> <li>• Calculate permutations and combinations</li> <li>• Calculate probabilities and odds</li> <li>• Calculate conditional probabilities</li> </ul>	<p><i>Unit Description:</i> Perform operations with matrices.</p> <p><i>Unit Targets:</i></p> <ul style="list-style-type: none"> <li>• Add and subtract matrices with the same dimensions</li> <li>• Perform scalar and matrix multiplication of matrices with appropriate dimensions</li> <li>• Solve inequalities with matrices</li> </ul>	<p><i>Unit Description:</i> Perform financial calculations and compare financial investments with different terms. Understand and create and manage a personal budget.</p> <p><i>Unit Targets:</i></p> <ul style="list-style-type: none"> <li>• Calculate simple interest</li> <li>• Calculate compound interest</li> <li>• Understand and perform calculations with annuities</li> <li>• Understand and perform calculations with amortization</li> <li>• Research and choose a virtual job</li> <li>• Research and choose a virtual home</li> <li>• Set up a budget to support your virtual research</li> </ul>
--	---	--	---

			<ul style="list-style-type: none"><li>• Explore and compare the different types of bank accounts</li><li>• Manage the bank account</li></ul>
--	--	--	--

# Finite Grades 11-12 Unit One

<b>Unit Title:</b> Accuplacer/SAT Prep & Linear Programming	
<b>Unit Summary:</b> Prepare secondary education assessments & Maximize return on investment when there are multiple restrictions.	
<b>Primary Interdisciplinary Connections:</b> Business, Science	
<b>21<sup>st</sup> Century Career and Life Themes:</b> Global Awareness, Financial Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy	
<b>Learning Targets</b>	
<b>NJSLS Standards:</b> 9-12.A.CED.1, 9-12.A.CED.2, 9-12.A.CED.3, 9-12.A.REI.1, 9-12.A.REI.5, 9-12.A.REI.6, 9-12.A.REI.7, 9-12.F.IF.4, 9-12.F.IF.5, 9-12.F.IF.7 a-c	
<b>Technology Standards:</b> 8.1.12.A.3, 8.1.12.C.1	
<b>Content Statements:</b>	
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.
2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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.
4	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.
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.
6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
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 $x^2 + y^2 = 3$ .
8	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. ★
9	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. ★
10	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ a. Graph quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
<b>Big Idea:</b> Prepare for secondary education assessments. Maximize return on investment when there are multiple restrictions.	
<b>Unit Essential Questions:</b> <ul style="list-style-type: none"> <li>● How do I eliminate answer choices for the secondary education assessments?</li> <li>● How can I find the point of intersection of two linear graphs?</li> <li>● How can I represent multiple constraints on the same graph?</li> <li>● How can I maximize the return on an investment using linear programming?</li> <li>●</li> </ul>	<b>Unit Enduring Understandings:</b> <ul style="list-style-type: none"> <li>● Use various test taking skills.</li> <li>● Use graphing, substitution, and elimination to find the point of intersection of two linear graphs.</li> <li>● Graph linear inequalities on the same coordinate plane to find the feasible region.</li> <li>● Find the vertices of feasible regions and determine which vertices the maximums and minimums occur.</li> </ul>
<b>Unit Learning Targets</b> <i>Students will...</i> <ul style="list-style-type: none"> <li>● 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.</li> <li>● Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</li> <li>● 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.</li> <li>● 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.</li> <li>● 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.</li> <li>● Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</li> <li>● 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 <math>y = -3x</math> and the circle <math>x^2 + y^2 = 3</math>.</li> </ul>	

- 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. ★
- 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. ★
- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ a. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. b. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

## Evidence of Learning

**Summative Assessment:** Quizzes and Tests

**Formative Assessments:**

- Homework
- Classwork
- Other activities at teacher's discretion

## Lesson Plans

<i>Activities/Interdisciplinary Connections</i>	<i>Timeframe</i>
<ul style="list-style-type: none"> <li>● Solve Systems of Equations using the following methods:               <ul style="list-style-type: none"> <li>Graphing                   <ol style="list-style-type: none"> <li>1. Re-write the two linear equations in slope intercept form.</li> <li>2. Graph each equation using different colored pencils.</li> <li>3. Find the point of intersection.</li> </ol> </li> <li>Substitution                   <ol style="list-style-type: none"> <li>1. Solve one equation in one variable.</li> <li>2. Substitute the previously solved equation into the second equation.</li> <li>3. Find both variables</li> </ol> </li> </ul> </li> </ul>	<p>30 minutes</p> <p>Weeks 1-10</p>

<p>Elimination</p> <ol style="list-style-type: none"> <li>1. Use addition or subtraction to eliminate a variable.</li> <li>2. Solve for the existing variable.</li> <li>3. Use substitution to find the remaining variable.</li> </ol> <ul style="list-style-type: none"> <li>● Make the connection using either method you will always get the same answer.</li> <li>● Interpret the answer “no solution” with parallel lines.</li> </ul>	
<i>Teacher Resources</i>	<i>Teacher Note</i>
<ul style="list-style-type: none"> <li>● Whiteboard, SMART board, Projector or Blackboard.</li> <li>● Notebook paper or poster board.</li> </ul>	<p>Colored pencils and ruler are needed for this activity.</p>

**Differentiating Instruction:  
Students with Disabilities, English Language Learners,  
and Gifted & Talented Students**

Examples of Strategies and Practices that Support Students with Disabilities:

- Use of visual and multisensory formats
- Use of assisted technology
- Use of prompts
- Modification of content and student products
- Testing accommodations
- Authentic assessments

Examples of Strategies and Practices that Support Gifted & Talented Students:

- Adjusting the pace of lessons
- Curriculum compacting
- Inquiry-based instruction
- Independent study
- Higher-order thinking skills
- Interest-based content
- Student-driven instruction
- Real-world problems and scenarios

Examples of Strategies and Practices that Support English Language Learners:

- Pre-teaching of vocabulary and concepts
- Visual learning, including graphic organizers
- Use of cognates to increase comprehension
- Teacher modeling
- Pairing students with beginning English language skills with students who have more advanced English language skills

- Scaffolding
- Word walls
- Sentence frames
- Think-pair-share
- Cooperative learning groups



# Finite Grades 11-12 Unit Two

<b>Unit Title:</b> Probability and Statistics	
<b>Unit Summary:</b> Analyze and calculate probabilities and odds from situations with multiple outcomes.	
<b>Primary Interdisciplinary Connections:</b> Business, Science, Physical Education	
<b>21<sup>st</sup> Century Career and Life Themes:</b> Global Awareness, Financial Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy	
<b>Learning Targets</b>	
<b>NJSLS Standards:</b> .9-12.S.ID.1, 9-12.S.ID.2, 9-12.S.IC.1, 9-12.S.IC.2, 9-12.S.IC.3, 9-12.S.CP.1, 9-12.S.CP.2, 9-12.S.CP.3, 9-12.S.CP.5, 9-12.S.CP.6, 9-12.S.CP.7, 9-12.S.CP.8, 9-12.S.CP.9, 9-12.S.MD.5a, 9-12.S.MD.6, 9-12.S.MD.7	
<b>Technology Standards:</b> 8.1.12.A.3, 8.1.12.C.1	
<b>Content Statements:</b>	
1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
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.
3	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
4	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?
5	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
6	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
7	Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
8	Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
9	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.
10	Find the conditional probability of A given B as the fraction of B’s outcomes that also

	belong to A, and interpret the answer in terms of the model.
11	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ , and interpret the answer in terms of the model.
12	(+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)$ , and interpret the answer in terms of the model.
13	(+) Use permutations and combinations to compute probabilities of compound events and solve problems.
14	(+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast food restaurant
15	(+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
16	(+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

**Big Idea:** Analyze and calculate probabilities and odds from situations with multiple outcomes

**Unit Essential Questions:**

- How do I represent a sample space?
- How do I count numbers of possibilities?
- How do I calculate probabilities and odds?
- How do I find probabilities that are dependent upon another event?

**Unit Enduring Understandings:**

- Use the counting principle and Venn Diagrams to represent sample spaces.
- Use permutations and combinations to count numbers of possibilities.
- Use the definition of probability and the definition of odds to calculate probabilities and odds.
- Use definition of conditional probability to calculate problems with conditional probabilities.

**Unit Learning Targets**

*Students will...*

- Represent data with plots on the real number line (dot plots, histograms, and box plots).
- 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.
- Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?
- Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
- Describe events as subsets of a sample space (the set of outcomes) using characteristics

(or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).

- Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
- Understand the conditional probability of A given B as  $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
- Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.
- Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A, and interpret the answer in terms of the model.
- Apply the Addition Rule,  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ , and interpret the answer in terms of the model.
- (+) Apply the general Multiplication Rule in a uniform probability model,  $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$ , and interpret the answer in terms of the model.
- (+) Use permutations and combinations to compute probabilities of compound events and solve problems.
- (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast food restaurant
- (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
- (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

## Evidence of Learning

**Summative Assessment:** Quizzes and Tests

**Formative Assessments:**

- Homework
- Classwork
- Other activities at teacher’s discretion

## Lesson Plans

<i>Activities/Interdisciplinary Connections</i>	<i>Timeframe</i>
● Statements with “And” and “Or”	30 minutes

<p>Use Venn Diagram to investigate the difference in statements with “and” and those with “or”.</p> <ol style="list-style-type: none"> <li>1. Create scenarios such as two situations that could happen independently or together.</li> <li>2. Break into small groups (3-4 students). Each student assigned an identification letter.</li> <li>3. Each group draws their Venn diagram and classifies each student by placing their letter in the appropriate part of the Venn diagram.</li> <li>4. Are you taking an art class? Are you taking a foreign language?</li> <li>5. Students create scenarios for the other groups to use to recreate the exercise. Repeat as many times as possible in allotted time.</li> </ol>	<p>20-30 minutes</p> <p>Weeks 11-20</p>
<p><i>Teacher Resources</i></p>	<p><i>Teacher Note</i></p>
<ul style="list-style-type: none"> <li>• Whiteboard, SMART board, Projector or Blackboard.</li> <li>• Notebook paper or poster board.</li> </ul>	<p>Colored pencils and ruler are needed for this activity.</p>

**Differentiating Instruction:  
Students with Disabilities, English Language Learners,  
and Gifted & Talented Students**

Examples of Strategies and Practices that Support Students with Disabilities:

- Use of visual and multisensory formats
- Use of assisted technology
- Use of prompts
- Modification of content and student products
- Testing accommodations
- Authentic assessments

Examples of Strategies and Practices that Support Gifted & Talented Students:

- Adjusting the pace of lessons
- Curriculum compacting
- Inquiry-based instruction
- Independent study
- Higher-order thinking skills
- Interest-based content
- Student-driven instruction
- Real-world problems and scenarios

Examples of Strategies and Practices that Support English Language Learners:

- Pre-teaching of vocabulary and concepts

- Visual learning, including graphic organizers
- Use of cognates to increase comprehension
- Teacher modeling
- Pairing students with beginning English language skills with students who have more advanced English language skills
- Scaffolding
- Word walls
- Sentence frames
- Think-pair-share
- Cooperative learning groups

# Finite    Grades 11-12    Unit Three

<b>Unit Title:</b> Matrices	
<b>Unit Summary:</b> Perform various operations of matrices	
<b>Primary Interdisciplinary Connections:</b> Business, Cryptography, Social Studies	
<b>21<sup>st</sup> Century Career and Life Themes:</b> Global Awareness, Financial Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy	
<b>Learning Targets</b>	
<b>NJSLS Standards:</b> 9-12.N.VM.6, 9-12.N.VM.7, 9-12.N.VM.7,9-12.N.VM.8, 9-12.N.VM.9, 9-12.N.VM.10, 9-12.A.REI.9	
<b>Technology Standards:</b> 8.1.12.A.3, 8.1.12.C.1	
<b>Content Statements:</b>	
1	Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
2	Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
3	Add, subtract, and multiply matrices of appropriate dimensions.
4	Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
5	Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
6	Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension $3 \times 3$ or greater).
<b>Big Idea:</b> Use matrices to solve various problems.	
<b>Unit Essential Questions:</b> <ul style="list-style-type: none"> <li>● What is the difference between scalar multiplication and matrix multiplication?</li> <li>● Is matrix multiplication commutative?</li> <li>● How can I solve systems of linear equations using matrix operations?</li> <li>● How can I encode and decode messages using matrices?</li> </ul>	<b>Unit Enduring Understandings:</b> <ul style="list-style-type: none"> <li>● Identify dimensions of matrices to perform operations.</li> <li>● Set up linear equations in matrix form to solve for variables.</li> <li>● Calculate the inverse of matrices to encrypt messages.</li> </ul>
<b>Unit Learning Targets</b> <i>Students will...</i> <ul style="list-style-type: none"> <li>● Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.</li> <li>● Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a</li> </ul>	

game are doubled.

- Add, subtract, and multiply matrices of appropriate dimensions.
- Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
- Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
- Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension  $3 \times 3$  or greater).

## Evidence of Learning

**Summative Assessment:** Quizzes and Test

**Formative Assessments:**

- Homework
- Classwork
- Other activities at the teacher's discretion.

## Lesson Plans

<i>Activities/Interdisciplinary Connections</i>	<i>Timeframe</i>
<ul style="list-style-type: none"> <li>● Solve a system of linear equations               <ul style="list-style-type: none"> <li>○ Set up the system in matrix form</li> <li>○ Calculate inverses of matrices</li> <li>○ Perform matrix multiplication to solve for the variables.</li> </ul> </li> <li>● Encode and decode messages               <ul style="list-style-type: none"> <li>○ Use matrix multiplication to send hidden messages.</li> <li>○ Use inverses to find original messages.</li> </ul> </li> <li>● Use clips from the movie “Imitation Game” to show use of encryption in a real-life situation from the past.</li> </ul>	Weeks 21-30
<i>Teacher Resources</i>	<i>Teacher Note</i>
<ul style="list-style-type: none"> <li>● Whiteboard, Smart Board, Projector, or Blackboard</li> <li>● Notebook paper or poster</li> </ul>	Have students work with each other to create encoded messages and decode it with a key provided.

**Differentiating Instruction:  
Students with Disabilities, English Language Learners,  
and Gifted & Talented Students**

Examples of Strategies and Practices that Support Students with Disabilities:

- Use of visual and multisensory formats
- Use of assisted technology
- Use of prompts
- Modification of content and student products
- Testing accommodations
- Authentic assessments

Examples of Strategies and Practices that Support Gifted & Talented Students:

- Adjusting the pace of lessons
- Curriculum compacting
- Inquiry-based instruction
- Independent study
- Higher-order thinking skills
- Interest-based content
- Student-driven instruction
- Real-world problems and scenarios

Examples of Strategies and Practices that Support English Language Learners:

- Pre-teaching of vocabulary and concepts
- Visual learning, including graphic organizers
- Use of cognates to increase comprehension
- Teacher modeling
- Pairing students with beginning English language skills with students who have more advanced English language skills
- Scaffolding
- Word walls
- Sentence frames
- Think-pair-share
- Cooperative learning groups



# Finite Grades 11-12 Unit Four

<b>Unit Title:</b> Finance and Budget	
<b>Unit Summary:</b> Perform financial calculations and compare financial investments with different terms to understand, create, and manage a personal budget.	
<b>Primary Interdisciplinary Connections:</b> Business, Physical Education, Civics, Art, Theater, Music	
<b>21<sup>st</sup> Century Career and Life Themes:</b> Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy, Life and Career Skills, Information Literacy	
<b>Learning Targets</b>	
<b>NJSLS Standards:</b> NJSLS.9-12.F.IF.C.8.b, 9-12.F.LE.2, 9-12.A.SSE.1b, 9-12.A.SSE.3c, 9-12.A.SS.4, 9-12.A.APR.1	
<b>Technology Standards:</b> 8.1.12.A.3, 8.1.12.C.1	
<b>Content Statements:</b>	
1	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$ , $y = (0.97)^t$ , $y = (1.01)^{12t}$ , $y = (1.2)^{t/10}$ , and classify them as representing exponential growth or decay
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)
3	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 $P$
4	Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15^t$ can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%
5	Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments ★
6	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
<b>Big Idea:</b> Perform financial calculations and compare financial investments with different terms to understand, create, and manage a personal budget.	
<b>Unit Essential Questions:</b> <ul style="list-style-type: none"> <li>● How do I calculate simple interest?</li> <li>● How do I calculate compound interest?</li> <li>● How do I compare the terms of annuities?</li> <li>● How do I compare the terms of debt</li> </ul>	<b>Unit Enduring Understandings:</b> <ul style="list-style-type: none"> <li>● Understand and use the simple interest formula.</li> <li>● Understand and use the compound interest formula.</li> <li>● Understand and use the annuity formulas to</li> </ul>

<p>structures?</p> <ul style="list-style-type: none"> <li>● What salary can I expect based on my career goals?</li> <li>● How do I choose a home?</li> <li>● How do I open a bank account?</li> <li>● How do I manage a bank account?</li> <li>● How do I manage a budget?</li> </ul>	<p>find accumulated amounts, payment amounts, and numbers of period required. Compare annuities with various terms.</p> <ul style="list-style-type: none"> <li>● Understand and use amortization formulas to find and present value payment amounts and amounts owed. Compare amortizations with various terms.</li> <li>● Determine expected salary range through internet research.</li> <li>● Determine features and costs of a home through internet research.</li> <li>● Compare terms and types of bank accounts.</li> <li>● Determine monthly credits and debits.</li> <li>● Calculate monthly expenses verses monthly income.</li> </ul>
---	--

### Unit Learning Targets

*Students will...*

- Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as  $y = (1.02)^t$ ,  $y = (0.97)^t$ ,  $y = (1.01)^{12t}$ ,  $y = (1.2)^{t/10}$ , and classify them as representing exponential growth or decay
- 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).
- 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  $P$
- Use the properties of exponents to transform expressions for exponential functions. For example the expression  $1.15^t$  can be rewritten as  $(1.151/12)^{12t} \approx 1.012^{12t}$  to reveal the approximate equivalent monthly interest rate if the annual rate is 15%
- Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments. ★
- 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

## Evidence of Learning

**Summative Assessment:** Quizzes and Tests

**Formative Assessments:**

- Homework
- Classwork
- Other activities at teacher's discretion

## Lesson Plans

<i>Activities/Interdisciplinary Connections</i>	<i>Timeframe</i>
<ol style="list-style-type: none"> <li>1. Calculate compound interest for real life car payments: Research a car on the internet</li> <li>1. Compare purchasing and leasing a vehicle.</li> <li>2. Find the price of the vehicle.</li> <li>3. Find the interest rate for borrowing money for the car.</li> <li>4. Print out a picture of the car, along with the price and interest rate for borrowing money.</li> </ol> <p>Calculations</p> <ol style="list-style-type: none"> <li>1. Use the compound interest formula to calculate the amount of interest you owe if you borrow money for 3 years.</li> <li>2. Use the compound interest formula to calculate the amount of interest you owe if you borrow money for 5 years.</li> <li>3. Compare the two findings.</li> </ol> <p>What does the car cost you?</p> <ol style="list-style-type: none"> <li>1. Calculate the total amount due on the loan.</li> <li>2. Do you think you can afford the car?</li> </ol>	20-30 minutes
<ul style="list-style-type: none"> <li>● Calculate a mortgage payment: Research a home on the internet</li> <li>1. Compare houses in the area that have the same criteria.</li> <li>2. Find the price of the home.</li> <li>3. Find the interest rate for borrowing money from a local bank.</li> <li>4. Determine how many years you will borrow the money for.</li> </ul> <p>Calculations</p>	1 week
	Weeks 31-40

<ol style="list-style-type: none"> <li>1. Use the compound interest formula to calculate the amount of interest you owe if you borrow money for 30 years.</li> <li>2. Use the compound interest formula to calculate the amount of interest you owe if you borrow money for 20 years.</li> </ol> <p>What does the house cost you?</p> <ol style="list-style-type: none"> <li>1. Calculate the total amount due on the loan.</li> <li>2. What would you have to pay a month if you wanted to pay off your mortgage in 15 years?</li> </ol> <ul style="list-style-type: none"> <li>● Check your calculations using an on-line mortgage calculator (example- Weichert.com)</li> </ul>	
--	--

<i>Teacher Resources</i>	<i>Teacher Note</i>
<ul style="list-style-type: none"> <li>● Whiteboard, SMART board, Projector or Blackboard, computer use.</li> <li>● Notebook paper or poster board.</li> </ul>	<p>Scissors and tape may be needed for this activity.</p> <p>Have students present their findings to the class.</p>

**Differentiating Instruction:  
Students with Disabilities, English Language Learners,  
and Gifted & Talented Students**

- Examples of Strategies and Practices that Support Students with Disabilities:
- Use of visual and multisensory formats
  - Use of assisted technology
  - Use of prompts
  - Modification of content and student products
  - Testing accommodations
  - Authentic assessments
- Examples of Strategies and Practices that Support Gifted & Talented Students:
- Adjusting the pace of lessons

- Curriculum compacting
- Inquiry-based instruction
- Independent study
- Higher-order thinking skills
- Interest-based content
- Student-driven instruction
- Real-world problems and scenarios

Examples of Strategies and Practices that Support English Language Learners:

- Pre-teaching of vocabulary and concepts
- Visual learning, including graphic organizers
- Use of cognates to increase comprehension
- Teacher modeling
- Pairing students with beginning English language skills with students who have more advanced English language skills
- Scaffolding
- Word walls
- Sentence frames
- Think-pair-share
- Cooperative learning groups