



Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:

Meeting the needs of all students with a proud tradition of academic excellence.

DEPARTMENT: Mathematics

COURSE: Pre AP Algebra I

Curriculum Development Timeline

School: Ocean Township High School

Course: Pre-AP Algebra I

Department: Mathematics

Board Approval	Supervisor	Notes
July 2009	Janet Bluefield	Born Date
July 2012	Janet Bluefield	Revisions
August 2017	Nichole Kerney	Revisions
March 2019	Nichole Kerney	Review
August 2022	Gerard Marrone	Alignment to Standards
August 2026	Greg Colon	Alignment to Standards & Revision

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Pacing Guide			
Cycle	Marking Period 1	Cycle	Marking Period 3
1	Solving Linear Equations	21	Exponential Properties
2	Solving Linear Equations	22	Exponential Properties
3	Linear Equations and Functions	23	Exponential Functions
4	Linear Equations and Functions	24	Exponential Functions
5	Linear Equations and Functions	25	Exponential Functions
6	Linear Equations and Functions	26	Exponential Functions
7	Linear Equations and Functions	27	Polynomials Expressions & Factoring
8	Linear Equations and Functions	28	Polynomials Expressions & Factoring
9	Linear Equations and Functions	29	Polynomials Expressions & Factoring
10	Scatter Plots	30	Polynomials Expressions & Factoring
		31	Quadratic Equations and Functions
Cycle	Marking Period 2	Cycle	Marking Period 4
11	Systems of Linear Equations and Inequalities	32	Quadratic Equations and Functions
12	Systems of Linear Equations and Inequalities	33	Quadratic Equations and Functions
13	Systems of Linear Equations and Inequalities	34	Quadratic Equations and Functions
14	Systems of Linear Equations and Inequalities	35	Quadratic Equations and Functions
15	Systems of Linear Equations and Inequalities	36	Quadratic Equations and Functions

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16	Systems of Linear Equations and Inequalities	37	Quadratic Equations and Functions
17	Geometric Sequences	38	Quadratic Equations and Functions
18	Geometric Sequences	39	Quadratic Equations and Functions
19	Radical Expressions & Equations	40	Analyze, Construct, and use: Exponential, Linear, Quadratic, Piecewise Functions
20	Radical Expressions & Equations	41	Analyze, Construct, and use: Exponential, Linear, Quadratic, Piecewise Functions
		42	Analyze, Construct, and use: Exponential, Linear, Quadratic, Piecewise Functions

Core Instructional & Supplemental Materials including various levels of Texts

Core Instruction: Big Ideas Algebra 1 Textbook and Ebook (Cengage Learning) & College Board Pre-AP Algebra 1 Framework

Supplemental: iXL Math, NJSLA Released Questions, Desmos

Special Education and ELL Supplemental: Video Tutor - BigIdeasMath.com

Time Frame	2 cycles ~ 6 (56 minute) days
Topic	
Solving Linear Equations	
Alignment to Standards	
N.Q.1 – Reason Quantitatively and Use Units to Solve Problems- 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. A.SSE.1.a – Interpret the Structure of Expressions	

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Interpret expressions that represent a quantity in terms of its context

A.CED.2 – Create Equations That Describe Numbers or Relationships

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

F.IF.4 – Interpret Functions That Arise in Applications in Terms of the Context

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.

Learning Objectives and Activities

SWBAT answer the following questions:

- How do you evaluate algebraic expressions and powers?
- How do you model relationships with variables and equations?
- How do you simplify expressions and formulas?
- How do you classify and compare real numbers?
- How do you represent functions as tables, graphs, and rules?
- How do you combine numbers using order of operations?
- How do you use the distributive property to combine like terms?
- How do you use the properties to solve equations?
- How do you solve multi-step equations and inequalities?
- How can you determine the solution of an equation or inequality (no solution, infinite solutions, one solution)?
- How do you transform a literal equation?
- How do you solve a proportion?

SWBAT demonstrate understanding of the following:

- How large amounts of data are presented in a concise format, such as a graph or table.
- What happens to positive and negative values when they are combined.
- When solving an equation, 3 things may result: x will equal a number, the x will eliminate leaving either a true or false statement- if true, there are infinite solutions, if false, and there are no solutions to the equation.
- The purpose of transforming a literal equation is to solve for a different value, such as $\text{Area} = \text{length} \times \text{width}$, what if you had the area and the width, how would you find the length?

Learning Activities:

- Video Tutor-bigideasmath.com
- Modeling Activity
- Real-World Application-reading graphs in current newspapers
- Equation Bingo
- Group Practice

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Assessments

Formative:

- Classwork and Homework
- IXL Practice
- Teacher Observation
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes
- Topic Tests

Alternative:

- Kahoot
- Quizizz
- Quizlet
- Blooket

Interdisciplinary Connections

Science: MS-ETS1-1: Students estimate irrational numbers while defining the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions..

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1

Demonstrate the ability to reflect, revise, and explain reasoning and decision-making when solving problems collaboratively.

9.4.8.CI.2

Collaborate with others to develop a solution using multiple perspectives. Aligns with discussion, group presentations, or group project-based learning.

9.4.8.CI.3

Use collaborative technologies to explore diverse viewpoints and generate ideas for solutions. Group problem-solving, peer teaching, or inquiry based tasks.

9.4.12.CI.2 Critically analyze ideas within and between groups to ensure productive collaboration. Encourages meaningful group work with clear roles and outcomes.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize

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information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Career Education

- **9.4.12.CI.2** – Communicate ideas clearly and effectively, using verbal, nonverbal, and digital communication techniques.
- **9.4.12.CT.3** – Engage in discussions to clarify ideas, present opinions, and build on others' contributions.

Time Frame	7 cycles ~ 21 (56 minute) blocks
Topic	
Linear Equations and Functions	
Alignment to Standards	

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A.SSE.1.a – Interpret the Structure of Expressions

Interpret parts of an expression, such as terms, factors, and coefficients.

A.REI.1 – Understand Solving Equations as a Process of Reasoning and Explain the Reasoning

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.3 – Solve Equations and Inequalities in One Variable

Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.CED.1 – Create Equations That Describe Numbers or Relationships

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.3 – Represent Constraints by Equations or Inequalities

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.

A.CED.4 – Rearranging Formulas

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Learning Objectives and Activities

SWBAT answer the following questions:

- How do you model an equation for a real-life application?
- How do you find the constant rate of change?
- Is the sequence arithmetic?
- What is the n th term in arithmetic sequence?
- Does the equation represent direct variation?
- What is the slope of the line?
- How to write in function notation?
- What is the standard equation of the line?
- What is the slope-intercept form of the line?
- What is the point-slope intercept form of the line?

SWBAT demonstrate understanding of the following:

- Constant rate of change
- Linear functions
- Linear equations
- Arithmetic Sequences
- Linear models of nonlinear scenarios

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- Two variable linear inequalities.

Learning Activities:

- Real life applications of arithmetic sequences - how do determine how many rows are in a stadium.
- Writing real life applications of linear equations to solve problems.
- Students make observations about a speedometer and discuss the two scales.
- Students examine and draw conclusions about a table used to convert from mph to kmh
- Students create their own conversion table
- Students compare graphs and equations from both conversion tables in the lesson.
- Students explore the relationship between side length and diagonal length as a representation of direct variation.
- Students describe a variety of visual representations of arithmetic sequences leading to the exploration of arithmetic sequences.
- Students investigate a roadtrip scenario from different perspectives and write an equation for each.
- Students have the opportunity to write, graph, and evaluate functions.
- Students recall function notation and write a function for temperature conversion.
- Students complete a card-sorting activity that will help solidify the relationship among the algebraic forms, graphs, and verbal descriptions of a linear scenario.

Assessments

Formative:

- Daily Practice Problems
- Class Debate of Approaches/Mathematical Methods
- Graphic Organizer
- Math Scavenger Hunt/Trail

Summative:

- Mid-unit Quizzes

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- Topic Tests
- Problem-based Quiz/Test on on creating equations from real-world situation

Alternative:

- Kahoot
- Quizizz
- Quizlet
- Blooket

Interdisciplinary Connections

Science: **HS-LS1-7:** Use mathematical and computational thinking to describe and model a scientific process.

Connection: Linear functions can model growth patterns in populations or the spread of substances in ecosystems.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1

Demonstrate the ability to reflect, revise, and explain reasoning and decision-making when solving problems collaboratively.

9.4.8.CI.2

Collaborate with others to develop a solution using multiple perspectives. Aligns with discussion, group presentations, or group project-based learning.

9.4.8.CI.3

Use collaborative technologies to explore diverse viewpoints and generate ideas for solutions. Group problem-solving, peer teaching, or inquiry based tasks.

9.4.12.CI.2 Critically analyze ideas within and between groups to ensure productive collaboration. Encourages meaningful group work with clear roles and outcomes.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live

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to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Career Education

9.4.12.CT.4 – Demonstrate creativity in generating ideas and solutions through brainstorming or innovative thinking.

9.4.12.TL.5 – Use technology to produce creative work such as videos, graphics, or presentations that demonstrate innovative thinking.

9.4.12.CT.2 – Apply critical thinking strategies to solve complex problems and consider multiple solutions.

9.4.12.TL.2 – Use technology tools to analyze data, identify patterns, and draw conclusions.

Time Frame	1 cycle ~ 3 (56 minute blocks)
Topic	
Scatter Plots	
Alignment to Standards	
8.SP.1 – Investigate Patterns of Association in Bivariate Data Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 8.SP.2 – Investigate Patterns of Association in Bivariate Data	





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Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

S.ID.B.6a – Summarize, Represent, and Interpret Data on Two Quantitative Variables

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 – Summarize, Represent, and Interpret Data on Two Quantitative Variables

Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology

S.ID.B.6c – Summarize, Represent, and Interpret Data on Two Quantitative Variables

Fit a linear function for a scatter plot that suggests a linear association

Learning Objectives and Activities

SWBAT answer the following questions:

- What makes a scatter plot have positive, negative, or no correlation?
- How do you find the line of best fit?
- How can you use the line of best fit to predict future events?
- How can you determine whether the scatterplot of the relationship between two quantities can be reasonably modeled by a linear model?

SWBAT demonstrate understanding of the following:

- Linear Regression
- Graphing and interpreting scatter plots
- How to use data to predict future events.

Learning Activities:

- Guided notes with real life examples.
- Students will research data and make their own scatter plot based off that data and use data to predict future events.
- Students construct a scatter plot with a real-world data set and analyze it to argue that a linear equation is an appropriate model for the data. They then create and use their linear model of the data to make predictions about electric car sales. The task requires students to make choices about how to display the data, which may affect the conclusions they draw from their analysis.

Assessments

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Formative:

- IXL Practice
- Teacher Observation
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes

Benchmark:

- Cumulative final exam with multiple choice, short answer, and extended constructed response questions.

Alternative:

- Kahoot/Quizizz
- Individual or group productive struggle assessment during introductory lessons

Interdisciplinary Connections

ELA: W.9-10.1: When students are justifying their reasoning on short answer and extended constructed response questions they write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

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Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Students will use graphing calculators to use math tools strategically and attend to precision and will use Desmos in order to discover new concepts involving graphing and functions.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

Career Education

9.4.12.CI.1 – Demonstrate the ability to reflect, revise, and explain reasoning when solving real-world problems.

9.4.12.CI.2 – Critically analyze diverse ideas to create solutions.

9.4.12.CT.2 – Collaborate to solve open-ended problems.

9.4.12.CT.3 – Evaluate diverse perspectives in solving problems.

Time Frame	6 cycles ~ 18 (56 minute) blocks
Topic	
Systems of Linear Equations and Inequalities	
Alignment to Standards	
N.Q.2 – Reason Quantitatively and Use Units to Solve Problems Define appropriate quantities for the purpose of descriptive modeling.	
N.Q.3 – Reason Quantitatively and Use Units to Solve Problems Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	

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F.IF.4 – Interpret Functions That Arise in Applications in Terms of the Context

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship

F.IF.5 – Interpret Functions That Arise in Applications in Terms of the Context

Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.6 – Interpret Functions That Arise in Applications in Terms of the Context

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.7.a – Analyze Functions Using Different Representations

Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.BF.1.a – Build a Function That Models a Relationship Between Two Quantities

Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.LE.2 – Construct and Compare Linear, Quadratic, and Exponential Models and Solve Problems

Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs.

F.LE.5 – Interpret Expressions for Functions in Terms of the Situation They Model

Interpret the parameters in a linear or exponential function in terms of a context.

S.ID.7 – Interpret Linear Models

Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

A.CED.2 – Create Equations That Describe Numbers or Relationships

Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.CED.3 – Create Equations That Describe Numbers or Relationships

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.





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A.REI.10 – Understand Solving Equations as a Process of Reasoning and Explain the Reasoning

Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

A.REI.12 – Solve Systems of Equations

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.

A.REI.C.5 (+) Solve Systems of Linear Equations

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.6 – Solve Systems of Equations

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A.REI.11 – Represent and Solve Equations and Inequalities Graphically

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.

F.IF.9 – Analyze Functions Using Different Representations

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

F.IF.2 – Understand the Concept of a Function and Use Function Notation

Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

SWBAT answer the following questions:

- How do you find the slope of a line and interpret slope as a rate of change from tables and graphs?
- How do you write and graph equations in slope-intercept form, standard form and point-slope form?
- How do you write an equation of a line given two points?
- How do you write equations of parallel and perpendicular lines?

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- How do you graph a linear inequality in two variables?
- Slope is a ratio of rise over run
- Determine the sign of the slope by looking at the line from left to right
- There are many ways to solve problems but some are more efficient than others.
- Graphs and equations are alternative ways for depicting and analyzing patterns of change.
- Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables and words. Each representation of a given function is simply a different way of expressing the same idea.
- How do you solve a system by graphing?
- How do you solve a system by substitution?
- How do you solve a system by eliminating a variable?
- What kind of application problem can be solved using a system? How do you determine the number of solutions of a system?

SWBAT demonstrate understanding of the following:

- The point of intersection of two linear equations can be determined by several methods (graphing, substitution, elimination).
- Systems of equations can have no solutions, 1 solution or infinite solutions depending on the equations in the system.
- In some cases one method may be difficult and another method may be a better choice. In some cases the lines may be parallel or the same line.
- Solving a system of equations is a useful way to find solutions to real world problems (ie break even point and other applications)

Learning Activities:

- Video tutor – bigideasmath.com
- TI 83 – tables
- Worksheets
- Graphing a line on a coordinate plane constructed on the floor of the classroom
- Use a graphing calculator or website, such as, http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@eqns_lines&lid=4 to discover how changing the coefficient of x or the constant changes the slope and y-intercept in the graph.
- Use the graphing calculator with the Smart board to engage class discussions
- Desmos
- Students analyze a real-life scenario that has one solution. Students begin to recognize the relationships between the algebraic representation of a system of equations and the number of solutions it will have. Students analyze modification of the scenario from previous examples and through analysis students build context-based understanding of systems with no solutions and

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systems with infinite solutions.

- Students use a graphing calculator to solve a system of equations where the intersection point of the two lines is not in the standard viewing window.
- Students will write a system of linear inequalities to model the constraints of a certain resource: a shipping container. Solving the problem involves modeling the constraints of a single shipment and then deciding whether or not certain combinations of flower pots can be shipped in a single shipment. The task should help students understand how inequalities are useful for making complex decisions.

Assessments

Formative:

- Daily Practice Problems
- IXL Practice
- Teacher Observation
- Graphic Organizer

Summative:

- Mid-unit Quizzes
- Topic Tests

Alternative:

- Observation Assessment with Problem-solving
- Kahoot/Quizizz

Interdisciplinary Connections

Career Readiness, Life Literacies, and Key Skills

9.1.8.CDM.2: In solving a system of equations students will demonstrate an understanding of the terminology associated with different types of credit (e.g., credit cards, installment loans, mortgages, lines of credit) and compare and calculate the interest rates associated with each.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives

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on a real-world problem.

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- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Career Education

9.4.12.CI.1 – Demonstrate the ability to reflect, revise, and apply creative processes to solve real-world problems.

9.4.12.CI.2 – Critically analyze diverse perspectives for creating innovative solutions.

Time Frame	2 Cycles ~ 6 (56 minute blocks)
Topic	
Geometric Sequences	
Alignment to Standards	
F.BF.A.2 – Write Arithmetic and Geometric Sequences Both Recursively and with an Explicit Formula	

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Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F.LE.A.2 – Construct Linear and Exponential Functions

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).

Learning Objectives and Activities

SWBAT answer the following questions:

- Is the relationship exponential?
- What is a geometric sequence?
- How do you construct a geometric sequence?
- What do you know about the ratios of successive terms in geometric sequences?
- How can a geometric sequence be algebraically expressed?

SWBAT demonstrate understanding of the following:

- You can compare and make predictions about data by organizing graphically and analyzing spread and central tendencies.
- Convert a given representation of a geometric sequence to another representation of the geometric sequence.
- Determine whether a relationship is exponential or nonexponential based on a numerical sequence whose indices increase by a constant amount.

Learning Activities:

- Graphing calculator activity (such as height vs. shoe size)
- Comparing Arithmetic and Geometric Sequences Students explore and compare sequences that increase or decrease in different ways.
- Modeling Pizza Night with Sequence Formulas Students explore a thought experiment involving different rates or ratios of change.
- Investigating Fractal Patterns Students extend fractal image sequences and write a sequence formula for a particular feature of the fractal.

Assessments

Formative:

- Classwork and Homework
- Teacher Observation
- Class Debate of Approaches/Mathematical Methods
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes

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- Topic Tests

Alternative:

- Observation Assessment with Problem-solving
- Kahoot/Quizizz

Interdisciplinary Connections

Science (NJSLS-S)

HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

Connection: Geometric sequences can model exponential decay in chemical reactions.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.4 – Collaborate to solve complex problems by sharing information and ideas.

9.4.12.CI.4 – Utilize teamwork skills in a variety of collaborative environments.

9.4.12.CT.5 – Contribute productively to team discussions and tasks.

9.4.12.CT.2 – Apply strategies for team effectiveness and group collaboration in problem-solving.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

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- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Students will use graphing calculators to use math tools strategically and attend to precision.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

Career Education

9.4.12.CT.1 – Use critical thinking and problem-solving strategies to approach complex tasks.

9.4.12.TL.3 – Select appropriate digital tools to organize and present information.

9.4.12.CI.2 – Communicate ideas clearly and effectively, using verbal, nonverbal, and digital communication techniques.

9.4.12.CT.3 – Engage in discussions to clarify ideas, present opinions, and build on others' contributions.

Time Frame	2 Cycles ~6 (56 minute blocks)
Topic	
Radical Expressions and Equations	
Alignment to Standards	
A.REI.2 – Solve Rational and Radical Equations Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	
N.RN.A.3 – Use Properties of Rational and Irrational Numbers Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	

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COURSE: Pre AP Algebra I

Learning Objectives and Activities

SWBAT answer the following questions:

- How do you simplify a radical?
- How do you estimate a radical?
- How do you rewrite a radical using exponents?
- How do you simplify radicals involving products and quotients?
- How do you simplify sums and differences?

SWBAT demonstrate understanding of the following:

- Operations can be performed with radical expressions.
- Radical expressions can be simplified by using factoring of the number into primes.
- Square roots are the reverse of perfect squares.
- Why can simplifying a radical first help when combining radical expressions?
- Why would we want to write 5 instead of $\sqrt{25}$?

Learning Activities:

- Create a table of and compare different radicals
- Small group practice
- Jeopardy
- Student presentation
- Communicators

Assessments

Formative:

- Classwork and Homework
- Daily Practice Problems
- IXL Practice
- Teacher Observation

Summative:

- Mid-unit Quizzes
- Topic Tests

Alternative:

- Kahoot
- Quizizz

Interdisciplinary Connections

Career Readiness, Life Literacies, and Key Skills

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COURSE: Pre AP Algebra I

9.4.12.CI.3 – Apply critical thinking skills to analyze and solve problems in a creative manner.

9.4.12.CT.1 – Use critical thinking skills to evaluate situations, identify problems, and formulate solutions.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Career Education

9.4.12.CI.3 – Apply creativity to generate ideas and solutions to problems.

9.4.12.CT.1 – Utilize critical thinking to make decisions and solve problems innovatively.

9.4.12.CT.2 – Use critical thinking skills to analyze and solve complex problems.

9.4.12.CI.2 – Demonstrate innovative thinking in evaluating problems and solutions.





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Time Frame	6 Cycles ~ 18 (56 minute blocks)
Topic	
Exponents and Exponential Functions	
Alignment to Standards	
N.RN.1 – Extend the Properties of Exponents to Rational Exponents 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.	
A.SSE.3.c – Choose and Produce Equivalent Forms of Expressions Use the properties of exponents to transform expressions for exponential functions.	
A.SSE.1.b – Interpret the Structure of Expressions Interpret complicated expressions by viewing one or more of their parts as a single entity.	
A.CED.2 – Create Equations That Describe Numbers or Relationships Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	
A.REI.10 – Understand Solving Equations as a Process of Reasoning Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane	
F.IF.2 – Understand the Concept of a Function and Use Function Notation Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	
F.IF.7.e – Analyze Functions Using Different Representations Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude	
F.IF.8b Use properties of exponents to interpret exponential functions. Interpret growth factor and decay factor in equivalent forms	
F.IF.9 – Compare Properties of Two Functions Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	
F.LE.1.a – Construct and Compare Linear, Quadratic, and Exponential Models Distinguish between situations that can be modeled with linear functions and with exponential functions.	
F.LE.1.b – Construct and Compare Linear, Quadratic, and Exponential Models Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	

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COURSE: Pre AP Algebra I

F.LE.1.c – Construct and Compare Linear, Quadratic, and Exponential Models

Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F.LE.2 – Construct Linear and Exponential Functions

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.3 – Observe and Interpret the Differences Between Linear and Exponential Models

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.5 – Interpret Parameters in Linear and Exponential Functions

Interpret the parameters in a linear or exponential function in terms of a context.

N.RN.2 - Extend the Properties of Exponents to Rational Exponents

Rewrite expressions involving radicals and rational exponents using properties of exponents.

Learning Objectives and Activities

SWBAT answer the following questions:

- Is a relationship exponential?
- How can you determine between exponential growth and decay?
- How can you apply exponential functions to solve problems?
- How do you use exponent properties involving products and quotients?
- How do you simplify expressions using zero and negative exponents?
- How do you simplify exponential expressions with multiple variables?
- How do you simplify a power to a power?
- What does an exponential function look like?
- How do you write and graph an exponential growth/decay function?

SWBAT demonstrate understanding of the following:

- Construct and apply exponential functions to solve problems given mathematical or applied context.
- To simplify algebraic expressions with exponents.
- Recognize and graph exponential functions with a table of values
- Real world situations involving exponential relationships can be solved using multiple representations

Learning Activities:

- Video tutor – bigideasmath.com
- TI 83 – explore exponential graphs
- Experiment – exponential growth or decay model (ie m&m activity)

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- Worksheets
- PowerPoint slides on teacher drive – “monomials rules review”
- Jeopardy – computer lab or projector.
- Students develop an exponential function to model the depreciating value of money over time and use it to make predictions/
- Students explore a method that geneticists commonly use to generate many copies of a gene for their laboratory experiments.
- Students will do an activity that applies their understanding of geometric sequences and exponential functions to answer questions about a novel context that involved a percent increase in the size of an image displayed on a screen, which can be modeled by an exponential function.

Assessments

Formative:

- Classwork and Homework
- Daily Practice Problems
- Teacher Observation
- Math Scavenger Hunt/Trail
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes
- Topic Tests

Alternative:

- Observation Assessment with Problem-solving
- Kahoot/Quizizz
- Individual or group productive struggle assessment during introductory lessons

Interdisciplinary Connections

Science:

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems.

Connection: Population growth is modeled using exponential functions.

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Connection: Exponential decay can be used to model resource depletion or radioactive contamination.





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COURSE: Pre AP Algebra I

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.2 – Collaborate with individuals inside a group to accomplish a task, recognizing individual contributions and responsibilities.

9.4.12.IML.2 – Evaluate various types of resources to solve problems related to work and life.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Students will use Desmos in order to discover new concepts involving graphing and functions.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

Career Education

9.4.12.CI.1 – Demonstrate the ability to reflect, analyze, and use creative skills and

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COURSE: Pre AP Algebra I

ideas.

9.4.12.CI.2 – Create solutions to problems using original and innovative ideas.

9.4.12.TL.1 – Assess digital tools based on features such as accessibility, capacity, and utility for accomplishing a specified task.

9.4.12.TL.4 – Collaborate in online learning communities or virtual worlds to analyze and propose solutions to real-world problems.

Time Frame	4 cycles ~ 12 (56 minute blocks)
Topic	
Polynomial Expressions and Factoring	
Alignment to Standards	
A.APR.1 – Perform Arithmetic Operations on Polynomials 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. A.APR.2 - Arithmetic with Polynomial Expressions Know and apply the Remainder Theorem and understand the relationship between factors and zeros. A.APR.3 – Identify Zeros of Polynomials Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial A.SSE.2 – Use Structure to Rewrite Expressions Use the structure of an expression to identify ways to rewrite it. A.SSE.3.a – Choose and Produce Equivalent Forms of Expressions Factor a quadratic expression to reveal the zeros of the function it defines. A.APR.C.4 (+)- Prove polynomial identities and use them to describe numerical relationships. A.APR.2 Know and apply the Remainder Theorem and understand the relationship between factors and zeros.	
Learning Objectives and Activities	
SWBAT answer the following questions:	

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- How do you factor using the greatest common factor?
- How do you add, subtract, and multiply polynomials?
- How do you use special product patterns to multiply binomials?
- How do you factor a difference of squares?
- How do you factor a perfect square trinomial?
- How do you factor a trinomial with a leading coefficient?
- How do you factor completely?

SWBAT demonstrate understanding of the following:

- Understanding the properties of real numbers can be used to multiply a monomial by a polynomial or simplify the product of binomials.
- Factoring is the opposite of the distributive property.
- What does it mean to find a factor of a number?
- Explain why a factored expression is useful-what can we do with it?

Learning Activities:

- Factoring Relay Game
- Find someone who factoring activity
- Algebra Tiles Activity
- Using Models to Factor
- Small group practice
- Communicators

Assessments

Formative:

- Classwork and Homework
- IXL Practice
- Teacher Observation
- Math Scavenger Hunt/Trail
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes
- Topic Tests
- Problem-based Quiz/Test on Maximization

Alternative:

- Observation Assessment with Problem-solving
- Individual or group productive struggle assessment during introductory lessons

Interdisciplinary Connections

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COURSE: Pre AP Algebra I

Career Readiness, Life Literacies, and Key Skills

- 9.4.12.CC.1** – Use collaborative digital tools to work together and share information.
- 9.4.12.CC.2** – Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas.
- 9.4.12.CC.3** – Collaborate in diverse teams to achieve a common goal and contribute to the collective work.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

Supplemental instruction and math games will be presented using IXL Math and Video Tutor bigideasmath.com.

- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Students will use graphing calculators to use math tools strategically and attend to precision.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

Career Education

- 9.4.12.CC.1** – Use digital tools to communicate and work collaboratively to support

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individual learning and contribute to the learning of others.

9.4.12.CC.2 – Demonstrate originality and inventiveness in work, and understand the real-world limits to adopting new ideas (includes logical reasoning and articulation).

Time Frame	9 cycles ~ 27 (56 minute blocks)
Topic	
Quadratic Equations and Functions	
Alignment to Standards	
A.APR.3 – Identify Zeros of Polynomials Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. A.CED.1 – Create Equations and Inequalities 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.2 – Create Equations That Describe Numbers or Relationships Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.REI.4.a – Solve Quadratic Equations Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. A.REI.4.b – Solve Quadratic Equations 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.10 – Understand Solving Equations as a Process of Reasoning Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. A.SSE.3.a – Choose and Produce Equivalent Forms of Expressions Standard: Factor a quadratic expression to reveal the zeros of the function it defines. A.SSE.3.b – Choose and Produce Equivalent Forms of Expressions	

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Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

F.IF.2 – Understand the Concept of a Function and Use Function Notation

Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.4 – Interpret Functions That Arise in Applications

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F.IF.7.a – Analyze Functions Using Different Representations

Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.IF.8.a – Write Functions in Equivalent Forms

Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

F.IF.9 – Analyze Functions Using Different Representations

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)

Learning Objectives and Activities

SWBAT answer the following questions:

- How does the value of “a” affect a quadratic?
- What is a maximum or minimum value?
- How do you find the vertex in standard, vertex, and intercept forms?
- How do you graph a quadratic function?
- How do you solve a quadratic using factoring?
- How do you solve a quadratic using graphing?
- How do you solve a quadratic using square roots?
- How do you solve a quadratic using the quadratic formula?
- What does the discriminant tell you about the solutions of a quadratic function?

SWBAT demonstrate understanding of the following:

- Students will be able to distinguish second degree equations (quadratic) from first degree (linear). Students will be able to compare and identify applications of linear, quadratic or exponential functions as models of real world situations.
- The quadratic formula is most appropriately used when factoring a quadratic equation is not possible.
- Distinguish between the different forms of a quadratic.
- Finding the zeros from a graph, equation, and/or table of values.

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Learning Activities:

- Students examine a staircase built from LEGO bricks and explore the resulting quadratic sequence.
- Students match the factored form of a quadratic with its graph.
- Students complete another matching activity, but now they must figure out the a-value to match the graphs correctly.
- Discovery of discriminant activity.
- Students apply their understanding of a quadratic function to a novel context. The students generate a function to model the parabolic path of a football, and construct a graph of the parabola to answer questions.
- Video tutor – bigideasmath.com
- TI 83 – compare transformations of parent function, compare linear, quadratic, exponential
- Internet project on powerpoint to determine applications of parabolas.
- Excel /TI 83 activity to find linear, quadratic, exponential regression trend line.
- Worksheets
- Communicators

Assessments

Formative:

- IXL Practice
- Teacher Observation
- Class Debate of Approaches/Mathematical Methods
- Graphic Organizer
- Math Scavenger Hunt/Trail
- Entrance/Exit Cards

Summative:

- Mid-unit Quizzes
- Topic Tests

Alternative:

- Observation Assessment with Problem-solving
- Kahoot/Quizizz
- Individual or group productive struggle assessment during introductory lessons

Interdisciplinary Connections

Science: **HS-PS2-4:** Analyze data to support the claim that gravitational interactions are attractive and vary with the square of the distance.





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COURSE: Pre AP Algebra I

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.2 – Explain the potential benefits and limitations of collaboration in problem-solving and innovative thinking.

9.4.12.IML.2 – Evaluate the degree to which information meets a need including considering the source, authority, accuracy, and purpose.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet based game sites such as Quizizz, Kahoot, and Quizlet live to reflect on their learning progress.

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

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- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Students will use Google Classroom to collaborate, work towards solving authentic problems, or participate in an online classroom discussion utilizing pre-learned etiquette about blended learning platforms.

- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Students will use graphing calculators to use math tools strategically and attend to precision and will use Desmos in order to discover new concepts involving graphing and functions.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping

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DEPARTMENT: Mathematics

COURSE: Pre AP Algebra I

9.4.12.CI.1 – Demonstrate creative thinking for problem-solving.
9.4.12.CT.2 – Analyze the value of collaboration and perseverance in solving complex problems.
9.4.12.TL.2 – Create a digital tool to collect or analyze data that supports productivity.

Time Frame	3 cycles ~ 9 (56 minute blocks)
Topic	
Analyze, Construct, and use: Exponential, Linear, Quadratic and Piecewise Functions	
Alignment to Standards	
A.CED.2 – Create Equations That Describe Numbers or Relationships Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.3 – Represent Constraints by Equations or Inequalities 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. F.IF.4 – Interpret Functions That Arise in Applications in Terms of the Context For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship. F.IF.5 – Relate the Domain of a Function to Its Graph Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F.IF.6 – Calculate and Interpret Average Rate of Change Calculate and interpret the average rate of change of a function over a specified interval. F.IF.7.a,b – Graph Functions Expressed Symbolically Graph linear and quadratic functions and show intercepts, maxima, and minima; graph exponential functions showing intercepts and end behavior. F.BF.1 – Build a Function That Models a Relationship Between Two Quantities Write a function that describes a relationship between two quantities. F.BF.3 – Identify the Effect of Transformations Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$.	
Learning Objectives and Activities	

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SWBAT answer the following questions:

- How do different function families behave and compare?
- How do graphs, tables, equations, and verbal descriptions represent the same relationship?
- How do you interpret average rate of change in context?
- How do you construct a function model from data or a scenario?
- How do piecewise functions model changing conditions?
- How do domain and range affect interpretation of a model?

SWBAT demonstrate understanding of the following:

- Linear functions have a constant rate of change and produce straight-line graphs.
- Exponential functions involve repeated multiplication and grow or decay at increasing rates.
- Quadratic functions create parabolic graphs with maximum or minimum values.
- Piecewise functions are defined by different rules over different intervals.
- Graphs, tables, verbal descriptions, and equations can represent the same relationship in different ways.
- Transformations change the position, direction, or shape of a graph while maintaining the function family characteristics.
- The context of a problem determines reasonable domain and range values.
- Functions can model and predict situations involving finance, science, population growth, motion, and business applications.

Learning Activities:

- Video Tutor – bigideasmath.com
- Function Family Sorting Activity
- Real-World Modeling Investigation
- Graphing Calculator Exploration
- Analyzing Data Tables and Scatterplots
- Collaborative Graph Matching Activity
- Piecewise Function Scenarios
- Comparing Multiple Representations Activity
- Small Group Practice
- Station Rotations
- Error Analysis Tasks
- Function Transformation Investigation
- Class Discussion and Justification Tasks

Assessments

Formative:

- Classwork and Homework

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- IXL Practice
- Teacher Observation
- Entrance/Exit Cards
- Think-Pair-Share Activities
- Desmos Exploration Checks
- Collaborative Whiteboard Responses

Summative:

- Mid-unit Quizzes
- Topic Tests
- Performance-Based Modeling Task
- Constructed Response Assessments

Alternative:

- Kahoot
- Quizizz
- Quizlet
- Blooket
- Desmos Activities

Interdisciplinary Connections

Science: HS-LS2-1: Students analyze exponential population growth and interpret graphical models related to ecosystems and environmental factors

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1

Demonstrate the ability to reflect, revise, and explain reasoning and decision-making when solving problems collaboratively.

9.4.8.CI.2

Collaborate with others to develop a solution using multiple perspectives. Aligns with discussion, group presentations, or project-based learning.

9.4.8.CI.3

Use collaborative technologies to explore diverse viewpoints and generate ideas for solutions. Group problem-solving, peer teaching, or inquiry-based tasks.

9.4.12.CI.2

Critically analyze ideas within and between groups to ensure productive collaboration. Encourages meaningful group work with clear roles and outcomes.

9.4.12.CT.1

Identify problem-solving strategies used in the development of an innovative product

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or practice.

9.4.12.CT.2

Explain the potential benefits of collaborating to enhance critical thinking and problem solving.

Technology Integration

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Students will access the Big Ideas online ebook to further investigate lesson concepts and demonstrate understanding of standards.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Students will use internet-based game sites such as Quizizz, Kahoot, Quizlet Live, and Desmos to reflect on their learning progress.

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. Supplemental instruction and math games will be presented using IXL Math, Desmos, and Video Tutor bigideasmath.com.

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task.

Students will use Google Classroom to collaborate, work toward solving authentic problems, or participate in online classroom discussions utilizing pre-learned etiquette about blended learning platforms.

9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

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9.4.12.CI.2 – Communicate ideas clearly and effectively, using verbal, nonverbal, and digital communication techniques.

9.4.12.CT.3 – Engage in discussions to clarify ideas, present opinions, and build on others' contributions.

9.4.12.IML.5 – Evaluate information and determine its impact on the intended audience and purpose

Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)

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ELL:

- [Curriculum Companion](#)
- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- [Curriculum Companion](#)
- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations

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- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns

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