Hoboken Public Schools

Pre-AP Algebra I Curriculum

Updated SY 25-26

Pre-AP Algebra I HOBOKEN PUBLIC SCHOOLS

Course Description
The Pre-AP Algebra 1 course reflects the **2023 New Jersey Student Learning Standards** at the high school level and is designed to give students the requisite skills for all future mathematics courses through situational problem solving. It is designed to deepen students' understanding of linear relationships by emphasizing patterns of change, multiple representations of functions and equations, modeling real world scenarios with functions, and methods for finding and representing solutions of equations and inequalities. Taken together, these ideas provide a powerful set of conceptual tools that students can use to make sense of their world through mathematics. The course focuses on the foundational algebraic knowledge and skills that matter most for college and career readiness. The Pre-AP Algebra 1 framework guides students to connect core ideas within and across the units of the course, promoting a coherent understanding of linear relationships.

While the Pre-AP Algebra 1 framework is organized into four core units of study, the content is grounded in four big ideas, which are cross-cutting concepts that build conceptual understanding and spiral throughout the course. Since these ideas cut across units, they serve as the underlying foundation for the enduring understandings, key concepts, and learning objectives that make up the focus of each unit. A deep and productive understanding of the concepts presented in Pre-AP Algebra 1 relies on these four big ideas:

- **Patterns of Change:** Families of functions are uniquely defined by their patterns of change. Linear functions have a constant rate of change, quadratic functions have a linear rate of change, and exponential functions have a constant multiplicative rate of change.
- **Representations:** Functions and equations can be represented graphically, numerically (in tables), algebraically (with symbols), or verbally (in words). Algebraic forms of functions and equations can be purposefully manipulated into equivalent forms to reveal certain aspects of the function/equation.
- **Modeling with Functions:** Functions can be used to model real-world phenomena. A function derived from a real-world context can be manipulated free of its context, but the solution must be translated back in order to interpret its meaning in context.
- **Solutions:** A solution to an equation or inequality is a value or set of values that makes the equation or inequality true. Solutions can be found by applying rules of algebra to symbolic expressions, examining a graph of the equation or inequality, or testing numerical values.

The Pre-AP Algebra 1 course resources are designed to expose students to a wide range of career opportunities that depend upon Algebra 1 knowledge and skills.

Pacing Guide

Unit Titles	Time Frame
Unit 1: Linear Functions and Linear Equations	September - November
Unit 2: Systems of Linear Equations and Inequalities	November - December
Unit 3: Quadratic Functions	January - March
Unit 4: Exponent Properties and Exponential Functions	March - April
Unit 5: PLTW App Creator	April - June

Climate Change standards are denoted with this symbol.

Course Resources and Materials

- Pre-AP Algebra I Teacher and Student Resources, College Board, 2021
- enVision Math 2024 (available in English & Spanish)
- Desmos Classroom
- NJ Student Learning Standards in Mathematics
- PLTW
- DeltaMath
- IXL
- LinkIt! Assessments
- National Library of Virtual Manipulatives
- Illustrative Mathematics - Teacher & Student Resources
- Khan Academy
- Math Planet
- NJSLA Mathematics Practice Tests
- NJDOE Digital Item Library

Unit 1 – Linear Functions and Linear Equations
Timeframe: September - November
Unit 1 Overview

Linear relationships are among the most prevalent and useful relationships in mathematics and the real world. Any equality in two variables that exhibits a constant rate of change for these variables is linear. Real-world contexts that have a constant rate of change and data sets with a nearly constant rate of change can be effectively modeled by a linear function. Students explore all aspects of linear relationships in this unit: contextual problems that involve constant rate of change, lines in the coordinate plane, arithmetic sequences, and algebraic means of expressing a linear relationship between two quantities. Through this unit, students develop deep skills with linear functions and equations and an appreciation for the simplicity and power of linear functions as building blocks of all higher mathematics.

Essential Questions

- What does the slope of a graph tell us about the data it models?
- How can you identify functions and their components when they are represented in a variety of forms, such as graphs, tables, and ordered pairs?
- How can linear functions be used to model situations and solve problems?

- How do you know if an ordered pair is a solution to a two-variable linear equation or inequality?

Essential Learning Outcomes

- Students will understand that a linear relationship has a constant rate of change, which can be visualized as the slope of the associated graph.
- Students will understand that there are many ways to algebraically represent a linear function and each form reveals different aspects of the function.
- Students will understand that linear functions can be used to model contextual scenarios that involve a constant rate of change or data whose general trend is linear.
- Students will understand that a solution to a two-variable linear equation or inequality is an ordered pair that makes the equation or inequality true.

Standards Addressed

- A.CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- A.CED.A.4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
- A.REI.A.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- A.REI.D.10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- A.REI.D.12 - Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
- A.SSE.A.1.a - Interpret parts of an expression, such as terms, factors, and coefficients.
- F.BF.A.1.a - Determine an explicit expression, a recursive process, or steps for calculation from a context.
- F.IF.A.1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
- F.IF.A.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- F.IF.A.3 - Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n + 1) = f(n) + f(n - 1)$ *for* $n \geq 1$.
- F.IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
- F.IF.B.5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number*

of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

- F.IF.B.6 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- F.IF.C.7.b - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- F.LE.A.1.b - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- F.LE.A.2 - Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- F.LE.B.5 - Interpret the parameters in a linear or exponential function in terms of a context.
- N.Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- S.ID.B.6.a - 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.6.b - Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
- S.ID.B.6.c - Fit a linear function for a scatter plot that suggests a linear association.
- S.ID.C.7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Standards for Mathematical Practice

- MP1. Make sense of problems and persevere in solving them.
- MP2. Reason abstractly and quantitatively.
- MP3. Construct viable arguments and critique the reasoning of others.
- MP4. Model with mathematics.
- MP5. Use appropriate tools strategically.
- MP6. Attend to precision.
- MP7. Look for and make use of structure.
- MP8. Look for and express regularity in repeated reasoning.

Integrated Accommodations and Modifications

- **Special Education Students**
    - Ongoing Interventions, strategic Interventions and Intensive Interventions that are teacher and/or technologically driven within the curriculum and targeted to standards in need of support.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest

- Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.

➢ **English Language Learners**
- Bilingual language glossary for mathematical literacy and vocabulary prior to and during each lesson.
- English Language Learner support embedded into each lesson for use during the instructional part of the lesson (rephrasing, models, photos,etc.)
- Targeted support strategies that focus on key areas of language development: listening, speaking, reading, and writing for students at different proficiency levels.
- Technology supported assignments aligned with standards in students native language.

➢ **Skills Fragile Students**
- Teacher led reteach to build understanding which encompass guided reteaching activities for teachers to utilize when students need a better understanding of lesson topics.
- Readiness assessment individualized study plan generated based on a students' score on the topic readiness assessment. Allows students to gain additional support in standards that should have been mastered in a previous grade.
- Adaptive practice and homework utilizing recommended resources
- Encourage students to make transformations - use a common task or item in a different way
- Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
- Extended time for revisions or opportunity to identify and develop areas of personal interest

➢ **504 Students**
- Video tutorials for each lesson with units for students to access as needed.
- Mathematical literacy and vocabulary activities that provide scaffolded support for students to build vocabulary
- Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
- Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
- Extended time for revisions or opportunity to identify and develop areas of personal interest

➢ **Gifted & Talented Students**
- Enrichment activities for teachers to utilize when learners are advanced within the given standard/topic.
- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- Modeling or independent student led research

Assessments (Diagnostic, Formative, Summative, Benchmark, Alternative)

➢ Course Readiness Assessments

- ➢ Topic Readiness Assessments
- ➢ Independent problems during lessons
- ➢ Learning Checkpoints
- ➢ Entrance & Exit Tickets
- ➢ Self-Assessments
- ➢ Topic Assessments
- ➢ Performance Tasks
- ➢ Benchmark Assessments
- ➢ Mid-Course Assessments
- ➢ End of Course Assessments
- ➢ NJSLA Released Items

Integration of Computer Science and Design Thinking

- ➢ 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- ➢ 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

Integration of Career Readiness, Life Literacies, and Key Skills

- ➢ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- ➢ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.
- ➢ 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

Integration of Financial Literacy Standards (NJSLS 9.1)

- **9.1.8.CP.1: Compare prices for the same goods or services.**
- **9.1.8.CP.2: Analyze how spending habits affect one's ability to save.**

Integration of Career Awareness Standards (NJSLS 9.2)

- 9.2.8.CAP.15: Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.

Integration of Civics (NJSLS - Social Studies)

- 6.3.8.CivicsPR.4: Use evidence and quantitative data to propose or defend a public policy related to climate change.

Integration of Diversity, Equity, and Inclusion (N.J.S.A. 18A:35-4.36a): (See Appendix A)

- Amistad / African- American History: Students examine the **Amistad case (1839)** and model data related to the trans-Atlantic slave trade, interpreting rates of change to understand historical and economic patterns tied to abolition efforts.

Interdisciplinary Connections

- ➢ *Social Studies / Civics:* Students use primary-source data and historical context to analyze how economic inequality and freedom movements can be quantified through linear relationships.

- ➢ *NJSLS ELA Companion Standards*

    - NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
    - NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
    - NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
    - NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
    - NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- *NJSLS Science*
    - HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit 2 - Systems of Linear Equations and Inequalities
Timeframe: November - December
Unit 2 Overview

Across Unit 2, students are asked to solve systems of equations in support of two goals: to determine the solution to the system of equations and to become strategic and efficient in choosing a method to solve the system. Students use systems of linear equations and systems of linear inequalities to model physical phenomena, especially those with multiple constraints where an optimal solution to an objective function is desired. Through these contexts students build upon their prior knowledge of solving systems of equations and develop more sophisticated understandings about what the solution(s) to a system means in the context of the problem.

Essential Questions

- What does the solution to a system of linear equations represent?
- What do the solutions to a system of linear inequalities represent?
- How many solutions can systems have?
- What strategies might I use to find the solution or solutions to a system of linear equations or inequalities?
- How do I determine if an ordered pair is a solution or not to a system of linear equations or inequalities?
- How do you use systems of linear equations and inequalities to model situations and solve problems?

Essential Learning Outcomes

- Students will understand that a solution to a system of linear equations or inequalities is an ordered pair of numbers that satisfies all the equations or inequalities simultaneously.
- Students will understand that solving a system of linear equations or inequalities is a process of determining the value or values that make the equation or inequality true.

- Students will understand that systems of linear equations or inequalities can be used to model scenarios that include multiple constraints, such as resource limitations, goals, comparisons, and tolerances.

Standards Addressed

- A.CED.A.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.CED.A.3 - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
- A.REI.C.5 - Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- A.REI.C.6 - Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A.REI.D.11 - Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- A.REI.D.12 - Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
- N.Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Standards for Mathematical Practice

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Integrated Accommodations and Modifications

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    - Ongoing Interventions, strategic Interventions and Intensive Interventions that are teacher and/or technologically driven within the curriculum and targeted to standards in need of support.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient,

cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.

- **English Language Learners**
  - Bilingual language glossary for mathematical literacy and vocabulary prior to and during each lesson.
  - English Language Learner support embedded into each lesson for use during the instructional part of the lesson (rephrasing, models, photos,etc.)
  - Targeted support strategies that focus on key areas of language development: listening, speaking, reading, and writing for students at different proficiency levels.
  - Technology supported assignments aligned with standards in students native language.
- **Skills Fragile Students**
  - Teacher led reteach to build understanding which encompass guided reteaching activities for teachers to utilize when students need a better understanding of lesson topics.
  - Readiness assessment individualized study plan generated based on a students' score on the topic readiness assessment. Allows students to gain additional support in standards that should have been mastered in a previous grade.
  - Adaptive practice and homework utilizing recommended resources
  - Encourage students to make transformations - use a common task or item in a different way
  - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
  - Extended time for revisions or opportunity to identify and develop areas of personal interest
- **504 Students**
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  - Mathematical literacy and vocabulary activities that provide scaffolded support for students to build vocabulary
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- **Gifted & Talented Students**
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  - Encourage students to explore concepts in depth and encourage independent studies or investigations.
  - Modeling or independent student led research

Assessments (Diagnostic, Formative, Summative, Benchmark, Alternative)

- Course Readiness Assessments
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- Independent problems during lessons

- ➢ Learning Checkpoints
- ➢ Entrance & Exit Tickets
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Integration of Computer Science and Design Thinking

- ➢ 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
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Integration of Career Readiness, Life Literacies, and Key Skills

- ➢ 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- ➢ 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.
- ➢ 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

Integration of Financial Literacy Standards (NJSLS 9.1)

- 9.1.8.FP.3: Explain how self-regulation is important to managing money (e.g., delayed gratification, impulse buying, peer pressure, etc.).
- 9.1.8.FP.6: Compare and contrast advertising messages to understand what they are trying to accomplish.

Integration of Career Awareness Standards (NJSLS 9.2)

- 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.

Integration of Civics (NJSLS - Social Studies)

- 6.3.8.CivicsPR.4: Use evidence and quantitative data to propose or defend a public policy related to climate change.

Integration of Diversity, Equity, and Inclusion (N.J.S.A. 18A:35-4.36a): (See Appendix A)

- Persons with Disabilities: Students apply systems of equations to model cost constraints when designing an accessible community space (e.g., ramp slope vs. stair construction). They find optimal solutions that balance cost, safety, and inclusion.

Interdisciplinary Connections

- ➢ *Engineering / Civic Planning:* Students connect mathematical modeling to Universal Design principles and ADA compliance, exploring STEM applications for social equity.
- ➢ *NJSLS ELA Companion Standards*

- NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
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- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

➢ *NJSLS Science*
- HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
- HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Unit 3 – Quadratic Functions
Timeframe: January - March
Unit 3 Overview

In this unit, students develop a strong foundation in the important concept of quadratic functions. Students should understand that quadratic functions have a linear rate of change and are often formed by multiplying two linear expressions, and therefore are not linear. Quadratic functions are useful for modeling phenomena that have a linear rate of change and symmetry around a unique minimum or maximum. This foundational understanding of quadratics helps students build their conceptual knowledge of nonlinear functions and prepares them for further study of polynomial and rational functions in Algebra 2.

Essential Questions

➢ How can a quadratic function be built from a linear function?
➢ How can we use tables, graphs, and equations to help us understand how quadratic and exponential functions grow?
➢ How can we rewrite quadratic functions as a product of linear factors?
➢ How can we use sketches and equations of quadratic functions to model situations and make predictions?
➢ What do the solutions of a quadratic function represent?
➢ How can I determine if the solutions to a quadratic equation will be real or complex?
➢ How can I derive the Quadratic Formula and use it to solve quadratic equations?

Essential Learning Outcomes

➢ Students will understand that quadratic functions have a linear rate of change.

- Students will understand that quadratic functions can be expressed as a product of linear factors.
- Students will understand that quadratic functions can be used to model scenarios that involve a linear rate of change and symmetry around a unique minimum or maximum.
- Students will understand that every quadratic equation, $ax^2 + bx + c = 0$, where a is not zero, has at most two real solutions. These solutions can be determined using the quadratic formula.

Standards Addressed

- A.CED.A.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A.APR.A.1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- A.REI.B.4.a - 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.B.4.b - Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
- A.SSE.A.2 - Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.*
- A.SSE.B.3.a - Factor a quadratic expression to reveal the zeros of the function it defines.
- A.SSE.B.3.b - Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- F.IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
- F.IF.C.7.a - Graph linear and quadratic functions and show intercepts, maxima, and minima.
- F.IF.C.8.a - Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

Standards for Mathematical Practice

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        - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
        - Extended time for revisions or opportunity to identify and develop areas of personal interest
- **Gifted & Talented Students**
    - Enrichment activities for teachers to utilize when learners are advanced within the given standard/topic.
    - Encourage students to explore concepts in depth and encourage independent studies or investigations.
    - Modeling or independent student led research

Assessments (Diagnostic, Formative, Summative, Benchmark, Alternative)

- Course Readiness Assessments
- Topic Readiness Assessments
- Independent problems during lessons
- Learning Checkpoints
- Entrance & Exit Tickets
- Self-Assessments
- Topic Assessments
- Performance Tasks
- Benchmark Assessments
- Mid-Course Assessments
- End of Course Assessments
- NJSLA Released Items

Integration of Computer Science and Design Thinking

- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

Integration of Career Readiness, Life Literacies, and Key Skills

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

Integration of Financial Literacy Standards (NJSLS 9.1)

- 9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.
- 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.

Integration of Career Awareness Standards (NJSLS 9.2)

- 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

Integration of Diversity, Equity, and Inclusion (N.J.S.A. 18A:35-4.36a): (See Appendix A)

- Holocaust: Students analyze parabolic data representing population decline and post-war recovery (1940-1960). They reflect on prejudice and discrimination through a "Universe of Obligation" graphic and complete a Graffiti Board reflection from Facing History's Teaching Holocaust and Human Behavior.

Interdisciplinary Connections

- ➢ *ELA / Social Studies:* Students connect quantitative data to historical texts and reflective writing on identity, choices, and bias. (Aligned to NJ Holocaust Curriculum Unit 1: *Prejudice and Discrimination*.)
- ➢ *NJSLS ELA Companion Standards*
  - NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
  - NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
  - NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
  - NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
  - NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- ➢ *NJSLS Science*
  - HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit 4 – Exponent Properties and Exponential Functions
Timeframe: March - April
Unit 4 Overview

Students explore exponent rules as an extension of geometric sequences and the properties of multiplication and division for real numbers. Students should make sense of exponent rules and not simply memorize them without understanding how they arise. The unit culminates in students investigating how exponential functions can model physical phenomena that exhibit a constant multiplicative growth. Exponential functions are framed as multiplicative analogues of linear functions. Thus, a tight connection should be drawn between these two classes of functions and their shared properties.

Essential Questions

- ➢ How can I apply the properties of multiplication and division to solve problems involving exponents?
- ➢ How does the growth rate of an exponential function differ from that of a linear function?
- ➢ How do you use exponential functions to model situations and solve problems involving growth or decay?
- ➢ How do graphs and tables help us estimate the solution to an equation that involves exponential expressions?

Essential Learning Outcomes

- Students will understand that properties of exponents are derived from the properties of multiplication and division.
- Students will understand that an exponential function has constant multiplicative growth or decay.
- Students will understand that exponential functions can be used to model contextual scenarios that involve constant multiplicative growth or decay.
- Students will understand that graphs and tables can be used to estimate the solution to an equation that involves exponential expressions.

Standards Addressed

- A.SSE.A.1.b - Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)n as the product of P and a factor not depending on P.*
- A.SSE.B.3.c - Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
- F.BF.A.1.a - Determine an explicit expression, a recursive process, or steps for calculation from a context.
- F.IF.A.2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- F.IF.A.3 - Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n + 1) = f(n) + f(n - 1)$ *for* $n \geq 1$.
- F.IF.B.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
- F.IF.B.5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*
- F.IF.B.6 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- F.IF.C.7.e - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
- F.LE.A.1.a - Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- F.LE.A.1.b - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- F.LE.A.1.c - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another
- F.LE.A.2 - Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- F.LE.B.5 - Interpret the parameters in a linear or exponential function in terms of a context.

- N.Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.RN.A.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- N.RN.A.3 - Simplify radicals, including algebraic radicals (e.g. , simplify).

Standards for Mathematical Practice

- MP1. Make sense of problems and persevere in solving them.
- MP2. Reason abstractly and quantitatively.
- MP3. Construct viable arguments and critique the reasoning of others.
- MP4. Model with mathematics.
- MP5. Use appropriate tools strategically.
- MP6. Attend to precision.
- MP7. Look for and make use of structure.
- MP8. Look for and express regularity in repeated reasoning.

Integrated Accommodations and Modifications

- **Special Education Students**
  - Ongoing Interventions, strategic Interventions and Intensive Interventions that are teacher and/or technologically driven within the curriculum and targeted to standards in need of support.
  - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
  - Extended time for revisions or opportunity to identify and develop areas of personal interest
  - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
  - Bilingual language glossary for mathematical literacy and vocabulary prior to and during each lesson.
  - English Language Learner support embedded into each lesson for use during the instructional part of the lesson (rephrasing, models, photos,etc.)
  - Targeted support strategies that focus on key areas of language development: listening, speaking, reading, and writing for students at different proficiency levels.
  - Technology supported assignments aligned with standards in students native language.
- **Skills Fragile Students**
  - Teacher led reteach to build understanding which encompass guided reteaching activities for teachers to utilize when students need a better understanding of lesson topics.
  - Readiness assessment individualized study plan generated based on a students' score on the topic readiness assessment. Allows students to gain

additional support in standards that should have been mastered in a previous grade.
    - Adaptive practice and homework utilizing recommended resources
    - Encourage students to make transformations - use a common task or item in a different way
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest
- **504 Students**
    - Video tutorials for each lesson with units for students to access as needed.
    - Mathematical literacy and vocabulary activities that provide scaffolded support for students to build vocabulary
    - Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest
- **Gifted & Talented Students**
    - Enrichment activities for teachers to utilize when learners are advanced within the given standard/topic.
    - Encourage students to explore concepts in depth and encourage independent studies or investigations.
    - Modeling or independent student led research

Assessments (Diagnostic, Formative, Summative, Benchmark, Alternative)

- Course Readiness Assessments
- Topic Readiness Assessments
- Independent problems during lessons
- Learning Checkpoints
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- Self-Assessments
- Topic Assessments
- Performance Tasks
- Benchmark Assessments
- Mid-Course Assessments
- End of Course Assessments
- NJSLA Released Items

Integration of Computer Science and Design Thinking

- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

Integration of Career Readiness, Life Literacies, and Key Skills

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

- ➢ 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

Integration of Financial Literacy Standards (NJSLS 9.1)

- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

Integration of Career Awareness Standards (NJSLS 9.2)

- 9.2.8.CAP.10: Evaluate how careers have evolved regionally, nationally, and globally.

Integration of Diversity, Equity, and Inclusion (N.J.S.A. 18A:35-4.36a): (See Appendix A)

- AAPI: Students explore the exponential rise of global internet connectivity through the contributions of **AAPI innovators**, such as **Ajay Bhatt** (co-inventor of the USB) and **Jerry Yang** (co-founder of Yahoo!). They model how exponential growth in digital communication technologies connects cultures and economies worldwide.

Interdisciplinary Connections

- ➢ *Computer Science / Global Studies / Technology History:* Students connect exponential functions in mathematics to real technological and societal change driven by AAPI innovators, linking mathematical reasoning to cultural and historical context.
- ➢ *NJSLS ELA Companion Standards*
  - NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
  - NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
  - NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
  - NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
  - NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- ➢ *NJSLS Science Standards*
  - HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
  - HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
  - HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Unit 5 - PLTW App Creator
Timeframe: May - June
Unit 5 Overview

This unit exposes students to computer science as a means of computationally analyzing and developing solutions to authentic problems through mobile app development, and conveys the positive impact of the application of computer science to other disciplines and to society.

Resources

- www.pltw.org

Essential Questions

- In what ways does technology affect people's lives?
- How do computer scientists design and develop mobile apps that meet desired needs?
- What does effective teamwork look like?
- What do programming best practices look like?
- How do diverse perspectives of team members impact a solution?
- How do you express yourself and your creativity through computer science?
- How has computing affected the world we live in?
- How do computers represent the data in words, numbers, pictures, and sound?
- How is a complex piece of software organized?
- How do teams plan and create complex solutions to a problem?
- How do I safely use the Internet?
- How do you decide and consider potential trade-offs?
- How do people collaborate to create software applications?
- How does information cross networks?
- How is data processed in a computing system?
- Why is analyzing a computational model important?
- How can we protect our digital data?

Essential Learning Outcomes

- Students will collaborate when programming.
- Students will manipulate numeric data from input, for analysis, and for output.
- Students will implement and analyze algorithms using simple conditional logic.
- Students will implement and analyze algorithms using nested conditional logic.
- Students will reduce the value of a variable resulting from execution of particular code.
- Students will identify and use helpful resources when programming.
- Students will use the tools of a language and development environment to create original programming solutions.
- Students will construct a user interface.
- Students will design a program by breaking a large plan into smaller modules.
- Students will generalize a solution to an algorithmic problem.
- Students will create and modify audio and image data.
- Students will write and test modular code to incrementally create a program.
- Students will encapsulate a set of related statements in a function or procedure.
- Students will convert a given quantity among bases 2, 10, and 16.

Integrated Accommodations and Modifications

- **Special Education Students**
  - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge of mathematical concepts.
  - Provide extended time for revisions or opportunity to identify and develop areas of personal interest.
  - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
  - Invite students to explore different points of view on a particular mathematical standard and compare.
  - Provided translated materials and audio versions of text when applicable.
- **Skills Fragile Students**
  - Encourage students to make transformations - use a common task or item in a different way
  - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge of mathematical concepts.
  - Provide extended time for revisions or opportunity to identify and develop areas of personal interest.
- **504 Students**
  - Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
  - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge of mathematical concepts.
  - Provide extended time for revisions or opportunity to identify and develop areas of personal interest
- **Gifted & Talented Students**
  - Encourage students to explore concepts in depth and encourage independent studies or investigations.
  - Modeling or independent student led research

Assessments (Formative, Summative, Benchmark, Alternative)

- Formal Assessments by Way of Tests and Quizzes
- Multimedia Presentation
- Accountable Talk
- Vocabulary Quizzes
- Topic Quizzes
- Class Participation
- Class or small group discussions
- Topic blogging
- Journaling

NJSLS Standard 8.1 Computer Science

- 8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
- 8.1.8.CS.2: Design a system that combines hardware and software components to process data.
- 8.1.8.CS.3: Justify design decisions and explain potential system trade-offs.
- 8.1.8.CS.4: Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.
- 8.1.8.NI.1: Model how information is broken down into smaller pieces, transmitted as addressed packets through multiple devices over networks and the Internet, and reassembled at the destination.
- 8.1.8.NI.2: Model the role of protocols in transmitting data across networks and the Internet and how they enable secure and errorless communication.
- 8.1.8.NI.3: Explain how network security depends on a combination of hardware, software, and practices that control access to data and systems.
- 8.1.8.NI.4: Explain how new security measures have been created in response to key malware events.
- 8.1.8.IC.1: Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options.
- 8.1.8.IC.2: Describe issues of bias and accessibility in the design of existing technologies.
- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
- 8.1.8.DA.2: Explain the difference between how the computer stores data as bits and how the data is displayed.
- 8.1.8.DA.3: Identify the appropriate tool to access data based on its file format.
- 8.1.8.DA.4: Transform data to remove errors and improve the accuracy of the data for analysis
- 8.1.8.DA.5: Test, analyze, and refine computational models.
- 8.1.8.DA.6: Analyze climate change computational models and propose refinements.
- 8.1.8.AP.1: Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.
- 8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.
- 8.1.8.AP.3: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.
- 8.1.8.AP.4: Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.
- 8.1.8.AP.5: Create procedures with parameters to organize code and make it easier to reuse.
- 8.1.8.AP.6: Refine a solution that meets users' needs by incorporating feedback from team members and users.

- 8.1.8.AP.7: Design programs, incorporating existing code, media, and libraries, and give attribution.
- 8.1.8.AP.8: Systematically test and refine programs using a range of test cases and users
- 8.1.8.AP.9: Document programs in order to make them easier to follow, test, and debug.

NJSLS Standard 8.2 Design Thinking

- 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
- 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team.
- 8.2.8.ED.5: Explain the need for optimization in a design process.
- 8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues.
- 8.2.8.ITH.2: Compare how technologies have influenced society over time.
- 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies.
- 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

Integration of NJSLS Standard 9 Career Readiness, Life Literacies & Key Skills

- 9.4.8.CI.2: Repurpose an existing resource in an innovative way
- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas
- 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.
- 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective
- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
- 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
- 9.4.8.DC.3: Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure.
- 9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.
- 9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure.
- 9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation
- 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.

- 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
- 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 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
- 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
- 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data
- 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.
- 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event.
- 9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.
- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem

Integration of Financial Literacy Standards (NJSLS 9.1)

- 9.1.8.CR.2: Compare various ways to give back through strengths, passions, goals, and other personal factors

Integration of Career Awareness Standards (NJSLS 9.2)

- 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement

Integration of Civics (NJSLS - Social Studies)

- 6.3.8.CivicsPR.4: Use evidence and quantitative data to propose or defend a public policy related to climate change.

Integration of Diversity, Equity, and Inclusion (N.J.S.A. 18A:35-4.36a): (See Appendix A)

- LGBTQ+: Students explore the impact of diverse voices in technology and design apps that promote equity or mental-health support for LGBTQ+ youth. They analyze data on representation in STEM and reflect on how inclusive innovation drives progress.

Interdisciplinary Connections

- *Computer Science / Health / Sociology:* Students apply coding and data skills to design solutions that encourage belonging and awareness of diversity in digital spaces.
- *NJSLS Science Standards*

- NGSS.P1 - Science and Engineering Practices Asking questions (for science) and defining problems (for engineering)
- NGSS.P2 - Science and Engineering Practices Developing and using models
- NGSS.P4 - Science and Engineering Practices Analyzing and interpreting data
- NGSS.P5 - Science and Engineering Practices Using mathematics and computational thinking NGSS.P6 - Science and Engineering Practices Constructing explanations (for science) and designing solutions (for engineering)
- NGSS.P8 - Science and Engineering Practices Obtaining, evaluating, and communicating information
- NGSS.MS-ETS1-1 - Engineering Design Define 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.
- NGSS.MS-ETS1-3 - Engineering Design Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

➢ *NJSLS ELA Companion Standards*

- NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- NJSLSA.R4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
- RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
- NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.6-8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

DEI Integration Chart

Unit	Description	Example
1	Amistad / African- American History	Students examine the **Amistad case (1839)** and model data related to the trans-Atlantic slave trade, interpreting rates of change to understand historical and economic patterns tied to abolition efforts.
2	Persons with Disabilities	Students apply systems of equations to model cost constraints when designing an accessible community space (e.g., ramp slope vs. stair construction). They find optimal solutions that balance cost, safety, and inclusion.

3	Holocaust Education	Students analyze parabolic data representing population decline and post-war recovery (1940-1960). They reflect on prejudice and discrimination through a “Universe of Obligation” graphic and complete a Graffiti Board reflection from Facing History’s Teaching Holocaust and Human Behavior.
4	AAPI (Asian American and Pacific Islander Heritage)	Students explore the exponential rise of global internet connectivity through the contributions of AAPI innovators, such as Ajay Bhatt (co-inventor of the USB) and Jerry Yang (co-founder of Yahoo!). They model how exponential growth in digital communication technologies connects cultures and economies worldwide.
5	LGBTQ+	Students explore the impact of diverse voices in technology and design apps that promote equity or mental-health support for LGBTQ+ youth. They analyze data on representation in STEM and reflect on how inclusive innovation drives progress.