BUTLER SCHOOL DISTRICT

Math for 21st Century Careers Curriculum

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Adapted from:
New Jersey Student Learning Standards for Mathematics
New Jersey Student Learning Standards: 21st Century Life and Careers

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VISION

The Butler School District's Mathematics Department's objective is to prepare students to think critically, innovate, communicate, and collaborate in an ever-changing world. The Mathematics curriculum provides students with quality, rigorous instruction to help them become better **problem solvers, troubleshooters, and analytical thinkers.** The rich, educational experience provided within the Butler School District will produce young adults with the foundation and expertise they need for the future. It is the goal to challenge each student to develop and extend mathematical proficiency through highest quality mathematics teaching and standard-based assessments that meet the learning needs of each student. Butler Mathematics students will become individuals who persevere in their pursuit of lifelong learning through a culture that appreciates the beauty and usefulness of math.

As a result of a Butler Mathematics education, students will be able to…

- Synthesize mathematical skills across disciplines
- Develop into confident mathematicians
- Learn at their own pace and advance their understanding in a variety of ways
- Collaborate with others and contribute productively and articulately
- Act responsibly and be accountable for actions, in person and online
- Effectively approach, analyze, plan, and apply appropriate strategies for problem solving in ambitious contexts with accommodations for those who need it.
- Persevere through difficult situations and tasks and maintain a growth mindset despite adversity.
- Draw on knowledge from a wide variety of mathematical topics with flexibility to approach the same problem from different mathematical perspectives or represent the mathematics in different ways.
- Evaluate situations, draw logical conclusions, and develop, describe and apply solutions.
- Construct and support arguments.
- Evaluate their own reasoning and critique the reasoning of others.
- Assess the reasonableness of a solution with respect to the given construct or problem context.
- Use effective communication to engage in peer collaboration, reflecting on whether or not a solution is viable.
- Create appropriate representations of mathematical situations across a variety of mediums. These models will support the student's ability to demonstrate and explain their mathematical understanding.
- Use mathematical tools to explore and deepen their understanding of mathematical concepts.
- Make effective choices regarding the use of any available tools.
- Make appropriate use of technology as a tool that is constantly changing and evolving.
- Attend to precision in their mathematical calculations and in their communication.
- Calculate accurately and efficiently and express numerical answers with a degree of precision that is appropriate to the given context.
- Develop precision in their use of mathematical language.
- Look closely to determine patterns and structures within mathematics.
- Make meaningful connections between their knowledge from previous experiences and the content they are currently exploring.
- Develop deep understandings of mathematical concepts such that these understandings become applicable building blocks for future learning.
- Use their mathematical understandings to make generalizations that apply to various mathematical circumstances.
- Identify patterns in mathematics that can be used to solve problems that are challenging relative to their learning comfort zone.
- Use generalizations to increase the efficiency and manageability of their work.
- Demonstrate growth mindset and grit in effectively approaching ever-rigorous problem solving.
- Apply appropriate strategies with differentiated levels of support.
- Be confident in participating in higher level discussions that will assess and advance the understanding of concepts.
- Learn mathematics through exploring and solving contextual and mathematical problems

COURSE OVERVIEW

The Butler School District's "Math for 21st Century Careers" course is comprised as an intensive course designed to augment students' skills in mathematics necessary for college and career readiness;

COMPONENTS OF THE COURSE

This course will Integrate the the State Standards for Math with the 21st Century Life and Careers Standards into a skill-enhancing program of intensive mathematical investigation, problem solving, decision making, and presentation through student collaboration; Build upon topics both provided by the teacher and generated by students; Use and reinforce content and data from a spectrum of real-world data sources (e.g., natural resource, environmental, weather, agricultural, energy-use and production, economic, labor, population and demographic, scientific, media, sports, entertainment, and health data); Use presentation and other communication technologies to develop, refine, and share solutions, ideas, and problems; Require research using technology, interviews, and traditional print resources; Require high-interest, high-level problem solving, decision making, analysis, and critical thinking, and evaluation in content and applied contexts; and enhance students desire to use mathematics.

GOALS

New Jersey Student Learning Standards
New Jersey Department of Education Instructional Units for Mathematics

ASSESSMENT

Student learning will be assessed through a variety of formative, summative, benchmark, and alternative assessments.

SCOPE AND SEQUENCE
(*Pacing Guide*)

Unit of Study	Estimated time
Unit 1: Algebra I and Functions	11 weeks
Unit 2: Geometry and Trigonometry	11 weeks
Unit 3: Algebra II and Data Science	9 weeks
Unit 4: Placement testing and 21st Century Project	9 weeks

AFFIRMATIVE ACTION COMPLIANCE STATEMENT

The Butler Public Schools are committed to the achievement of increased cultural awareness, respect, and equity amongst our students, teachers, and community. We are pleased to present all pupils with information pertaining to possible career, professional, or vocational opportunities which in no way restricts or limits options on the basis of race, color, creed, religion, sex, ancestry, national origin, or socioeconomic status.

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Students with IEPs, 504s, and/or Students at Risk of Failure Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided through conferences and small groups. The teacher utilizes visual and multi-sensory methods of instruction in addition to assistive technology when needed. Students are provided with graphic organizers and other scaffolded material. Modification of content and product may be deemed necessary based on student needs. Students are provided with testing accommodations and authentic assessments.

Gifted & Talented Students Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided to the student through conferences and small groups. Students are engaged through inquiry-based instruction to develop higher-order thinking skills. Activities are developed based on student interests and student goals. Students engage in real-world projects and scenarios.

English Language Learners Students read authentic texts and write authentic pieces at their independent and instructional reading levels. Individualized feedback is provided to students through conferences and small groups. Students are pre-taught vocabulary terms and concepts. Teachers engage students through visual learning, including the use of graphic organizers. Teachers use cognates to increase comprehension. The teacher models tasks and concepts, and pairs students learning English with students who have more advanced English language skills. Scaffolding is provided including word walls, sentence frames, think-pair-share, cooperative learning groups, and teacher think-alouds.

21ST CENTURY THEMES & SKILLS

Embedded in many of our units of study and problem based learning projects are the 21st Century Themes as prescribed by the New Jersey Department of Education. These themes are as follows:

- Global Awareness
- Financial, Economic, Business, and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

CURRICULUM ADDENDA FOR SPECIAL EDUCATION

This curriculum can be both grade and age appropriate for special education students and serves as a guide for the special education teacher in line with the district's written philosophy of special education, as stated within Policy #6700 concerning Programs for Educationally Disabled Students. Based on the Child Study Team evaluation and consultation with the parent and classroom teacher, an individualized education plan may include modifications to content, instructional procedures, student expectations, and targeted achievement outcomes of this curriculum document in accordance with the identified needs of an eligible student. This educational plan will then become a supplement guide that the classroom teacher, parent, and Child Study Team will use to measure the individual student's performance and achievement.

CURRICULUM ADDENDA FOR ENGLISH LANGUAGE LEARNERS

This curriculum guide is appropriate and is implemented for all students according to age and grade, and is in line with the district's written philosophy of English language acquisition concerning Bilingual Instruction and English as a Second Language Programs. In accordance with the New Jersey Administrative Code 6A:15, the contents herein provide equitable instructional opportunities for English Language Learners to meet the New Jersey Student Learning Standards and to participate in all academic and non-academic courses. Students enrolled in a Bilingual and/or an ESL program may, in consultation with the classroom teacher and Bilingual and/or ESL teacher, receive modification to content,

instructional procedures, student expectations and targeted achievement outcomes of this curriculum document in accordance with the students developmental and linguistic needs.

DIVERSITY AND INCLUSION

In alignment with the 2020 NJSLS, the Mathematics Curriculum materials will:

Cultivate respect towards minority groups to foster appreciation of their differences as well as their contributions to the advancement of mathematics

Analyze and appreciate the diverse contributions made in the past (scientifically, economically, politically, and socially) at both the state and federal level as exemplified through mathematics

Examine grade-level texts and resources that simultaneously highlight mathematics as well as the contributions made to it by those of different genders, ethnicities, and abilities.

Employ mathematics as a means of communication — whether in regard to empathy, inclusivity, or advocacy — in an effort to creatively inspire solutions for those with specific needs.

Engage in authentic learning experiences that motivate the acquisition and application of varied perspectives in mathematics

Facilitate the ability to communicate effectively through mathematics while applying content knowledge, interdisciplinary connections, and thinking skills to do so.

Foster active student participation in an inclusive culture that honors mathematicians of all genders, ethnicities, and abilities.

Analyze and develop an understanding of how scientific, economic, political, social, and cultural aspects of society influence new technological and mathematical processes.

Reflect on both personal and non-personal experiences aimed to promote empathy and inclusivity for all regardless of our differences.

UNIT 1 ALGEBRA 1 AND FUNCTIONS
UNIT SUMMARY
In this unit, students will review: Seeing Structure and Expressions Creating Equations Reasoning with Equations and Inequalities Interpreting Functions Interpreting Linear Models Linear and Exponential Models
NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS 2023
A.SSE.A1 Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. 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** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
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 to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

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. *(Limited to linear, quadratic, and exponential equations with integer exponents).*

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. *(Limited to quadratic equations.)*

A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.B.4 Solve quadratic equations in one variable.

a. 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.
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. *(Writing solutions for quadratic equations that have roots with nonzero imaginary parts is not required).*

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. *(Limited to 2x2 systems and have real-world context)*

A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A.REI.D.11 Explain why the *x*-coordinates of the points where the graphs of the equations *y* =*f*(*x*) and *y* = *g*(*x*) intersect are the solutions of the equation *f*(*x*) = *g*(*x*); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f*(*x*) and/or *g*(*x*) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* *(Limited to linear, 2nd degree polynomial (ie quadratic) and absolute value functions. Finding solutions approximately is limited to cases where f(x) and g(x) are 2nd degree polynomial functions).*

A.REI.D.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

F.IF.A.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.

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. (Limited to linear functions, quadratic functions, and exponential functions with domains in the integers. Tasks should have a real-world context.)*

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. *(Limited to linear, quadratic functions, and exponential functions with domains in the integers. Tasks have a real-world context.)* ★

F.IF.C.7b . Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. *(Limited to piecewise-defined functions, including step functions and absolute value functions).*

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.

F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. (Limited to linear functions, quadratic functions, and exponential functions with domains in the integers).*

F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x)+k , kf(x) , f(kx) , and f(x+k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them. (Identifying the effect on the graph of replacing f(x) by f(x)+k, kf(x), f(kx), and f(x+k) for specific values of k (both positive and negative) is limited to linear and quadratic functions; experimenting with cases and illustrating an explanation of effects on the graph using technology is limited to linear functions, quadratic functions, and exponential functions with domains in the integers. Tasks do not involve recognizing even and odd functions.)*

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). *(Limited to constructing linear functions, including arithmetic sequences, and exponential functions. Exponential functions are limited to those with domains in the integers. Tasks do not use subscript notation).*

S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit

S.ID.C.9 Distinguish between correlation and causation.

INTERDISCIPLINARY CONNECTIONS

New Jersey Student Learning Standards- Science
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-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
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.

New Jersey Student Learning Standards-Language Arts (2023):

L.VL.11–12.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.MF.11–12.6. Synthesize complex information across multiple sources and formats to develop ideas, resolve conflicting information, or develop an interpretation that goes beyond explicit text information (e.g., express a personal point of view, new interpretation of the concept).

W.WR.11–12.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

SL.PE.11–12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.II.11–12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

SL.PI.11–12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

SL.UM.11–12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes
9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content
9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others
9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

2020 New Jersey Student Learning Standards – 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.
8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy	**9.2: Career Awareness, Exploration & Preparation, and Training**	**9.3: Career and Technical Education**
A. Financial Institutions B. Financial Psychology C. Planning and Budgeting D. Risk Management and Insurance E. Civic Financial Responsibility F. Credit Profile G. Economic and Government Influences H. Credit and Debt Management	A. Career Awareness (K-2) B. Career Awareness and Planning (3-5) C. Career Awareness and Planning (6-8) D. Career Awareness and Planning (9-12) **9.4 Life Literacies and Key**	A. Agriculture B. Architecture C. Arts,A/V, Technology D. Business Management E. Education F. Finance G. Government H. Health Science I. Hospital & Tourism J. Human Services K. Information Tech. L. Law and Public Safety

	Skills A. Creativity and Innovation B Critical Thinking and Problem-solving C. Digital Citizenship D. Global and Cultural Awareness E. Information and Media Literacy F. Technology Literacy	M. Manufacturing N. Marketing O. Science, Technology, Engineering & Math P. Trans./Logistics

TECHNOLOGY STANDARDS	
8.1: Computer Science A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	**8.2 Design Thinking** A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture

ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
Students will be able to solve equalities, inequalities, and absolute value inequalities and use the skill to solve real world problems. Students will graph equations and be able to pull out important data the graph may tell us. Students will create matrices and use them to solve systems of inequalities. Students will apply properties to solve polynomials.	How do you solve equations in one or two variables? How do you graph an equation and what does the graph tell us? How do you solve inequalities or absolute values? What is a Polynomial?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…

- the key features of a graph include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior
- sketch linear and exponential graphs showing key features of a relationship between two quantities given a verbal description of the relationship
- interpret key features of graphs and tables that model a linear or exponential relationship between two quantities in the context of those quantities
- the domain is the set of all possible input values and the range is the set of all possible output values
- in a function, each element of the domain is assigned to exactly one element in the range
- $f(x)$ denotes the output for a given input value of x, for a function f
- the graph of a f is equivalent to the graph of $y = f(x)$
- use function notation to find range values for inputs from a function's domain
- interpret statements that use function notation in terms of a context
- relate the domain of a function to its graph
- relate the domain of a function to the quantitative relationship it describes in the context of the problem or situation

- calculate the average rate of change of linear and exponential functions, presented as a table, over a specified interval and interpret it in the context of the problem
- estimate the average rate of change of linear and exponential functions from a graph and interpret it in the context of the problem
- calculate the average rate of change of linear and exponential function, presented symbolically, over a specified interval and interpret it in the context of the problem
- compare properties of two exponential functions each represented in different ways (numerically, graphically, algebraically, or verbally)
- identify the effect on the graph of linear and exponential functions by replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k, and illustrate an explanation of the effects on the graph using technology
- identify the effect on the graph of linear and exponential functions by replacing $f(x)$ by $kf(x)$ and $f(kx)$ for specific values of k, and illustrate an explanation of the effects on the graph using technology
- find the value of k given graphs of linear and exponential functions
- experiment with all cases, $f(x) + k$, $f(x + k)$, $kf(x)$ and $f(kx)$, and illustrate an explanation of the effects on the graph using technology
- recognize even and odd functions from their graphs and algebraic expressions for them
- recognize situations in which one quantity changes at a constant rate per unit interval relative to another (linear relationships)
- recognize situations in which a quantity grows or decays by a constant percent (exponential relationships)
- distinguish between situations that can be modeled with linear functions and with exponential functions

SUGGESTED ACTIVITIES

Teachers will..

- Lecture and incorporate demonstrations
- Utilize small group instruction
- Create Projects
- Develop activities
- Utilize dynamic online learning software

Students will…

A.REI.B.3, A.REI.A.1 Reasoning with Linear Inequalities
A.CED.A.3 Equations and Formulas
A.CED.A.1 Planes and Wheat
A.CED.A.1 Paying the Rent
A.REI.A.1 Zero Product Property 1
A.CED.A.2 Clea on an Escalator
A.CED.A.3 Solving inequalities - Carbon Emissions **Climate**
Choose a Mathematician to Research **DEI**
A.CED.A.3 Dimes and Quarters
A.REI.C.5 Solving Two Equations in Two Unknowns
A.REI.D.12 Fishing Adventures 3 **DEI**
F.IF.B.6 Temperature Change **CC**
A.SSE.A.2 Equivalent Expressions
A.REI.B.4 Visualizing Completing the Square
A.SSE.B.3 Rewriting a Quadratic Expression
F.IF.C.7a Graphs of Quadratic Functions
A.REI.D.11 Introduction to Polynomials - College Fund

A.APR.B.3 - Graphing from Factors 1

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**
Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	Unit Tests End-of-Book Test NJGPA Test
Benchmark Assessment: Envision Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
Teacher created Materials EnVision math program for Algebra 1,Geometry,Algebra II, Data Science	Warm ups, exit slips, PowerPoints, Guided Notes	Math XL Illustrative Mathematics; National Council of Teachers of Mathematics; Khan Academy; Desmos; Math Warehouse; Mathematics Assessment Resource Services (MARS); Learn Zillion; Edulastic; Nearpod; Ed-Puzzles;Quizizz;Kahoot

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations

Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 2 GEOMETRY AND TRIGONOMETRY

UNIT SUMMARY

In this unit, students will work with:

- Congruence
- Modeling with Geometry
- Similarity, Right Triangles and Trigonometry
- Circles
- Expressing Geometric Properties with Equations
- Geometric Measurement and dimension

NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS 2023

G.CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

G.CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

G.CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent

G.CO.B.8. Explain the criteria for triangle congruence.

G.CO.C.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point

G.CO.C.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

G.CO.D.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

G.CO.D.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

G.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

G.MG.A.2 (+): Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

G.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

G.SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor:

a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged
b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

G.SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

G.SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

G.SRT.B.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

G.SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

G.SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G.SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles

G.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G.C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

G.GPE.B.4 Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2) .*

G.GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

G.GPE.B.6(+) Find the point on a directed line segment between two given points that partitions the segment in a given ratio

G.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula

G.GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.

G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

INTERDISCIPLINARY CONNECTIONS

New Jersey Student Learning Standards- Science

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-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

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.

New Jersey Student Learning Standards-Language Arts (2023)

L.VL.9–10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.AA.9–10.7. Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.

W.WR.9–10.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.II.9–10.2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.

SL.PI.9–10.4. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

SL.UM.9–10.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)

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

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes
9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content
9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others
9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

2020 New Jersey Student Learning Standards – 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.
8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

21st CENTURY LIFE AND CAREER STANDARDS

9.1: Personal Financial Literacy
A. Civic Responsibility
B. Financial Institutions
C. Financial Psychology
D. Planning and Budgeting
E. Risk Management and Insurance
F. Civic Financial Responsibility
G. Credit Profile
H. Economic and Government Influences
I. Credit and Debt Management

9.2: Career Awareness, Exploration & Preparation, and Training
A. Career Awareness (K-2)
B. Career Awareness and Planning (3-5)
C. Career Awareness and Planning (6-8)
D. Career Awareness and Planning (9-12)

9.4 Life Literacies and Key Skills
A. Creativity and Innovation
B Critical Thinking and Problem-solving
C. Digital Citizenship
D. Global and Cultural Awareness
E. Information and Media Literacy
F. Technology Literacy

9.3: Career and Technical Education
A. Agriculture
B. Architecture
C. Arts,A/V, Technology
D. Business Management
E. Education
F. Finance
G. Government
H. Health Science
I. Hospital & Tourism
J. Human Services
K. Information Tech.
L. Law and Public Safety
M. Manufacturing
N. Marketing
O. Science, Technology, Engineering & Math
P. Trans./Logistics

TECHNOLOGY STANDARDS

8.1: Computer Science
A. Computing systems
B. Networks and the Internet
C. Impacts of Computing
D. Data & Analysis

8.2 Design Thinking
A. Engineering Design
B. Interaction of Technology and Humans
C. Nature of Technology
D. Effects of Technology on the Natural World

E. Algorithms & Programming	E. Ethics & Culture
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
Use trigonometric functions to solve unknown values Radians vs Degrees Unit Circle values Identity proofs	How do I find Radian Measure and convert it into degrees? How do I find values of triangles using trigonometry? How do I find circle measures? What is the graph of the trigonometric functions and how do I translate them? How can I prove trigonometric functions?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…
Find angle relationships and similar triangles
Use trigonometric functions correctly
Solve right triangles
Understand and use formulas for circles and quadrilaterals
Understand the meaning of radian measure
Convert between degrees and radians
Find function values for angles in radians
Find Arc Length and areas of sectors of circles
Graph Sine and Cosine Functions
Apply translations to the Sine and Cosine functions
Learn and Use the Fundamental Identities of trigonometry
Prove trigonometric identities
Define and Graph inverse functions
Solve trigonometric equations

SUGGESTED ACTIVITIES

Teachers will…

- Lecture and incorporate demonstrations
- Utilize small group instruction
- Create Projects
- Develop activities
- Utilize dynamic online learning software

Students will…

G.CO.A.1 Defining Parallel Lines
G.CO.A.1 Defining Perpendicular Lines
G.CO.A.4 Defining Rotations
G.CO.A.5 Showing a Triangle Congruence
G.CO.B.7 Properties of Congruent Triangles
G.CO.B.8 Why does SAS Work?
G.CO.B.8 Why does SSS Work?
G.CO.B.8 Why does ASA Work?
G.CO.C.9 Solar Panelling a House **Climate**
G.SRT.A.1 Dilating a Line
G.SRT.A.1 Swelling Sahara **Climate**
G.SRT.A.2 Are They Similar?

G.SRT.A. 2 Similar Triangles
G.SRT.A.3 Similar Triangles
G.SRT.C.8 Right Triangle Applications-choose 2 **DEI**
G.CO.C.10 Midpoints of Triangle Sides
G.SRT.B.4 Joining Two Midpoints of Sides of a Triangle
G.SRT.B.4 Pythagorean Theorem
G.SRT.B.5 Tangent Line to Two Circles
G.GPE.B.4 An Advancing Hurricane **Climate**
Choose a shape on the quadrilateral hierarchy and research various mathematicians and properties associated with the shape. **DEI**

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**
Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	Unit Tests End-of-Book Test NJGPA Test
Benchmark Assessment: Envision Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
Teacher created Materials **EnVision** math program for Algebra 1,Geometry,Algebra II, Data Science	Warm ups, exit slips, PowerPoints, Guided Notes	Math XL Illustrative Mathematics; National Council of Teachers of Mathematics; Khan Academy; Desmos; Math Warehouse; Mathematics Assessment Resource Services (MARS); Learn Zillion; Edulastic; Nearpod; Ed-Puzzles;Quizizz;Kahoot

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations

Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 3: ALGEBRA II

UNIT SUMMARY

In this unit, students will learn
- Real Number System
- Seeing Structures in Expressions
- Arithmetic with Polynomials and Rational Expressions
- Interpreting functions
- Building Functions

Linear and Exponential models

NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS 2023

N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

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

A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it.

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.APR.B.2 . Know and apply the Remainder Theorem: *For a polynomial p x( ) and a number a , the remainder on division by x a− is p a( ) , so p a( ) 0 = if and only if x a− is a factor of p x( ).*

A.APR.B.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial

A.REI.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. *(Limited to simple rational or radical equations.)*

A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise

A.REI.B.4. Solve quadratic equations in one variable

A.REI.B.4b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. *(Limited in the case of equations that have roots with nonzero imaginary parts, solutions are to be writing as* $a \pm bi$ *for real numbers a and b.)*

A.REI.D.11. Explain why the x coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

F.IF.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. *(Limited to polynomial, exponential, and logarithmic functions. Tasks should have a real-world context.)*

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. *(Limited to polynomial, exponential, and logarithmic functions. Tasks should have a real-world context.)*

F.IF.C.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*(Limited to square root and cube root functions)*

F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. *(Limited to polynomial, exponential, and logarithmic functions)*

F.BF.A.1a Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context. *(Tasks may involve polynomial, exponential, and logarithmic functions. Tasks may involve recognizing even and odd functions)*

F.BF.A.1b Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

F.BF.A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms
F.BF.B.4a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.
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). *(Constructing linear and exponential functions includes constructing geometric sequences and arithmetic sequences. Tasks may involve function or subscript notation)*

INTERDISCIPLINARY CONNECTIONS

New Jersey Student Learning Standards- Science
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-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
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.

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L.VL.9–10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.AA.9–10.7. Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.

W.WR.9–10.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.II.9–10.2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.

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SL.UM.9–10.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes
9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content
9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others
9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

2020 New Jersey Student Learning Standards – 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.
8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy	**9.2: Career Awareness, Exploration & Preparation, and Training**	**9.3: Career and Technical Education**
J. Civic Responsibility	G. Career Awareness (K-2)	Q. Agriculture
K. Financial Institutions	H. Career Awareness and Planning (3-5)	R. Architecture
L. Financial Psychology	I. Career Awareness and	S. Arts,A/V, Technology
M. Planning and Budgeting		T. Business Management
N. Risk Management and		U. Education

Insurance O. Civic Financial Responsibility P. Credit Profile Q. Economic and Government Influences R. Credit and Debt Management	Planning (6-8) J. Career Awareness and Planning (9-12) **9.4 Life Literacies and Key Skills** A. Creativity and Innovation B Critical Thinking and Problem-solving C. Digital Citizenship D. Global and Cultural Awareness K. Information and Media Literacy L. Technology Literacy	V. Finance W. Government X. Health Science Y. Hospital & Tourism Z. Human Services AA. Information Tech. BB. Law and Public Safety CC. Manufacturing DD. Marketing EE. Science, Technology, Engineering & Math FF. Trans./Logistics

TECHNOLOGY STANDARDS	
8.1: Computer Science A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	**8.2 Design Thinking** A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
As with real solutions, complex solutions to quadratic equations may be determined by taking square roots, factoring, and completing the square. Solutions of linear systems contain different function types. Students are able to: • factor polynomials. • analyze a table of values to determine where the polynomial is increasing and decreasing. • use the zeros of the polynomial to create rough graph Inverse relationships exist between roots and powers. Solutions to complex systems of nonlinear functions can be approximated graphically	What kind of solutions will I have if I solve a quadratic? How can I solve a system with data? Algebraically? Graphically? What are the characteristics of a function? How can I approximate the solutions to a system of nonlinear functions?
STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)	
Students are learning to/that… • interpret key features of radical functions from graphs and tables in the context of the problem. • sketch graphs of radical functions given a verbal description of the relationship between the quantities.	

• identify intercepts and intervals where function is increasing/decreasing.
• determine the practical domain of a radical function.
• determine key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior

SUGGESTED ACTIVITIES

Teachers will…

- Lecture and incorporate demonstrations
- Utilize small group instruction
- Create Projects
- Develop activities
- Utilize dynamic online learning software

Students will…

N.CN.C.7, A.REI.B.4b Completing the square
A.REI.C.7 Linear and Quadratic System
N.RN.A.1 Evaluating Exponential Expressions
N.RN.A.2 Rational or Irrational?
A.SSE.B.3c Forms of exponential expressions
F.IF.C.8b Carbon 14 dating in practice I **Climate**
F.LE.A.4 Carbon 14 dating **Climate**
A.APR.B.3 Graphing from Factors III
F.IF.C.7c Graphs of Power Functions
A.APR.D.6 Combined Fuel Efficiency **Climate**
A.REI.A.1 Products and Reciprocals
A.REI.A.2 Radical Equations

EVIDENCE OF LEARNING

Formative Assessments:	**Summative Assessment:**
Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	Unit Tests End-of-Book Test NJGPA Test
Benchmark Assessment: Envision Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
		Math XL

Teacher created Materials **EnVision** math program for Algebra 1,Geometry,Algebra II, Data Science	Warm ups, exit slips, PowerPoints, Guided Notes	Illustrative Mathematics; National Council of Teachers of Mathematics; Khan Academy; Desmos; Math Warehouse; Mathematics Assessment Resource Services (MARS); Learn Zillion; Edulastic; Nearpod; Ed-Puzzles;Quizizz;Kahoot

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions
Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment

Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers

UNIT 4: DATA SCIENCE AND 21st CENTURY PROJECT

UNIT SUMMARY

In this unit, students will learn…
Probability and Statistics (4 weeks)
Complete a 21st Century Project (4 weeks)

NEW JERSEY STUDENT LEARNING STANDARDS MATHEMATICS 2023

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
S.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets
S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
S.ID.A.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
S.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.

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
b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
c. Fit a linear function for a scatter plot that suggests a linear association

S.IC.A.1(+) Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
S.IC.A.2(+) Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation
S.IC.B.3(+) Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
S.IC.B.5(+) Use data from a randomized experiment to compare two treatments; use simulations to decide if differences
S.IC.B.6(+) Evaluate reports based on data.
S.CP.A.1(+) Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
S.CP.A.2(+) Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S.CP.A.3(+) Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
S.CP.A.4(+) Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities

INTERDISCIPLINARY CONNECTIONS

New Jersey Student Learning Standards- Science
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-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
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.

New Jersey Student Learning Standards-Language Arts (2023)

L.VL.9–10.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, including technical meanings, choosing flexibly from a range of strategies.

RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.AA.9–10.7. Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.

W.WR.9–10.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

SL.II.9–10.2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.

SL.PI.9–10.4. Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

SL.UM.9–10.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest..

New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills (2020)

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

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes

9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content

9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others

9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

2020 New Jersey Student Learning Standards – 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.

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

21st CENTURY LIFE AND CAREER STANDARDS

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success.

1. Act as a responsible and contributing community member and employee.
2. Attend to financial well-being.
3. Consider the environmental, social and economic impacts of decisions.
4. Demonstrate creativity and innovation.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Model integrity, ethical leadership and effective management.
7. Plan education and career paths aligned to personal goals.
8. Use technology to enhance productivity, increase collaboration and communicate effectively.
9. Work productively in teams while using cultural global competence.

9.1: Personal Financial Literacy	**9.2: Career Awareness, Exploration & Preparation, and Training**	**9.3: Career and Technical Education**
S. Civic Responsibility	M. Career Awareness (K-2)	GG. Agriculture
T. Financial Institutions	N. Career Awareness and Planning (3-5)	HH. Architecture
U. Financial Psychology	O. Career Awareness and Planning (6-8)	II. Arts,A/V, Technology
V. Planning and Budgeting	P. Career Awareness and Planning (9-12)	JJ. Business Management
W. Risk Management and Insurance		KK. Education
X. Civic Financial Responsibility		LL. Finance
		MM. Government
		NN. Health Science

Y. Credit Profile Z. Economic and Government Influences AA. Credit and Debt Management	**9.4 Life Literacies and Key Skills** A. Creativity and Innovation B Critical Thinking and Problem-solving C. Digital Citizenship D. Global and Cultural Awareness Q. Information and Media Literacy R. Technology Literacy	OO. Hospital & Tourism PP. Human Services QQ. Information Tech. RR. Law and Public Safety SS. Manufacturing TT. Marketing UU. Science, Technology, Engineering & Math VV. Trans./Logistics

TECHNOLOGY STANDARDS	
8.1: Computer Science A. Computing systems B. Networks and the Internet C. Impacts of Computing D. Data & Analysis E. Algorithms & Programming	**8.2 Design Thinking** A. Engineering Design B. Interaction of Technology and Humans C. Nature of Technology D. Effects of Technology on the Natural World E. Ethics & Culture
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
Mean and standard deviation are used to fit in a normal distribution Population percentages may be estimated when the data are approximately normally distributed. Statistics is a process for making inferences about a population based on analysis of a random sample from the population Random processes can be described mathematically by using a model: a list or description of possible outcomes. Collecting data from a random sample of a population makes it possible to draw conclusions about the whole population. Randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. Sample surveys, experiments, and observational studies serve different statistical purposes allowing for different statistical analyses. Appropriately drawn samples of a population may be used to estimate a population mean or population proportion.	What is a normal distribution and what does it mean for the population What are random sampling methods? Why is random sampling important? What is theoretical modeling? What is experimental modeling? What is the difference between sample surveys, experiments and observational studies? How can you simulate random sampling?

STUDENT LEARNING OBJECTIVES (Students are learning to / Students are learning that)

Students are learning to/that…
• Summarize, represent, and interpret data on a single count or measurement variable • Understand and evaluate random processes underlying statistical experiments
• Make inferences and justify conclusions from sample surveys, experiments and observational studies
• Understand the independence and conditional probability and use them to interpret data
• Use the rules of probability to compute probabilities of compound events in a uniform probability model

SUGGESTED ACTIVITIES

Teachers will…

- Lecture and incorporate demonstrations
- Utilize small group instruction
- Create Projects
- Develop activities
- Utilize dynamic online learning software

The students will…
Choose a real world application to demonstrate mastery of mathematics knowledge necessary to solve the problem. The project may be presented in any way the student chooses. Examples might include:
Opening of a new business in town
Expansion and/or redecoration of a store or business
Research whether a certain product will be successful in terms of sales
S.ID.A.1 Speed Trap
S.ID.A.2 Understanding Standard Deviation
S.ID.A.3 Measuring Variability in a Data Set
S.ID.A.4 Do You Fit in This Car? **DEI**
S.ID.B.5 Musical Preference **DEI**
S.ID.B.6a Olympic Men's 100 Meter Dash
S.ID.B.6b Restaurant Bill and Party Size

EVIDENCE OF LEARNING

Formative Assessments: Classroom Discussion Exit Slip Checklists Peer Assessment Vocabulary Quizzes Rubrics Participation and teacher observation Mini Whiteboard Responses Think-Pair-Share Concept Map Classroom Poll	**Summative Assessment:** Unit Tests End-of-Book Test NJGPA Test
Benchmark Assessment: Star 360 Benchmark Unit Benchmarks	**Alternative Assessments:** Project Portfolio

INSTRUCTIONAL RESOURCES

Core Instructional Resource:	**Teacher Created Materials:**	**Supplemental Resources:**
Teacher created Materials **EnVision** math program for Algebra 1,Geometry,Algebra II, Data Science	Warm ups, exit slips, PowerPoints, Guided Notes	Math XL Illustrative Mathematics; National Council of Teachers of Mathematics; Khan Academy; Desmos; Math Warehouse; Mathematics Assessment Resource Services (MARS); Learn Zillion; Edulastic; Nearpod; Ed-Puzzles;Quizizz;Kahoot

INTEGRATED ACCOMMODATIONS AND MODIFICATIONS

Special Education:
Provide modified notes and access to extra copies online
Provide oral reminders and check student work during independent work time
Model skills/techniques to be mastered
Check and sign assignment planner
Preferential seating
Pair visual prompts with verbal presentations
Modified or scaffolded homework and classwork
Extended time as needed
Provide graphic organizers and study guides

English Learners:
Provide scaffolded assignments and assessments
Pair visual prompts with visual presentations
Check and sign assignment planner
Native Language translation (peer, online assistive technology, translation device, bilingual dictionary)
Extended time for assignment and assessment as needed
Highlight key vocabulary
Use graphic organizers
Provide verbal and written directions
Preferential seating with a English-speaking peer

At Risk of Failure:
Check and sign assignment planner
Encourage class participation and reinforce skills
Model skills and assignments
Extended to time to complete class work
Preferential seating
Provide extra help outside of class and 1:1 instruction when needed
Communicate regularly with students' other teachers
Provide positive feedback for tasks well done
Encourage student to proofread assessments and projects and ask for teacher proofreading of large writing assignments

Gifted and Talented:
Pose higher-level thinking questions

Provide higher level reading and writing materials for literacy based activities
Probe student to extend thinking beyond the text or connect two or more texts
Provide alternate or project-based assessments and assignments

Students with 504 Plans
Provide extended time as needed
Modify length of writing assignment
Provide short breaks within the lesson
Provide scaffolding for students
Utilize graphic organizers