

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

Original Adoption: 2023 NJSLs English Language Arts and English as a Second Language (8-21-24); Math NJSLs Mathematics (8-21-24); 2020 NJSLs Science, Social Studies, Career Readiness, Life Literacies & Key Skills, Computer Design & Thinking, Visual & Performing Arts, World Language, Comprehensive Health and Physical Education (5-11-22)

Created By:

Recommended Pacing Guide

Unit 1: Linear Equations	45 days
Unit 2: Functions	23 days
Unit 3: Quadratics	60 days
Unit 4: Data	9 days

Alignment with State Mandates

The following colors are used throughout this document to indicate areas in which the curriculum is aligned with the following NJSA requirements:

- Holocaust and genocides ([N.J.S.A. 18A:35-28](#))
- History and contributions of African-Americans (Amistad Law) ([N.J.S.A. 18A:35-4.43](#))
- Highlight and promote diversity and inclusion (Diversity & Inclusion Law) ([N.J.S.A. 18A:35-4.36a](#))
- History of disabled and LGBT persons included in middle and high school curriculum ([Section 18A:35-4.35](#))
- Climate Change - to prepare students to understand how and why climate change happens, the impact it has on our local and global communities and to act in informed and sustainable ways. Please [click here](#) for specific examples (by subject).

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

Unit 1: Linear Equations	45 days
<u>New Jersey Learning Standards-Mathematics</u>	
N.Q.A.1.	Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.
N.Q.A.2.	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.A.3.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
A.REI.A.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
A.REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A.REI.C.5.(+)	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions
A.REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
A.REI.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). [Focus on linear equations.]
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.* [Focus on linear equations.]
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.SSE.A.1a.	Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.
A.CED.A.1.	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions.
A.CED.A.2	Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.
A.CED.A.3.	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. <i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i>
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 .
S.ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

S.ID.B.6a	Fit a function to the data (including 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, quadratic, and exponential models.
S.ID.B.6c	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.
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.

Standards of Mathematical Practices

MP1. Make sense of problems and persevere in solving them	<ul style="list-style-type: none"> ● Find meaning in problems ● Look for entry points ● Analyze, conjecture and plan solution pathways ● Monitor and adjust ● Verify answers ● Ask themselves the question: “Does this make sense?”
MP2. Reason abstractly and quantitatively.	<ul style="list-style-type: none"> ● Make sense of quantities and their relationships in problems ● Learn to contextualized and decontextualized ● Create coherent representations of problems
MP3. Construct viable arguments and critique the reasoning of others.	<ul style="list-style-type: none"> ● Understand and use information to construct arguments ● Make and explore the truth of conjectures ● Recognize and use counterexamples ● Justify conclusions and respond to arguments of others
MP4. Model with Mathematics.	<ul style="list-style-type: none"> ● Apply mathematics to problems in everyday life ● Make assumptions and approximations ● Identify quantities in a practical situation ● Interpret results in the context of the situation and reflect on whether the results make sense
MP5. Use appropriate tools strategically	<ul style="list-style-type: none"> ● Consider the available tools when solving problems ● Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools) ● Make sound decisions of which of these tools might be helpful
MP6. Attend to precision.	<ul style="list-style-type: none"> ● Communicate precisely to others ● Use clear definitions, state the meaning of symbols and are careful about specifying units of measure

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

	and labeling axes <ul style="list-style-type: none"> ● Calculate accurately and efficiently
MP7. Look for and make use of structure.	<ul style="list-style-type: none"> ● Discern patterns and structures ● Can step back for an overview and shift perspective ● See complicated things as single objects or as being composed of several objects

Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> ● Recognize one’s personal traits, strengths, and limitations ● Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> ● Recognize the skills needed to establish and achieve personal and educational goals ● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> ● Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> ● Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
ELA Standards	
● SL.AS.9–10.6.	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.
● 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.
Science Standards	
● HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
● HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other

Computer Science & Design Thinking	
8.1 Computer Science	
<ul style="list-style-type: none"> ● 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim. 	
8.2 Design Thinking	
<ul style="list-style-type: none"> ● 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. ● 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. 	

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- 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).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

Alternative Assessments:

- Teacher-Created Projects
- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- <https://www.engageny.org>

Summative Assessments:

- Unit Tests
- Midterm Exam
- Final Exam

Benchmark Assessments:

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Unit Common Assessment

Knowledge & Skills

Enduring Understandings:

- Algebraic expressions, equations, and inequalities are tools for representing and analyzing real-world

Essential Questions:

How can we use algebraic expressions and equations to represent real-world situations and communicate relationships between quantities?

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

situations, allowing us to describe relationships and make predictions.

- The structure of an expression reveals meaningful information about the quantities involved, and recognizing this structure helps us interpret, simplify, and manipulate expressions effectively.
- Solving equations and inequalities involves applying logical, consistent operations, and the resulting solutions must be interpreted within the context of a problem to determine their validity.
- Linear functions can be represented in multiple forms, and each representation (graph, table, equation, scenario) highlights different features of the relationship.
- The slope and intercepts of a linear function describe patterns of change and initial conditions, making them critical for modeling and reasoning about real-world phenomena.
Scatter plots and lines of best fit allow us to analyze data, identify trends, and make informed predictions, even when values vary naturally.
- Systems of equations and inequalities model situations involving multiple constraints or relationships, and their solutions represent points or regions where these relationships coexist.
- Mathematical tools—including technology, graphing, tables, and symbolic methods—provide different but interconnected ways to explore, verify, and deepen understanding of algebraic relationships.

- What does it mean to solve an equation or inequality, and how do we know whether a solution makes sense in context?
- How do the structure and components of an expression help us interpret what each part represents in a scenario?
- In what ways do tables, graphs, and equations each reveal different information about linear relationships?
- How can the slope, initial value, and intercepts of a linear function help us understand and predict real-world behavior?
- How can we determine whether a relationship is linear, nonlinear, or has a meaningful trend when analyzing real data?
- What does the point of intersection of two equations represent, and why is it important for solving real-world problems involving systems?
- How do technology, graphing tools, and algebraic methods support our ability to solve equations, inequalities, and systems accurately?

Content

Students will know...

- The structure of algebraic expressions, including how terms, coefficients, constants, and factors represent quantities in real-world scenarios.
- How linear relationships arise in contexts and how initial value, rate of change, intercepts, and variables connect across equations, tables, graphs, and verbal descriptions.
- That solving linear equations and inequalities involves maintaining equality or inequality through inverse operations, and that solutions represent meaningful values within a given context.

Skills

Students will be able to ...

- identify different parts of an expression, including terms, factors and constants.
- explain the meaning of parts of an expression in context.
- solve linear equations with coefficients represented by letters in one variable.
- use the properties of equality to justify steps in solving linear equations.
- solve linear inequalities in one variable.
- rearrange linear formulas and literal equations, isolating a specific variable.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- That multi-step equations and formulas with letter coefficients follow the same structural rules as numeric equations and can be rearranged to isolate a desired variable.
- How a graph of a linear equation or inequality represents all possible solutions and how to interpret features such as intercepts, slope, and shaded regions.
- That scatter plots reveal patterns in real data and that linear trends can be modeled with a line of best fit, including understanding the meaning of correlation and its coefficient.
- That systems of linear equations or inequalities represent situations with two variables and that their solutions correspond to intersection points or overlapping regions on a graph.
- That technology, tables, and graphs can be used to generate, approximate, or verify solutions to linear equations, inequalities, and systems.

- identify and describe relationships between quantities in word problems.
- create linear equations and inequalities in one variable.
- use equations and inequalities to solve real world problems.
- explain each step in the solution process.
- create linear equations in two variables, including those from a context.
- select appropriate scales for constructing a graph.
- interpret the origin in graphs.
- graph equations on coordinate axes, including labels and scales.
- identify and describe the solutions in the graph of an equation.
- distinguish linear models representing approximately linear data from linear equations representing “perfectly” linear relationships.
- create a scatter plot and sketch a line of best fit.
- fit a linear function to data using technology.
- solve problems using prediction equations.
- interpret the slope and the intercepts of the linear model in context.
- determine the correlation coefficient for the linear model using technology.
- determine the direction and strength of the linear association between two variables.
- explain the relationship between the x-coordinate of a point of intersection and the solution to the equation $f(x) = g(x)$ for linear equations $y = f(x)$ and $y = g(x)$.
- find approximate solutions to the system by making a table of values, graphing, and finding successive approximations.
- identify and define variables representing essential features for the model.
- model real world situations by creating a system of linear equations.
- solve systems of linear equations using the elimination or substitution method.
- solve systems of linear equations by graphing.
- interpret the solution(s) in context.
- model real world situations by creating a system of linear inequalities given a context.
- interpret the solution(s) in context.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- [HS-Q Activities](#)
- [HS-A.SSE Activities](#)
- [HS-A.CED Activities](#)
- [HS-A.REI Activities](#)
- [HS-S.ID Activities](#)

Supplemental resources:

- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- www.desmos.com
- www.kahoot.com
- www.quizizz.com
- <https://www.deltamath.com>
- <https://www.ixl.com/math>
- <https://nj.digitalitemlibrary.com/home>
- [Mathematicians](#)
- <https://www.radicalmath.org/math-social-justice>
- [Alan Turing Gizmos Grades 9-12](#)
- [Diverse Mathematician](#)

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice

- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

504 Plans:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
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Gifted and Talented:

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

Students at Risk of Failure:

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers

- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
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- Directions repeated, clarified, and reworded
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- Math tool paper available
- Cooperative learning groups
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Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
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- Preview lessons
- Graphic organizers
- Highlight key words

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

Unit 2: Functions	23 days
<u>New Jersey Learning Standards-Mathematics</u>	
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. <i>For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.</i>
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. *[Focus on exponential functions]
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 <i>domain for the function</i>
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	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
F.IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.C.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

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. *[Limit to linear and exponential]
F.LE.A.1. F.LE.A.1a.	Distinguish between situations that can be modeled with linear functions and with exponential functions. 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.1b. F.LE.A.1c.	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. 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). *[Algebra 1 limitation: exponential expressions with integer exponents]
F.LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context
F.BF.A.1 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
A.SSE.A.1. A.SSE.A.1a. A.SSE.A.1b.	Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients. Interpret complicated expressions by viewing one or more of their parts as a single entity. <i>For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.</i> *[Algebra 1 limitation: exponential expressions with integer exponents]
A.SSE.B.3. A.SSE.B.3c.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression Use the properties of exponents to transform expressions for exponential functions. <i>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%.</i> *[Algebra 1: limit to exponential expressions with integer exponents]

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Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

	<ul style="list-style-type: none"> ● Make and explore the truth of conjectures ● Recognize and use counterexamples ● Justify conclusions and respond to arguments of others
MP4. Model with Mathematics.	<ul style="list-style-type: none"> ● Apply mathematics to problems in everyday life ● Make assumptions and approximations ● Identify quantities in a practical situation ● Interpret results in the context of the situation and reflect on whether the results make sense
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Interdisciplinary Connections

ELA Standards	
<ul style="list-style-type: none"> ● SL.AS.9–10.6. 	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.
<ul style="list-style-type: none"> ● 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.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
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Science Standards	
<ul style="list-style-type: none"> ● HS-LS1-4 	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
<ul style="list-style-type: none"> ● HS-ESS1-4 	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Computer Science & Design Thinking

8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

8.2 Design Thinking

- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 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).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

Alternative Assessments:

- Teacher-Created Projects
- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- <https://www.engageny.org>

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
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Summative Assessments: <ul style="list-style-type: none"> ● Unit Tests ● Midterm Exam ● Final Exam 	Benchmark Assessments: <ul style="list-style-type: none"> ● Quarterly Benchmarks ● Beginning/End of Year Assessment ● Unit Common Assessment
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Knowledge & Skills

Enduring Understandings: <ul style="list-style-type: none"> ● A function is a rule that pairs each input with exactly one output, and its behavior is determined by both its structure and its domain. ● Function notation provides a consistent way to communicate, evaluate, and interpret relationships between quantities. ● Linear functions show constant additive change, while exponential functions show constant multiplicative or percent change, and these patterns determine which model best represents real-world behavior. Key features of graphs and tables—such as intercepts, growth or decay patterns, and average rate of change—reveal meaningful information about the underlying context. ● Equivalent expressions can be strategically rewritten to highlight properties such as growth factors, interest rates, or geometric patterns in a situation. ● Sequences, including arithmetic and geometric, can be viewed as functions, and they model discrete patterns of change. ● The parameters in linear and exponential functions represent meaningful quantities such as initial values, rates of change, and growth/decay factors. ● Functions can be represented in multiple ways, and comparing these representations strengthens conceptual understanding and supports informed decision-making in applied contexts. 	Essential Questions: <ul style="list-style-type: none"> ● What makes a relationship a function, and why is it important to distinguish between the domain, range, and the rule that connects them? ● How can function notation help us describe, evaluate, and interpret relationships in real-world contexts? ● In what ways do linear and exponential functions model different types of change, and how can we determine which model best represents a situation? ● How do the representations of a function—graph, table, equation, and verbal description—each reveal different properties of the relationship? ● How can identifying key features such as intercepts, intervals of increase or decrease, end behavior, and rate of change help us understand and compare functions? ● How does interpreting parameters, factors, and coefficients deepen our understanding of growth, decay, and other quantitative patterns in context? ● Why is it important to select an appropriate domain for a given situation, and how does the domain influence the behavior and meaning of a function? ● How can transformations, recursive definitions, and algebraic manipulation help us build, rewrite, and analyze linear and exponential functions?
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Content <i>Students will know...</i> <ul style="list-style-type: none"> ● That a function assigns each input in the domain exactly one output in the range, and that $f(x)$ represents the output associated with input x. ● That linear functions grow by equal differences, 	Skills <i>Students will be able to ...</i> <ul style="list-style-type: none"> ● use the definition of a function to determine whether a relationship is a function. ● use function notation once a relation is determined to be a function. ● evaluate functions for given inputs in the domain.
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Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

while exponential functions grow by equal factors or by a constant percent rate, and that this distinction determines which model fits a real-world situation.

- How to recognize, describe, and build functions (explicit, recursive, graphical, table-based, or contextual), including arithmetic and geometric sequences as special function types.

How to interpret expressions and functions in context, including the meaning of terms, coefficients, factors, parameters, and growth/decay factors in linear and exponential models.

- How to construct linear and exponential functions from graphs, tables, two points, or verbal descriptions, and how to compare functions represented in different forms.

- How key features of a function—such as intercepts, intervals of increase or decrease, and rate of change, describe meaningful characteristics of a situation.

- That the domain of a function is determined by the context and must be interpreted based on what values are reasonable or possible in the real world.

- How the average rate of change, slope, or growth factor of a function can be calculated numerically, interpreted graphically, and used to compare trends across models.

- explain statements involving function notation in the context of the problem.
- identify and describe situations in which one quantity changes at a constant rate.
- identify and describe situations in which a quantity grows or decays by a constant percent.
- show that linear functions grow by equal differences over equal intervals.
- show that exponential functions grow by equal factors over equal intervals.
- create arithmetic and geometric sequences from verbal descriptions.
- create arithmetic sequences from linear functions.
- create geometric sequences from exponential functions.
- identify recursively defined sequences as functions.
- create linear and exponential functions given: a graph; a description of a relationship; a table of values.
- given a verbal description of a relationship, sketch linear and exponential functions.
- identify intercepts and intervals where the function is positive/negative.
- interpret parameters in context.
- determine the *practical* domain of a function.
- compare key features of two linear functions represented in different ways.
- compare key features of two exponential functions represented in different ways.
- calculate the rate of change from a table of values or from a function presented symbolically.
- estimate the rate of change from a graph.
- graph linear and piecewise-defined functions.
- graph more complicated cases of functions using technology.
- identify and describe key features of the graphs of linear and piecewise-defined functions.
- given a context, write an explicit expression, a recursive process or steps for calculation for linear and exponential relationships.
- interpret parts of linear and exponential functions in context.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- [HS-F.IF Activities](#)
- [HS-F.BF Activities](#)
- [HS-LE.A Activities](#)
- [HS-A.SSE Activities](#)

Supplemental resources:

- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- www.desmos.com
- www.kahoot.com
- www.quizizz.com
- <https://www.deltamath.com>
- <https://www.ixl.com/math>
- <https://nj.digitalitemlibrary.com/home>
- <https://www.radicalmath.org/math-social-justice>
- [Alan Turing Gizmos Grades 9-12](#)
- [African Americans in Math](#)

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration
- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate

- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions

504 Plans:

- Extra help opportunities provided
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Gifted and Talented:

- Cooperative Learning Groups
- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
- Inquiry Based Project
- Interest Based/Choice Activities

Students at Risk of Failure:

- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
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- Chunking Information
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- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues
- Visual Models
- Technology Integration
- Assistive Technology
- Credit Recovery

Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication
- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

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Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

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- Build relationships with students by interviewing students to understand their background

Unit 3: Quadratics	60 days
<u>New Jersey Learning Standards-Mathematics</u>	
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.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. *[Algebra 1: limit to quadratic and cubic functions in which linear and quadratic factors are available]
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.SSE.B.3a. A.SSE.B.3b	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression Factor a quadratic expression to reveal the zeros of the function it defines. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
A.REI.B.4.	Solve quadratic equations in one variable.
A.REI.B.4a.	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.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

A.REI.B.4b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .
A.REI.D.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.* [Focus on linear equations.]
A.CED.A.1.	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions.
F.BF.A.1 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
F.BF.B.3.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
F.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. *[Focus on exponential functions]
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 F.IF.C.7a	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.C.8 F.IF.C.8a	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. 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. *[Limit to linear and exponential]
F.LE.A.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

MP1. Make sense of problems and persevere in solving them	<ul style="list-style-type: none"> ● Find meaning in problems ● Look for entry points ● Analyze, conjecture and plan solution pathways ● Monitor and adjust ● Verify answers ● Ask themselves the question: “Does this make sense?”
MP2. Reason abstractly and quantitatively.	<ul style="list-style-type: none"> ● Make sense of quantities and their relationships in problems ● Learn to contextualized and decontextualized ● Create coherent representations of problems
MP3. Construct viable arguments and critique the reasoning of others.	<ul style="list-style-type: none"> ● Understand and use information to construct arguments ● Make and explore the truth of conjectures ● Recognize and use counterexamples ● Justify conclusions and respond to arguments of others
MP4. Model with Mathematics.	<ul style="list-style-type: none"> ● Apply mathematics to problems in everyday life ● Make assumptions and approximations ● Identify quantities in a practical situation ● Interpret results in the context of the situation and reflect on whether the results make sense
MP5. Use appropriate tools strategically	<ul style="list-style-type: none"> ● Consider the available tools when solving problems ● Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools) ● Make sound decisions of which of these tools might be helpful
MP6. Attend to precision.	<ul style="list-style-type: none"> ● Communicate precisely to others ● Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes ● Calculate accurately and efficiently
MP7. Look for and make use of structure.	<ul style="list-style-type: none"> ● Discern patterns and structures ● Can step back for an overview and shift perspective ● See complicated things as single objects or as being composed of several objects

Social and Emotional Learning Standards

Self-Awareness	<ul style="list-style-type: none"> ● Recognize one’s personal traits, strengths, and limitations ● Recognize the importance of self-confidence in handling daily tasks and challenges
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Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
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Self-Management	<ul style="list-style-type: none"> ● Recognize the skills needed to establish and achieve personal and educational goals ● Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> ● Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> ● Develop, implement and model effective problem solving and critical thinking skills

<u>Interdisciplinary Connections</u>	
	ELA Standards
● SL.AS.9–10.6.	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.
● 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.
	Science Standards
● HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.
● HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

<u>Computer Science & Design Thinking</u>
8.1 Computer Science
<ul style="list-style-type: none"> ● 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
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<ul style="list-style-type: none"> ● 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. ● 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. ● 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).

<u>Career Readiness, Life Literacies & Key Skills</u>
9.1 Personal Financial Literacy
<ul style="list-style-type: none"> ● 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.” ● 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products. ● 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
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Alternative Assessments:

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Summative Assessments:

- Unit Tests
- Midterm Exam
- Final Exam

Benchmark Assessments:

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Unit Common Assessment

Knowledge & Skills

Enduring Understandings:

- Polynomial expressions behave in predictable ways: they are closed under addition, subtraction, and multiplication, and their structure can be used to rewrite and analyze them.
- Quadratic expressions can be represented in multiple equivalent forms, and each form reveals different characteristics such as zeros, maximum or minimum values, symmetry, and rate of change.
- Quadratic equations can be solved through a variety of methods, and the choice of method depends on the structure of the equation.
- A quadratic function's graph provides visual insight into key features such as vertex, intercepts, intervals of increase and decrease, and end behavior.

Essential Questions:

- How can the structure of a polynomial or quadratic expression help us rewrite it and reveal important features of the function it represents?
- In what ways do different methods for solving quadratic equations—factoring, square roots, completing the square, and the quadratic formula—highlight different mathematical ideas?
- How do the zeros, vertex, symmetry, and end behavior of a quadratic function help us understand and interpret real-world situations?
- What is the relationship between the algebraic form of a quadratic function and the shape of its graph?
- How can comparing algebraic, graphical, numerical, and verbal representations of functions help us analyze and interpret their properties?

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- Functions can be represented symbolically, graphically, numerically, or verbally, and comparing these representations strengthens understanding of their behavior.
- Exponential functions grow faster than linear and quadratic functions, a fact that becomes clear when analyzing tables, graphs, or long-term patterns.
- Intersection points of two functions represent solutions to equations of the form $f(x) = g(x)$, and these solutions can be found exactly or approximated using graphs and technology.

- Why does exponential growth eventually exceed linear and quadratic growth, and how can we see this behavior in tables and graphs?
- How do transformations ($f(x)+k$, $k \cdot f(x)$, $f(kx)$, $f(x+k)$) affect a function's graph, and how can we use these effects to model changes in real-world contexts?
- How can we use intersections of graphs to approximate or determine solutions to equations involving linear, quadratic, and other types of functions?

Content

Students will know...

- That polynomial expressions form a system closed under addition, subtraction, and multiplication, and that these operations preserve the structure of the polynomial.
- That the structure of an expression can be used to rewrite it in meaningful ways, allowing patterns such as factored form, perfect squares, and differences of squares to be recognized and applied.
- That quadratic equations may have one solution, two solutions, or no real solutions, and that complex solutions arise naturally from the structure of certain quadratic expressions.
- That equivalent forms of a quadratic function (standard form, factored form, vertex form) reveal different properties, such as zeros, maximum or minimum values, symmetry, and the direction of opening.
- Solving quadratic equations can be approached through multiple methods, and the choice of method depends on the initial form and structure of the equation.
- Functions model relationships between quantities and that key features of graphs—intercepts, vertex, intervals of increase/decrease, and end behavior—provide meaningful information about those relationships.
- That the domain of a function is determined not

Skills

Students will be able to ...

- add and subtract polynomials.
- multiply polynomials.
- recognize numerical expressions as a difference of squares and rewrite the expression as the product of sums/differences.
 - recognize polynomial expressions in one variable as a difference of squares and rewrite the expression as the product of sums/differences.
- use the method of completing the square to transform a quadratic equation in x into an equation of the form $(x - p)^2 = q$.
- derive the quadratic formula from $(x - p)^2 = q$.
- solve quadratic equations in one variable by inspection.
- solve quadratic equations in one variable by taking square roots.
- solve quadratic equations in one variable by completing the square.
- solve quadratic equations in one variable using the quadratic formula.
- solve quadratic equations in one variable by factoring.
- strategically select, as appropriate to the initial form of the equation, a method for solving a quadratic equation in one variable.
- write complex solutions of the quadratic formula in $a \pm bi$ form.
- analyze the quadratic formula, recognizing the

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

just by algebraic rules but by the real-world context the function is intended to model.

- That intersections of functions represent solutions to equations of the form $f(x) = g(x)$, and these intersection points may be found exactly or approximated using tables, graphs, or technology.

- That exponential functions eventually outgrow linear and quadratic functions, a pattern that can be observed by comparing tables, graphs, and long-term behavior.

conditions leading to complex solutions (discriminant).

- interpret maximum/minimum and intercepts of quadratic functions from graphs and tables in the context of the problem.
- sketch graphs of quadratic 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 function.
- factor a quadratic expression for the purpose of revealing the zeros of a function.
- complete the square for the purpose of revealing the maximum or minimum of a function.
- graph quadratic functions expressed symbolically.
- graph more complicated cases of quadratic functions using technology.
- identify and describe key features of the graphs of quadratic functions.
- given two quadratic functions, each represented in a different way, compare the properties of the functions.
- create quadratic equations in one variable.
- use quadratic equations to solve real world problems.
- calculate the rate of change of a quadratic function from a table of values or from a function presented symbolically.
- estimate the rate of change from a graph of a quadratic function.
- analyze graphs and tables to compare rates of change of exponential and quadratic functions.
- perform transformations on graphs of linear and quadratic functions.
- identify the effect on the graph of replacing $f(x)$ by
 - $f(x) + k$;
 - $k f(x)$;
 - $f(kx)$;
 - $f(x + k)$ for specific values of k (both positive and negative).
- identify the effect on the graph of combinations of transformations.
- given the graph, find the value of k .
- illustrate an explanation of the effects on linear

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

and quadratic graphs using technology.

- approximate the solution(x) to a system of equations consisting of a linear and a quadratic function by using technology to graph the functions, by making a table of values and/or by finding successive approximations.

- find the zeros of a polynomial (quadratic and cubic).

- test domain intervals to determine where $f(x)$ is greater than or less than zero.

- use zeros of a function to sketch a graph.

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- [HS-A.SSE Activities](#)
- [HS-A.REI Activities](#)
- [HS-A.CED Activities](#)
- [HS-F.IF Activities](#)
- [HS-F.BF Activities](#)
- [HS-F.LE Activities](#)
- [HS-A.APR Activities](#)

Supplemental resources:

- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- www.desmos.com
- www.kahoot.com
- www.quizizz.com
- <https://www.deltamath.com>
- <https://www.ixl.com/math>
- <https://nj.digitalitemlibrary.com/home>
- <https://www.radicalmath.org/math-social-justice>
- [Alan Turing Gizmos Grades 9-12](#)
- [Polynomial solutions of difference equations](#)

Suggested Accommodations

English Language Learners:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives/Concrete Models
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues
- Visual Models
- Technology Integration

- Hands-On/Experiential Activities
- Native language support when possible
- Sheltered English Instructional Strategies
- Provide additional time

Special Education/Students with Disabilities:

- Extra help opportunities provided
- Credit Recovery
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
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Gifted and Talented:

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- Enriched Assignments
- Tiered Assignments
- Word Problems
- NJSLA questions
- Model Curriculum Questions
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- Interest Based/Choice Activities

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Economically Disadvantaged:

- Pre-teach vocabulary using visuals and gestures
- Chunk texts
- Summarize as you go
- Preview lessons
- Graphic organizers
- Highlight key words
- Sentence starters
- Prompting and cueing
- Activate schema
- Build background knowledge

Culturally Diverse:

- Create pictures, posters, art, books, maps, flags, etc to hang in the classroom.
- Create an emotionally positive classroom climate.
- Bring in guest speakers
- Create effective communication

- Model and teach cultural respect
- Build relationships with students by interviewing students to understand their background

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Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

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Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

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Unit 4: Data	9 days
New Jersey Learning Standards-Mathematics	
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.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.

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

S.ID.B.6.	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
S.ID.B.6.a	Fit a function to the data (including 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, quadratic, and exponential models.
S.ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
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. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>
F.IF.B.5.	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>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.</i>

Standards of Mathematical Practices

MP1. Make sense of problems and persevere in solving them	<ul style="list-style-type: none"> ● Find meaning in problems ● Look for entry points ● Analyze, conjecture and plan solution pathways ● Monitor and adjust ● Verify answers ● Ask themselves the question: “Does this make sense?”
MP2. Reason abstractly and quantitatively.	<ul style="list-style-type: none"> ● Make sense of quantities and their relationships in problems ● Learn to contextualized and decontextualized ● Create coherent representations of problems
MP3. Construct viable arguments and critique the reasoning of others.	<ul style="list-style-type: none"> ● Understand and use information to construct arguments ● Make and explore the truth of conjectures ● Recognize and use counterexamples ● Justify conclusions and respond to arguments of others
MP4. Model with Mathematics.	<ul style="list-style-type: none"> ● Apply mathematics to problems in everyday life ● Make assumptions and approximations ● Identify quantities in a practical situation ● Interpret results in the context of the situation and reflect on whether the results make sense
MP5. Use appropriate tools strategically	<ul style="list-style-type: none"> ● Consider the available tools when solving problems

Lakewood School District Curriculum Guide

Grade: High School	Content Area: Mathematics - Algebra I
---------------------------	--

	<ul style="list-style-type: none"> • Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools) • Make sound decisions of which of these tools might be helpful
MP6. Attend to precision.	<ul style="list-style-type: none"> • Communicate precisely to others • Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes • Calculate accurately and efficiently
MP7. Look for and make use of structure.	<ul style="list-style-type: none"> • Discern patterns and structures • Can step back for an overview and shift perspective • See complicated things as single objects or as being composed of several objects

Social and Emotional Learning Standards	
Self-Awareness	<ul style="list-style-type: none"> • Recognize one’s personal traits, strengths, and limitations • Recognize the importance of self-confidence in handling daily tasks and challenges
Self-Management	<ul style="list-style-type: none"> • Recognize the skills needed to establish and achieve personal and educational goals • Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one’s goals
Social Awareness	<ul style="list-style-type: none"> • Demonstrate an understanding of the need for mutual respect when viewpoints differ
Responsible Decision-Making	<ul style="list-style-type: none"> • Develop, implement and model effective problem solving and critical thinking skills

Interdisciplinary Connections	
	ELA Standards
• SL.AS.9–10.6.	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.
• 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.
	Science Standards
• HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.
• HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

Computer Science & Design Thinking

8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

8.2 Design Thinking

- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 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).

Career Readiness, Life Literacies & Key Skills

9.1 Personal Financial Literacy

- 9.1.5.EG.1: Explain and give examples of what is meant by the term “tax.”
- 9.1.8.FI.4: Analyze the interest rates and fees associated with financial products.
- 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

9.4 Life Literacies & Key Skills

- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

Evidence of Student Learning

Formative Tasks:

- Oral Questioning
- Student Conference
- Self-Assessment
- Hand Signals
- Communicators
- Graphic Organizers
- Teacher Observation
- DOL
- Quiz Classwork
- NJSLA Released questions
- Problem of the Day

Alternative Assessments:

- Teacher-Created Projects
- <https://www.illustrativemathematics.org/>
- <https://www.khanacademy.org/>
- <https://www.engageny.org>

Summative Assessments:

- Unit Tests
- Midterm Exam
- Final Exam

Benchmark Assessments:

- Quarterly Benchmarks
- Beginning/End of Year Assessment
- Unit Common Assessment

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

Knowledge & Skills

Enduring Understandings:

- Data distributions can be described and compared by examining their shape, center, and variability, and different visual displays highlight different aspects of these characteristics.
- Measures such as mean, median, interquartile range, and standard deviation provide important numerical summaries of data, and selecting the appropriate measure depends on the structure and shape of the distribution.
- Outliers can influence measures of center and spread and must be accounted for when interpreting or comparing data sets.
- Two-way frequency tables organize categorical data in a way that allows us to analyze relationships, identify trends, and recognize potential associations between variables.
- Scatter plots reveal patterns in bivariate quantitative data, and mathematical models can be used to describe, predict, and interpret these relationships.
- The quality of a model can be evaluated by analyzing residuals, which show how far predicted values fall from actual data.
- Graphs of functions modeling real-world situations contain key features that carry meaningful interpretations about the quantities involved.

The domain of a function is determined not only by mathematical rules but also by the constraints of the real-world context it represents.

Essential Questions:

- How can different graphical displays (dot plots, histograms, box plots) help us understand the shape, center, and spread of a data set?
- What can measures of center and variability tell us about real-world situations, and how does the shape of a distribution influence which measures are most meaningful?
- How do outliers affect our interpretation of data and the conclusions we draw from it?
- What can joint, marginal, and conditional relative frequencies reveal about the possible association between two categorical variables?
- How can scatter plots help us understand the relationship between two quantitative variables, and when is it appropriate to model that relationship with a linear, quadratic, or exponential function?
- How can residuals help us judge whether a model is a good fit for the data?
- How do key features of a graph (intercepts, intervals of increase or decrease, end behavior) help us interpret and make sense of a real-world situation?
- Why is choosing an appropriate domain critical when modeling real-world phenomena with a function?

Content

Students will know...

- That numerical data can be represented in multiple formats (dot plots, histograms, box plots), and each format highlights different features of a distribution such as shape, center, variability, and outliers.
- That measures of center (mean, median) and measures of spread (interquartile range, standard deviation) are chosen based on the shape and characteristics of the data distribution.

Skills

Students will be able to ...

- represent data with dot plots on the real number line.
- represent data with histograms on the real number line.
- represent data with box plots on the real number line.
- represent two or more data sets with plots and use appropriate statistics to compare their center and spread.

Lakewood School District Curriculum Guide

Grade: High School

Content Area: Mathematics - Algebra I

- That differences in shape, center, and spread between data sets provide meaningful information about real-world contexts, and that outliers can significantly affect these interpretations.
- That two-way frequency tables summarize relationships between two categorical variables and that joint, marginal, and conditional relative frequencies can reveal associations or trends.
- That scatter plots visually represent the relationship between two quantitative variables and that patterns in the data may suggest linear, quadratic, or exponential trends.
- That mathematical models (including linear, quadratic, or exponential functions) can be fit to real-world data, and the appropriateness of a model can be assessed using residuals.
- Key features of graphs representing real-world situations, such as intercepts, intervals of increase or decrease, and end behavior, provide insight into the relationship between variables.
That the domain of a function or model must reflect what values are reasonable in a given real-world context.

- interpret differences in shape, center, and spread in context.
- explain possible effects of extreme data points (outliers) when summarizing data and interpreting shape, center and spread.
- construct two-way frequency tables for categorical data.
- interpret joint, marginal and conditional relative frequencies in context.
- explain possible associations between categorical data in two-way tables.
- identify and describe trends in the data.
- fit a function to data using technology.
- solve problems using functions fitted to data (prediction equations).
- interpret the intercepts of models in context.
- plot residuals of linear and non-linear functions.
- analyze residuals in order to informally evaluate the fit of linear and non-linear functions.

Core Instructional & Supplemental Materials

Suggested Activities/Resources:

- [HS-F.IF Activities](#)
- [HS-S.ID Activities](#)

Supplemental resources:

- <https://www.illustrativemathematics.org/>
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- www.desmos.com
- www.kahoot.com
- www.quizizz.com
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- [Ethnomathematics](#)

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Grade: High School

Content Area: Mathematics - Algebra I

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