2022-2023 Scope and Sequence
Mathematics – Algebraic Reasoning

Course Design

In Algebraic Reasoning, students build on the knowledge and skills for mathematics in Kindergarten-Grade 8 and Algebra I, continue with the development of mathematical reasoning related to algebraic understandings and processes, and deepen a foundation for studies in subsequent mathematics courses. Students will broaden their knowledge of functions and relationships, including linear, quadratic, square root, rational, cubic, cube root, exponential, absolute value, and logarithmic functions. Students study these functions through analysis and application that includes explorations of patterns and structure, number and algebraic methods, and modeling from data using tools that build to workforce and college readiness such as probes, measurement tools, and software tools, including spreadsheets.
Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

The prerequisite for enrollment in Algebraic Reasoning is Algebra I.

Cycle 1	**29 Days** Aug. 22-Sept. 30, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		The Mathematical Process Standards are integrated throughout the course in all activities and lessons. Teachers should refer to these standards for instructional strategies and depth of rigor. Specific process standards have been highlighted for each unit, but these process standards should not be the only process standards associated with the daily lessons. **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: Ⓟⓢ **ALGR.1A** Apply mathematics to problems arising in everyday life, society, and the workplace. Ⓟⓢ **ALGR.1B** Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Ⓟⓢ **ALGR.1C** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems. Ⓟⓢ **ALGR.1D** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate. Ⓟⓢ **ALGR.1E** Create and use representations to organize, record, and communicate mathematical ideas. Ⓟⓢ **ALGR.1F** Analyze mathematical relationships to connect and communicate mathematical ideas. Ⓟⓢ **ALGR.1G** Display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 1: Linear Functions Students identify a linear function from its finite differences and write the function rule. Students will analyze and identify attributes of linear functions in context of graphical, tabular, symbolic, and real-world models.	**8** class periods (90-min. each) or **16** class periods (45-min. each) *Teachers Report to Campuses Aug. 8* *Teacher Service Days Aug. 8-12, Aug. 16-19* *Teacher Prep Day (no students) Aug. 15* *Labor Day Sept. 5*	**Patterns and Structure.** The student applies mathematical processes to connect finite differences or common ratios to attributes of functions. The student is expected to: • **ALGR.2A Determine the patterns that identify the relationship between a function and its common ratio or related finite differences as appropriate**, **including linear**, quadratic, cubic, and exponential functions. • **ALGR.2B Classify a function as linear**, quadratic, cubic, and exponential **when a function is represented tabularly using finite differences or common ratios as appropriate.** • **ALGR.2C** Determine the function that models a given table of related values using finite differences and its restricted domain and range. **Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function ***f(x) = x***, $f(x) = x^2$ $f(x) = \sqrt{x}, f(x) = \frac{1}{x}, f(x) = x^3, f(x) = \sqrt[3]{x}, f(x) = b^x, f(x) = \lvert x \rvert, f(x) = \log_b x,$ where *b* is 10 or *e*; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3B Compare and contrast the key attributes of a function and its inverse when it exists**, **including domain**, **range**, maxima, minima, **and intercepts, tabularly, graphically, and symbolically.** • **ALGR.3C Verify that two functions are inverses of each other tabularly and graphically** such as situations involving compound interest and interest rate, velocity and braking distance, and **Fahrenheit-Celsius conversions**. • **ALGR.3D Represent a resulting function tabularly, graphically, and symbolically when functions are combined or separated using arithmetic operations** such as combining a 20% discount and a 6% sales tax on a sale to determine $h(x)$, the total sale, *f(x) = 0.8x, g(x) = 0.06(0.8x),* and *h(x) = f(x) + g(x).* • **ALGR.3E** Model a situation using function notation when the output of one function is the input of a second function such as determining a function for *h(x) = g(f(x)) = 1.06(0.8x)* the final purchase price, *h(x)* of an item with price *x* dollars representing a 20% discount, *f(x) = 0.8x* followed by a 6% sales tax, *g(x) = 1.06x*. • **ALGR.3F Compare and contrast a function and possible functions that can be used to build it tabularly, graphically, and symbolically** such as a quadratic function that results from multiplying two linear functions **Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function**, including quadratic, rational, and exponential functions.

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Cycle 1	29 Days Aug. 22-Sept. 30, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		Modeling from Data. The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7B Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including linear**, quadratic, exponential, and rational **functions**. • **ALGR.7D Determine an appropriate function model, including linear**, quadratic, and exponential **functions, for a set of data arising from real-world situations using finite differences and average rates of change.** • **ALGR.7E** Determine if a given linear function is a reasonable model for a set of data arising from a real-world situation.
Unit 2: Absolute Value Functions Students identifies and analyze attributes of absolute value functions in context of graphical, tabular, symbolic, and real-world models. (continues in cycle 2)	**6** class periods (90-min. each) or **12** class periods (45-min. each)	**Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, $f(x) = x$, $f(x) = x^2$ $f(x) = \sqrt{x}$, $f(x) = \frac{1}{x}$, $f(x) = x^3$, $f(x) = \sqrt[3]{x}$, $f(x) = b^x$, $\mathbf{f(x) = \lvert x \rvert}$, $f(x) = \log_b x$, where b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3A Compare and contrast the key attributes, including domain, range, maxima, minima, and intercepts, of a set of functions such as** a set comprised of a linear, a quadratic, and an exponential function or **a set comprised of an absolute value**, a quadratic, and a square root **function tabularly, graphically, and symbolically.** • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically. • **ALGR.3C Verify that two functions are inverses of each other tabularly and graphically** such as situations involving compound interest and interest rate, velocity and braking distance, and Fahrenheit-Celsius conversions. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation.

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Cycle 2	23 Days Oct. 3 - Nov. 4, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs) The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 2: Absolute Value Functions Students identifies and analyze attributes of absolute value functions in context of graphical, tabular, symbolic, and real-world models. (continued from cycle 1)	**6** class periods (90-min. each) or **12** class periods (45-min. each)	**Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, $f(x) = x$, $f(x) = x^2$ $f(x) = \sqrt{x}, f(x) = \frac{1}{x}, f(x) = x^3, f(x) = \sqrt[3]{x}, f(x) = b^x,$ **$f(x) = \lvert x \rvert$,** $f(x) = \log_b x,$ where b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3A Compare and contrast the key attributes, including domain, range, maxima, minima, and intercepts, of a set of functions such as** a set comprised of a linear, a quadratic, and an exponential function or **a set comprised of an absolute value**, a quadratic, and a square root **function tabularly, graphically, and symbolically.** • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically. • **ALGR.3C Verify that two functions are inverses of each other tabularly and graphically** such as situations involving compound interest and interest rate, velocity and braking distance, and Fahrenheit-Celsius conversions. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation.
Unit 3: Matrices and Systems of Linear Equations Students perform operations on matrices and solve systems of equations of two- and three-variable equations in context of mathematical and real-world situations using matrices. (continues in cycle 3)	**8** class periods (90-min. each) or **16** class periods (45-min. each)	**Number and Algebraic Methods.** The student applies mathematical processes to represent, simplify, and perform operations on matrices and to solve systems of equations using matrices. The student is expected to: • **ALGR.5A** Add and subtract matrices. • **ALGR.5B** Multiply matrices. • **ALGR.5C** Multiply matrices by a scalar. • **ALGR.5D** Represent and solve systems of two linear equations arising from mathematical and real-world situations using matrices. • **ALGR.5E** Represent and solve systems of three linear equations arising from mathematical and real-world situations using matrices and technology. **Modeling from Data**. The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7D Determine an appropriate function model, including linear**, quadratic, and exponential functions, **for a set of data arising from real-world situations using finite differences and average rates of change.** • **ALGR.7E** Determine if a given linear function is a reasonable model for a set of data arising from a real-world situation.

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Cycle 3	28 Days Nov. 7-Dec. 21, 2022	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 3: Matrices and Systems of Linear Equations Students perform operations on matrices and solve systems of equations of two- and three-variable equations in context of mathematical and real-world situations using matrices. (continued from cycle 2)	**8** class periods (90-min. each) or **16** class periods (45-min. each) *Thanksgiving Break* *Nov. 21-25* *Winter Break (students)* *Dec. 22 - Jan. 6* *Winter Break (teachers)* *Dec. 22 - Jan. 4*	**Number and Algebraic Methods.** The student applies mathematical processes to represent, simplify, and perform operations on matrices and to solve systems of equations using matrices. The student is expected to: • **ALGR.5A** Add and subtract matrices. • **ALGR.5B** Multiply matrices. • **ALGR.5C** Multiply matrices by a scalar. • **ALGR.5D** Represent and solve systems of two linear equations arising from mathematical and real-world situations using matrices. • **ALGR.5E** Represent and solve systems of three linear equations arising from mathematical and real-world situations using matrices and technology. **Modeling from Data**. The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7D Determine an appropriate function model, including linear**, quadratic, and exponential functions, **for a set of data arising from real-world situations using finite differences and average rates of change.** • **ALGR.7E** Determine if a given linear function is a reasonable model for a set of data arising from a real-world situation.
Unit 4: Quadratic Functions Students identify a quadratic function from its finite differences and write the function rule. Students will analyze and identify attributes of quadratic functions in context of graphical, tabular, symbolic, and real-world models.	**9** class periods (90-min. each) or **18** class periods (45-min. each)	**Patterns and Structure.** The student applies mathematical processes to connect finite differences or common ratios to attributes of functions. The student is expected to: • **ALGR.2A Determine the patterns that identify the relationship between a function and its common ratio or related finite differences as appropriate**, **including** linear, **quadratic**, cubic, and exponential functions. • **ALGR.2B Classify a function as** linear, **quadratic**, cubic, and exponential **when a function is represented tabularly using finite differences or common ratios as appropriate.** **Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, $f(x) = x$, $\mathbf{f(x) = x^2}$ $f(x)=\sqrt{x}, f(x)=\frac{1}{x}, f(x)=x^3, f(x)=\sqrt[3]{x}, f(x)=b^x, f(x)=\lvert x \rvert, f(x)=\log_b x,$ where b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3A Compare and contrast the key attributes, including domain, range, maxima, minima, and intercepts, of a set of functions such as** a set comprised of a linear, **a quadratic**, and an exponential function or a set comprised of an absolute value, **a quadratic**, and a square root function **tabularly, graphically, and symbolically.** • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically.

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Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		• **ALGR.3F** Compare and contrast a function and possible functions that can be used to build it tabularly, graphically, and symbolically such as a quadratic function that results from multiplying two linear functions. **Number and Algebraic Methods.** The student applies mathematical processes to simplify and perform operations on functions represented in a variety of ways, including real-world situations. The student is expected to: • **ALGR.4A** Connect tabular representations to symbolic representations when adding, subtracting, and multiplying polynomial functions arising from mathematical and real-world situations such as applications involving surface area and volume. • **ALGR.4B Compare and contrast the results when** adding two linear functions **and multiplying two linear functions that are represented tabularly, graphically, and symbolically.** • **ALGR.4D Determine the linear factors of a polynomial function of degree two** and of degree three **when represented symbolically and tabularly and graphically where appropriate.** **Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function**, including **quadratic**, rational, and exponential **functions**. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7B Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including** linear, **quadratic**, exponential, and rational **functions**. • **ALGR.7C** Determine the accuracy of a prediction from a function that models a set of data compared to the actual data using comparisons between average rates of change and finite differences such as gathering data from an emptying tank and comparing the average rate of change of the volume or the second differences in the volume to key attributes of the given model. • **ALGR.7D Determine an appropriate function model, including** linear, **quadratic**, and exponential **functions**, **for a set of data arising from real-world situations using finite differences and average rates of change.**

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Cycle 4	33 Days Jan. 9 - Feb. 24, 2023	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs) The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 5: Cubic Functions Students identify a cubic function from its finite differences and write the function rule. Students will analyze and identify attributes of cubic functions in context of graphical, tabular, symbolic, and real-world models.	**8** class periods (90-min. each) or **16** class periods (45-min. each) *Winter Break (students) Dec. 22 - Jan. 6* *Winter Break (teachers) Dec. 22 - Jan. 4* *MLK Jr. Day Jan. 16* *Teacher Prep Day (no students) Jan. 5* *Teacher Service Day (no students) Jan. 6* *Teacher Service Day (no students) Feb. 20*	**Patterns and Structure.** The student applies mathematical processes to connect finite differences or common ratios to attributes of functions. The student is expected to: • **ALGR.2A Determine the patterns that identify the relationship between a function and its common ratio or related finite differences as appropriate**, **including** linear, quadratic, **cubic**, and exponential **functions**. • **ALGR.2B Classify a function as** linear, quadratic, **cubic**, and exponential **when a function is represented tabularly using finite differences or common ratios as appropriate.** • **ALGR.2C** Determine the function that models a given table of related values using finite differences and its restricted domain and range. • **ALGR.2D** Determine a function that models real-world data and mathematical contexts using finite differences such as the age of a tree and its circumference, figurative numbers, average velocity, and average acceleration. **Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function $f(x) = x$, $f(x) = x^2$ $f(x) = \sqrt{x}, f(x) = \frac{1}{x}, f(x) = x^3, \mathbf{f(x) = \sqrt[3]{x}}, f(x) = b^x, f(x) = \lvert x \rvert, f(x) = \log_b x,$ here b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically**.** • **ALGR.3F** Compare and contrast a function and possible functions that can be used to build it tabularly, graphically, and symbolically such as a quadratic function that results from multiplying two linear functions. **Number and Algebraic Methods.** The student applies mathematical processes to simplify and perform operations on functions represented in a variety of ways, including real-world situations. The student is expected to: • **ALGR.4A** Connect tabular representations to symbolic representations when adding, subtracting, and multiplying polynomial functions arising from mathematical and real-world situations such as applications involving surface area and volume. • **ALGR.4B Compare and contrast the results when** adding two linear functions **and multiplying two linear functions that are represented tabularly, graphically, and symbolically.** • **ALGR.4C Determine the quotient of a polynomial function of degree three** and of degree four **when divided by a polynomial function of degree one and of degree two when represented tabularly and symbolically.** • **ALGR.4D Determine the linear factors of a polynomial function** of degree two and **of degree three when represented symbolically and tabularly and graphically where appropriate.**

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Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		Number and Algebraic Methods. The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function**, including quadratic, rational, and exponential functions. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7C** Determine the accuracy of a prediction from a function that models a set of data compared to the actual data using comparisons between average rates of change and finite differences such as gathering data from an emptying tank and comparing the average rate of change of the volume or the second differences in the volume to key attributes of the given model.

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Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 6: Square- and Cube-Root Functions Students identify a square-root and cube-root function from its finite differences and define their relationship to quadratic and cubic functions. Students will analyze and identify attributes of square-root and cube-root functions in context of graphical, tabular, symbolic, and real-world models.	**5** class periods (90-min. each) or **10** class periods (45-min. each)	**Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function $f(x) = x$, $f(x) = x^2$ $\boldsymbol{f(x) = \sqrt{x}}$, $f(x) = \frac{1}{x}$, $f(x) = x^3$, $\boldsymbol{f(x) = \sqrt[3]{x}}$, $f(x) = b^x$, $f(x) = \lvert x \rvert$, $f(x) = \log_b x$, where b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3A Compare and contrast the key attributes, including domain, range**, **maxima**, **minima**, **and intercepts, of a set of functions such as** a set comprised of a linear**,** a quadratic, and an exponential function or a set comprised of an absolute value, a quadratic, and a **square root function tabularly, graphically, and symbolically.** • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically. • **ALGR.3C Verify that two functions are inverses of each other tabularly and graphically** such as situations involving compound interest and interest rate, velocity and braking distance, and Fahrenheit-Celsius conversions. **Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6C Approximate solutions to equations arising from questions asked about** exponential, logarithmic, **square root**, and cubic **functions that model real-world applications tabularly and graphically.** **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation.

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Cycle 5	28 Days Feb. 27 - Apr. 14, 2023	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*

Unit	# Class Periods	Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs) The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 7: Exponential and Logarithmic Functions Students identify an exponential function from its common ratio and write a function rule. Students will analyze and identify attributes of exponential and logarithmic functions in context of graphical, tabular, symbolic, and real-world models.	**7** class periods (90-min. each) or **14** class periods (45-min. each) *Spring Break* *Mar. 13-17* *Chávez-Huerta Day* *Mar. 31* *Spring Holiday* *Apr. 7*	**Patterns and Structure.** The student applies mathematical processes to connect finite differences or common ratios to attributes of functions. The student is expected to: • **ALGR.2A Determine the patterns that identify the relationship between a function and its common ratio or related finite differences as appropriate**, **including** linear, quadratic, cubic, and **exponential functions.** • **ALGR.2B Classify a function as** linear, quadratic, cubic, and **exponential when a function is represented tabularly using finite differences or common ratios as appropriate.** **Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function, $f(x) = x$, $f(x) = x^2$ $f(x) = \sqrt{x}, f(x) = \frac{1}{x}, f(x) = x^3, f(x) = \sqrt[3]{x}$, $\mathbf{f(x) = b^x}, f(x) = \lvert x \rvert$, $\mathbf{f(x) = log_b x}$, **where *b* is 10 or *e***; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3A Compare and contrast the key attributes, including domain, range**, **maxima**, **minima**, **and intercepts, of a set of functions such as** a set comprised of a linear**,** a quadratic, and **an exponential function** or a set comprised of an absolute value, a quadratic, and a square root function **tabularly, graphically, and symbolically.** • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically. • **ALGR.3C Verify that two functions are inverses of each other tabularly and graphically** such as situations involving compound interest and interest rate, velocity and braking distance, and Fahrenheit-Celsius conversions. **Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function, including** quadratic, rational, and **exponential functions.** • **ALGR.6C Approximate solutions to equations arising from questions asked about exponential**, **logarithmic**, square root, and cubic **functions that model real-world applications tabularly and graphically.** **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation.

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Cycle 5	28 Days Feb. 27 - Apr. 14, 2023	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		• **ALGR.7B Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including** linear, quadratic, **exponential**, and rational **functions**. • **ALGR.7D Determine an appropriate function model, including** linear, quadratic, and **exponential functions**, **for a set of data arising from real-world situations using finite differences and average rates of change.**
Unit 8: Rational Functions Students analyze and predict reasonable input and output values for rational functions in real-world situations. (continues in cycle 5)	**7** class periods (90-min. each) or **14** class periods (45-min. each)	**Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function**, including quadratic, **rational**, and exponential **functions**. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7B Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including** linear, quadratic, exponential, and **rational functions.**

2022-2023 Scope and Sequence
Mathematics – Algebraic Reasoning

Cycle 6	31 Days Apr. 17 - May 31, 2023	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
Unit 8: Rational Functions Students analyze and predict reasonable input and output values for rational functions in real-world situations. (continued from cycle 5)	**7** class periods (90-min. each) or **14** class periods (45-min. each) *Spring Holiday* *April 21* *Memorial Day* *May 29* *Teacher Prep Day (no students)* *June 1*	**Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6A Estimate a reasonable input value that results in a given output value for a given function**, including quadratic, **rational**, and exponential **functions**. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7B Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including** linear, quadratic, exponential, and **rational functions.**
Unit 9: Analyzing Real-World Models Students analyze and model data based on real-world situations with corresponding functions.	**9** class periods (90-min. each) or **18** class periods (45-min. each)	**Patterns and Structure.** The student applies mathematical processes to connect finite differences or common ratios to attributes of functions. The student is expected to: • **ALGR.2D** Determine a function that models real-world data and mathematical contexts using finite differences such as the age of a tree and its circumference, figurative numbers, average velocity, and average acceleration. **Patterns and Structure.** The student applies mathematical processes to understand the connections among representations of functions and combinations of functions, including the constant function $f(x) = x$, $f(x) = x^2$, $f(x) = \sqrt{x}, f(x) = \frac{1}{x}, f(x) = x^3, f(x) = \sqrt[3]{x}, f(x) = b^x, f(x) = \lvert x \rvert, f(x) = log_b x$, where b is 10 or e; functions and their inverses; and key attributes of these functions. The student is expected to: • **ALGR.3B** Compare and contrast the key attributes of a function and its inverse when it exists, including domain, range, maxima, minima, and intercepts, tabularly, graphically, and symbolically. • **ALGR.3C** Verify that two functions are inverses of each other tabularly and graphically such as situations involving compound interest and interest rate, velocity and braking distance, and Fahrenheit-Celsius conversions. • **ALGR.3D** Represent a resulting function tabularly, graphically, and symbolically when functions are combined or separated using arithmetic operations such as combining a 20% discount and a 6% sales tax on a sale to determine $h(x)$, the total sale, $f(x) = 0.8x$, $g(x) = 0.06(0.8x)$ and $h(x) = f(x) + g(x)$. • **ALGR.3E** Model a situation using function notation when the output of one function is the input of a second function such as determining a function $h(x) = g(f(x)) = 1.06(0.8x)$ for the final purchase price, $h(x)$ of an item with

Cycle 6	31 Days Apr. 17 - May 31, 2023	*The recommended number of class periods is less than the number of days in the grading cycle to accommodate differentiated instruction, extended learning time, and assessment days. Complete instructional planning information and support are in the HISD Curriculum documents.*
Unit	**# Class Periods**	**Texas Essential Knowledge and Skills/Student Expectations (TEKS/SEs)** The **bold face** words in the TEKS SEs indicate concepts addressed specially in this unit, the unbolded concepts are addressed in other units of this course. **The student will:**
		price *x* dSollars representing a 20% discount, $f(x) = 0.8x$ followed by a 6% sales tax, $g(x) = 1.06x$. **Number and Algebraic Methods.** The student applies mathematical processes to represent, simplify, and perform operations on matrices and to solve systems of equations using matrices. The student is expected to: • **ALGR.5D** Represent and solve systems of two linear equations arising from mathematical and real-world situations using matrices. • **ALGR.5E** Represent and solve systems of three linear equations arising from mathematical and real-world situations using matrices and technology. **Number and Algebraic Methods.** The student applies mathematical processes to estimate and determine solutions to equations resulting from functions and real-world applications with fluency. The student is expected to: • **ALGR.6B** Solve equations arising from questions asked about functions that model real-world applications, including linear and quadratic functions, tabularly, graphically, and symbolically. • **ALGR.6C** Approximate solutions to equations arising from questions asked about exponential, logarithmic, square root, and cubic functions that model real-world applications tabularly and graphically. **Modeling from Data.** The student applies mathematical processes to analyze and model data based on real-world situations with corresponding functions. The student is expected to: • **ALGR.7A** Represent domain and range of a function using interval notation, inequalities, and set (builder) notation. • **ALGR.7B** Compare and contrast between the mathematical and reasonable domain and range of functions modeling real-world situations, including linear, quadratic, exponential, and rational functions. • **ALGR.7C** Determine the accuracy of a prediction from a function that models a set of data compared to the actual data using comparisons between average rates of change and finite differences such as gathering data from an emptying tank and comparing the average rate of change of the volume or the second differences in the volume to key attributes of the given model. • **ALGR.7D** Determine an appropriate function model, including linear, quadratic, and exponential functions, for a set of data arising from real-world situations using finite differences and average rates of change. • **ALGR.7E** Determine if a given linear function is a reasonable model for a set of data arising from a real-world situation.