Course Title:	Content Area:	Grade Level:	Credit (if applicable)
Algebra 2	**Mathematics**	**10-12**	**1.0**

Course Description:

Students begin the course with a study of sequences, which is also an opportunity to revisit linear and exponential functions. Students represent functions in a variety of ways while addressing some aspects of mathematical modeling. This work leads to looking at situations that are well modeled by polynomials before pivoting to a study of the structure of polynomial graphs and expressions. Students do arithmetic on polynomials and rational functions and use different forms to identify asymptotes and end behavior. Students also study polynomial identities and use some key identities to establish the formula for the sum of the first terms of a geometric sequence.

Next, students extend exponent rules to include rational exponents. They solve equations involving square and cube roots before developing the idea of a number whose square is , expanding the number system to include complex numbers. This allows them to solve quadratic equations with non-real solutions.

Building on rational exponents, students return to their study of exponential functions and establish that the property of growth by equal factors over equal intervals holds even when the interval has non-integer length. They use logarithms to solve for unknown exponents, and are introduced to the number and its use in modeling continuous growth. Logarithm functions and some situations they model well are also briefly addressed.

Students learn to transform functions graphically and algebraically. In previous courses and units, students adjusted the parameters of particular types of models to fit data. Here, they consolidate and generalize this understanding. This work is useful in the study of periodic functions that come next. Students work with the unit circle to make sense of trigonometric functions and use those functions to model periodic relationships.

Within the classroom activities, students have opportunities to engage in aspects of mathematical modeling. Additionally, modeling prompts are provided for use throughout the course. Modeling prompts offer opportunities for students to engage in the full modeling cycle. These can be implemented in a variety of ways. Please see the course guide for a more detailed explanation of modeling prompts.

Aligned Core Resources:	**Connection to the BPS Vision of the Graduate**
Illustrative Mathematics Algebra 1 & 2	**Content Mastery** • Develop and draw from a baseline understanding of • knowledge in academic disciplines from our Bristol curriculum **Critical Thinking and Problem Solving** • Collect, assess and analyze relevant information • Reason effectively. Use systems thinking • Make sound judgments and decisions. Identify, define and solve authentic problems and essential questions. • Reflect critically on learning experience, processes and solutions • Transfer knowledge to other situations
Additional Course Information: ***Knowledge/Skill Dependent courses/prerequisites***	**Link to Completed Equity Audit**
Algebra 1 Statistics & Geometry	

Standard Matrix

Standards	Aligned Lessons
HSA-APR.A	Alg2.2.6, Alg2.2.12, Alg2.2.13, Alg2.2.14
HSA-APR.A.1	Alg2.2.2, Alg2.2.4, Alg2.2.6
HSA-APR.B	Alg2.2.5, Alg2.2.6, Alg2.2.7, Alg2.2.14
HSA-APR.B.2	Alg2.2.15
HSA-APR.B.3	Alg2.2.5, Alg2.2.10, Alg2.2.12, Alg2.2.14
HSA-APR.C	Alg2.2.25
HSA-APR.C.4	Alg2.2.23, Alg2.2.24
HSA-APR.D	Alg2.2.24
HSA-APR.D.6	Alg2.2.18, Alg2.2.19
HSA-CED.A.1	Alg2.2.20, Alg2.2.21
HSA-CED.A.2	Alg2.2.1, Alg2.2.2, Alg2.2.16, Alg2.2.17, Alg2.2.20
HSA-CED.A.4	Alg2.2.16
HSA-REI.A.1	Alg2.2.20, Alg2.2.21, Alg2.3.7
HSA-REI.A.2	Alg2.2.22, Alg2.3.6, Alg2.3.7, Alg2.3.8, Alg2.3.9
HSA-REI.B.4	Alg2.3.18
HSA-REI.B.4.a	Alg2.3.16
HSA-REI.B.4.b	Alg2.3.7, Alg2.3.16, Alg2.3.17, Alg2.3.19
HSA-REI.C.7	Alg2.2.11
HSA-REI.D.11	Alg2.2.2, Alg2.2.11, Alg2.2.21, Alg2.3.8, Alg2.3.17, Alg2.4.15, Alg2.4.16
HSA-SSE.A	Alg2.2.3, Alg2.2.8, Alg2.2.9, Alg2.4.5
HSA-SSE.A.1	Alg2.2.2, Alg2.2.18, Alg2.2.19, Alg2.2.26, Alg2.4.2, Alg2.4.4, Alg2.4.6, Alg2.4.7
HSA-SSE.A.1.a	Alg2.2.1, Alg2.2.7
HSA-SSE.A.1.b	Alg2.4.13
HSA-SSE.A.2	Alg2.2.23, Alg2.2.25
HSA-SSE.B.3	Alg2.2.6, Alg2.4.7, Alg2.4.10
HSA-SSE.B.3.c	Alg2.4.4
HSA-SSE.B.4	Alg2.2.25, Alg2.2.26
HSF-BF.A.1	Alg2.5.7
HSF-BF.A.1.a	Alg2.1.11, Alg2.4.8
HSF-BF.A.1.b	Alg2.5.10, Alg2.5.11

HSF-BF.A.2	Alg2.1.5, Alg2.1.6, Alg2.1.7, Alg2.1.8, Alg2.1.9, Alg2.1.10, Alg2.1.11
HSF-BF.B.3	Alg2.5.1, Alg2.5.2, Alg2.5.3, Alg2.5.4, Alg2.5.5, Alg2.5.6, Alg2.5.7, Alg2.5.8, Alg2.5.9, Alg2.5.11, Alg2.6.15, Alg2.6.17
HSF-IF.A.2	Alg2.2.2, Alg2.4.12
HSF-IF.A.3	Alg2.1.5, Alg2.1.7, Alg2.1.9
HSF-IF.B.4	Alg2.2.1, Alg2.2.17, Alg2.4.18, Alg2.5.11, Alg2.6.8, Alg2.6.15, Alg2.6.18
HSF-IF.B.5	Alg2.1.9, Alg2.2.1
HSF-IF.C	Alg2.1.3, Alg2.1.4, Alg2.1.6, Alg2.2.9, Alg2.2.17, Alg2.2.18, Alg2.4.17, Alg2.5.5, Alg2.5.10, Alg2.6.8
HSF-IF.C.7	Alg2.2.3, Alg2.2.17, Alg2.4.13, Alg2.6.9, Alg2.6.12
HSF-IF.C.7.c	Alg2.2.10
HSF-IF.C.7.e	Alg2.4.15, Alg2.4.17, Alg2.6.13, Alg2.6.14, Alg2.6.15, Alg2.6.16, Alg2.6.17, Alg2.6.18, Alg2.6.19
HSF-IF.C.8	Alg2.5.6
HSF-IF.C.8.b	Alg2.4.6
HSF-LE.A	Alg 2.4.13
HSF-LE.A.1.a	Alg2.4.5
HSF-LE.A.1.b	Alg2.4.1, Alg2.4.5
HSF-LE.A.1.c	Alg2.4.1
HSF-LE.A.2	Alg 2.1.5, Alg2.1.6, Alg2.1.7, Alg2.1.8, Alg 2.1.9, Alg 2.1.10, Alg2.4.1, Alg 2.4.2, Alg 2.4.3, Alg 2.4.4, Alg2.4.6
HSF-LE.A.4	Alg 2.4.9, Alg2.4.10, Alg 2.4.11, Alg 2.4.14, Alg2.4.15, Alg2.4.16, Alg2.4.17, Alg2.4.18
HSF-LE.B	Alg2.5.11
HSF-LE.B.5	Alg 2.4.2, Alg2.4.7, Alg 2.4.12, Alg 2.4.13, Alg2.4.15
HSF-TF.A	Alg2.6.3, Alg2.6.4, Alg2.6.5, Alg2.6.9
HSF-TF.A.1	Alg2.6.3, Alg2.6.4, Alg2.6.18
HSF-TF.A.2	Alg2.6.5, Alg2.6.6, Alg2.6.10, Alg2.6.11, Alg2.6.12
HSF-TF.B	Alg2.6.7, Alg2.6.14, Alg2.6.16, Alg2.6.19
HSF-TF.B.5	Alg2.6.13, Alg2.6.18, Alg2.6.19
HSF-TF.C.8	Alg2.6.5, Alg2.6.6
HSG-GPE.B.7	Alg2.7.6
HSN-CN.A.1	Alg2.3.10, Alg2.3.11, Alg2.3.12, Alg2.3.13, Alg 2.3.14
HSN-CN.A.2	Alg2.3.12, Alg2.3.13, Alg 2.3.14, Alg2.3.15

HSN-CN.C.7	Alg2.3.17, Alg2.3.18, Alg2.3.19
HSN-Q.A.1	Alg2.6.18
HSN-RN.A.1	Alg2.3.3, Alg 2.3.4, Alg2.3.5, Alg 2.4.3, Alg2.4.6, Alg2.4.7
HSN-RN.A.2	Alg2.3.3, Alg 2.3.4, Alg2.3.5
HSS-IC.A.1	Alg2.7.3
HSS-IC.A.2	Alg2.7.8
HSS-IC.B.3	Alg2.7.1, Alg2.7.2, Alg2.7.3, Alg2.7.13
HSS-IC.B.4	Alg 2.7.9, Alg2.7.10, Alg2.7.11, Alg2.7.12
HSS-IC.B.5	Alg2.7.13, Alg2.7.14, Alg2.7.15, Alg2.7.16
HSS-IC.B.6	Alg2.7.1, Alg2.7.2, Alg2.7.13
HSS-ID.A.1	Alg2.7.4, Alg2.7.5, Alg2.7.6
HSS-ID.A.2	Alg2.7.4, Alg2.7.5
HSS-ID.A.4	Alg2.7.6, Alg 2.7.7, Alg2.7.14, Alg2.7.15
HSS-ID.B.6.a	Alg2.5.7, Alg2.5.8, Alg2.5.11

Unit Links

A2.1 Sequences & Functions
Alg1 Unit 6 Introduction to Quadratic Functions (Academic Only)
A1.7 Quadratic Equations
A2.2 Polynomials and Rational Functions
A2.3 Complex Numbers and Rational Exponents
A2.4 Exponential Function
A2.5 Transformations of Functions (Accelerated Only)
A2.6 Trigonometric Functions (Accelerated Only)

Unit Title:

A2.1 Sequences & Functions

Relevant Standards: Bold indicates priority

Standards	Aligned Lessons
Alg2.1.1	HSF-BF.A.1.a, HSF-BF.A.2
Alg2.1.2	HSF-BF.A.2, HSF-LE.A.2
Alg2.1.3	HSF-BF.A.2, HSF-IF.A.3, HSF-IF.C, HSF-LE.A.2
Alg2.1.4	HSF-IF.C
Alg2.1.5	HSF-BF.A.2, HSF-IF.A.3, HSF-LE.A.2
Alg2.1.6	HSF-BF.A.2, HSF-IF.C, HSF-LE.A.2
Alg2.1.7	HSF-BF.A.2, HSF-IF.A.3, HSF-LE.A.2
Alg2.1.8	HSF-BF.A.2, HSF-LE.A.2
Alg2.1.9	HSF-BF.A.2, HSF-IF.A.3, HSF-IF.B.5, HSF-LE.A.2
Alg2.1.10	HSF-BF.A.2, HSF-LE.A.2
Alg2.1.11	HSA-SSE.B.4, HSF-BF.A.1.a, HSF-BF.A.2

Unit Narrative

This unit provides an opportunity to revisit representations of functions (including graphs, tables, and expressions) at the beginning of the Algebra 2 course, and also introduces the concept of sequences. Through many concrete examples, students learn to identify geometric and arithmetic sequences. Beginning with an invitation to describe sequences informally, students progress to writing terms of sequences arising from mathematical situations, using representations such as tables and graphs. They progress to using function notation to define sequences recursively and then explicitly for the n^{th} term. Throughout the unit, students learn that sequences are functions and that geometric and arithmetic sequences are examples of the exponential and linear functions they learned about in previous courses, defined on a subset of the integers. In the last part of the unit, students use sequences to model several situations represented in different ways. Finally, students encounter some situations where it makes sense to compute the sum of a finite sequence. A formula for such a sum is developed in a future unit.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1-Lesson 3 • CFA 2-Lesson 5 • CFA 3-Lesson 9 • EoU	7 Blocks (includes 1.5 blocks for review/flex)
Family Overview (link below)	**Integration of Technology:**
Sequences and Functions	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology**

	(beyond core resources):
Arithmetic sequence; geometric sequence; sequence; term	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 1 Unit 5	Algebra 2, Unit 2
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An EL can determine the meaning of words and phrases in oral presentations and literary and informational text.	See italicized targets below.

Lesson Sequence	Learning Target	Success Criteria/Assessment/Resources
1 *(lessons 1)*	• I can give an example of a sequence.	• I can comprehend the term "sequence" as a list of numbers. • I can describe (orally) a recursive rule for identifying the next term of a simple sequence. • I can generate a sequence that arises from a mathematical context.
2 *(lessons 2-7)*	• I can find missing terms in a geometric sequence (L2). • *I can explain what it means for a sequence to be arithmetic or geometric (L3).* • I can use a spreadsheet to create many terms of a sequence (L4). • I can use technology to graph a sequence (L4). • *I can define arithmetic and geometric sequences recursively using function notation (L5).* • I can represent a sequence in different ways (L6).	• CFA1: Lesson 3 Cool Down • CFA 2: Lesson 5 Cool Down

	• *I can ask questions to get the information needed to represent a sequence in different ways (7).*	
3 *(lessons 8-11)*	• *I can explain why different equations can represent the same sequence (L8).* • I can represent situations with sequences (L9). • I can define a sequence using an equation(L10). • I can determine the sum of a sequence representing a situation (L11).	• CFA 3: Lesson 9 Cool Down

Unit Title:

Alg1 Unit 6 Introduction to Quadratic Functions *(Academic Only)*

Unit Story (video)-From iM Hub

Relevant Standards:

Standards	Aligned Lessons
Alg1.6.1	HSF-BF.A.1.a, HSF-LE.A
Alg1.6.2	HSA-SSE.A.1, HSA-SSE.B.3, HSF-BF.A.1.a
Alg1.6.3	HSA-SSE.A.1, HSF-BF.A.1.a, HSF-IF.A.2
Alg1.6.4	HSF-BF.A.1.a, HSF-IF.C, HSF-LE.A.3
Alg1.6.5	HSF-BF.A.1, HSF-BF.A.1.a, HSF-IF.A.2
Alg1.6.6	HSF-BF.A.1, HSF-BF.A.1.a, HSF-IF.B.5, HSF-IF.C, HSF-IF.C.7.a
Alg1.6.7	HSF-BF.A.1.a, HSF-IF.B.5, HSF-IF.C.7.a
Alg1.6.8	HSA-SSE.A, HSA-SSE.A.2, HSA-SSE.B.3, HSF-IF.C.8
Alg1.6.9	HSA-SSE.A.2, HSA-SSE.B.3, HSF-IF.C.8
Alg1.6.10	HSA-SSE.B.3
Alg1.6.11	HSA-SSE.A, HSF-IF.C.7.a
Alg1.6.12	HSF-BF.B.3, HSF-IF.C, HSF-IF.C.7, HSF-LE.A.2
Alg1.6.13	HSA-SSE.B.3, HSF-BF.B.3, HSF-IF.C.7, HSF-IF.C.7.a
Alg1.6.14	HSF-IF.A.2, HSF-IF.B.4, HSF-IF.C.7.a, HSF-IF.C.8, HSF-IF.C.9
Alg1.6.15	HSF-BF.B.3, HSF-IF.C, HSF-IF.C.7.a, HSF-IF.C.8.a
Alg1.6.16	HSF-IF.C, HSF-IF.C.7.a
Alg1.6.17	HSF-BF.B.3, HSF-IF.C, HSF-IF.C.7.a

Unit Narrative

In this unit, students study quadratic functions systematically. They look at patterns which grow quadratically and contrast them with linear and exponential growth. Then they examine other quadratic relationships via tables, graphs, and equations, gaining appreciation for some of the special features of quadratic functions and the situations they represent. They analyze equivalent quadratic expressions and how these expressions help to reveal important behavior of the associated quadratic function and its graph. They gain an appreciation for the factored, standard, and vertex forms of a quadratic function and use these forms to solve problems.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1 (Lesson 7) • CFA 2 (Lesson 9) • CFA 3 (Lesson 14) • MoU (Lesson 10) • EoU	12 Blocks

Family Overview (link below)	Integration of Technology:
Introduction to Quadratic Functions	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning.* • Desmos • KH Math Tools • Edulastic
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Absolute value, association, average rate of change, bell shaped distribution, bimodal distribution, categorical data, categorical variable, causal relationship, constraint, correlation coefficient, decreasing function, dependent variable, distribution, domain, elimination, equivalent equations, equivalent systems, exponential function, factored form, five-number summary, function, function notation, growth factor, growth rate, horizontal intercept, increasing (function), independent variable, inverse (function), linear function, maximum, minimum, model, negative relationship, non-statistical question, numerical data, outlier, piecewise function, positive relationship, quadratic expression, quadratic function, range, relative frequency table, residual, skewed distribution, solution to a system of equations, standard deviation, standard form, statistic, statistical question, strong relationship, substitution, symmetric distribution, systems of equations, system of inequalities, two-way table, uniform distribution, variable, vertex, vertex form, vertical intercept, weak relationship, zero (of a function)	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 1: Unit 5	Algebra 1: Unit 7 Algebra 2: Unit 2
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Foster collaboration and community **Share:** In the 21st century, all learners must be able to communicate and collaborate effectively within a community of learners. This is easier for some than others, but remains a goal for all learners. The distribution of mentoring through peers can greatly increase the opportunities for one-on-one support. When carefully structured, such peer cooperation can significantly increase the available support for sustained engagement. Flexible rather than fixed grouping allows better differentiation and multiple roles, as well as providing opportunities to learn how to work most effectively with others. Options should be provided in how learners build and utilize these important skills.	• Create cooperative learning groups with clear goals, roles, and responsibilities • Provide prompts that guide learners in when and how to ask peers and/or teachers for help • Encourage and support opportunities for peer interactions and supports (e.g., peer-tutors) • Create expectations for group work (e.g., rubrics, norms, etc.)

Supporting Multilingual/English Learners		
Related CELP standards:		**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.		• I can participate in conversations, discussions, and written exchanges on a range of mathematical topics using academic and domain specific vocabulary. • I can express my ideas to my collaborative group.
Lesson Sequence	**Learning Target**	**Success Criteria/Assessment/Resources**
(1) **Lessons 1-2**	Lesson 1: A Different Kind of Change • I can create drawings, tables, and graphs that represent the area of a garden. • I can recognize a situation represented by a graph that increases then decreases. Lesson 2: How Does it Change? • I can describe how a pattern is growing. • I can tell whether a pattern is growing linearly, exponentially, or quadratically. • I know an expression with a squared term is called quadratic.	•
(2) **Lessons 3-7**	Lesson 3: Building Quadratic Functions from Geometric Patterns • I can recognize quadratic functions written in different ways. • I can use information from a pattern of shapes to write a quadratic function. • I know that, in a pattern of shapes, the step number is the input and the number of squares is the output. Lesson 4: Comparing Quadratic and Exponential Functions • I can explain using graphs, tables, or calculations that exponential functions eventually grow faster than quadratic functions. Lesson 5: Building Quadratic Functions to Describe Situations (Part 1) • I can explain the meaning of the terms in a quadratic expression that represents the height of a falling object. • I can use tables, graphs and equations to represent the height of a falling object. Lesson 6: Building Quadratic Functions to Describe Situations (Part 2) • I can create quadratic functions and graphs that represent a situation. • I can relate the vertex of a graph and	• CFA 1: Lesson 7 Cool Down

	the zeros of a function to a situation. ● I know that the domain of a function can depend on the situation it represents. Lesson 7: Building Quadratic Functions to Describe Situations (Part 3) ● I can choose a domain that makes sense in a revenue situation. ● I can model revenue with quadratic functions and graphs. ● I can relate the vertex of a graph and the zeros of a function to a revenue situation.	
(3) **Lessons 8-10**	Lesson 8: Equivalent Quadratic Expressions ● I can rewrite quadratic expressions in different forms by using an area diagram or the distributive property. Lesson 9: Standard Form and Factored Form ● I can rewrite quadratic expressions given in factored form in standard form using either the distributive property or a diagram. ● I know the difference between "factored form" and "standard form." Lesson 10: Graphs of Functions in Standard and Factored Forms ● I can explain the meaning of the intercepts on a graph of a quadratic function in terms of the situation it represents. ● I know how the numbers in the factored form of a quadratic expression relate to the intercepts of its graph.	● CFA 2: Lesson 9 Cool Down
(4) **Lessons 11-17**	Lesson 11: Graphing from the Factored Form ● I can graph a quadratic function given in factored form. ● I know how to find the vertex and -intercept of the graph of a quadratic function in factored form without graphing it first. Lesson 12: Graphing the Standard Form (Part 1) ● I can explain how the and in affect the graph of the equation. ● I understand how graphs, tables, and equations that represent the same quadratic function are related. Lesson 13: Graphing the Standard Form (Part 2) ● I can explain how the in affects the graph of the equation.	● CFA 3: Lesson 14 Cool Down

	• I can match equations given in standard and factored form with their graph. Lesson 14: Graphs that Represent Situations • I can explain how a quadratic equation and its graph relate to a situation. Lesson 15: Vertex form • I can recognize the “vertex form” of a quadratic equation. • I can relate the numbers in the vertex form of a quadratic equation to its graph. Lesson 16: Graphing from the vertex form • I can graph a quadratic function given in vertex form, showing a maximum or minimum and the y-intercept. • I know how to find a maximum or a minimum of a quadratic function given in vertex form without first graphing it. Lesson 17: Changing the Vertex • I can describe how changing a number in the vertex form of a quadratic function affects its graph.	

Unit Title:

A1.7 Quadratic Equations

Unit Story (video)-From iM Hub

Relevant Standards: Bold indicates priority

Standards	Aligned Lessons
Alg1.7.1	HSA-CED.A.1, HSA-CED.A.3
Alg1.7.2	HSA-CED.A.1, HSA-REI.B.4
Alg1.7.3	HSA-REI.A.1, HSA-REI.B.4.b
Alg1.7.4	HSA-CED.A.1, HSA-REI.B.4, HSA-REI.B.4.b, HSA-SSE.B.3
Alg1.7.5	HSA-REI.A.1, HSA-REI.B.4, HSA-REI.B.4.b, HSA-REI.D, HSA-REI.D.10
Alg1.7.6	HSA-REI.B.4.b, HSA-SSE.A.2, HSA-SSE.B.3.a
Alg1.7.7	HSA-REI.B.4.b, HSA-SSE.A.2, HSA-SSE.B.3.a
Alg1.7.8	HSA-REI.B.4.b, HSA-SSE.A.2, HSA-SSE.B.3.a
Alg1.7.9	HSA-REI.B.4, HSA-REI.B.4.b, HSA-SSE.B.3.a
Alg1.7.10	HSA-REI.B.4.b, HSA-REI.D, HSA-SSE.A, HSA-SSE.A.2, HSA-SSE.B.3.a, HSF-IF.B.4
Alg1.7.11	HSA-REI.B.4.a, HSA-REI.B.4.b, HSA-SSE.A.2
Alg1.7.12	HSA-REI.B.4.a, HSA-REI.B.4.b, HSA-SSE.A, HSA-SSE.A.2
Alg1.7.13	HSA-REI.A, HSA-REI.B.4.b
Alg1.7.14	HSA-REI.B.4.a, HSA-REI.B.4.b, HSA-SSE.A.2
Alg1.7.15	HSA-REI.B.4.a, HSA-REI.B.4.b, HSA-REI.D, HSN-RN.B
Alg1.7.16	HSA-REI.B.4.b, HSA-SSE.A
Alg1.7.17	HSA-CED.A.1, HSA-REI.A, HSA-REI.B.4, HSA-REI.B.4.b, HSF-IF.B.5
Alg1.7.18	HSA-CED.A.1, HSA-REI.B.4.b, HSF-IF.A.2
Alg1.7.19	HSA-REI.B.4.a, HSA-SSE.A.2
Alg1.7.20	HSA-REI.B.4.b, HSF-IF.C.7.a, HSN-RN.B.3
Alg1.7.21	HSA-REI.B.4.b, HSN-RN.B, HSN-RN.B.3
Alg1.7.22	HSA-SSE.A.2, HSA-SSE.B.3, HSA-SSE.B.3.b, HSF-IF.C
Alg1.7.23	HSA-SSE.B.3.b, HSF-IF.C, HSF-IF.C.9
Alg1.7.24	HSA-REI.B.4.b, HSA-REI.C.7, HSF-IF.C.8.a

Unit Narrative

In this unit, students interpret, write, and solve quadratic equations. They learn that writing and solving quadratic equations is a way to precisely describe and answer questions about quadratic functions. It is especially useful for finding input values that produce certain outputs.

Students solve quadratic equations by reasoning, by rewriting expressions in factored form and using the zero product property, by completing the square, and by applying the quadratic formula. They also rewrite expressions

in vertex form to solve problems about the maximum or minimum value of a function. Along the way, students see that quadratic equations may have 2, 1, or 0 solutions, and that the solutions may be rational or irrational.	
Demonstration of Learning:	**Pacing for Unit**
• CFA 1 Lesson 9 • CFA 2 Lesson 17 • CFA 3 Lesson 22 • EoU	12 Blocks
Family Overview (link below)	**Integration of Technology:**
Quadratic Equations	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Absolute value; association; average root of change; bell-shaped distribution; bimodal distribution; categorical data; casual relationship; coefficient; completing the square; constant term; constraint; correlation coefficient; decreasing (function); distribution; domain; elimination; equivalent equations; equivalent systems; exponential function; factored form; five number summary; function; function notation; growth factor; growth rate; horizontal intercept; increasing function; independent variable; inverse function; irrational number; linear term; maximum; minimum; model; negative relationship; negative relationship; non-statistical question; numerical data; outlier; perfect square; piecewise function; positive relationship; quadratic expression; quadratic formula; quadratic function; range; rational number; relative frequency table; residual; skewed distribution; solution to a system of equations; standard deviation; standard form; statistic; statistical question; strong relationship; substitution; symmetric distribution; system of equations; system of inequalities; two-way table; uniform distribution; variable; vertex form; vertical intercept; weak relationships; zero (of a function); zero product property	Graphing technology; scientific calculators; scissors; sticky notes; tools for creating a visual display Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 1 Unit 6	Geometry Unit 6, Unit 8
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships

	• Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems

Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	See italicized targets below

Lesson Sequence	**Learning Target**	**Success Criteria/Assessment/Resources**
1	Lesson 1: Finding Unknown Inputs • *I can explain the meaning of a solution to an equation in terms of a situation.* • *I can write a quadratic equation that represents a situation.* Lesson 2: When and Why Do We Write Quadratic Equations • I can recognize the factored form of a quadratic expression and know when it can be useful for solving problems. • I can use a graph to find the solutions to a quadratic equation but also know its limitations.	•
2	Lesson 3: Solving Quadratic Equations By Reasoning • I can find solutions to quadratic equations by reasoning about the values that make the equation true. • I know that quadratic equations may have two solutions. Lesson 4: Solving Quadratic Equation With The Zero Product Property • *I can explain the meaning of the "zero product property."* • I can find solutions to quadratic equations when one side is a product of factors and the other side is zero. Lesson 5: How Many Solutions • *I can explain why dividing by a variable to solve a quadratic equation is not a good strategy.* • I know that quadratic equations can have no solutions and can explain why there are none. Lesson 6: Rewriting Quadratic Expressions In Factored Form. • *I can explain how the numbers in a*	• CFA 1: Lesson 9 Cool Down

	quadratic expression in factored form relate to the numbers in an equivalent expression in standard form. ● When given quadratic expressions in factored form, I can rewrite them in standard form. ● When given quadratic expressions in the form of $x^2 + bx+c$, I can rewrite them in factored form. Lesson 7: Rewriting Expressions In Factored Form ● *I can explain how the numbers and signs in a quadratic expression in factored form relate to the numbers and signs in an equivalent expression in standard form.* ● *When given a quadratic expression given in standard form with a negative constant term, I can write an equivalent expression in factored form.* Lesson 8: Rewriting Quadratic Equations in Factored Form ● *I can explain why multiplying a sum and a difference,* $(x+m)(x-m)$ *, results in a quadratic expression with no linear term.* ● When given quadratic expressions in the form of x^2+bx+c , I can rewrite them in factored form. Lesson 9: Solving Quadratic Equations Using Factored Form ● I can rearrange a quadratic equation to be written as {expression in factored form = 0} and find the solutions. ● I can recognize quadratic equations that have 0, 1, or 2 solutions when they are written in factored form. Lesson 10: Rewriting Quadratic Expressions in Factored Form ● I can use the factored form of a quadratic expression or a graph of a quadratic function to answer questions about a situation. ● When given quadratic expressions of the form x^2+bx+c and *a* is not 1, I can write equivalent expressions in factored form.	
3	Lesson 11: What are perfect squares ● I can recognize perfect-square expressions written in different forms. ● I can recognize quadratic equations that have a perfect-square expression and solve the equations. Lesson 12: Completing the Square P1	● CFA 2: lesson 17 Cool Down

	• *I can explain what it means to "complete the square" and describe how to do it.* • I can solve quadratic equations by completing the square and finding square roots. Lesson 13: Completing the Square P2 • When given a quadratic equation in which the coefficient of the squared term is 1, I can solve it by completing the square. Lesson 14: Completing the Square P3 • I can complete the square for quadratic expressions of the form ax^2+bx+c when a is not 1 and explain the process. • I can solve quadratic equations in which the squared term coefficient is not 1 by completing the square. Lesson 15: Quadratic Equations with Irrational Solutions • I can use the radical and "plus-minus" symbols to represent solutions to quadratic equations. • *I know why the plus-minus symbol is used when solving quadratic equations by finding square roots.*	
4	Lesson 16:The Quadratic Formula • I can use the quadratic formula to solve quadratic equations. • *I know some methods for solving quadratic equations can be more convenient than others.* Lesson 17: Applying the Quadratic Formula (Part 1) • *I can use the quadratic formula to solve an equation and interpret the solutions in terms of a situation.* Lesson 18: Applying the Quadratic Formula (Part 2) • I can identify common errors when using the quadratic formula. • I know some ways to tell if a number is a solution to a quadratic equation. Lesson 19: Deriving the Quadratic Formula • *I can explain the steps and complete some missing steps for deriving the quadratic formula.* • I know how the quadratic formula is related to the process of completing the square for a quadratic equation $ax^2+bx+c=0$. Lesson 20: Rational and Irrational Solutions • *I can explain why adding a rational*	• CFA 3: Lessons 22 Cool Down

	number and an irrational number produces an irrational number. ● *I can explain why multiplying a rational number (except 0) and an irrational number produces an irrational number.* ● *I can explain why sums or products of two rational numbers are rational.* Lesson 21: Sums and Products of Rational and Irrational Numbers ● *I can explain why adding a rational number and an irrational number produces an irrational number.* ● *I can explain why multiplying a rational number (except 0) and an irrational number produces an irrational number.* ● *I can explain why sums or products of two rational numbers are rational.* Lesson 22: Rewriting Quadratic Expressions in Vertex Form ● I can identify the vertex of the graph of a quadratic function when the expression that defines it is written in vertex form. ● I know the meaning of the term "vertex form" and can recognize examples of quadratic expressions written in this form. ● When given a quadratic expression in standard form, I can rewrite it in vertex form. Lesson 23: Using Quadratic Expressions in Vertex Form to Solve Problems ● I can find the maximum or minimum of a function by writing the quadratic expression that defines it in vertex form. ● *When given a quadratic function in vertex form, I can explain why the vertex is a maximum or minimum.* Lesson 24: Using Quadratic Equations to Model Situations and Solve Problems ● *I can interpret information about a quadratic function given its equation or a graph.* ● I can rewrite quadratic functions in different but equivalent forms of my choosing and use that form to solve problems. ● In situations modeled by quadratic functions, I can decide which form to use depending on the questions being asked.	

Unit Title:

A2.2 Polynomials and Rational Functions

Relevant Standards: Bold indicates priority

Lesson	Standards Addressed
Alg2.2.1	HSA-CED.A.2, HSA-SSE.A.1.a, HSF-IF.B.4, HSF-IF.B.5
Alg2.2.2	HSA-APR.A.1, HSA-CED.A.2, HSA-REI.D.11, HSA-SSE.A.1, HSF-IF.A.2
Alg2.2.3	HSA-SSE.A, HSF-BF.B.3, HSF-IF.B.4, HSF-IF.C.7, HSF-IF.C.7.c
Alg2.2.4	HSA-APR.A.1
Alg2.2.5	HSA-APR.B, HSA-APR.B.3
Alg2.2.6	HSA-APR.A, HSA-APR.A.1, HSA-APR.B, HSA-APR.B.3, HSA-SSE.B.3, HSF-BF.B.3
Alg2.2.7	HSA-APR.B, HSA-APR.B.3, HSA-SSE.A.1.a, HSF-IF.C.7.c
Alg2.2.8	HSA-APR.B.3, HSA-SSE.A, HSF-IF.C, HSF-IF.C.7.c
Alg2.2.9	HSA-SSE.A, HSF-BF.B.3, HSF-IF.C
Alg2.2.10	HSA-APR.B.3, HSF-IF.C.7.c
Alg2.2.11	HSA-APR.B, HSA-REI.C.7, HSA-REI.D.11
Alg2.2.12	HSA-APR.A, HSA-APR.B.2, HSA-APR.B.3
Alg2.2.13	HSA-APR.A, HSA-APR.B.2
Alg2.2.14	HSA-APR.A, HSA-APR.B, HSA-APR.B.2, HSA-APR.B.3
Alg2.2.15	HSA-APR.B.2
Alg2.2.16	HSA-CED.A, HSA-CED.A.2, HSA-CED.A.4
Alg2.2.17	HSA-CED.A.2, HSF-BF.B.3, HSF-IF.B.4, HSF-IF.C, HSF-IF.C.7
Alg2.2.18	HSA-APR.D.6, HSA-SSE.A.1, HSF-IF.C
Alg2.2.19	HSA-APR.D.6, HSA-SSE.A.1, HSF-IF.C.7
Alg2.2.20	HSA-CED.A.1, HSA-CED.A.2, HSA-REI.A, HSA-REI.A.1
Alg2.2.21	HSA-CED.A.1, HSA-REI.A, HSA-REI.A.1, HSA-REI.D.11
Alg2.2.22	HSA-REI.A.2
Alg2.2.23	HSA-APR.C.4, HSA-SSE.A.2, HSA-SSE.B.4
Alg2.2.24	HSA-APR.C.4, HSA-APR.D
Alg2.2.25	HSA-APR.C, HSA-SSE.A.2, HSA-SSE.B.4
Alg2.2.26	HSA-SSE.A.1, HSA-SSE.B.4

Unit Narrative:

In this unit, students expand their understanding of polynomials from linear and quadratic to those of higher degree. They are introduced to situations polynomials can model. They study graphs and equations of the same function and make connections between factors and zeros. Students learn to divide polynomials and to sketch graphs of polynomials given in factored form. Building on this work, students investigate rational functions. They

learn to interpret the meaning of asymptotes in context and strategies for solving rational equations. The unit concludes with a study of polynomial identities and deriving the formula for the sum of the first terms in a geometric sequence.	
Demonstration of Learning:	**Pacing for Unit**
• CFA 1: Lesson 6/7 • CFA 2: Lesson 13 • CFA 3: Lesson 21 • EoU	17 Days
Family Overview (link below)	**Integration of Technology:**
Polynomials and Rational Functions	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
E, amplitude, arithmetic sequence, complex number, degree, end behavior, even function, experimental study, geometric sequence, horizontal asymptote, identity, imaginary numbers logarithm, logarithmic function, margin of error, midline, multiplicity, observational behavior, odd function, period, periodic function, polynomial, pythagorean identity, random selection, rational function, real number, relative frequency histogram, relative maximum, relative minimum, survey, term, treatment, unit circle, vertical asymptote	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 1, Unit 7; Algebra 2, Unit 1	Algebra 2, Unit 3 & Unit 7
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and	See italicized learning targets below.

written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.			
Lesson Sequence	**Learning Target**	**Success Criteria/ Assessment**	**Resources**
1	Lesson 1: Let's Make a Box ● I can create and interpret a polynomial that models the volume of a box. Lesson 2: Funding the Future ● I can use polynomials to understand different kinds of situations. Lesson 3: Introducing Polynomials ● I can identify important characteristics of polynomial graphs and expressions. Lesson 4: Combining Polynomials ● I understand that if you add, subtract, or multiply polynomials, you get another polynomial.		
	Lessons 5-15 Lesson 5: Connecting Factors and Zeros ● I can find the zeros of a function from its factored form. Lesson 6: Different Forms ● I can identify features of polynomials and their graphs using their standard and factored forms. Lesson 7: Using factors and Zeros ● I can write an expression for a function that has specific horizontal intercepts. Lesson 8: End Behavior (Part 1) ● *I understand why a function's end behavior is determined by its leading term.* Lesson 9: End Behavior (Part 2) ● I can identify the end behavior of a polynomial function from its equation. Lesson 10: Multiplicity ● I can use zeros and multiplicities to sketch a graph of a polynomial. Lesson 11: Finding Intersections ● I can find where two polynomial functions intersect. Lesson 12: Polynomial Division (Part 1) ● I can divide one polynomial by another. Lesson 13: Polynomial Division (part 2) ● I can use long division to divide polynomials. Lesson 14: What do you know about Polynomials? ● I can use division to rewrite a polynomial in factored form starting		CFA 1: Combines Lessons 6 & 7 Cool Downs CFA 2: Lesson 13 Cool Down

	from a known factor and then sketch what it looks like. Lesson 15: The remainder Theorem ● *I understand the remainder theorem and why it's true.*		
	Lesson 16: Minimizing Surface Area ● I can write a rational function to model different properties of cylinders. Lesson 17: Graphs of Rational Functions (Part 1) ● *I can identify a vertical asymptote from a graph or an equation of a rational function.* Lesson 18: Graphs of Rational Functions (Part 2) ● *I can identify a horizontal asymptote from a graph or an equation of a rational function.* Lesson 19: End Behavior of Rational Functions ● I can find the end behavior of a rational function by rewriting it as $f(x) = q(x) + \frac{r(x)}{b(x)}$.		CFA 3: Lesson 21 Cool Down
	Lesson 20: Rational Equations (Part 1) ● *I can write rational expressions that represent averages to answer questions about the situation.* Lesson 21: Rational Equations (Part 2) ● I can write and solve equations with simple rational expressions on each side. Lesson 22: Solving Rational Equations ● *I know how to check for extraneous solutions to rational equations.*		
	Lesson 23: Polynomial Identities (Part 1) ● I understand what an identity is in mathematics. Lesson 24: Polynomial Identities (Part 2) ● I can justify why identities are true. Lesson 25: Summing Up ● I understand why the geometric sum formula is true. Lesson 26: Using the Sum ● I can use the geometric sum formula to solve problems.		

Unit Title:

A2.3 Complex Numbers and Rational Exponents

Relevant Standards: Bold indicates priority

Lesson	Standards Addressed
Alg2.3.1	HSN-RN.A.1, HSN-RN.A.2
Alg2.3.2	HSN-RN.A.1, HSN-RN.A.2
Alg2.3.3	HSN-RN.A.1, HSN-RN.A.2
Alg2.3.4	HSN-RN.A.1, HSN-RN.A.2
Alg2.3.5	HSN-RN.A.1, HSN-RN.A.2
Alg2.3.6	HSA-REI.A.2
Alg2.3.7	HSA-REI.A.1, HSA-REI.A.2, HSA-REI.B.4.b
Alg2.3.8	HSA-REI.A.2, HSA-REI.D.11
Alg2.3.9	HSA-REI.A.2
Alg2.3.10	HSN-CN.A.1, HSN-CN.A.2
Alg2.3.11	HSN-CN.A.1, HSN-CN.A.2, HSN-CN.C.7
Alg2.3.12	HSN-CN.A.1, HSN-CN.A.2
Alg2.3.13	HSN-CN.A.1, HSN-CN.A.2
Alg2.3.14	HSN-CN.A.1, HSN-CN.A.2
Alg2.3.15	HSN-CN.A.2, HSN-CN.C.7
Alg2.3.16	HSA-REI.B.4.a, HSA-REI.B.4.b
Alg2.3.17	HSA-REI.B.4.b, HSA-REI.D.11, HSN-CN.C.7
Alg2.3.18	HSA-REI.B.4, HSN-CN.C.7
Alg2.3.19	HSA-REI.B.4.b, HSN-CN.C.7

Unit Narrative:

In this unit, students use what they know about exponents and radicals to extend exponent rules to include rational exponents (for example, $5^{\frac{1}{3}} = \sqrt[3]{5}$), solve various equations involving squares and square roots, develop the concept of complex numbers by defining a new number whose square is -1, and use complex numbers to find solutions to quadratic equations.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1: Lesson 4 • CFA 2: Lesson 9 • CFA 3: Lesson 18 • EoU	14 Blocks
Family Overview (link below)	**Integration of Technology:**

Complex Numbers and Rational Exponents	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Arithmetic sequence; complex number, degree, end behavior, geometric sequence, horizontal asymptote, identity, multiplicity, polynomial, rational function, real number, relative maximum, relative point, relative minimum, sequence, term, vertical asymptote	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 2, Unit 2	Algebra 2, Unit4
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	See italicized learning targets below.

Lesson Sequence	Learning Target	Success Criteria/Assessment/Resources
1 (Lessons 1-5)	Lesson 1: Properties of Exponents • *I can evaluate expressions with integer exponents.* Lesson 2: Square Roots and Cube Roots • I can calculate square and cube roots. Lesson 3: Exponents that are Unit Fractions • I can write square and cube roots as exponents. Lesson 4: Positive Rational Exponents • *I can interpret exponents that are fractions.*	CFA 1: Lesson 4 Cool Down

	Lesson 5: Negative Rational Exponents ● I can interpret exponents that are negative fractions.	
2 (Lessons 6-9)	Lesson 6: Squares and Square roots ● I understand that the square root symbol means the positive square root. Lesson 7: Equivalent Equations ● I can solve equations by squaring or finding square roots. Lesson 8: Cubes and Cube Roots ● I can solve equations by cubing or finding cube roots. Lesson 9: Solving Radical Equations ● I can solve equations with radicals in them.	CFA 2: Lesson 9 Cool Down
3 (Lessons 10-15)	Lesson 10: A New Kind of Number ● I can represent $\sqrt{-1}$ and multiples of it. Lesson 11: Introducing the Number i ● I can use *i* to solve equations. Lesson 12: Arithmetic with Complex Numbers ● I can add complex numbers and calculate powers of imaginary numbers. Lesson 13: Multiplying Complex Numbers ● I can multiply complex numbers. Lesson 14: More Arithmetic with Complex Numbers ● I can do arithmetic with complex numbers. Lesson 15: Working Backwards ● I can find real and imaginary parts of complex numbers if I know enough about the numbers and their product.	
4 (Lessons 16-19)	Lesson 16: Solving Quadratics ● *I can solve quadratic equations by completing the square or by using the quadratic formula.* Lesson 17: Completing the Square and Complex Solutions ● *I can find complex solutions to quadratic equations by completing the square.* Lesson 18: The Quadratic Formula and Complex Solutions ● *I can find complex solutions to quadratic equations by using the quadratic formula.* Lesson 19: Real and Non-Real Solutions ● I can find complex solutions to quadratic equations.	CFA 3: Lesson 18 Cool Down

Unit Title:

A2.4 Exponential Function

Relevant Standards: Bold indicates priority

Lesson	Standards Addressed
Alg2.4.1	HSF-LE.A.1.b, HSF-LE.A.1.c, HSF-LE.A.2
Alg2.4.2	HSA-SSE.A.1, HSF-LE.A.2, HSF-LE.B.5
Alg2.4.3	HSF-LE.A.2, HSN-RN.A.1
Alg2.4.4	HSA-SSE.A.1, HSA-SSE.B.3.c, HSF-LE.A.2
Alg2.4.5	HSA-SSE.A, HSF-LE.A.1.a, HSF-LE.A.1.b
Alg2.4.6	HSA-SSE.A.1, HSF-IF.C.8.b, HSF-LE.A.2, HSN-RN.A.1
Alg2.4.7	HSA-SSE.A.1, HSA-SSE.B.3, HSF-LE.B.5, HSN-RN.A.1
Alg2.4.8	HSF-BF.A.1.a, HSF-LE.A.4
Alg2.4.9	HSF-LE.A.4
Alg2.4.10	HSA-SSE.B.3, HSF-LE.A.4
Alg2.4.11	HSF-LE.A.4
Alg2.4.12	HSF-IF.A.2, HSF-LE.A.4, HSF-LE.B.5
Alg2.4.13	HSA-SSE.A.1.b, HSF-IF.C.7, HSF-LE.A, HSF-LE.A.4, HSF-LE.B.5
Alg2.4.14	HSF-LE.A.4
Alg2.4.15	HSA-REI.D.11, HSF-IF.C.7.e, HSF-LE.A.4, HSF-LE.B.5
Alg2.4.16	HSA-REI.D.11, HSF-LE.A.4
Alg2.4.17	HSF-IF.C, HSF-IF.C.7.e, HSF-LE.A.4
Alg2.4.18	HSF-IF.B.4, HSF-LE.A.4

Unit Narrative:

In this unit, students build on their understanding of exponential functions from an earlier course. Previously, they saw functions whose domain is the integers. Here, they write, interpret, and evaluate exponential functions whose domain is the real numbers. In the second half of the unit, students learn about logarithms in base 2 and 10 as a way to express the exponent that makes an exponential equation true. They then use logarithms to solve exponential equations and to answer questions about exponential functions. During this time, students encounter the constant ϵ and learn that it is used to model situations with continuous growth rates, leading to working with the natural logarithm. The unit ends with an exposure to logarithmic functions.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1 • CFA 2 • CFA 3 • EoU	14 Blocks

Family Overview (link below)	Integration of Technology:
Exponential Functions and Equations	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Arithmetic sequence, complex number, degree, e, end behavior, geometric sequence, horizontal asymptote, identity, imaginary number, logarithm, logarithmic function, multiplicity, natural logarithm, polynomial, rational function, real number, relative maximum, relative minimum, sequence, term, vertical asymptote	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Algebra 1, Unit 5 Algebra 2, Unit 3	Algebra 2, Unit 5
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	See italicized learning targets below.

Lesson Sequence	Learning Target	Success Criteria/Assessment/Resources
1 (Lessons 1-2)	Lesson 1: Growing and Shrinking • *I understand how to calculate values that are changing exponentially.* Lesson 2: Representations of Growth and Decay • *I understand that exponential functions change by equal factors over equal intervals.*	

2 (Lessons 3-7)	Lesson 3: Understanding Rational Inputs ● I can determine the value of exponential functions at non-whole number inputs. Lesson 4: Representing Functions at rational Inputs ● I understand how to calculate a growth or decay factor of an exponential function for different input intervals. Lesson 5: Changes Over rational Intervals ● *I can explain why an exponential function changes by the same factor over equal intervals, even when those intervals are not whole numbers.* Lesson 6: Writing Equations for Exponential Functions ● *I can write equations for exponential functions from two input-output pairs, even when the input pairs are not one unit apart.* Lesson 7: Interpreting and Writing Logarithmic Equations ● I can use the half-life of elements to calculate how much of the element remains over time.	
3 (Lessons 8-11)	Lesson 8: Unknown Exponents ● I can approximate the value of unknown exponents. Lesson 9: What is a Logarithm? ● *I understand that a logarithm is a way to represent an exponent in an exponential equation.* Lesson 10: Interpreting and Writing Logarithmic Equations ● I understand how to evaluate a logarithmic expression. Lesson 11: Evaluating Logarithmic Expressions ● I can use known values of logarithms to estimate the value of other logarithms. ● I can use technology to determine the value of a logarithm.	
4 (Lessons 12-14)	Lesson 12: The Number e ● I know that ϵ is an irrational constant, like π , that has a value of about 2.718. Lesson 13: Exponential Functions with Base e ● *I understand that ϵ is used in exponential models when we assume the growth rate is applied at every moment.* Lesson 14: Solving Exponential	

	Equations ● I can solve simple exponential equations using logarithms.	
5 (Lessons 15-18)	Lesson 15: Using Graphs and Logarithms to Solve Problems (Part 1) ● I can solve exponential equations using logs or by graphing Lesson 16: Using Graphs and Logarithms to Solve Problems (Part 2) ● I can calculate where two exponential graphs meet using logarithms. ● *I can interpret the intersection of the graphs of two exponential functions in context.* Lesson 17: Logarithmic Functions ● *I can interpret logarithmic functions in context.* Lesson 18: Applications of Logarithmic Functions ● I understand how logarithms are used to measure things like acidity and the intensity of earthquakes.	

Unit Title:

A2.5 Transformations of Functions *(Accelerated Only)*

Relevant Standards: Bold indicates priority

Lesson	Standards Addressed
Alg2.5.1	HSF-BF.B.3, HSS-ID.B.6.a
Alg2.5.2	HSF-BF.B.3
Alg2.5.3	HSF-BF.A.1, HSF-BF.B.3, HSS-ID.B.6.a
Alg2.5.4	HSF-BF.B.3
Alg2.5.5	HSF-BF.B.3, HSF-IF.C
Alg2.5.6	HSF-BF.B.3, HSF-IF.C.8
Alg2.5.7	HSF-BF.A.1, HSF-BF.B.3, HSS-ID.B.6.a
Alg2.5.8	HSF-BF.A.1, HSF-BF.B.3, HSS-ID.B.6.a
Alg2.5.9	HSF-BF.B.3
Alg2.5.10	HSF-BF.A.1.b, HSF-IF.C
Alg2.5.11	HSF-BF.A.1.b, HSF-BF.B.3, HSF-IF.B.4, HSF-LE.B, HSS-ID.B.6.a

Unit Narrative:

In this unit, students consider functions as a whole and understand how they can be transformed to fit the needs of a situation, which is an aspect of modeling with mathematics (MP4). Students make connections between representations as they translate, reflect, and apply scale factors to different types of functions. As the unit progresses, so too does the language students use to describe transformations with precision (MP6). The unit ends with students applying transformations to different functions to model a real world data set.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1 • CFA 2 • CFA 3 • EoU	10 Blocks
Family Overview (link below)	**Integration of Technology:**
Transformations of Functions	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Arithmetic sequence, complex number, degree, e, end behavior, even function, geometric sequence, horizontal asymptote, identity, logarithm, logarithmic function, multiplicity, natural logarithm, odd function, polynomial,	Desmos KH Math Tools Edulastic

rational function, real number, relative maximum, relative minimum, sequence, term, vertical asymptote	
Connections to Prior Units:	**Connections to Future Units:**
Geometry, Unit 5 Algebra 2, Unit 4	Algebra 2, Unit 6
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	See italicized learning targets below.

Lesson Sequence	Learning Target	Success Criteria/Assessment/Resources
1 (Lessons 1-7)	Lesson 1: Matching up to Data • *I can describe how a graph is transformed.* Lesson 2: Moving Functions • I can use function notation to represent a vertical or horizontal translation from one graph to another. Lesson 3: More Movement • *I can write equations to represent vertical and horizontal translations of graphs.* • *I understand the relationship between graphs and equations describing horizontal translations.* Lesson 4: Reflecting Functions • I can reflect a graph across either the x- or y -axis. Lesson 5: Some Functions Have Symmetry • I can identify even and odd functions by their graphs.	

	Lesson 6: Symmetry in Equations ● I can complete graphs of even and odd functions if I know what half the graph looks like. ● *I can identify even and odd functions by their equations.* Lesson 7: Expressing Transformations of Functional Algebraically ● *I can write an equation from a description of how a graph is transformed.*	
2 (Lessons 8-9)	Lesson 8: Scaling Outputs ● I can calculate the scale factor needed to transform the output of a function to model data. Lesson 9: Scaling Inputs ● *I can describe the effect of a scale factor on the input of a function.* ● *I understand the differences between scaling the outputs and scaling the inputs of a function.*	
3 (Lessons 10-11)	Lesson 10: Combining Functions ● I can combine two functions in different ways. Lesson 11: Making a Model for Data ● I can transform a function so its graph models a data set.	

Unit Title:

A2.6 Trigonometric Functions *(Accelerated Only)*

Relevant Standards: Bold indicates priority

Lesson	Standards Addressed
Alg2.6.1	HSF-TF.A, HSF-TF.C
Alg2.6.2	HSF-TF.A.2, HSF-TF.C.8
Alg2.6.3	HSF-TF.A, HSF-TF.A.1, HSF-TF.A.2, HSF-TF.C.8
Alg2.6.4	HSF-TF.A, HSF-TF.A.1, HSF-TF.A.2
Alg2.6.5	HSF-TF.A, HSF-TF.A.2, HSF-TF.C.8
Alg2.6.6	HSF-TF.A.2, HSF-TF.C.8
Alg2.6.7	HSF-TF.B, HSF-TF.B.5
Alg2.6.8	HSF-IF.B.4, HSF-IF.C, HSF-TF.B
Alg2.6.9	HSF-IF.C.7, HSF-TF.A
Alg2.6.10	HSF-TF.A.2, HSF-TF.B
Alg2.6.11	HSF-TF.A.2
Alg2.6.12	HSF-IF.C.7, HSF-TF.A.2
Alg2.6.13	HSF-IF.C.7.e, HSF-TF.B.5
Alg2.6.14	HSF-IF.C.7.e, HSF-TF.B
Alg2.6.15	HSF-BF.B.3, HSF-IF.B.4, HSF-IF.C.7.e
Alg2.6.16	HSF-IF.C.7.e, HSF-TF.B, HSF-TF.B.5
Alg2.6.17	HSF-BF.B.3, HSF-IF.C.7.e
Alg2.6.18	HSF-IF.B.4, HSF-IF.C.7.e, HSF-TF.A.1, HSF-TF.B.5, HSN-Q.A.1
Alg2.6.19	HSF-IF.C.7.e, HSF-TF.B, HSF-TF.B.5

Unit Narrative:

In this unit, students are introduced to trigonometric functions. While they have studied a variety of function types with different key features previously, this is the first time students are asked to consider periodic functions, that is, functions whose output values repeat at regular intervals. Students first consider circular motion and learn to use right triangle trigonometry to identify the coordinates of a point on a circle. The unit circle is introduced, and students study the symmetry of its coordinates and reason about radian angles knowing a full circle has an angle of 2π . From the unit circle, the domain of cosine, sine, and tangent are expanded and students begin to think about them as functions. Students graph these functions using their knowledge of the unit circle and expand the domain of the functions a second time to angles beyond 2π and less than 0. The second half of this unit builds directly on the work of the previous unit by having students apply their knowledge of transformations to trigonometric functions and use these functions to model periodic situations.

Demonstration of Learning:	**Pacing for Unit**
• CFA 1	14 days

• CFA 2 • CFA 3 • EoU	
Family Overview (link below)	**Integration of Technology:**
Trigonometric Functions	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning*
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**
Amplitude, arithmetic sequence, complex number, degree, e, end behavior, even function, geometric sequence, horizontal asymptote, identity, imaginary number, logarithm, logarithmic function, midline, multiplicity, natural logarithm, odd function, period, periodic function, polynomial, pythagorean identity, rational function, real number, relative maximum, relative minimum, sequence, term, unit circle, vertical asymptote,	Desmos KH Math Tools Edulastic
Connections to Prior Units:	**Connections to Future Units:**
Geometry: Unit 4, Unit 7 Algebra 2 Unit 5	None
Differentiation through Universal Design for Learning	
UDL Indicator	**Teacher Actions:**
Comprehension: Highlight patterns, critical features, big ideas, and relationships	• Highlight or emphasize key elements in text, graphics, diagrams, formulas • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships • Use multiple examples and non-examples to emphasize critical features • Use cues and prompts to draw attention to critical features • Highlight previously learned skills that can be used to solve unfamiliar problems
Supporting Multilingual/English Learners	
Related CELP standards:	**Learning Targets:**
An ML can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	See italicized targets below.

Lesson Sequence	Learning Target	Success Criteria/Assessment/Resources
1	Lesson 1: Moving in Circles	

(Lessons 1-7)	• I can use the Pythagorean Theorem to find coordinates of points on a circle centered at the origin. • *I understand that a periodic function is one with outputs that repeat at regular intervals.* Lesson 2: Revisiting Right triangles • *I understand how to use trigonometry to express the coordinates of a point in quadrant 1 that is 1 unit away from the origin.* Lesson 3: The Unit circle (Part 1) • *I understand that a radian angle measurement is the ratio of the arc length to the radius of the circle.* • *I understand that points on a unit circle can be defined by their coordinates or by an angle of rotation.* Lesson 4: The Unit Circle (Part 2) • I can find different angles on the unit circle and estimate their coordinates. Lesson 5: The Pythagorean Identity (part 1) • I can use the Pythagorean Identity to calculate values of coordinates given one coordinate to start from. • *I understand that the coordinates of a point on the unit circle at* θ *radians can be written as* $(cos(\theta),\ sin\ (\theta))$. Lesson 6:The Pythagorean Identity (Part 2) • I can use the Pythagorean Identity to find the values of cosine, sine, and tangent of an angle if I know one of them and the quadrant of the angle. Lesson 7: Finding Unknown Coordinates on a Circle • I can use cosine and sine to figure out information about points rotating in circles.	
2 (Lessons 8-12)	Lesson 8: Rising and Falling • I understand that the graph of a periodic function can look like a wave whose outputs repeat between the same maximum and minimum values. Lesson 9: Introduction to Trigonometric Functions • I can use the coordinates of points on the unit circle to graph the cosine and sine functions. Lesson 10: Beyond 2π • *I understand how to find the values of cosine and sine for inputs greater than* 2π *radians.* Lesson 11: Extending the Domain of Trigonometric Functions	

	• *I understand how to find the values of cosine and sine for inputs less than 0 radians.* Lesson 12: Tangent • *I can explain why the tangent function has a period of π.* • I understand why the graph of tangent has asymptotes.	
3 (Lessons 13-18)	Lesson 13: Amplitude and Midline • *I can write a trigonometric function to represent situations with different amplitudes and midlines.* Lesson 14: Transforming Trigonometric Functions • I can graph a horizontal translation of a trigonometric function. • *I can use the amplitude and midline of a trigonometric equation to describe a situation.* Lesson 15: Features of Trigonometric Graphs (part 1) • *I can identify the midline, amplitude, and horizontal translation of a trigonometric function given a graph or equation.* Lesson 16: Features of Trigonometric Graphs (Part 2) • I can find the period of a trigonometric function using an equation or graph. Lesson 17: Comparing Transformations • *I can ask questions to figure out how a trigonometric function was transformed.* • I can create an equation of a trigonometric function using information about its graph. Lesson 18: Modeling Circular Motion • I can represent a circular motion situation using a graph and an equation.	
4 (Lesson 19)	Lesson 19: Beyond Circles • *I can create a model of data that is approximately periodic and use the model to make predictions.*	