Mathematics
Algebra I: Year at a Glance
2019 - 2020

Q1		Q2		Q3		Q4	
Module 1 **Aug. 12 – Oct. 11**		**Module 3** **Oct. 21 - Dec. 20**		**Module 4** **Jan. 6 – Mar. 13**		**Modules 2 and 5** **Mar. 23 – May 22** **TN Ready Testing** **Apr 13 – May 8**	
Module 1 **Relationships Between Quantities and Reasoning with Equations and Their Graphs**		**Module 3** **Linear and Exponential Functions**		**Module 4** **Polynomials and Quadratic Expressions, Equations, and Functions**		**Modules 2** **Descriptive Statistics** **Module 5** **A Synthesis of Modeling with Equations and Functions**	
A1. N.Q.A.1	A1.A.REI. C.4*	A1. A. SSE. B.3	A1. F.IF.C.8*	A1. A. SSE. A.1	A1. F.IF.C.6*	A1. N.Q.A.2	A1. S.ID.A.1
A1. N.Q.A.2	A1.A.REI. D.5*	A1. A. SSE. B.3c*	A1. F.BF.A.1	A1. A. SSE. A.2	A1. F.IF.C.7*	A1. N.Q.A.3	A1. S.ID.A.2
A1. N.Q.A.3	A1.A.REI. D.7*	A1. A. CED.A.1	A1. F.BF.A.1a	A1. A. SSE. B.3	A1. F.IF.C.8*	A1. A. CED.A.1	A1. S.ID.A.3
A1. A. APR.A.1		A1.A.REI. D.6*	A1. F.BF.B.2*	A1. A. APR.A.1	A1. F.BF.B.2*	A1. A. CED.A.2	A1. S.ID.B.4*
A1. A. CED.A.1		A1. F.IF.A.1	A1. F.LE.A.1a	A1. A. APR.B.2*		A1. F.IF.B.3*	A1. S.ID.B.4a*
A1. A. CED.A.2		A1. F.IF.A.2	A1. F.LE.A.2	A1. A. REI.B.3*		A1. F.IF.B.4*	A1. S.ID.B.4b*
A1. A. CED.A.3		A1. F.IF.B.3*	A1. F.LE.A.3	A1. A. CED.A.1		A1. F.IF.B.5*	A1. S.ID.C.5*
A1. A. CED.A.4		A1. F.IF.B.4*	A1. F.LE.B.4*	A1. A. CED.A.2		A1. F.BF.A.1	A1. S.ID.C.6*
A1. A. SSE. A.1		A1. F.IF.B.5*		A1.A.REI. D.6*		A1. F.LE.A.1	A1. S.ID.C.7*
A1. A. SSE. A.2		A1. F.IF.C.6*		A1. F.IF.B.3*		A1. F.LE.A.1b	
A1. A. REI.A.1		A1. F.IF.C.6a*		A1. F.IF.B.4*		A1. F.LE.A.1c	
A1.A.REI.B. 2*		A1. F.IF.C.6b*		A1. F.IF.B.5*		A1. F.LE.A.2	

Key: **Major Content** ➢ **Supporting Content**

*** (asterisk) Indicates a standard with differences between the TN State Standards' numbering and/or verbiage and the standards in Eureka**

Note: Please use this suggested pacing as a guide. It is understood that teachers may be up to 1 week ahead or 1 week behind depending on the needs of their students.

Use the instructional map and Digital Suite resources as you prepare to teach a module for additional guidance in planning, pacing, and suggestions for omissions.

Introduction

Destination 2025, Shelby County Schools' 10-year strategic plan, is designed not only to improve the quality of public education, but also to create a more knowledgeable, productive workforce and ultimately benefit our entire community.

What will success look like?

In order to achieve these ambitious goals, we must collectively work to provide our students with high quality, college and career ready aligned instruction. The Tennessee State Standards provide a common set of expectations for what students will know and be able to do at the end of a grade. The State of Tennessee provides two sets of standards, which include the Standards for Mathematical Content and The Standards for Mathematical Practice. The Content Standards set high expectations for all students to ensure that Tennessee graduates are prepared to meet the rigorous demands of mathematical understanding for college and career. The eight Standards for Mathematical Practice describe the varieties of expertise, habits of mind, and productive dispositions that educators seek to develop in all students. The Tennessee State Standards also represent three fundamental shifts in mathematics instruction: **focus, coherence and rigor**.

Throughout this curriculum map, you will see resources as well as links to tasks that will support you in ensuring that students are able to reach the demands of the standards in your classroom. In addition to the resources embedded in the map, there are some high-leverage resources around the content standards and mathematical practice standards that teachers should consistently access. For a full description of each, click on the links below.

How to Use the Maps

Overview
An overview is provided for each quarter and includes the topics, focus standards, intended rigor of the standards and foundational skills needed for success of those standards.

Your curriculum map contains four columns that each highlight specific instructional components. Use the details below as a guide for information included in each column.

Tennessee State Standards
TN State Standards are located in the left column. Each content standard is identified as Major Content or Supporting Content. A key can be found at the bottom of the map.

Content
This section contains learning objectives based upon the TN State Standards. Best practices tell us that clearly communicating measurable objectives lead to greater student understanding. Additionally, essential questions are provided to guide student exploration and inquiry.

Instructional Support
District and web-based resources have been provided in the Instructional Support column. You will find a variety of instructional resources that align with the content standards. The additional resources provided should be used as needed for content support and scaffolding.

Vocabulary and Fluency
The inclusion of vocabulary serves as a resource for teacher planning and for building a common language across K-12 mathematics. One of the goals for Tennessee State Standards is to create a common language, and the expectation is that teachers will embed this language throughout their daily lessons. In order to aid your planning, we have also included a list of fluency activities for each lesson. It is expected that fluency practice will be a part of your daily instruction. (Note: Fluency practice is not intended to be speed drills, but rather an intentional sequence to support student automaticity. Conceptual understanding must underpin the work of fluency.

Instructional Calendar
As a support to teachers and leaders, an instructional calendar is provided ***as a guide***. Teachers should use this calendar for effective planning and pacing, and leaders should use this calendar to provide *support* for teachers. Due to variances in class schedules and differentiated support that may be needed for students' adjustment to the calendar may be required.

Topics Addressed in Quarter

Topic A: Quadratic Expressions, Equations, Functions, and Their Connection to Rectangles
Topic B: Using Different Forms for Quadratic Functions
Topic C: Function Transformations and Modeling

Time Frame: January 6 – March 13, 2020

Overview

In Algebra I, students have been analyzing the process of solving equations and developing fluency in writing, interpreting, and translating among various forms of linear equations (Module 1) and linear and exponential functions (Module 3). These experiences set the stage for Module 4. Here, students continue to interpret expressions, create equations, rewrite equations and functions in different but equivalent forms, and graph and interpret functions using polynomial functions—more specifically quadratic functions as well as square root and cube root functions.

Grade Level Standard	Type of Rigor	Foundational Standards
A1. A. SSE.A.1	Conceptual Understanding	6.EE.A.2b, 7. EE.A.2
A1. A. SSE.A.2	Conceptual Understanding	6.EE.A.3, 7. EE.A.1
A1. A. SSE. B.3	Conceptual Understanding, Procedural Fluency	6.EE.A.3, 7. EE.A.1
A1. A. APR.A.1	Conceptual Understanding & Procedural Fluency	7. EE.A.1, 8. EE.A.1
A1. A. APR.B.2*	Conceptual Understanding, Procedural Fluency	7. EE.A.1
A1. A. REI.B.3*	Conceptual Understanding & Procedural Fluency	7. EE.A.1, 8. EE.A.2
A1.A.REI. D.6*	Conceptual Understanding & Procedural Fluency	8. EE.C.8a, 8. EE.C.8b
A1. A. CED.A.1	Conceptual Understanding, Procedural Fluency & Application	7. EE.B.4, 8. EE.C.7
A1. A. CED.A.2	Conceptual Understanding, Procedural Fluency & Application	8. EE.C.8, 8.F.A.3, 8. F.B.4
A1. F.IF.B.3*	Conceptual Understanding	8.F.B.5
A1. F.IF.B.4*	Conceptual Understanding	Introductory
A1. F.IF.B.5*	Conceptual Understanding & Procedural Fluency	8.F.B.4
A1. F.IF.C.6*	Conceptual Understanding, Procedural Fluency	8.EE.B.5, 8.F.A.3
A1. F.IF.C.7*	Conceptual Understanding, Procedural Fluency	7. EE.A.1
A1. F.IF.C.8*	Conceptual Understanding, Procedural Fluency	Introductory
A1. F.BF.B.2*	Conceptual Understanding, Procedural Fluency	Introductory
Indicates 2017-2018 Power Standard		
Instructional Focus Documents-Algebra I		

Module 4: Polynomial and Quadratic Expressions, Equations, and Functions

Algebra I Pacing and Preparation Guide

Allow approximately 3.5 weeks for instruction, review and assessment of Topic A

Mid-Module 4 Assessment Window – February 5-7

Allow 1.5 weeks for instruction, review and assessment of Topic B

Allow approximately 2 weeks for instruction, review and assessment of Topic C

End-of-Module 4 Assessment Window – March 11-13

TN STATE STANDARDS	CONTENT	INSTRUCTIONAL SUPPORT	VOCABULARY
Domain: Seeing Structure in Expressions **Cluster:** Interpret the structure of expressions A1.A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.* A1.A.SSE.A.2 Use the structure of an expression to identify ways to rewrite it A1.A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines **Domain:** Arithmetic with Polynomials and Rational Expressions **Cluster:** Perform arithmetic operations on polynomials A1. A. APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition,	**Essential Questions:** • What is the importance of identifying the structure of an expression and ways to rewrite it? • Why is it important to solve and produce equivalent forms of an expression? • When is factoring the best method to solve a quadratic equation? • Why is it important to know the operations of integers to understand the properties of polynomials? • How are the methods of solving a quadratic equation related? • What does factoring mean? • How do quadratic functions compare to linear functions? • What are the connections between different representations of quadratics? • What do the solutions of a quadratic represent? • How can we apply quadratics to real life situations? • **Topic A Objectives** **Lesson 1:** A1.A.SSE.A.2, A1. A. APR.A.1 • Students use the distributive property to multiply a monomial by a polynomial and understand that factoring reverses the multiplication process. • Students use polynomial expressions as side lengths of polygons and find area by multiplying.	**Topic A: Quadratic Expressions, Equations, Functions, and Their Connection to Rectangles** **Special Note:** *It is recommended that teachers access the additional resources below to meet the needs of your students.* **Lesson 1:** (Arlington Algebra Project: Greatest Common Factors pg.215/Factoring Difference of Perfect Squares pg.219) Lesson 2: (Arlington Algebra Project: Factoring Trinomials pg.223/Factoring Completely pg.227) **Lesson 3** **Lesson 4** **Lesson 5** **Lesson 6** **Lesson 7:** (Arlington Algebra Project: Quadratic Functions Applications pg.188) / (eMath U8:L8 Quadratic Word Problems) **Lesson 8:** (Arlington Algebra Project: Properties of the Graph of a Quadratic Function pg.167) **Lesson 9:** (eMath U8:L6 Zeros of a Quadratic) / (Arlington Algebra Project: Using Quadratic Functions to Factor pg.239) **Optional:** Before Lesson 10, Review material covered in Module 1, Lesson 2: Graphs of Quadratic Functions **Lesson 10** **Special Note:** *It is recommended that teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.*	**Vocabulary/Familiar Terms and Symbols for Module 4**: Average rate of change Binomial Closed Closure Coefficient Cube root Cubic Degree of a polynomial Domain and range Explicit expression Factor Integers Irrational numbers Monomial Parabola Power Quadratic Rational numbers Real numbers Recursive process Solution set Solutions (solution set) of an equation Square root Term Trinomial Zeros of a function

subtraction, and multiplication; add, subtract, and multiply polynomials.

Domain: Create equations

Cluster: Create equations that describe numbers or relationships.

- **A1.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems.
  Tasks are limited to linear, quadratic, or exponential equations with integer exponents.
- **A1.A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales

Domain: Reasoning with Equations and Inequalities

Cluster: Solve equations and inequalities in one variable.

- **A1.A.REI.B.3b (formerly A-REI.B.4b)** Solve quadratic equations and inequalities in one variable.
  b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.
  Tasks do not require students to write solutions for quadratic equations that have roots with nonzero imaginary parts. However, tasks can require the student to recognize cases in which a quadratic equation has no real solutions.

Domain: Reasoning with Equations and Inequalities

Cluster: Represent and solve equations and inequalities graphically.

- **A1. A. REI.D.6 (formerly A. REI.D.11)** Explain why the *x*-coordinates of the

- Students recognize patterns and formulate shortcuts for writing the expanded form of binomials whose expanded form is a perfect square or the difference of perfect squares.

Lesson 2: A1.A.SSE.A.2, A1. A. APR.A.1

- Students understand that factoring reverses the multiplication process as they find the linear factors of basic, factorable quadratic trinomials.

Lesson 3: A1.A.SSE.A.2

- Students develop strategies for factoring quadratic expressions that are not easily factorable, making use of the structure of the quadratic expression.

Lesson 4: A1.A.SSE.A.2

- Students factor quadratic expressions that cannot be easily factored and develop additional strategies for factorization, including splitting the linear term, using graphing calculators, and using geometric or tabular models.

Lesson 5: A1.A.SSE.A.2, A1.A.CED.A.1

- Students solve increasingly complex one-variable equations, some of which need algebraic manipulation, including factoring as a first step and using the zero product property.

Lesson 6: A1.A.REI.B.3b

- Students use appropriate and efficient strategies to find solutions to basic quadratic equations.
- Students interpret the verbal description of a problem and its solutions in context and then justify the solutions using algebraic reasoning.

Lesson 7: A1.A.SSE.B.3a, A1.A.CED.A.1

- Students interpret word problems to create equations in one variable and solve them (i.e., determine the solution set) using factoring and the zero product

Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.

Additional Resources:

Khan Academy Videos: Quadratics and Polynomials

Task(s)

Polynomial Farm

Illustrative: Non-negative Polynomials

Illustrative Math: Powers of 11

Math Shell: Arithmetic with Polynomials and Rational Expressions

Achieve the Core: Factored Form of a Quadratic Function

MathBits Algebra I Notebook

Mid-Module 4 Assessment
(Complete by 2/7/20;** carefully select appropriate problems**)

New or Recently Introduced Terms for Module 4:

Axis of symmetry of the graph of a quadratic function
Cube root function
Cubic function
Degree of a monomial term
Degree of a polynomial
Discriminant
End behavior of a quadratic function
Factored form for a quadratic function
Leading coefficient
Parent function
Quadratic formula
Quadratic function
Roots of a polynomial function
Square root function
Standard form for a quadratic function
Standard form of a polynomial in one
Vertex form
Vertex of the graph of a quadratic

points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the approximate solutions using technology.

Domain: Interpreting Functions
Cluster: Interpret functions that arise in applications in terms of the context.

- **A1. F.IF.B.3 (formerly F.IF.B.4)** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
  Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.
  i) Tasks have a real-world context.
  ii) Tasks are limited to linear functions, quadratic functions, absolute value functions, and exponential functions with domains in the integers
- **A1. F.IF.B.4 (formerly F.IF.B.5)** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
- **A1. F.IF.B.5 (formerly F.IF.B.6)** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
  i) Tasks have a real-world context.
  ii) Tasks are limited to linear functions, quadratic functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers

Domain: Interpreting Functions

Cluster: Analyze functions using different representations.

- **A1.F.IF.C.6 (formerly F.IF.C.7)** Graph functions expressed symbolically and show key features of the

property.

Lesson 8: A1. F.IF.B.3, A1.F.IF.C.6a

- Students examine quadratic equations in two variables represented graphically on a coordinate plane and recognize the symmetry of the graph. They explore key features of graphs of quadratic functions: y-intercept and x-intercept, the vertex, the axis of symmetry, increasing and decreasing intervals, negative and positive intervals, and end behavior. They sketch graphs of quadratic functions as a symmetric curve with a highest or lowest point corresponding to its vertex and an axis of symmetry passing through the vertex.

Lessons 9: A1. A. APR.B.2, A1. F.IF.B.3, A1.F.IF.C.6a

- Students use the factored form of a quadratic equation to construct a rough graph, use the graph of a quadratic equation to construct a quadratic equation in factored form, and relate the solutions of a quadratic equation in one variable to the zeros of the function it defines.
- Students understand that the number of zeros in a polynomial function corresponds to the number of linear factors of the related expression and that different functions may have the same zeros but different maxima or minima.

Lessons 10: A1. F.IF.B.3, A1. F.IF.B.5

- Students interpret quadratic functions from graphs and tables: zeros (xx-intercepts), yy-intercept, the minimum or maximum value (vertex), the graph's axis of symmetry, positive and negative values for the function, increasing and decreasing intervals, and the graph's end behavior.
- Students determine an appropriate

Topic A: Quadratic Expressions, Equations, Functions, and Their Connection to Rectangles

Special Note: *It is recommended that teachers access the additional resources below to meet the needs of your students.*

Lesson 1: (Arlington Algebra Project: Greatest Common Factors pg.215/Factoring Difference of Perfect Squares pg.219)
Lesson 2: (Arlington Algebra Project: Factoring Trinomials pg.223/Factoring Completely pg.227)
Lesson 3
Lesson 4
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Lesson 6
Lesson 7: (Arlington Algebra Project: Quadratic Functions Applications pg.188) / (eMath U8:L8 Quadratic Word Problems)
Lesson 8: (Arlington Algebra Project: Properties of the Graph of a Quadratic Function pg.167)
Lesson 9: (eMath U8:L6 Zeros of a Quadratic) / (Arlington Algebra Project: Using Quadratic Functions to Factor pg.239)
Optional: Before Lesson 10, Review material covered in Module 1, Lesson 2: Graphs of Quadratic Functions
Lesson 10

Special Note: *It is recommended that teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.*

Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.

Additional Resources:
Khan Academy Videos: Quadratics and Polynomials

Vocabulary/Familiar Terms and Symbols for Module 4:

Average rate of change
Binomial
Closed
Closure
Coefficient
Cube root
Cubic
Degree of a polynomial
Domain and range
Explicit expression
Factor
Integers
Irrational numbers
Monomial
Parabola
Power
Quadratic
Rational numbers
Real numbers
Recursive process
Solution set
Solutions (solution set) of an equation
Square root
Term
Trinomial
Zeros of a function

New or Recently Introduced Terms for Module 4:

Axis of symmetry of the graph of a quadratic function
Cube root function
Cubic function
Degree of a monomial term
Degree of a polynomial
Discriminant

graph, by hand and using technology. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. **Domain:** Arithmetic with Polynomials and Rational Expressions **Cluster:** Understand the relationships between zeros and factors of polynomials. ➢ **A1. A. APR.B.2 (formerly A.APR.B.3)** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. *Graphing is limited to linear and quadratic polynomials.*	domain and range for a function's graph and when given a quadratic function in a context, recognize restrictions on the domain.	**Task(s)** Polynomial Farm Illustrative: Non-negative Polynomials Illustrative Math: Powers of 11 Math Shell: Arithmetic with Polynomials and Rational Expressions Achieve the Core: Factored Form of a Quadratic Function MathBits Algebra I Notebook **Mid-Module 4 Assessment** ***(Complete by 2/7/20;** carefully select appropriate problems)*	End behavior of a quadratic function Factored form for a quadratic function Leading coefficient Parent function Quadratic formula Quadratic function Roots of a polynomial function Square root function Standard form for a quadratic function Standard form of a polynomial in one Vertex form Vertex of the graph of a quadratic
Domain: Seeing Structure in Expressions **Cluster:** Interpret the structure of expressions **A1.A.SSE.A.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.* **A1.A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it **A1.A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines b. Complete the square in a quadratic expression in the form $Ax^2 + Bx + C$ to	**Topic B Objectives:** **Lesson 11: A1.A.SSE.B.3a, A1.A.SSE.B.3b, A1.A.REI.B.3** • Students rewrite quadratic expressions given in standard form, $ax^2 + bx + c$ (with $a = 1$), in the equivalent completed-square form, $a(x-h)^2 + k$, and recognize cases for which factored or completed-square form is most efficient to use. **Lesson 12: A1.A.SSE.A.1, A1.A.SSE.B.3, A1. A. APR.B.2, A1.A.CED.A.1, A1.A.CED.A.2, A1.A.REI.B.3** • Students rewrite quadratic expressions given in standard form, $ax^2 + bx + c$ (with $a \neq 1$), as equivalent expressions in completed-square form $a(x-h)^2 + k$. They build quadratic expressions in basic business application contexts and rewrite them in equivalent forms. **Lesson 13: A1.A.SSE.B.3, A1.A.REI.B.3 A1. F.IF.C.7** • Students solve complex quadratic equations, including those with a leading coefficient other than 1, by completing the	**Topic B: Using Different Forms for Quadratic Functions** **Special Note:** *It is recommended that teachers access the additional resources below to meet the needs of your students.* **Lesson 11** **Lesson 12:** (eMath U8:L4 Completing the Square) **Lesson 13** **Lesson 14 (optional)** **Lesson 15** **Lesson 16** **Lesson 17** **Special Note:** *It is recommended that teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.* *Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.*	**Vocabulary/Familiar Terms and Symbols for Module 4**: Average rate of change Binomial Closed Closure Coefficient Cube root Cubic Degree of a polynomial Domain and range Explicit expression Factor Integers Irrational numbers Monomial Parabola Power Quadratic Rational numbers Real numbers Recursive process Solution set Solutions (solution set) of an equation Square root

reveal the maximum or minimum value of the function it defines.

Domain: Arithmetic with Polynomials and Rational Expressions

Cluster: Understand the relationships between zeros and factors of polynomials.

- **A1. A. APR.B.2 (formerly A.APR.B.3)** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. *Graphing is limited to linear and quadratic polynomials.*

Domain: Create equations

Cluster: Create equations that describe numbers or relationships.

- **A1.A.CED.A.1** Create equations and inequalities in one variable and use them to solve problems. *Tasks are limited to linear, quadratic, or exponential equations with integer exponents.*
- **A1.A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales

Domain: Reasoning with Equations and Inequalities

Cluster: Solve equations and inequalities in one variable.

- **A1.A.REI.B.3 (formerly A-REI.B.4)** Solve quadratic equations and inequalities in one variable.
  a. Use the method of completing the square to rewrite any quadratic equation in *x* into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive

square. Some solutions may be irrational. Students draw conclusions about the properties of irrational numbers, including closure for the irrational number system under various operations.

Lesson 14: A1.A.REI.B.3

- Students derive the quadratic formula by completing the square for a general quadratic equation in standard form, $a^2 + bx + c = 0$, and use it to verify the solutions for equations from the previous lesson for which they have already factored or completed the square.

Lesson 15: A1.A.REI.B.3

- Students use the quadratic formula to solve quadratic equations that cannot be easily factored.
- Students understand that the discriminant, $bb2 - 4aaaa$, can be used to determine whether a quadratic equation has one, two, or no real solutions.

Lesson 16: A1.A.SSE.A.1, A1.A.CED.A.1, A1. F.IF.C.6a, A1. F.IF.C.7

- Students graph simple quadratic equations of the form $y = a(x - h)^2 + k$ (completed-square or vertex form), recognizing that (h, k) represents the vertex of the graph and use a graph to construct a quadratic equation in vertex form.
- Students understand the relationship between the leading coefficient of a quadratic function and its concavity and slope and recognize that an infinite number of quadratic functions share the same vertex.

Lesson 17: A1. F.IF.B.3, A1. F.IF.C.6a, A1. F.IF.C.7

- Students graph a variety of quadratic functions using the form $f(x) = ax^2 + bx$

Additional Resources:
Khan Academy Videos: Quadratics and Polynomials
TN Task Arc: Developing an Understanding of Quadratics

MathBits Algebra I Notebook

Topic B: Using Different Forms for Quadratic Functions

Special Note: *It is recommended that teachers access the additional resources below to meet the needs of your students.*

Lesson 11
Lesson 12: (eMath U8:L4 Completing the Square)
Lesson 13
Lesson 14 (optional)
Lesson 15
Lesson 16
Lesson 17

Special Note: *It is recommended that teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.*

Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.

Additional Resources:
Khan Academy Videos: Quadratics and Polynomials
TN Task Arc: Developing an Understanding of Quadratics
MathBits Algebra I Notebook

Term
Trinomial
Zeros of a function

New or Recently Introduced Terms for Module 4:
Axis of symmetry of the graph of a quadratic function
Cube root function
Cubic function
Degree of a monomial term
Degree of a polynomial
Discriminant
End behavior of a quadratic function
Factored form for a quadratic function
Leading coefficient
Parent function
Quadratic formula
Quadratic function
Roots of a polynomial function
Square root function
Standard form for a quadratic function
Standard form of a polynomial in one
Vertex form
Vertex of the graph of a quadratic

the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions. *For A1. A. REI.B.3b: Tasks do not require students to write solutions for quadratic equations that have roots with nonzero imaginary parts. However, tasks can require the student to recognize cases in which a quadratic equation has no real solutions.* **Domain**: Interpreting Functions **Cluster:** Interpret functions that arise in applications in terms of the context. **A1. F.IF.B.3 (formerly F.IF.B.4)** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.* *i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, quadratic functions, absolute value functions, and exponential functions with domains in the integers* **A1. F.IF.B.5 (formerly F.IF.B.6)** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *i) Tasks have a real-world context.* *ii) Tasks are limited to linear functions, quadratic functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers.*	+ c (standard form). • Students analyze and draw conclusions about contextual applications using the key features of a function and its graph.	**Topic B: Using Different Forms for Quadratic Functions** **Special Note:** *It is recommended that teachers access the additional resources below to meet the needs of your students.* **Lesson 11** **Lesson 12:** (eMath U8:L4 Completing the Square) **Lesson 13** **Lesson 14 (optional)** **Lesson 15** **Lesson 16** **Lesson 17** **Special Note:** *It is recommended that teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.* *Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.* **Additional Resources:** Khan Academy Videos: Quadratics and Polynomials TN Task Arc: Developing an Understanding of Quadratics MathBits Algebra I Notebook	**Vocabulary/Familiar Terms and Symbols for Module 4**: Average rate of change Binomial Closed Closure Coefficient Cube root Cubic Degree of a polynomial Domain and range Explicit expression Factor Integers Irrational numbers Monomial Parabola Power Quadratic Rational numbers Real numbers Recursive process Solution set Solutions (solution set) of an equation Square root Term Trinomial Zeros of a function **New or Recently Introduced Terms for Module 4:** Axis of symmetry of the graph of a quadratic function Cube root function Cubic function Degree of a monomial term Degree of a polynomial Discriminant

Domain: Interpreting Functions **Cluster:** Analyze functions using different representations. ➢ A1. F.IF.C.6 **(formerly F.IF.C.7)** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. **a**. Graph linear and quadratic functions and show intercepts, maxima, and minima. ➢ A1. F.IF.C.7 **(formerly F.IF.C.8)** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **a**. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.			End behavior of a quadratic function Factored form for a quadratic function Leading coefficient Parent function Quadratic formula Quadratic function Roots of a polynomial function Square root function Standard form for a quadratic function Standard form of a polynomial in one Vertex form Vertex of the graph of a quadratic
Domain: Create equations **Cluster:** Create equations that describe numbers or relationships. ■ A1.A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales **Domain**: Interpreting Functions **Cluster:** Interpret functions that arise in applications in terms of the context. ■ A1. F.IF.B.5 **(formerly F.IF.B.6)** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	**Topic C Objectives:** **Lesson 18: A1. F.IF.C.6b** • Students compare the basic quadratic (parent) function, $y = x^2$, to the square root function and do the same with cubic and cube root functions. They then sketch graphs of square root and cube root functions, taking into consideration any constraints on the domain and range. **Lesson 19: A1. F.IF.C.6b, A1. F.BF.B.2** • Students recognize and use parent functions for linear, absolute value, quadratic, square root, and cube root functions to perform vertical and horizontal translations. They identify how the graph of $y = f(x)$ relates to the graphs of $yy = f(x) + k$ and $y = f(x + k)$ for any specific values of k, positive or negative, and find the constant value, k, given the parent functions and the	**Topic C: Transformations of Functions** **Special Note:** *It is recommended that teachers access the additional resources below to meet the needs of your students.* Lesson 18 Lesson 19 Lesson 20 Lesson 21 ~~Lesson 22~~ (omit) Lesson 23 (optional) Lesson 24 (optional) **Additional Resource(s):** Khan Academy Videos: Absolute Value and Piecewise Functions MathBits Algebra I Notebook **Special Note:** *It is recommended that*	**Vocabulary/Familiar Terms and Symbols for Module 4**: Average rate of change Binomial Closed Closure Coefficient Cube root Cubic Degree of a polynomial Domain and range Explicit expression Factor Integers Irrational numbers Monomial Parabola Power Quadratic

i) Tasks have a real-world context. *ii) Tasks are limited to linear functions, quadratic functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers.* **Domain**: Interpreting Functions **Cluster:** Analyze functions using different representations. ➢ A1. F.IF.C.6 **(formerly F.IF.C.7)** Graph functions expressed symbolically and show key features of the graph, by hand and using technology. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions ➢ A1. F.IF.C.7 **(formerly F.IF.C.8)** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **a**. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. ➢ A1. F.IF.C.8 **(formerly F.IF.C.9)** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **Domain**: Building Functions **Cluster:** Build new functions from existing functions. ➢ A1. F.BF.B.2 **(formerly F.BF.B.3)**	translated graphs. Students write the function representing the translated graphs. **Lesson 20:** A1. F.IF.C.6b, A1. F.BF.B.2 • Students recognize and use parent functions for absolute value, quadratic, square root, and cube root to perform transformations that stretch and shrink the graphs of the functions. They identify the effect on the graph of $y = f(x)$ when $f(x)$ is replaced with $kf(x)$ and $f(kx)$, for any specified value of k, positive or negative, and identify the constant value, k, given the graphs of the parent functions and the transformed functions. Students write the formulas for the transformed functions given their graphs. **Lesson 21:** A1. F.IF.C.6b, A1. F.BF.B.2 • Students make a connection between the symbolic and graphic forms of quadratic equations in the completed-square (vertex) form. They efficiently sketch a graph of a quadratic function in the form, $f(x) = a(x - h)^2 + k$, by transforming the quadratic parent function, $f(x) = x^2$, without the use of technology. They then write a function defined by a quadratic graph by transforming the quadratic parent function. **Lesson 23: (optional)** A1.A.CED.A.2, A1. F.IF.B.5, A1. F.IF.C.6b, A1. F.IF.C.8, A1. F.BF.B.2 • Students write the quadratic function described verbally in a given context. They graph, interpret, analyze, check results, draw conclusions, and apply key features of a quadratic function to real-life applications in business and physics. **Lesson 24: (optional)** A1.A.CED.A.2, A1.F.IF.B.5, A1. F.IF.C.6b, A1. F.IF.C.8, A1. F.BF.B.2 • Students create a quadratic function from	*teachers assess student gaps and scaffold accordingly using the resources/ tasks/lessons in the Resource Toolbox or those provided under Additional Resources.* *Also, assessments other than Mid-Module and End-of-Module assessments should be given based upon the lessons taught and the needs of the students.* **End-of-Module 4 Assessment (Complete by 3/13/20**; *carefully select appropriate problems*) **Special Note**: *It is recommended that teachers should begin preparing for next quarter with by attending the Module Study for Module 2 that will be held towards the end of the quarter.*	Rational numbers Real numbers Recursive process Solution set Solutions (solution set) of an equation Square root Term Trinomial Zeros of a function **New or Recently Introduced Terms for Module 4:** Axis of symmetry of the graph of a quadratic function Cube root function Cubic function Degree of a monomial term Degree of a polynomial Discriminant End behavior of a quadratic function Factored form for a quadratic function Leading coefficient Parent function Quadratic formula Quadratic function Roots of a polynomial function Square root function Standard form for a quadratic function Standard form of a polynomial in one Vertex form Vertex of the graph of a quadratic

Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *k f(x)*, *f(kx)*, and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.	a data set based on a contextual situation, sketch its graph, and interpret both the function and the graph in context. They answer questions and make predictions related to the data, the quadratic function, and graph.		

RESOURCE TOOLKIT

Standards

***Teacher Guide* to Algebra I Standards: Linear Equations**
HS Flip Book with Examples of Each Standard
CCSS
http://www.ccsstoolbox.org/
http://parcconline.org/
Achieve
Tennessee Academic Standards for Mathematics
Tennessee Assessment LiveBinder
Achieve the Core Coherence Map

Videos

Khan Academy
Illuminations (NCTM)
Discovery Education
The Futures Channel
The Teaching Channel
Teachertube.com
Get The Math
eMathInstruction

Calculator

Texas Instruments Education
TI-Nspire
http://www.atomiclearning.com/ti_84
TICommonCore.com
http://www.casioeducation.com/educators

Manipulatives/Other Resources

MathBits Algebra I Notebook
Problem Attic
OpenEd
National Library of Virtual Manipulatives
http://www.shodor.org/interactivate/activities/
Edugoodies
Graphic Organizers (9-12)

SEL Resources

SEL Connections with Math Practices
SEL Core Competencies
The Collaborative for Academic, Social, and Emotional Learning (CASEL)

Tasks/Lessons

Edutoolbox (formerly Tncore.org)
Mathematics Assessment Project (MARS Tasks, Lessons & PD Modules)
Dan Meyer's Three-Act Math Tasks
Illustrative Math Tasks
UT Dana Center
Inside Math Tasks
LearnZillion
eMathInstruction
Arlington Algebra Project

ACT/SAT Testing

ACT & SAT
TN ACT Information & Resources
ACT College & Career Readiness Mathematics Standards
SAT Connections
SAT Practice from Khan Academy

Curriculum and Instruction – Mathematics

Quarter 3 **Algebra I**

January 2020						
Suggested Lessons for the Week	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Notes:**
			1 Winter Break	**2**	**3**	***Please use this suggested pacing as a guide. It is understood that teachers may be up to 1 week ahead or 1 week behind depending on their individual class needs.***
Module 4, Topic A (Lessons 1 & 2)	**6** *3rd Quarter Begins* Topic A Lesson 1	**7** Topic A Lesson 1	**8** Topic A Lesson 2	**9** Topic A Lesson 2	**10** **Flex Day Options** **A1.A.SSE.A.2** ***A1.A.APR.A.1** **Pacing** **Other**	**Flex Day Options Include:** ***Standard***- Suggested standard(s) to review for the day (*-denotes a Power Standard) ***Pacing*** – Use this time to adjust instruction to stay on pace. ***Other***- This includes assessments, review, re-teaching, etc.
Module 4, Topic A (Lessons 3 - 5)	**13** Topic A Lesson 3	**14** Topic A Lesson 4	**15** Topic A Lesson 4	**16** Topic A Lesson 5	**17** *1/2 day students* **Flex Day Options** **A1.A.REI.B.3b** **Pacing** **Other**	
Module 4, Topic A (Lessons 6 & 7)	**20** ***Martin Luther King Jr. Day (Out)***	**21** Topic A Lesson 6	**22** Topic A Lesson 6	**23** Topic A Lesson 7	**24** Topic A Lesson 7	
Module 4, Topic A (Lessons 8 & 9)	**27** Topic A Lesson 8	**28** Topic A Lesson 8	**29** Topic A Lesson 9	**30** Topic A Lesson 9	**31** **Flex Day Options** **A1.A.SSE.B.3a** **A1.A.CED.A.1** **Pacing** **Other**	

February 2020						
Suggested Lessons for the Week	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Notes:**
Module 4, Topic A (Lesson 10)	**3** Topic A Lesson 10	**4** Topic A Lesson 10	**5** Assessment, Remediation, and/or Further Application	**6** Mid Module Assessment (do not use problems from omitted lessons)	**7** **Flex Day Options** **A1. F.IF.B.3** **A1.F.IF.C.6a** **Pacing** **Other**	***Please use this suggested pacing as a guide. It is understood that teachers may be up to 1 week ahead or 1 week behind depending on their individual class needs.*** **Flex Day Options Include:** ***Standard***- Suggested standard(s) to review for the day (*-denotes a Power Standard) ***Pacing*** – Use this time to adjust instruction to stay on pace. ***Other***- This includes assessments, review, re-teaching, etc.
Module 4, Topic B (Lessons 11 - 13)	**10** Topic B Lesson 11	**11** Topic B Lesson 12	**12** Topic B Lesson 13	**13** *Parent Teacher Conferences* Topic B Lesson 13	**14** *1/2 day students* **Flex Day Options** **A1. F.IF.B.5** **Pacing** **Other**	
Module 4, Topic B (Lessons 15 - 17)	**17** ***President's Day***	**18** Topic B Lesson 15	**19** Topic B Lesson 15	**20** Topic B Lesson 16	**21** Topic B Lesson 17	
Module 4, Topic C (Lessons 18 & 19)	**24** Topic C Lesson 18	**25** Topic C Lesson 18	**26** Topic C Lesson 19	**27** Topic C Lesson 19	**28** **Flex Day Options** **A1.A.REI.B.3** **A1. F.IF.C.7** **Pacing** **Other**	

March 2020

Suggested Lessons for the Week	Monday	Tuesday	Wednesday	Thursday	Friday
Module 4, Topic C (Lessons 20 & 21)	**2** Topic C Lesson 20	**3** Topic C Lesson 20	**4** Topic C Lesson 21	**5** Topic C Lesson 21	**6** **Flex Day Options** **A1. F.IF.C.6b** **A1. F.BF.B.2** **Pacing** **Other**
Assessment, Remediation, and/or Further Application	**9** Assessment, Remediation, and/or Further Application	**10** Assessment, Remediation, and/or Further Application	**11** Assessment, Remediation, and/or Further Application	**12** End of Module Assessment (do not use problems from omitted lessons)	**13** *End of Quarter 3* **Flex Day Options** **A1. F.IF.C.6b** **A1. F.BF.B.2** **Pacing** **Other**
	16 Spring Break	**17**	**18**	**19**	**20**
	23 *Quarter 4 begins*	**24**	**25**	**26**	**27**
	30	**31**	1	2	3

Please use this suggested pacing as a guide. It is understood that teachers may be up to 1 week ahead or 1 week behind depending on their individual class needs.

Flex Day Options Include:

Standard- Suggested standard(s) to review for the day (*-denotes a Power Standard)

Pacing – Use this time to adjust instruction to stay on pace.

Other- This includes assessments, review, re-teaching, etc.