

Quarter 1	Quarter 2	Quarter 3	Quarter 4
Properties of Exponents, Expressions, Equations, and Inequalities, Linear Systems, Various Functions & Their Graphs, Rational and Irrational Expressions	Polynomials, Quadratic Functions and Equations	Basic Geometry, Similar Triangles, Measurement	Right Triangles, Probability and Statistics, Distance and Midpoint Formulas, Operations on Functions, Exponential Functions
August 12, 2019 – October 11, 2019	October 21, 2019 – December 20, 2019	January 6, 2020 – March 13, 2020	March 23, 2020 - May 22, 2020
B.A.CED.A.1	B.A.APR.A.1	B.A.REI.A.1	B.A.REI.D.4
B.A.CED.A.2	B.A.APR.B.2	B.A.SSE.A.2	B.F.IF.C.6
B.A.CED.A.3	B.A.REI.B.2	B. G.C.A.1	B.G.SRT.B.2
B.A.SSE.A.1	B.F.IF.A.2	B.G.GMD.A.1	B.G.SRT.B.3
B.A.REI.C.3	B.F.IF.C.4	B.G.GMD.A.2	B.G.SRT.B.4
B.A.REI.D.5	B.N.CN.A.1	B.G.GMD.A.3	B.S.CP.A.1
B.F.IF.A.1	B.N.CN.A.2	B.G.MG.A.1	B.S.CP.A.2
B.F.IF.B.3	B.N.Q.A.1	B.G.MG.A.2	B.S.CP.A.3
B.F.IF.C.4	B.N.Q.A.3	B.G.SRT.A.1	B.S.CP.A.4
B.F.IF.C.5		B.N.Q.A.2	B.S.ID.A.1
B.N.RN.A.1			B.S.ID.B.2
B.N.Q.A.1			B.S.ID.B.3
B.N.Q.A.3			
B.S.ID.C.4			



Quarter 2 BRIDGE MATH

#### 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?

80% of seniors will be college-or career-ready 90% of students will graduate on time

100%
of college-or career-ready
graduates enroll in
post-secondary opportunities

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**.

# Instructional Shifts for Mathematics

Focus

Coherence



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.

Tennessee Mathematics Content Standards Standards for Mathematical Practice Literacy Skills for Mathematical Proficency



Quarter 2 BRIDGE MATH

# **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 (for Algebra I, Algebra II & Geometry only). 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 & Resources**

District and web-based resources have been provided in the Instructional Support & Resources columns. 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. 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.



Quarter 2 BRIDGE MATH

## **Topics Addressed in Quarter**

- Polynomials
- Quadratic Functions and Equations

### Overview

The content at the beginning of this quarter introduces students to polynomial expressions and how to add, subtract, and multiply polynomials. Students will understand factoring as the reverse process of multiplication and this understanding is extended and connected to factoring polynomial expressions and solving basic polynomial equations. The ability to manipulate expressions is critical to students' understanding, particularly in solving quadratic equations. Students work extensively with factoring quadratics using various factoring techniques. Students will find and estimate roots, solve quadratics using the Quadratic Formula, completing the square, taking square roots, and by factoring using the Zero Product Property. Students will understand what it means to solve a quadratic equation. Building on previous units and prior courses that explored linear equations and expressions, students will begin to explore radicals and rational functions.

TN STATE STANDARDS	TN STATE STANDARDS CONTENT		INSTRUCTIONAL SUPPORT & RESOURCES	
Domain: Arithmetic with Polynomials and Rational Expressions (A.APR) Cluster: Perform arithmetic operations on polynomials.  B.A.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Unit 4 - Chapter 11: Polynom Chapter 8: Polynomials & Fac	ials (McGraw-Hill Bridge Math) toring (Prentice Hall Algebra 1) nstruction, review, and assessment)  McGraw-Hill Bridge Math 11-1 Add and Subtract Polynomials 11-2 Multiply by a Monomial 11-3 Divide and Find Factors  Prentice Hall Algebra 1 8-1 Adding and Subtracting Polynomials 8-2 Multiplying and Factoring	Vocabulary: Polynomial, monomial, coefficient, constant, binomial, trinomial, like terms, simplify, standard form, extracting factors, greatest common factor (GCF)  Writing in Math: Tell whether you prefer to group terms or use columns to add or subtract polynomials. Explain why you prefer that method.	
polynomiais.	<ul> <li>Students will multiply polynomials by monomials.</li> <li>Students will factor polynomials into a monomial factor and a polynomials factor.</li> </ul>	Concept Byte: Using Models to Multiply  Task(s):  Illustrative: Powers of 11	Explain why you prefer that method:  Explain how subtraction of polynomials is related to addition of polynomials.  How is algebraic multiplication of a monomial and a polynomial similar to arithmetic	



TN STATE STANDARDS	CONTENT	INSTRUCTIONAL SUPPORT & RESOURCES	
Domain: Arithmetic with Polynomials and Rational Expressions (A.APR) Cluster: Perform arithmetic operations on polynomials. B.A.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Essential Question(s): How are the properties of real numbers related to polynomials?  Objective(s): Students will multiply a binomial by a binomial. Students will write polynomials in standard form. Students will expand a product of two binomials.	Additional Resources: Khan Academy Videos: Intro to Polynomials Khan Academy Videos: Adding & Subtracting Polynomials Khan Academy Videos: Intro to factorization Khan Academy Videos: Factoring monomials Khan Academy Videos: Common monomial factors  McGraw-Hill Bridge Math 11-4 Multiply Two Binomials  Prentice Hall Algebra 1 8-3 Multiplying Binomials  Task(s): Multiplying Binomials Task Multiplying Polynomials Formative Assessment Task  Additional Resources: EngageNY Lesson: Multiplying Polynomials (Eureka Math Algebra I Module 1, Topic B, Lesson 9) Khan Academy: Multiplying Binomials by Binomials	wiltiplication of a single-digit number and a multi-digit number?  Vocabulary: binomial, distributive property, product, terms, expanding, sum and difference of two squares,  Writing in Math: Have students create multiple representations of binomial multiplication.  Have students write a response to the following: Can the product of two binomials ever have more than three terms? Explain your thinking.
		Virtual Nerd Video: Multiplying binomials using the distributive property	
Chapter 12: Quadratic Equations (McGraw-Hill Bridge Math)			
Chapter 9: Quadratic Functions & Equations (Prentice Hall Algebra 1)			
Chapter 4: Quadratic Functions and Equations (Prentice Hall Algebra 2)			
(Allow approximately 6 weeks for instruction, review, and assessment)			
Domain: Interpreting Functions (F.IF) Cluster: Analyze functions	Essential Question(s):  How can we determine which way the	McGraw-Hill Bridge Math 12-1 Graph Parabolas	Vocabulary: quadratic, quadratic equation, function, parabola, vertex, axis of symmetry



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TN STATE STANDARDS	CONTENT		PURI & RESOURCES
using different representations.  B.F.IF.C.4 Graph linear, quadratic, absolute value, and piecewise functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated ones.  Domain: Quantities (N.Q) Cluster: Reason quantitatively and use units to solve problems.  B.N.Q.A.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	parabola will be facing before you graph it?  How do we find the vertex when an equation is given? A graph?  How does a quadratic equation transform on a coordinate plane?  How can we recognize solutions on a parabola?  Objective(s): Students will graph quadratic functions.  Students will identify key features of a quadratic equation.	Prentice Hall Algebra 1 9-1 Quadratic Graphs and Their Properties Prentice Hall Algebra 2 4-1 Quadratic Functions and Transformations  Task(s): GSE Tasks: Modeling and Analyzing Quadratic Functions (a collection of tasks)  Additional Resources: Khan Academy: Forms & Features of Quadratic Functions 3-lesson unit on Quadratics  Shifting and Scaling Parabolas  Better Lesson: The Parabola (Day 1) Better Lesson: The Parabola (Day 2)	Writing in Math: What are some of the real-life applications of quadratic equations?  What do you notice about the location of the vertex and axis of symmetry of the parabola you obtain when you graph an equation in the form <i>y</i> = <i>ax</i> <sup>2</sup> + <i>c</i> ?
Domain: Reasoning with Equations and Inequalities (A.REI) Cluster: Solve equations and inequalities in one variable. B.A.REI.B.2 Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.  Domain: Interpreting Functions (F.IF) Cluster: Analyze functions	What are the advantages of a quadratic function in vertex form? In standard form?     How is any quadratic function related to the parent quadratic function?     How are the real solutions of a quadratic equation related to the graph of the related quadratic function?  Objective(s):     Students will graph functions defined by the general quadratic equation (standard form).	McGraw-Hill Bridge Math  12-2 The General Quadratic Function Prentice Hall Algebra 1  9-2 Quadratic Functions Prentice Hall Algebra 2  4-2 Standard Form of a Quadratic Function  Task(s): Illustrative: Identifying Quadratic Functions (Vertex Form)  Illustrative: Identifying Quadratic Functions (Standard Form)	Vocabulary: quadratic equation, standard form of a quadratic equation  Writing in Math:  Summarize the relationship between   a   and the width of the graph of $y = ax^2 + bx + c$ .  Compare standard form with vertex form using an actual function. Compare the steps needed to find the vertex.  Explain how you can use the <i>y</i> -intercept, vertex, and axis of symmetry to graph a quadratic function. Assume the vertex is not



TN STATE STANDARDS	CONTENT	INSTRUCTIONAL SUPPORT & RESOURCES	
using different representations.  B.F.IF.C.4 Graph linear, quadratic, absolute value, and piecewise functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated ones.  Domain: Quantities (N.Q) Cluster: Reason quantitatively and use units to solve problems.  B.N.Q.A.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	Students will solve quadratic equations by graphing	Additional Resources:  3-lesson unit on Quadratics  EngageNY Lesson: Algebra I Module 4, Topic A, Lesson 8 (Eureka Math Algebra I Module 4, Topic A, Lesson 8)  EngageNY Lesson: Algebra I Module 4, Topic A, Lesson 10 (Eureka Math Algebra I Module 4, Topic A, Lesson 8)	on the y axis.
Domain: Reasoning with Equations and Inequalities (A.REI) Cluster: Solve equations and inequalities in one variable. B.A.REI.B.2 Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.  Domain: Interpreting Functions (F.IF) Cluster: Analyze functions using different representations.	Essential Question(s): How can features of quadratic functions such as the equation, solutions, axis of symmetry, vertex, etc. be represented in tables, equations, and in "real world" contexts?  Objective(s): Students will solve quadratic equations by graphing and using square roots. Students will use factoring to solve quadratic equations.	McGraw-Hill Bridge Math  12-3 Factor and Graph  Prentice Hall Algebra 1  9-3 Solving Quadratic Equations  9-4 Factoring to Solve Quadratic Equations  Task(s): Illustrative: Building a General Quadratic Function  Tile Patterns  Additional Resources: Khan Academy: Solving quadratic equations by taking square root Khan Academy: Solving quadratic equations by factoring and using structure	Vocabulary: Zero-Product Property, roots of the equation, zeros of the function  Writing in Math:  When is it easier to solve a quadratic equation of the form $ax + bx + c = 0$ using square roots than to solve it using a graph?  How is factoring the expression $x^2 - 6x + 8$ similar to solving the equation $x^2 - 6x + 8 = 0$ ? How is it different?



TN STATE STANDARDS	CONTENT	INSTRUCTIONAL SUP	PORT & RESOURCES
B.F.IF.C.4 Graph linear, quadratic, absolute value, and piecewise functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated ones.  Domain: Quantities (N.Q) Cluster: Reason quantitatively and use units to solve problems. B.N.Q.A.1 Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.  Domain: The Complex Number System (N.CN) Cluster: Perform arithmetic operations with complex number is such that i2 = -1, and every complex number has the form a + bi with a and b real.  B.N.CN.A.2 Know and use the relation i2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	Essential Question(s):  • Why do imaginary numbers exist?  • How do you simplify and solve equations involving complex numbers?  Objective(s):  • Students will perform operations with pure imaginary numbers.  • Students will perform operations with complex numbers.	Solving Quadratics  ACT Academy ACT Academy™ is a free online learning tool and test practice program designed to help students get the best score possible on the ACT test, and well on their way to college and career success.  McGraw-Hill Bridge Math  12-4 Complex Numbers  Prentice Hall Algebra 2  4-8 Complex Numbers  Task(s):  Illustrative: Complex Square Roots  Additional Resources:  Khan Academy: Imaginary and Complex Numbers	Vocabulary: imaginary unit (i), complex number, pure imaginary numbers, Square Root Property  Writing in Math: Explain how complex numbers are related to quadratic equations.  Determine whether the following statement is always, sometimes, or never true. Explain your reasoning.  Every complex number has both a real part and an imaginary part.
Domain: Reasoning with Equations and Inequalities (A.REI) Cluster: Solve equations and	Essential Question(s): What does "completing the square" mean in the context of solving quadratic	McGraw-Hill Bridge Math 12-5 Completing the Square	Vocabulary: completing the square, Square Root Property



TN STATE STANDARDS	CONTENT	INSTRUCTIONAL SUP	PORT & RESOURCES
inequalities in one variable. <u>B.A.REI.B.2</u> Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for $x2 = 49$ ), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a $\pm$ bi for real numbers a and b.	equations?  Objective(s):  Students will solve equations by using the Square Root Property.  Students will solve quadratic equations by completing the square.	Prentice Hall Algebra 1 9-5 Completing the Square Task(s): Illustrative: Completing the Square Illustrative: Quadratic Sequence 1 Illustrative: Quadratic Sequence 2 Additional Resources: Khan Academy: Solving Quadratic equations by Completing the Square	Writing in Math: Can you solve any quadratic equation by completing the square? Explain your answer.
Domain: Reasoning with Equations and Inequalities (A.REI) Cluster: Solve equations and inequalities in one variable.  B.A.REI.B.2 Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.	Essential Question(s): How do you solve a quadratic equation using the Quadratic Formula?  Objective(s): Students will solve quadratic equations by using the Quadratic Formula.  Students will use the discriminant to determine the number and type of roots of a quadratic equation.	McGraw-Hill Bridge Math  12-6 The Quadratic Formula and the Discriminant  Prentice Hall Algebra 1  9-6 The Quadratic Formula and the Discriminant  Task(s):  Illustrative: Two Squares are Equal Illustrative: Springboard Dive  Additional Resources:  Khan Academy: Solving quadratics using the Quadratic Formula	Vocabulary: Quadratic Formula, discriminant,  Writing in Math:  Describe three different ways to solve  x² - 2x - 15 = 0. Which method do you prefer, and why?  Describe how finding the discriminant can assist you in solving quadratic equations.
Domain: Arithmetic with Polynomials and Rational Expressions (A.APR)  Cluster: Understand the relationship between zeros and factors of polynomials.	How do we determine the number and type of roots of a polynomial and find its zeros?	McGraw-Hill Bridge Math 12-7 Roots and Zeros Prentice Hall Algebra 2 5-1 Polynomial Functions	Vocabulary: Fundamental Theorem of Algebra  Writing in Math: Compare and contrast these three words:



		WATER COLOR	
TN STATE STANDARDS	CONTENT		PORT & RESOURCES
<b>B.A.APR.B.2</b> 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.	<ul> <li>What is the relationship between zeros and factors?</li> <li>What characteristics of polynomial functions can be seen on their graphs?</li> </ul>	5-2 Polynomials, Linear Factors, and Zeros  Task(s):  Illustrative: Throwing Baseballs	roots, zeros, and solutions.  Write a polynomial function of least degree with integral coefficients having zeros that include -1 and 1 + 2i.
Domain: Interpreting Functions (F.IF) Cluster: Understand the concept of a function and use function notation.  B.F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	Students will determine the number and type of roots for a polynomial equation.     Students will find the zeros of a polynomial function.	Additional Resources:  Khan Academy: The Fundamental Theorem of Algebra  Khan Academy: Finding Zeros of Polynomials  Khan Academy: Zeros of Polynomials and Their Graphs	
Domain: Quantities (N.Q) Cluster: Reason quantitatively and use units to solve problems. B.N.Q.A.3 Solve problems involving squares, square roots of numbers, cubes, and cube roots of numbers.	Essential Question(s): What are the key features of the graphs of radical and rational functions?  Objective(s): Students will graph radical functions. Students will solve radical equations. Students will solve radical equations with extraneous roots.	McGraw-Hill Bridge Math  12-9 Radical Equations  Prentice Hall Algebra 2  6-8 Graphing Radical Functions  6-5 Solving Square Root and Other Radical Equations  Additional Resources:  Khan Academy: Domain of radical functions Khan Academy: Graphs of radical Functions Khan Academy: Solving square-root equations Khan Academy: Radical Equations and Functions Khan Academy: Extraneous solutions of radical equations Radical Equations Radical Equations Resources	Vocabulary: radical function, square root function  Writing in Math: What makes a function radical?  Write some general rules about how to solve radical equations. Demonstrate your rules with a partner by solving a radical equation.



RESOURCE TOOLKIT				
Textbook Resources	Standards	Videos		
http://www.connected.mcgraw-hill.com/	Common Core Standards - Mathematics	<u>Brightstorm</u>		
http://www.pearsonsuccessnet.com/	Common Core Standards - Mathematics Appendix A	<u>Teacher Tube</u>		
	Edutoolbox (formerly TNCore)	The Futures Channel		
	http://www.ccsstoolbox.org/	Khan Academy		
	Common Core Lessons	Math TV		
	Tennessee State Math Standards	Lamar University Tutorial		
	HS Flip Book with Examples of each Standard	e Math Instruction		
		Shmoop		
Additional Sites	Interactive Manipulatives & Tasks	Calculator		
Illuminations (NCTM)	Illustrative Mathematics	Math Nspired		
Stem Resources		Texas Instrument Activities		
GSE Tasks: Modeling and Analyzing Quadratic Functions (a	Inside Math Tasks	Casio Activities		
collection of tasks)	Math Vision Project Tasks	Desmos		
	Better Lesson			
	SMARTboard Lessons			
	ACT & SAT			
	TN ACT Information & Resources			
	ACT College & Career Readiness Mathematics Standards			
	ACT Academy			
	SAT Connections			
	SAT Practice from Khan Academy			