Bartlett City School's Algebra II instructional maps are standards-based maps driven by the TN Standards and implemented using a variety of educational resources.

Algebra II builds on earlier experiences with linear equations and functions. The genre of functions expands to include polynomial, exponential, rational, and radical examples. Attention is given to inverses, composition of functions, and families of graphs. The instructional approach should provide opportunities for students to work together collaboratively and cooperatively while implementing technology as they solve routine and non-routine problems. Justifications, written and oral, should continue to be part of regular instruction.

The Tennessee State Standards will prepare students with essential knowledge and skills to compete in an increasingly global environment. These standards emphasize thinking, problem solving, and creativity through next generation assessments that go beyond multiple-choice tests to increase college and career-readiness among Tennessee students.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

Throughout the year, students should continue to develop proficiency with the Eight Standards for Mathematical Practice:

**1. Make sense of problems and persevere in solving them.**

**2. Reason abstractly and quantitatively.**

**3. Construct viable arguments and critique the reasoning of others.**

**4. Model with mathematics.**

**5. Use appropriate tools strategically.**

**6. Attend to precision.**

**7. Look for and make use of structure.**

**8. Look for and express regularity in repeated reasoning.**

These practices should become the natural way in which students come to understand and do mathematics and integrated into daily instruction, depending on the content to be understood or on the problem to be solved.

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| **Domain**  |  **Content Standard/Scope & Clarifications**  | **Content & Tasks** |
|  **Chapter 5 Part 2: Quadratic Functions and Relations** **(Allow 4.5 weeks for instruction, review, and assessment)** |
| A2.A.SSE.A.1Interpret the structure of expressions.A2.A.APR.A.2Understand the relationship between zeros and factors of polynomials.A2.A.CED.A.1Create equations that describe numbers or relationships.A2.A.APR.B.3Use polynomial identities to solve problems.A2.A.SSE.B.2Use expressions in equivalent forms to solve problems. | * Use the structure of the expression to identify ways to rewrite it.
* Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
* Create equations and inequalities in one variable and use them to solve problems.
* Create equations and inequalities in one variable and use them to solve problems.
* Know and use polynomial identities to describe numerical relationships.
* Use properties of exponents to rewrite expressions for exponential functions.

For A2.A.CED.A.1Include equations arising from linear, quadratic, rational, and exponential functions. Tasks have a real-world content.For A2.A.APR.B.3For example, compare (31)(29) = (30 +1)(30-1) = 302-12 with (x + y)(x – y) = x2 – y2 | Section 5-3: Solve Quadratic Equations by Factoring<https://learnzillion.com/lessonsets/718-use-the-structure-of-an-expression-to-identify-ways-to-rewrite-it> |
| A2.N.CN.A.1Perform arithmetic operations with complex numbers.A2.N.CN.A.2Perform arithmetic operations with complex numbers.A2.N.CN.B.3Use complex numbers in quadratic equations. | * Know there is a complex number *i* such that $i^{2}$ = -1, and every complex number has the form a + b*i* with *a* and *b* real.
* Know and use the relation $i^{2}$ = -1 and commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
* Solve quadratic equations with real coefficients that have complex solutions.
 | Section 5-4: Complex Numbers |
| A2.A.REI.B.3Solve equations and inequalities in one variable. | * Solve quadratic equations and inequalities in one variable:

Solve equations by inspection (e.g. for $x^{2}$ = 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 $a\pm b$i for real numbers *a* and *b*. | Section 5-5: Completing the Square |
| A2.A.REI.B.3Solve equations and inequalities in one variable.A2.A.APR.B.3Use polynomial identities to solve problems. | * Solve quadratic equations and inequalities in one variable:
1. Solve equations by inspection (e.g. for $x^{2}$=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 give complex solutions and write them as $a\pm b$i for real numbers *a* and *b*.
* Know and use polynomial identities to describe numerical relationships.

For A2.A.APR.B.3For example, compare (31)(29) = (30 +1)(30-1) = 302-12 with (x + y)(x – y) = x2 – y2 | Section 5-6: The Quadratic Formula and the Discriminant |
|  A2.F.IF.B.5Analyze functions using different representations.A2.F.BF.B.3Build new functions from existing functions. | * Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in table, or by verbal descriptions.
* Identify the effect on the graph of replacing f(x) by f(x) + k, kf(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.

For A2.F.IF.B.5Tasks may involve polynomial, exponential, and logarithmic functions.For A2.F.IF.B.3Tasks are limited to square root and cube root functions. The other functions are assessed in Algebra 1. | Section 5-7: Transformations with Quadratic Functions |
| A2.A.REI.C.5Solve systems of equations.A2.A.REI.D.6Represent and solve equations graphically. | * Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
* Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x) ; find the approximate solutions using technology.

For A2.A.REI.D.6Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.Tasks may involve any of the function types mentioned in the standard. | Chapter 5 Lesson 8 (Not in Textbook):Solving a System of Equations – One Linear and One Quadratic<http://www.montereyinstitute.org/courses/Algebra1/COURSE_TEXT_RESOURCE/U10_L2_T2_text_container.html><https://www.illustrativemathematics.org/content-standards/HSA/REI/C/7/tasks/576><https://learnzillion.com/lessonsets/442-solve-a-simple-system-consisting-of-a-linear-equation-and-a-quadratic-equation> 5-8 continued |
| **Domain**  |  **Content Standard/Scope & Clarifications**  | **Content & Tasks** |
| **Chapter 6 – Polynomials and Polynomial Functions****(Allow 4.5 weeks for instruction, review, and assessment)** |
| A2.A.SSE.A.1Interpret the structure of expressions.A2.A.SSE.B.2Write expressions in equivalent forms to solve problems.A2.F.BF.A.1Build a function that models a relationship between two quantities. | * Use the structure of an expression to identify ways to rewrite it.
* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression: \*
1. Use the properties of exponents to rewrite expressions for exponential functions.
* Write a function that describes a relationship between two quantities: \*
1. Determine an explicit expression, a recursive process, or steps for calculation from a context.
2. Combine standard function types using arithmetic operations.

For A2.A.SSE.A.1For example, see 2x4 + 3x2 – 5 as its factors (x2 – 1) and (2x2 +5); see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2); see $\frac{(x^{2}+4)}{(x^{2}+3)}$ as $\frac{(\left(x^{2}+3\right)+1)}{(x^{2}+3)}$, thus recognizing an opportunity to write it as 1 + $\frac{1}{x^{2}+3}$.For A2.A.SSE.B.2For example, the expression 1.15t can be rewritten as ((1.15)1/12)12t ≈1.01212t to reveal that the approximate equivalent monthly interest rate is 1.2% if the annual rate is 15%. 1. Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing and equivalent form of the expression reveals something about the situation.
2. Tasks are limited to exponential expressions with rational or real exponents.

For A2.F.BF.A.1For example, given cost and revenue functions, create a profit function.For A2.F.BF.A.1a 1. Tasks have a real-world context.
2. Tasks may involve linear functions, quadratic functions, and exponential functions.
 | Section 6-1: Operations with Polynomials |
| A2.A.APR.A.1Understand the relationship between zeros and factors of polynomials. | * Know and apply the Remainder Theorem: For a polynomial p(x) and a number *a*, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x).
 | Section 6-2: Dividing Polynomials |
| A2.F.IF.A.1Interpret functions that arise in applications in terms of the context. A2.F.BF.B.3Build new functions from existing functions. | * 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. \*
* Identify the effect on the graph of replacing f(x) by f(x) + k, kf(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.

For A2.F.IF.A.1Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.1. Tasks have a real-world context.
2. Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions.

For A2.F.BF.B.31. Tasks may involve polynomial, exponential, and logarithmic functions.
2. Tasks may involve recognizing even and odd functions.
 | Section 6-3: Polynomial Functions |
| A2.F.BF.B.3Build new functions from existing functions.A2.F.IF.B.5Analyze functions using different representations.A2.A.APR.A.2Understand the relationship between zeros and factors of polynomials.  | * Identify the effect on the graph of replacing f(x) by f(x) + k, kf(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.
* Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
* 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.

For A2.F.BF.B.31. Tasks may involve polynomial, exponential, and logarithmic functions.
2. Tasks may involve recognizing even and odd functions.

For A2.F.IF.B.5Tasks may involve polynomial, exponential, and logarithmic functions.For A2.APR.A.2Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of (x2 – 1)(x2 + 1). | Section 6-4: Analyzing Graphs of Polynomial Functions<http://map.mathshell.org/lessons.php?unit=9270&collection=8&redir=1> |
| A2.A.REI.A.1Understand solving equations as a process of reasoning and explain the reasoning.A2.A.APR.A.2Understand the relationship between zeros and factors of polynomials. | * Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
* 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.

For A2.A.REI.A.1Tasks are limited to square root, cube root, polynomial, rational, and logarithmic functions.For A2.APR.A.2Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of (x2 – 1)(x2 + 1). | Section 6-5: Solving Polynomial Equations |
| A2.A.APR.A.1Understand the relationship between zeros and factors of polynomials. | * Know and apply the Remainder Theorem: For a polynomial p(x) and a number *a*, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x).
 | Section 6-6: The Remainder and Factor Theorems |
| A2.A.APR.A.1Understand the relationship between zeros and factors of polynomials.A2.A.APR.A.2Understand the relationship between zeros and factors of polynomials. | * Know and apply the Remainder Theorem: For a polynomial p(x) and a number *a*, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x).
* 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.

For A2.APR.A.2Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of (x2 – 1)(x2 + 1). | Section 6-7: Roots and Zeros |
| A2.A.APR.A.1Understand the relationship between zeros and factors of polynomials.A2.A.APR.A.2Understand the relationship between zeros and factors of polynomials. | * Know and apply the Remainder Theorem: For a polynomial p(x) and a number *a*, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x).
* 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.

For A2.APR.A.2Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of (x2 – 1)(x2 + 1). | Section 6-8: Rational Zero Theorem  |

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| **RESOURCE TOOLBOX:**Khan Academy<https://www.khanacademy.org/math/algebra2>West Texas A & M Virtual Math Lab<http://www.wtamu.edu/academic/anns/mps/math/mathlab/>Free Kuta Worksheets:<http://kutasoftware.com/>COMPASS LEARNING ODYSSEY <https://www.thelearningodyssey.com/>TEACHER TUBE VIDEO TUTORING:<http://www.teachertube.com/> MATH TV VIDEO TUTORING: [http://www.mathtv.com/videos\_by\_topic#](http://www.mathtv.com/videos_by_topic)CONNECTED SITE:<http://connected.mcgraw-hill.com/connected/login.do>HOTMATH.COM <http://hotmath.com/help/bookindexes/hollidaytn212/index.html> GLENCOE PRACTICE QUIZ: <http://glencoe.mcgraw-hill.com/sites/0078884829/sitemap.html?resource=selfcheckquizzes> GLENCOE PRACTICE TEST: <http://glencoe.mcgraw-hill.com/sites/0078884829/sitemap.html?resource=chaptertest> GLENCOE STANDARDIZED PRACTICE TEST: <http://glencoe.mcgraw-hill.com/sites/0078884829/sitemap.html?resource=standardizedtestpractice>GLENCOE PERSONAL TUTOR VIDEO: <http://glencoe.mcgraw-hill.com/sites/0078884829/sitemap.html?resource=personaltutor> | **ADDITIONAL TASK RESOURCES:**<http://map.mathshell.org/materials/tasks.php?taskid=265&subpage=apprentice><http://www.utdanacenter.org/k12mathbenchmarks/tasks/tasks.php><http://schools.nyc.gov/Academics/CommonCoreLibrary/TasksUnitsStudentWork/default.htm> <http://www.dlt.ncssm.edu/algebra/HTML/09.htm> **TECHNOLOGY-GRAPHING CALCULATORS:**<http://www.ti-mathnspired.com> <http://education.ti.com/educationportal/activityexchange/activity> <http://www.internet4classrooms.com/eoc_algebra2.htm><http://illuminations.nctm.org/> <http://www.stemresources.com/><http://cuacs8.mck.ncsu.edu/mathsampleitems/main.html> <http://www.ilovemath.org/index.php?option=com_docman> <http://mathbits.com/MathBits/TISection/Openpage.htm> <http://mathbits.com/MathBits/TeacherResources/Algebra2/Algebra2.htm> |