



**Bridge to Algebra II  
Content Standards  
2016**

Course Title: Bridge to Algebra II  
Course/Unit Credit: 1  
Course Number: 435000  
Teacher Licensure: Please refer to the Course Code Management System (<https://adedata.arkansas.gov/ccms/>) for the most current licensure codes.  
Grades: 9-12  
Prerequisite: Students must have successfully completed coursework for Algebra I or Algebra A & B but not Algebra II. Students may enroll concurrently with Geometry but not concurrently with Algebra II.

### Bridge to Algebra II

Bridge to Algebra II was developed with the intent to provide students who have completed Algebra I, with the additional math foundation they need to be successful in an Algebra II course.

Each student learning expectation for Bridge to Algebra II is intended to:

- reinforce linear concepts that were previously included in the Algebra I Course;
- master quadratics and exponential concepts not included within the Arkansas Department of Education Algebra I Content Standards through modeling functions and summarizing, representing, and interpreting data; or
- introduce higher order concepts to prepare students for success in Algebra II.

Bridge to Algebra II does not require Arkansas Department of Education approval.

Notes:

1. Teacher notes offer clarification of the standards.
2. The Plus Standards (+) from the Arkansas Mathematics Standards may be incorporated into the curriculum to adequately prepare students for more rigorous courses (e.g., Advanced Placement, International Baccalaureate, or concurrent credit courses).
3. Italicized words are defined in the glossary.
4. All items in a bulleted list must be taught.
5. Asterisks (\*) identify potential opportunities to integrate content with the modeling practice.

Strand	Content Standard
Functional Relationships	1. Interpret the structure of expressions, write expressions in equivalent forms to solve problems, perform arithmetic operations on functions, and understand the relationship between <i>zeros</i> and <i>factors</i> of polynomials
Representing Functions	2. Represent and solve equations and inequalities graphically and analyze functions using different representations
Function Modeling	3. Create equations that describe numbers or relationships, interpret functions that arise in applications in terms of a context, analyze functions using different representations, build a function that models a relationship between two quantities, and build new functions from existing functions
Statistics and Probability	4. Summarize, represent, and interpret data on a single count or a measurement variable and use probability to evaluate outcomes of decisions

Strand: Functional Relationships

Content Standard 1: Interpret the structure of expressions, write expressions in equivalent forms to solve problems, perform arithmetic operations on functions, and understand the relationship between zeros and factors of polynomials.

FR.1.BTAII.1	<p>Interpret expressions that represent a quantity in terms of its context*</p> <ul style="list-style-type: none"> <li>• Interpret parts of an expression using appropriate vocabulary, such as terms, <i>factors</i>, and <i>coefficients</i></li> <li>• Interpret complicated expressions by viewing one or more of their parts as a single entity</li> </ul> <p>For example: Interpret <math>P(1 + r)^n</math> as the product of P and a factor not depending on P.</p>
FR.1.BTAII.2	<p>Use the structure of an expression to identify ways to rewrite it</p> <p>For example: See that <math>(x + 3)(x + 3)</math> is the same as <math>(x + 3)^2</math> or <math>x^4 - y^4</math> as <math>(x^2)^2 - (y^2)^2</math>, thus recognizing it as a difference of squares that can be factored as <math>(x^2 - y^2)(x^2 + y^2)</math>.</p>
FR.1.BTAII.3	<ul style="list-style-type: none"> <li>• Add, subtract, and multiply polynomials</li> <li>• Understand that polynomials, like the integers, are closed under addition, subtraction, and multiplication</li> </ul> <p>Note: If p and q are polynomials <math>p + q</math>, <math>p - q</math>, and <math>pq</math> are also polynomials.</p>
FR.1.BTAII.4	<p>Use various methods to factor quadratic polynomials; understand the relationship between the factored form of a quadratic polynomial and the zeros of a function</p>
FR.1.BTAII.5	<ul style="list-style-type: none"> <li>• Identify <i>zeros</i> of polynomials (linear, quadratic) when suitable factorizations are available</li> <li>• Use the <i>zeros</i> to construct a rough graph of the function defined by the polynomial</li> </ul>
FR.1.BTAII.6	<p>Solve linear equations, inequalities and <i>absolute value equations</i> in one variable, including equations with <i>coefficients</i> represented by letters</p>
FR.1.BTAII.7	<ul style="list-style-type: none"> <li>• Solve systems of equations in two variables using substitution and elimination</li> <li>• Understand that the solution to a system of equations will be the same when using substitution and elimination</li> </ul>
FR.1.BTAII.8	<p>In terms of a context, interpret the <i>parameters</i> (rates of growth or decay, <i>domain</i> and range restrictions where applicable) in a function</p>

Strand: Representing Functions

Content Standard 2: Represent and solve equations and inequalities graphically and analyze functions using different representations.

RF.2.BTAII.1	<p>Explain why the <math>x</math>-coordinates of the points where the graphs of the equations <math>y = f(x)</math> and <math>y = g(x)</math> intersect are the solutions of the equation <math>f(x) = g(x)</math>;</p> <p>Find the solutions approximately by:</p> <ul style="list-style-type: none"> <li>• Using technology to graph the functions</li> <li>• Making tables of values</li> <li>• Finding successive approximations</li> </ul> <p>Include cases (but not limited to) where <math>f(x)</math> and/or <math>g(x)</math> are:</p> <ul style="list-style-type: none"> <li>• Linear</li> <li>• Polynomial</li> <li>• Absolute value</li> <li>• Exponential</li> </ul> <p>Teacher notes: Modeling should be applied throughout this standard.</p>
RF.2.BTAII.2	<p>Graph functions expressed algebraically and show key features of the graph, with and without technology</p> <ul style="list-style-type: none"> <li>• Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima</li> <li>• Graph <i>square root</i>, <i>cube root</i>, and <i>piecewise-defined functions</i>, including step functions and <i>absolute value functions</i></li> <li>• Graph <i>exponential functions</i>, showing intercepts and <i>end behavior</i></li> </ul>
RF.2.BTAII.3	<p>Explain how extending the properties of integer exponents to rational exponents provides an alternative notation for radicals</p> <p>For example: We define <math>5^{4/3}</math> to be the cube root of <math>5^4</math> because we want <math>(5^{4/3})^{3/4} = 5</math> to hold.</p>
RF.2.BTAII.4	<p>Rewrite expressions involving radicals and rational exponents using the properties of exponents</p>
RF.2.BTAII.5	<p>Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or any polynomial function</p> <p>Note: The study of polynomial functions, in general, is reserved for Algebra 2. This standard leads to discussions of relative rates of growth in further coursework.</p>

RF.2.BTAII.6	<p>Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression*</p> <ul style="list-style-type: none"> <li>• Factor a quadratic expression to reveal the <i>zeros</i> of the function it defines</li> </ul> <p>Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines</p> <p>Note: Students should be able to identify and use various forms of a quadratic expression to solve problems.</p> <ul style="list-style-type: none"> <li>○ Standard Form: <math>ax^2 + bx + c</math></li> <li>○ Factored Form: <math>a(x - r_1)(x - r_2)</math></li> <li>○ Vertex Form: <math>a(x - h)^2 + k</math></li> </ul>
RF.2.BTAII.7	<p>Solve quadratic equations in one variable</p> <ul style="list-style-type: none"> <li>• Use the method of completing the square to transform any quadratic equation in <math>x</math> into an equation of the form <math>(x - p)^2 = q</math> that has the same solutions</li> </ul> <p>Note: This would be a good opportunity to demonstrate/explore how the quadratic formula is derived. This standard also connects to the transformations of functions and identifying key features of a graph (F-BF3). Introduce this with a leading coefficient of 1 in Algebra I. Finish mastery in Algebra II.</p> <ul style="list-style-type: none"> <li>• Solve quadratic equations (as appropriate to the initial form of the equation) by: <ul style="list-style-type: none"> <li>○ Inspection of a graph</li> <li>○ Taking square roots</li> <li>○ Completing the square</li> <li>○ Using the quadratic formula</li> <li>○ Factoring</li> </ul> </li> </ul>
RF.2.BTAII.8	<p>Solve systems of equations consisting of linear equations and nonlinear equations in two variables algebraically and graphically</p> <p>For example: Find the points of intersection between <math>y = -3x</math> and <math>y = x^2 + 2</math>.</p>

Strand: Function Modeling

Content Standard 3: Create equations that describe numbers or relationships, interpret functions that arise in applications in terms of a context, analyze functions using different representations, build a function that models a relationship between two quantities, and build new functions from existing functions.

FM.3.BTAII.1	<p>Create equations and inequalities in one variable and use them to solve problems</p> <p>Note: Including but not limited to equations arising from:</p> <ul style="list-style-type: none"> <li>• <i>Linear functions</i></li> <li>• <i>Quadratic functions</i></li> <li>• <i>Exponential functions</i></li> <li>• <i>Absolute value functions</i></li> </ul>
FM.3.BTAII.2	<ul style="list-style-type: none"> <li>• Create equations in two or more variables to represent relationships between quantities</li> <li>• Graph equations, in two variables, on a <i>coordinate plane</i></li> </ul>
FM.3.BTAII.3	<ul style="list-style-type: none"> <li>• Represent and interpret constraints by equations or inequalities, and by systems of equations and/or inequalities</li> <li>• Interpret solutions as viable or nonviable options in a modeling and/or real-world context</li> </ul>
FM.3.BTAII.4	Rearrange literal equations using the properties of equality
FM.3.BTAII.5	<p>For a function that models a relationship between two quantities:</p> <ul style="list-style-type: none"> <li>• Interpret key features of graphs and tables in terms of the quantities, and</li> <li>• Sketch graphs showing key features given a verbal description of the relationship</li> </ul> <p>Note: Key features may include but not limited to: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; <i>end behavior</i>; and periodicity.*</p>
FM.3.BTAII.6	<ul style="list-style-type: none"> <li>• Relate the <i>domain</i> of a function to its graph</li> <li>• Relate the <i>domain</i> of a function to the quantitative relationship it describes</li> </ul> <p>For example: If the function <math>h(n)</math> gives the number of person-hours it takes to assemble <math>n</math> engines in a factory, then the positive integers would be an appropriate <i>domain</i> for the function.*</p>
FM.3.BTAII.7	<ul style="list-style-type: none"> <li>• Calculate and interpret the <i>average rate of change</i> of a function (presented algebraically or as a table) over a specified interval*</li> <li>• Estimate the rate of change from a graph*</li> </ul>
FM.3.BTAII.8	<p>Graph functions expressed algebraically and show key features of the graph, with and without technology:</p> <ul style="list-style-type: none"> <li>• Graph <i>square root, cube root, and piecewise-defined functions</i>, including step functions and <i>absolute value functions</i></li> <li>• Graph <i>exponential functions</i>, showing intercepts and end behavior</li> </ul>

Strand: Function Modeling

Content Standard 3: Create equations that describe numbers or relationships, interpret functions that arise in applications in terms of a context, analyze functions using different representations, build a function that models a relationship between two quantities, and build new functions from existing functions.

FM.3.BTAII.9	<p>Write expressions for functions in different but equivalent forms to reveal key features of the function</p> <ul style="list-style-type: none"> <li>Use the process of factoring and completing the square in a quadratic function to show <i>zeros</i>, <i>extreme values</i> (vertex), and symmetry of the graph, and interpret these in terms of a context.</li> </ul> <p>Note: Connection to A.SSE.B.3</p>
FM.3.BTAII.10	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)
FM.3.BTAII.11	<p>Write a function that describes a relationship between two quantities*</p> <ul style="list-style-type: none"> <li>From a context, determine an explicit expression, a <i>recursive process</i>, or steps for calculation</li> </ul>
FM.3.BTAII.12	<ul style="list-style-type: none"> <li>Identify the effect on the graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>kf(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (<math>k</math>, a constant both positive and negative);</li> <li>Find the value of <math>k</math> given the graphs of the transformed functions</li> <li>Experiment with multiple transformations and illustrate an explanation of the effects on the graph with or without technology.</li> </ul> <p>Note: Include recognizing <i>even</i> and <i>odd functions</i> from their graphs and algebraic representations for them.</p>
FM.3.BTAII.13	<ul style="list-style-type: none"> <li>Solve an equation of the form <math>y = f(x)</math> for a simple function <math>f</math> that has an inverse and write an expression for the inverse. For example, <math>f(x) = 2x^2</math> or <math>f(x) = (x + 1)/(x - 1)</math> for <math>x \neq 1</math>.</li> </ul>
FM.3.BTAII.14	Define appropriate quantities for the purpose of <i>descriptive modeling</i> (i.e., use units appropriate to the problem being solved)
FM.3.BTAII.15	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities
FM.3.BTAII.16	Solve linear inequalities and systems of linear inequalities in two variables by graphing
FM.3.BTAII.17	Recognize that sequences are functions, sometimes defined recursively, whose <i>domain</i> is a subset of the integers [e.g., the Fibonacci sequence is defined recursively by $f(0) = f(1)$ , $f(n + 1) = f(n) + f(n - 1)$ for $n \geq 1$ ]
FM.3.BTAII.18	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another

FM.3.BTAII.19	<p>Construct linear and exponential equations, including <i>arithmetic</i> and <i>geometric sequences</i>:</p> <ul style="list-style-type: none"> <li>• given a graph</li> <li>• a description of a relationship</li> <li>• two input-output pairs (include reading these from a table)</li> </ul>
FM.3.BTAII.20	<p>Use the properties of exponents to transform expressions for <i>exponential functions</i></p> <p>For example: The expression <math>1.15^t</math> can be rewritten as <math>(1.15^{1/12})^{12t} \approx 1.012^{12t}</math> to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</p>

Strand: Statistics and Probability

Content Standard 4: Summarize, represent, and interpret data on a single count or a measurement variable and use probability to evaluate outcomes of decisions.

SP.4.BTAII.1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets
SP.4.BTAII.2	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related <ul style="list-style-type: none"><li>• Fit a function to the data; use functions fitted to data to solve problems in the context of the data</li></ul> Note: Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. The focus of Algebra I should be on linear and exponential models while the focus of Algebra II is more on quadratic and exponential models.
SP.4.BTAII.3	Compute (using technology) and interpret the <i>correlation coefficient</i> of a linear fit

Absolute value equation	Any equation with absolute value symbols; $ 2x - 7  = 21$
Absolute value function	Any function in the family with parent function $f(x) =  x $
Arithmetic Sequence	A sequence such as 1, 5, 9, 13, 17, ... or 12, 7, 2, -3, -8, -13, -18, ... which has a constant difference between terms
Average Rate of Change	The difference between two output values divided by the difference between corresponding input values
Coefficient	A number by which a variable is multiplied
Coordinate plane	A plane spanned by the x- and y-axis
Correlation Coefficient	A measure of how nearly a scatter plot falls on a straight line; the correlation coefficient is always between -1 and +1
Cube root function	Any function in the family with parent function $f(x) = \sqrt[3]{x}$
Descriptive Modeling	A mathematical process that describes real-world events and the relationships between factors responsible for them
Domain	The set of input values for a function
End Behavior	The behavior of a graph of $f(x)$ as $x$ approaches positive or negative infinity
Even Function	A function symmetric with respect to the y-axis; $f(-x) = f(x)$ for all $x$ in the domain of $f$
Exponential function	A function in which a variable appears in the exponent; $f(x) = 2^x$
Extreme Value	The maximum or minimum output value of a function
Factor	One of the numbers, variables or expressions multiplied to obtain a product
Geometric Sequence	A sequence such as 2, 6, 18, 54, 162, ... or $3, 1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \dots$ which has a constant ratio between terms
Linear function	A function characterized by a constant rate of change
Odd Function	The function whose graph is symmetric to the origin ; $f(-x) = -f(x)$
Parameters	A set of variables that define a system and determine its behavior and are varied
Piece-Wise Function	A function that consists of two or more functions defined on different intervals
Quadratic function	Any function in the family with parent function $f(x) = x^2$
Recursive formula (process)	A recursive formula has two parts: the value(s) of the first term(s), and a recursion equation that shows how to find each term from the term(s) before it
Square root function	Any function in the family with parent function $f(x) = \sqrt{x}$
Zeros	The values of the independent variable ( $x$ -value) that make the corresponding values of the function equal to zero