



LCPS Algebra 2 Yearly Overview and [Scope and Sequence](#) 2021-22

Algebra 2 Yearly Overview

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| Quarter 1 | Exploring Functions Graphically Standards of Learning: All.7, All.6 | Absolute Value Functions Standards of Learning: All.7a-h, k, All.3a | Quadratic Functions Standards of Learning: All.2, All.3b, All.4, All.7a-h, j-k, All.9 |
| Quarter 2 | Quadratic Functions (Continued from Quarter 1) | Polynomial Functions Standards of Learning: All.1c, All.7a-h, j-k, All.8 | |
| Quarter 3 | Rational Functions Standards of Learning: All.1a, All.3c, All.7 a, c-i, k, All.10 | Radical Functions Standards of Learning: All.1b, All.3d, All.7 a-h, j-k | |
| Quarter 4 | Exponential Functions Standards of Learning: All.5, All.7 a-i, k, All.9 | Investigating Statistics and Probability Standards of Learning: All.11, All.12 | |

VDOE Process Goals

- To build new mathematical knowledge through problem solving and to develop a repertoire of skills and strategies for solving a variety of problem types (**Problem Solving**)
- To communicate mathematical ideas coherently and clearly and to analyze and evaluate the mathematical thinking of others (**Communication**)
- To use logical reasoning in solving mathematical problems and to explain and justify mathematical ideas (**Reasoning**)
- To understand how mathematical ideas interconnect and build on one another and to use those connections to solve problems (**Connections**)
- To create and use a variety of representations in learning, doing, and communicating mathematics (**Representations**)



Algebra 2 Scope and Sequence

The Loudoun County Public Schools Mathematics Scope and Sequence provides a broad overview of the content units, the quarter in which each unit is taught, and the sequence of the standards within each unit. Resources to support instruction are located in the [Mathematics Curriculum Schoology Groups](#).

Curriculum Framework: The Curriculum Framework contains the 2016 *Mathematics Standards of Learning*, guidance for Understanding the Standard, and Essential Knowledge and Skills for students. Students are expected to continue to connect and apply knowledge and skills from Standards of Learning presented in previous grades as they deepen their mathematical understanding. Assessment items may not and should not be a verbatim reflection of the information presented in the Curriculum Framework.

Prerequisite Knowledge: These standards are the supporting concepts for the grade level concept. The hyperlinks are to the Just In Time Quick Check documentation which includes teacher notes, instructional plans, formative assessments, and activities to support student learning.

Mathematics Vertical Articulation Tool (MVAT): This tool provides support in identifying concepts aligned to the 2016 *Mathematics Standards of Learning* (SOL) that articulate across mathematics grade levels or courses.

Just In Time Quick Checks: Just in Time Mathematics Quick Checks are formative assessments that align to the 2016 Mathematics Standards of Learning (SOL). They are designed to help teachers identify students with unfinished learning and assist in planning instruction to fill potential gaps “just in time.” As new content is introduced throughout the school year, teachers can use these Quick Checks to identify and diagnose unfinished learning at grade level and/or to assess understanding of prerequisite knowledge that may be needed to access grade level content. Student gaps in mathematics understanding exist for a variety of reasons and these resources can be used to help get student mathematical learning back on track.

Essential Skills and Knowledge: This section provides a detailed expansion of the mathematics knowledge and skills that each student should know and be able to demonstrate. This is not meant to be an exhaustive list of student expectations.



Quarter 1

Exploring Functions Graphically

Curriculum Framework: All.7, A.6

| Prerequisite Knowledge MVAT | Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard) |
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| A.7a , A.7b , A.7c , A.7d , A.7e , A.7f | <p>All.6a Recognize the general shape of function families</p> <ul style="list-style-type: none">Recognize the general shape of function families.Recognize graphs of parent functions. <p>All.7a, All.7b, All.7c, All.7d, All.7e, All.7f, All.7g, All.7h, All.7i, All.7j, All.7k The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families graphically</p> <ul style="list-style-type: none">Identify the domain, range, zeros, and intercepts of a function presented graphically, including graphs with discontinuities. (a, d, e)Describe a function as continuous or discontinuous. (a)Given the graph of a function, identify intervals on which the function (linear, quadratic, absolute value, square root, cube root, polynomial, exponential, and logarithmic) is increasing or decreasing. (b)Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c)Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)For any x value in the domain of f, determine $f(x)$. (f)Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)Describe the end behavior of a function. (h)Determine the equations of vertical and horizontal asymptotes of functions (rational, exponential, and logarithmic). (i) |



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| | <ul style="list-style-type: none"> ● Determine the inverse of a function (linear, quadratic, cubic, square root, and cube root). (j) ● Graph the inverse of a function as a reflection over the line $y = x$. (j) ● Determine the composition of two functions graphically. (k) ● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, i, j, k) <p>All.6b Use knowledge of transformations to convert between equations and the corresponding graphs of functions.</p> <ul style="list-style-type: none"> ● Identify the graph of a function from the equation. ● Write the equation of a function given the graph. ● Graph a transformation of a parent function, given the equation. ● Identify the transformation(s) of a function. Transformations of exponential and logarithmic functions, given a graph, should be limited to a single transformation. ● Investigate and verify transformations of functions using a graphing utility. |
| <h2 style="margin: 0;">Absolute Value Functions</h2> <p style="margin: 0;">Curriculum Framework: All.7a-h, k, All.3a</p> | |
| <p>Prerequisite Knowledge</p> <p>MVAT</p> | <p>Essential Skills and Knowledge</p> <p>(with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard)</p> |
| <p>A.7a, A.7b, A.7c, A.7d, A.7e, A.7f</p> | <p>All.7a, All.7b, All.7c, All.7d, All.7e, All.7f, All.7g, All.7h, All.7k Investigate and analyze absolute value functions algebraically and graphically</p> <ul style="list-style-type: none"> ● Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e) ● Describe a function as continuous or discontinuous. (a) ● Given the graph of a function, identify intervals on which an absolute value function is increasing or decreasing. (b) ● Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c) ● Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c) |



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| | <ul style="list-style-type: none">● For any x value in the domain of f, determine $f(x)$. (f)● Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)● Describe the end behavior of a function. (h)● Determine the composition of two functions algebraically and graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, k) |
| A.4a , A.5a | All.3a Solve absolute value linear equations and inequalities <ul style="list-style-type: none">● Solve absolute value linear equations or inequalities in one variable algebraically.● Represent solutions to absolute value linear inequalities in one variable graphically.● Solve equations and verify algebraic solutions using a graphing utility. |
| Quadratic Functions (Continued in Quarter 2) Curriculum Framework: All.2, All.3b, All.4, All.7a-h, j-k, All.9 | |
| Prerequisite Knowledge MVAT | Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard) |
| A.7a , A.7b , A.7c , A.7d , A.7e , A.7f | All.7a, All.7b, All.7c, All.7d, All.7e, All.7f, All.7g, All.7h, All.7j, All.7k Investigate and analyze quadratic functions algebraically and graphically <ul style="list-style-type: none">● Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e)● Describe a function as continuous or discontinuous. (a)● Given the graph of a function, identify intervals on which a quadratic function is increasing or decreasing. (b)● Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c)● Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)● For any x value in the domain of f, determine $f(x)$. (f) |



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| | <ul style="list-style-type: none">● Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)● Describe the end behavior of a function. (h)● Determine the inverse of a quadratic function. (j)● Graph the inverse of a function as a reflection over the line $y = x$. (j)● Determine the composition of two functions graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, j, k) |
| A.9 | <p>All.9 Collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve practical problems, using mathematical models of quadratic functions</p> <ul style="list-style-type: none">● Determine an equation of the curve of best fit, using a graphing utility, given a set of no more than 20 data points in a table, graph, or practical situation.● Make predictions, using data, scatterplots, or the equation of the curve of best fit.● Solve practical problems involving an equation of the curve of best fit.● Evaluate the reasonableness of a mathematical model of a practical situation. |
| A.2b , A.2c , A.4b , A.4d | <p>All.4 The student will solve systems of linear-quadratic and quadratic-quadratic equations, algebraically and graphically</p> <ul style="list-style-type: none">● Determine the number of solutions to a linear-quadratic and quadratic-quadratic system of equations in two variables.● Solve a linear-quadratic system of two equations in two variables algebraically and graphically.● Solve a quadratic-quadratic system of two equations in two variables algebraically and graphically.● Solve systems of equations and verify solutions of systems of equations with a graphing utility. <p>All.3b Solve quadratic equations over the set of complex numbers</p> <ul style="list-style-type: none">● Solve a quadratic equation over the set of complex numbers algebraically.● Calculate the discriminant of a quadratic equation to determine the number and type of solutions.● Solve equations and verify algebraic solutions using a graphing utility. |
| A.2b | <p>All.2 Perform operations on complex numbers and express the results in simplest form using patterns of the powers of i</p> <ul style="list-style-type: none">● Recognize that the square root of -1 is represented as i.● Simplify radical expressions containing negative rational numbers and express in $a + bi$ form. |



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| | <ul style="list-style-type: none">● Simplify powers of i.● Add, subtract, and multiply complex numbers. |
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Quarter 2

Quadratic Functions

(Continued from Quarter 1)

Polynomial Functions

Curriculum Framework: All.1c, All.7a-h, j-k, All.8

Prerequisite Knowledge

[MVAT](#)

Essential Skills and Knowledge

(with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard)

[A.7a](#), [A.7b](#),
[A.7c](#), [A.7d](#),
[A.7e](#), [A.7f](#)

[All.7a](#), [All.7b](#), [All.7c](#), [All.7d](#), [All.7e](#), [All.7f](#), [All.7g](#), [All.7h](#), [All.7j](#), [All.7k](#) Investigate and analyze polynomial functions algebraically and graphically

- Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e)
- Describe a function as continuous or discontinuous. (a)
- Given the graph of a function, identify intervals on which a polynomial function is increasing or decreasing. (b)
- Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c)
- Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)
- For any x value in the domain of f , determine $f(x)$. (f)
- Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)
- Describe the end behavior of a function. (h)
- Determine the inverse of a cubic function. (j)
- Graph the inverse of a function as a reflection over the line $y = x$. (j)



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| | <ul style="list-style-type: none">● Determine the composition of two functions graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, j, k) |
| A.7c , A.7d | <p>AII.8 Investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression</p> <ul style="list-style-type: none">● Define a polynomial function in factored form, given its zeros.● Determine a factored form of a polynomial expression from the x-intercepts of the graph of its corresponding function.● For a function, identify zeros of multiplicity greater than 1 and describe the effect of those zeros on the graph of the function.● Given a polynomial equation, determine the number and type of solutions. |
| A.2c | <p>AII.1c Factor polynomials completely in one or two variables</p> <ul style="list-style-type: none">● Factor polynomials in one or two variables with no more than four terms completely over the set of integers. Factors of the polynomial should be constant, linear, or quadratic.● Verify polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials. |



Quarter 3

Rational Functions

Curriculum Framework: All.1a, All.3c, All.7 a, c-i, k, All.10

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| Prerequisite Knowledge MVAT | Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard) |
| A.7a , A.7b , A.7c , A.7d , A.7e , A.7f | All.7a, All.7c, All.7d, All.7e, All.7f, All.7g, All.7h, All.7i, All.7k Investigate and analyze rational functions algebraically and graphically <ul style="list-style-type: none">● Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e)● Describe a function as continuous or discontinuous. (a)● Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c)● Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)● For any x value in the domain of f, determine f(x). (f)● Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)● Describe the end behavior of a function. (h)● Determine the equations of vertical and horizontal asymptotes of rational functions. (i)● Determine the composition of two functions graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, c, d, e, f, g, h, i, k) |
| A.8 | All.10 Represent and solve problems, including practical problems, involving inverse variation, joint variation and a combination of direct and inverse variations <ul style="list-style-type: none">● Given a data set or practical situation, write the equation for an inverse variation. |



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| | <ul style="list-style-type: none">Given a data set or practical situation, write the equation for a joint variation.Solve problems, including practical problems, involving inverse variation, joint variation, and a combination of direct and inverse variations. |
| A.4a , A.4b | AII.3c Solve equations containing rational algebraic expressions <ul style="list-style-type: none">Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions.Solve equations and verify algebraic solutions using a graphing utility. |
| A.2b , A.2c | AII.1a Add, subtract, multiply, divide, and simplify rational algebraic expressions <ul style="list-style-type: none">Add, subtract, multiply, and divide rational algebraic expressions.Simplify a rational algebraic expression with monomial or binomial factors. Algebraic expressions should be limited to linear and quadratic expressions.Recognize a complex algebraic fraction, and simplify it as a quotient or product of simple algebraic fractions. |
| Radical Functions Curriculum Framework: AII.1b , AII.3d , AII.7 a-h, j-k | |
| Prerequisite Knowledge MVAT | Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard) |
| A.7a , A.7b , A.7c , A.7d , A.7e , A.7f | AII.7a, AII.7b, AII.7c, AII.7d, AII.7e, AII.7f, AII.7g, AII.7h, AII.7j, AII.7k Investigate and analyze radical functions algebraically and graphically <ul style="list-style-type: none">Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e)Describe a function as continuous or discontinuous. (a)Given the graph of a function, identify intervals on which a square root or cube root function is increasing or decreasing. (b)Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c) |



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| | <ul style="list-style-type: none">● Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)● For any x value in the domain of f, determine $f(x)$. (f)● Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)● Describe the end behavior of a function. (h)● Determine the inverse of a square root or cube root function. (j)● Graph the inverse of a function as a reflection over the line $y = x$. (j)● Determine the composition of two functions graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, j, k) |
| A.4a , A.4b | All.3d Solve equations containing radical expressions <ul style="list-style-type: none">● Solve an equation containing no more than one radical expression algebraically and graphically.● Solve equations and verify algebraic solutions using a graphing utility. |
| A.2a , A.3a , A.3b , A.3c | All.1b Add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents <ul style="list-style-type: none">● Simplify radical expressions containing positive rational numbers and variables.● Convert between radical expressions and expressions containing rational exponents.● Add and subtract radical expressions.● Multiply and divide radical expressions. Simplification may include rationalizing denominators |



Quarter 4

Exponential Functions

Curriculum Framework: All.5, All.7a-i, All.9

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| Prerequisite Knowledge MVAT | Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard) |
| A.7a , A.7b , A.7c , A.7d , A.7e , A.7f | All.7a, All.7b, All.7c, All.7d, All.7e, All.7f, All.7g, All.7h, All.7i, All.7k Investigate and analyze exponential functions algebraically and graphically <ul style="list-style-type: none">● Identify the domain, range, zeros, and intercepts of a function presented algebraically and graphically, including graphs with discontinuities. (a, d, e)● Describe a function as continuous or discontinuous. (a)● Given the graph of a function, identify intervals on which an exponential function is increasing or decreasing. (b)● Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c)● Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)● For any x value in the domain of f, determine $f(x)$. (f)● Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g)● Describe the end behavior of a function. (h)● Determine the equations of vertical and horizontal asymptotes of exponential functions. (i)● Determine the composition of two functions graphically. (k)● Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, c, d, e, f, g, h, i, k) |



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| <p>A.9</p> | <p>All.9 Collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve practical problems, using mathematical models of exponential functions</p> <ul style="list-style-type: none"> ● Determine an equation of the curve of best fit, using a graphing utility, given a set of no more than 20 data points in a table, graph, or practical situation. ● Make predictions, using data, scatterplots, or the equation of the curve of best fit. ● Solve practical problems involving an equation of the curve of best fit. ● Evaluate the reasonableness of a mathematical model of a practical situation. |
| <p>A.6a, A.6b</p> | <p>All.5 Investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first n terms, determining the nth term, and evaluating summation formulas. Notation will include \sum and a_n</p> <ul style="list-style-type: none"> ● Distinguish between a sequence and a series. ● Generalize patterns in a sequence using explicit and recursive formulas. ● Use and interpret the notations \sum, n, nth term, and a_n. ● Given the formula, determine a_n (the nth term) for an arithmetic or a geometric sequence. ● Given formulas, write the first n terms and determine the sum, S_n, of the first n terms of an arithmetic or geometric series. ● Given the formula, determine the sum of a convergent infinite series. ● Model practical situations using sequences and series. |

Investigating Statistics and Probability
 Curriculum Framework: [All.11](#), [All.12](#)

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| <p>Prerequisite Knowledge MVAT</p> | <p>Essential Skills and Knowledge (with links to VDOE Just In Time Quick Checks for details on how to support student understanding for each standard)</p> |
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| | <p>All.11c Apply properties of normal distributions to determine probabilities associated with areas under the standard normal curve.</p> <ul style="list-style-type: none"> ● Represent probability as area under the curve of a standard normal distribution. ● Use the graphing utility or a table of Standard Normal Probabilities to determine probabilities associated with areas under the standard normal curve. |
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| | <ul style="list-style-type: none">● Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. |
| | <p>All.11a Identify and describe properties of a normal distribution</p> <ul style="list-style-type: none">● Identify the properties of a normal distribution.● Describe how the standard deviation and the mean affect the graph of the normal distribution.● Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. |
| | <p>All.11b Interpret and compare z-scores for normally distributed data</p> <ul style="list-style-type: none">● Solve problems involving the relationship of the mean, standard deviation, and z-score of a normally distributed data set.● Compare two sets of normally distributed data using a standard normal distribution and z-scores, given the mean and standard deviation.● Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. |
| | <p>All.12 The student will compute and distinguish between permutations and combinations.</p> <ul style="list-style-type: none">● Compare and contrast permutations and combinations.● Calculate the number of permutations of n objects taken r at a time.● Calculate the number of combinations of n objects taken r at a time.● Use permutations and combinations as counting techniques to solve practical problems.● Calculate and verify permutations and combinations using a graphing utility. |