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**Access**

**Algebra 2**

**(#7921021)**

**Course Standards**

[MA.912.AR.1.1:](https://www.cpalms.org//PreviewStandard/Preview/15555) Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of its parts as a single entity.

**Clarifications:**
*Clarification 1:* Parts of an expression include factors, terms, constants, coefficients and variables.

*Clarification 2:* Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18279)  | Identify a part(s) of an equation or expression and explain the meaning within the context of a problem. |  |  |  |
| EssentialUnderstandings | Understand the following concepts and vocabulary: equation, expression, add (+), subtract (-), multiply (x), divide (), equal (=), Greater than (>), Less than (<), unknown (x), variables, and real-world contextUnderstand in a problem with real world context, the variables have meaning within the context of the problemEx. Distance Problem Distance Formula: d=rt (d = distance, r = rate, t = time)Ex. Interest ProblemInterest Formula: I = Prt (I = interest, P = principal, r = rate, t = time in years)Ex. Match items from a problem with variables (e.g., In the expression 6x + 7y, students explain that Bill had 6 times as many apples and 7 times as many oranges as Sam, with x representing the number of apples and y representing the number of oranges)  |  |  |  |
| Resources: | [Element Card](https://www.accesstofls.org/core_curriculum_resources/Math/BEST/Element_Cards/HS/Algebra_1/MA.912.AR.1.1.docx) |  |  |  |

[MA.912.AR.1.3:](https://www.cpalms.org//PreviewStandard/Preview/15557) Add, subtract and multiply polynomial expressions with rational number coefficients.

**Clarifications:**
*Clarification 1: I*nstruction includes an understanding that when any of these operations are performed with polynomials the result is also a polynomial.

*Clarification 2:* Within the Algebra 1 course, polynomial expressions are limited to 3 or fewer terms.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18281)  | Add, subtract and multiply polynomial expressions with integer coefficients. |  |  |  |
| EssentialUnderstandings | * Understand the following vocabulary and symbols: polynomial, variable, exponent, constant, coefficient, and like terms
* Identify examples of polynomials (an expression consisting of variables and coefficients with non-negative exponents)
* Identify non-examples of polynomials
* Sort variables into like terms when adding and subtracting polynomials (e.g., sort all the x’s and y’s)

Ex.  * Understand that polynomials can be added, subtracted, and multiplied (multiplication should be limited to no more than two polynomials)
 |  |  |  |
| Resources: | [Element Card](https://www.accesstofls.org/core_curriculum_resources/Math/BEST/Element_Cards/HS/Algebra_1/MA.912.AR.1.3.docx) |  |  |  |

[MA.912.AR.1.5:](https://www.cpalms.org//PreviewStandard/Preview/15559) Divide polynomial expressions using long division, synthetic division or algebraic manipulation. **Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18283) | Divide polynomial expressions using long division, synthetic division, and algebraic manipulation where the denominator is a linear expression. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: numerator, denominator, fraction, variable, polynomial, factoring, division, divisor, dividend, quotient, remainder, synthetic division, linear
* Understand factoring polynomials
* Understand that manipulatives can be used to factor an equation, Ex, algebra tiles
* Understand that an equation can be simplified by crossing out similar factors in the numerator and denominator (e.g., )
* Understand that manipulatives can be used to model dividing polynomials
* Understand that synthetic division can be used to divide polynomials only when the divisor is linear
* Understand that a rational expression can be rewritten using long division
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.1.6:](https://www.cpalms.org//PreviewStandard/Preview/15560) Solve mathematical and real-world problems involving addition, subtraction, multiplication or division of polynomials.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.6:](https://www.cpalms.org/PreviewAccessPoint/Preview/18284) | Solve mathematical or real-world problems involving addition, subtraction, multiplication or division of polynomials with integer coefficients. |  |  |  |
| EssentialUnderstandings | * Understand the following concepts and vocabulary:add (+), subtract (-), multiply (x), divide (÷), equal (=), unknown, polynomials, integers, distributive property, numerator, denominator, variable, equation, factor
* Understand how to add, subtract, multiply, and divide integers. (limited to 2-digit numbers)
* Sort variables into like terms when adding and subtracting polynomials (e.g., sort all the x’s and y’s)

Ex.   * Understand that multiplying polynomials requires distributive property (limited to no more than two polynomials).
* Understand that manipulatives can be used to factor an equation, Ex, algebra tiles
* Understand that an equation can be simplified by crossing out similar factors in the numerator and denominator (e.g., )
* Understand that manipulatives can be used to model addition, subtraction, multiplication and division of polynomials
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| Resources: |  |  |  |  |

[MA.912.AR.1.8:](https://www.cpalms.org//PreviewStandard/Preview/15882) Rewrite a polynomial expression as a product of polynomials over the real or complex number system.

**Clarifications:**
*Clarification 1:* Instruction includes factoring a sum or difference of squares and a sum or difference of cubes.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.8:](https://www.cpalms.org/PreviewAccessPoint/Preview/18286)  | Select a polynomial expression as a product of polynomials with integer coefficients over the real or complex number system. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: integers, polynomials, multiplication, term, complex number system, distributive property, monomials, binomials, factors, factoring, quadratic expressions, polynomial expressions
* Understand how to list the factors of integers (using tools)

Ex. 24Factors: (2)(12); (3)(8); (4)(6); (1)(24) * Understand how to multiply integers
* Understand that a polynomial expression is an expression consisting of more than one term
* Understand that multiplying polynomials requires distributive property (Limited to no more than two polynomials)
* Understand that a complex number is in the form of
* Understand the following rules for the complex number system:

  * Understand that factoring a quadratic expression will result in the product of monomials and/or binomials

Ex. Monomial and binomial: * Understand how to use factoring tools/methods to factor quadratic equations (E.g., Algebra tiles, guess and check, quadratic formula, order the steps, etc.)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.1.9:](https://www.cpalms.org//PreviewStandard/Preview/15562) Apply previous understanding of rational number operations to add, subtract, multiply and divide rational algebraic expressions.

**Clarifications:**
*Clarification 1*: Instruction includes the connection to fractions and common denominators.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.1.AP.9:](https://www.cpalms.org/PreviewAccessPoint/Preview/18287) | Apply previous understanding of rational number operations with common denominators to add and subtract rational expressions. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: numerator, denominator, rational expression, fraction, polynomials, common denominator, simplify, addition, subtraction
* Understand how to simplify a fraction with whole numbers
* Understand how to add or subtract polynomial expressions
* Understand that a rational expression is a fraction where the numerator and the denominator are polynomials
* Understand that a common denominator is a group of fractions that have a shared denominator
* Understand when adding and/or subtracting rational expressions with common denominators, combine like terms in the numerator (Simplify the new fraction if needed)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.3.2:](https://www.cpalms.org//PreviewStandard/Preview/15574) Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real and complex number systems.

**Clarifications:**
*Clarification 1*: Within this benchmark, the expectation is to solve by factoring techniques, taking square roots, the quadratic formula and completing the square.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18297)  | Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real number system. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: add (+), subtract (-), multiply (x), divide (), equal (=), one-variable, quadratic expression, quadratic equation, quadratic formula, real number system, factors, factored form, coefficient, exponent
* Understand the factors of real numbers
* Understand to determine the solutions to quadratic equations use factoring tools/methods (E.g., Algebra tiles, guess and check, quadratic formula, online tools, etc.)
* Understand the solution to a quadratic equation is what numerical value is substituted for the variable to make the equation equal to zero
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.3.3:](https://www.cpalms.org//PreviewStandard/Preview/15575) Given a mathematical or real-world context, write and solve one-variable quadratic inequalities over the real number system. Represent solutions algebraically or graphically.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18298) | Given a mathematical or real-world context, select a one-variable quadratic inequality over the real number system that represents the solution algebraically or graphically. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: add (+), subtract (-), multiply (x), divide (), equal (=), Greater than (>), less than (<), greater than or equal to (≥), less than or equal to (≤), one-variable, interval, quadratic expression, quadratic inequality, quadratic formula, real number system, factors, factored form, coefficient, exponent
* Understand the factors of real numbers

Ex. 24Factors: (2)(12); (3)(8);(4)(6);(1)(24) Ex. 6Factors: (1)(6); (2)(3)* Understand the solutions to quadratic inequalities by using factoring tools/methods

(E.g., Algebra tiles, guess and check,quadratic formula, online tools, etc.)Ex.Guess and Check: (provides the factors) (Quadratic expression) Find the Factors of the last term (6)Factors: (1)(6); (2)(3) If the last term is positive, you are adding to find the middle term. Choose the factors 6 and 1 because when added together they equal 7. The middle term is 7x.   (Factored form) (quadratic inequality) (Factored form)Set each factor equal to zero  (zeros) |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.3.4:](https://www.cpalms.org//PreviewStandard/Preview/15871) Write a quadratic function to represent the relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context.

**Clarifications:**
*Clarification 1*: Within the Algebra 1 course, a graph, written description or table of values must include the vertex and two points that are equidistant from the vertex.

*Clarification 2*: Instruction includes the use of standard form, factored form and vertex form.

*Clarification 3*: Within the Algebra 2 course, one of the given points must be the vertex or an *x*-intercept.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.4:](https://www.cpalms.org/PreviewAccessPoint/Preview/18299)  | Select a quadratic function to represent the relationship between two quantities from a graph. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: two-variable, vertex, vertex form, quadratic function, graph, point on the graph, opens upward, opens downward, parabola, leading coefficient, positive, negative.
* Understand that the graph of a quadratic function is a parabola.
* Understand where the vertex is located on the graph.

Ex: The highest point if the graph is open downward and the lowest point if the graph is open upward.* Understand what the variables in the vertex form represent.

Ex: Vertex = (*h*, *k*) (*h* is the *x*-value, *k* is the *y-*value)Leading coefficient = *a*Point on a graph = (*x, y*)* Understand when *a* is positive, the graph of the parabola opens upward.
* Understand when *a* is negative, the graph of the parabola opens downward.
* Understand that in the vertex form, *h* is replaced with the *x-*value of the vertex.

Ex. Vertex = (3, -1) * Understand that in the vertex form, *k* is replaced with the *y*-value of the vertex.

Ex. Vertex = (3, -1) * Understand that in the vertex form, we will replace *x* and *y* with a point on the graph to find the variable *a*

Ex. Point on a graph (1, 7)   (quadratic in vertex form) |  |  |  |
| Resources: | [Element Card](https://www.accesstofls.org/core_curriculum_resources/Math/BEST/Element_Cards/HS/Algebra_1/MA.912.AR.3.4.docx) |  |  |  |

[MA.912.AR.3.8:](https://www.cpalms.org//PreviewStandard/Preview/15579) Solve and graph mathematical and real-world problems that are modeled with quadratic functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; vertex; and symmetry.

*Clarification 2*: Instruction includes the use of standard form, factored form and vertex form.

*Clarification 3*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.
*Clarification 4*: Within the Algebra 1 course, notations for domain, range and constraints are limited to inequality and set-builder.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.8:](https://www.cpalms.org/PreviewAccessPoint/Preview/18303)  | Given a mathematical and/or real-world problem that is modeled with quadratic functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: vertex, vertex form, standard form, quadratic function, graph, opens upward, opens downward, parabola, positive number, negative number, maximum point, minimum point, *x*-axis, *y*-axis, *x*-intercept, *y*-intercept, axis of symmetry
* Understand that the graph of a quadratic function is a parabola
* Understand that the vertex form of a quadratic is
* Understand that the standard form of a quadratic is
* Understand what makes the graph open upward or downward. (parabola opens upward when a is positive and parabola opens downward when a is negative)
* Understand that the vertex is the minimum or maximum point on the graph of the parabola
* Understand in a real-world problem, the vertex represents maximum profit, maximum height, minimum cost for production, etc.
* Understand when given an equation in vertex form, the vertex is
* Understand when given an equation in standard form, the vertex is found by
* Understand that key features may include vertex, axis of symmetry, *x*-intercept(s), and *y*-intercept(s)
 |  |  |  |
| Resources: | [Element Card](https://www.accesstofls.org/core_curriculum_resources/Math/BEST/Element_Cards/HS/Algebra_1/MA.912.AR.3.8.docx) |  |  |  |

[MA.912.AR.3.9:](https://www.cpalms.org//PreviewStandard/Preview/15580) Given a mathematical or real-world context, write two-variable quadratic inequalities to represent relationships between quantities from a graph or a written description.

**Clarifications:**
*Clarification 1:* Instruction includes the use of standard form, factored form and vertex form where any inequality symbol can be represented.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.9:](https://www.cpalms.org/PreviewAccessPoint/Preview/18304) | Select two-variable quadratic inequalities to represent relationships between quantities from a graph or a written description. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: vertex, vertex form, standard form, quadratic function, graph, opens upward, opens downward, parabola, positive number, negative number, maximum point, minimum point, *x*-axis, *y*-axis, *x*-intercept, *y*-intercept, axis of symmetry, quadratic inequality, boundary line, shaded, key features, Greater than (>), Less than (<), greater than or equal to (≥), less than or equal to (≤).
* Understand that the graph of a quadratic function is a parabola
* Understand that key features may include vertex, axis of symmetry, *x*-intercept(s), and *y*-intercept(s)
* Understand to create the inequality that represents the quadratic function more than one key feature will be needed

Ex. vertex, *x*-intercept, *y*-intercept, etc. * Understand that the vertex is the minimum or maximum point on the graph of the parabola
* Understand when given an equation in vertex form, the vertex is
* Understand when given an equation in standard form, the vertex is found by
* Understand what makes the graph open upward or downward. (Parabola opens upward when a is positive and parabola opens downward when a is negative)
* Understand that the vertex form of a quadratic is
* Understand that the standard form of a quadratic is
* Understand if the inequality includes < or > , the boundary lines of the parabola will be dashed
* Understand if the inequality includes ≤ or ≥ , the boundary lines of the parabola will be solid
* Understand with quadratic inequalities:

If the inequality is <, shade below the dashed boundary lineIf the inequality is >, shade above the dashed boundary lineIf the inequality is ≤, shade below the solid boundary line If the inequality is ≥, shade above the solid boundary line* Understand in a real-world problem, the vertex represents maximum profit, maximum height, minimum cost for production, etc.
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| Resources: |  |  |  |  |

[MA.912.AR.3.10:](https://www.cpalms.org//PreviewStandard/Preview/15581) Given a mathematical or real-world context, graph the solution set to a two-variable quadratic inequality.

**Clarifications:**
*Clarification 1*: Instruction includes the use of standard form, factored form and vertex form where any inequality symbol can be represented.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.3.AP.10:](https://www.cpalms.org/PreviewAccessPoint/Preview/18305)  | Given a mathematical or real-world context, graph the solution set to a two-variable quadratic inequality. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: vertex, vertex form, standard form, quadratic function, graph, opens upward, opens downward, parabola, positive number, negative number, maximum point, minimum point, *x*-axis, *y*-axis, *x*-intercept, *y*-intercept, axis of symmetry, quadratic inequality, boundary line, shaded, key features, Greater than (>), Less than (<), greater than or equal to (≥), less than or equal to (≤)
* Understand that the graph of a quadratic function is a parabola
* Understand that key features may include vertex, axis of symmetry, *x*-intercept(s), and *y*-intercept(s)
* Understand that the vertex is the minimum or maximum point on the graph of the parabola
* Understand when given an equation in vertex form, the vertex is
* Understand when given an equation in standard form, the vertex is found by
* Understand what makes the graph open upward or downward (Parabola opens upward when a is positive and parabola opens downward when a is negative)
* Understand that the vertex form of a quadratic is
* Understand that the standard form of a quadratic is
* Understand if the inequality includes < or > , the boundary lines of the parabola will be dashed
* Understand if the inequality includes ≤ or ≥ , the boundary lines of the parabola will be solid.
* Understand with quadratic inequalities:

If the inequality is <, shade below the dashed boundary lineIf the inequality is >, shade above the dashed boundary lineIf the inequality is ≤, shade below the solid boundary line If the inequality is ≥, shade above the solid boundary line |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.4.2:](https://www.cpalms.org//PreviewStandard/Preview/15583) Given a mathematical or real-world context, write and solve one-variable absolute value inequalities. Represent solutions algebraically or graphically.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.4.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18307)  | Solve a one-variable absolute value inequality. Represent solutions algebraically or graphically. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: inequality, absolute value, negative number, positive number, distance, graph, greater than (>), less than (<), greater than or equal to (≥), less than or equal to (≤)
* Understand that the absolute value represents the distance a number is from zero
* Understand that an inequality of less than (<) or less than or equal to (≤) for the absolute value of x can be represented as or

Exnumber line with -3 and 3 indicated* Understand that an inequality of greater than (>) or greater than or equal to (≥) for the absolute value of x can be represented as or (for greater than) and (for greater than or equal to)

Ex. or  or number line with -4 and 4 indicated  |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.4.4:](https://www.cpalms.org//PreviewStandard/Preview/15585) Solve and graph mathematical and real-world problems that are modeled with absolute value functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; vertex; end behavior and symmetry.

*Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.4.AP.4:](https://www.cpalms.org/PreviewAccessPoint/Preview/18309)  | Given a mathematical and/or real-world problem that is modeled with absolute value functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | * Understand the following related vocabulary: absolute value, vertex, negative number, positive number, absolute value function, interior of absolute value function, maximum point, minimum point, ordered pairs, domain, range
* Understand that the vertex is the maximum or minimum point on the absolute value graph
* Understand what makes the graph open upward or downward

Ex.   Absolute value function opens upward when *a* is a positive numberAbsolute value function opens downward when *a* is a negative number* Understand that to find the x-value of the vertex of an absolute value function, set the interior of the absolute value equal to zero

Ex.Ex.* Understand that the *y*-value of the vertex of an absolute value function is *k*

Ex.Vertex (0, 0)Ex.Vertex (0, 3)* Understand that the value of *k* moves the graph up or down

Ex. Because k is 2, the graph shifts two places up graph illustrating k moves the graph up* Understand that the value of *h* moves the graph left or right

ExFind the zero of the interior of the absolute value.Therefore Therefore the graph has shifted to the left three places.graph illustrating h moves the graph left* Understand when graphing an absolute value graph, graph the vertex point first
* Understand after graphing the vertex, create a table of ordered pairs on the left and right side of the vertex

table of ordered pairs* Understand that the ordered pairs in the table create an absolute value graph

graph illustrating ordered pairs in table create absolute value graph* Understand that the domain is all the possible *x*-values for a graph
* Understand that the range is all the possible *y*-values for a graph
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.5.2:](https://www.cpalms.org//PreviewStandard/Preview/15587) Solve one-variable equations involving logarithms or exponential expressions. Interpret solutions as viable in terms of the context and identify any extraneous solutions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.5.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18310)  | Solve one-variable equations involving logarithms or exponential expressions. Identify any extraneous solutions. |  |  |  |
| EssentialUnderstandings | * Understand the concepts and vocabulary: algebraic logarithmic expression, exponent, equivalent, logarithm, base, properties, extraneous solution, simplified, undefined
* Understand how to identify expressions with exponents

E.g., (a⁴)* Understand what the exponent represents in expanded form

E.g., a4 = a × a × a× a* Understand what question a logarithm asks

example of logarithms* Understand the rules for logarithms
* Understand that the rules for logarithms will need to be applied to simplify expressions to find the solutions
* Understand the following would result in an extraneous solution: and . Both solutions are undefined
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.5.4:](https://www.cpalms.org//PreviewStandard/Preview/15589) Write an exponential function to represent a relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context.

**Clarifications:**

*Clarification 1:* Within the Algebra 1 course, exponential functions are limited to the forms , where *b* is a whole number greater than 1 or a unit fraction, or , where .

*Clarification 2:* Within the Algebra 1 course, tables are limited to having successive nonnegative integer inputs so that the function may be determined by finding ratios between successive outputs.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.5.AP.4:](https://www.cpalms.org/PreviewAccessPoint/Preview/18312) | Select an exponential function to represent two quantities from a graph or a table of values. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: *x*-axis, *y*-axis, *x*-value, *y*-value, left, right, increase, exponential function, exponential, table, graph, constant, common ratio, initial value, definable point, consecutive
* Understand when given a table of an exponential function the *x*-values will increase by a constant value and the *y*-values will increase by a common ratio
* Understand when given the exponential equation the variable *a* represents the initial value and the variable *b* represents the ratio between the *y*-values (
* Understand when a graph of the exponential function crosses the *y*-axis at a definable point the *y*-intercept is the initial value
* Understand when given a graph, to calculate the value for the variable b select two consecutive definable points and calculate the ratio between the *y*-values
 |  |  |  |
| Resources: | [Element Card](https://www.accesstofls.org/core_curriculum_resources/Math/BEST/Element_Cards/HS/Algebra_1/MA.912.AR.5.4.docx) |  |  |  |

[MA.912.AR.5.5:](https://www.cpalms.org//PreviewStandard/Preview/15590) Given an expression or equation representing an exponential function, reveal the constant percent rate of change per unit interval using the properties of exponents. Interpret the constant percent rate of change in terms of a real-world context.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
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| [MA.912.AR.5.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18313)  | Given an expression or equation representing an exponential function, reveal the constant percent rate of change per unit interval using the properties of exponents. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: algebraic expression, exponents, variable, base number, integers, growth, decay, constant percent change, initial value, properties of exponents
* Understand how to identify the parts of an algebraic expression

E.g., x7 where x is the base number and 7 is the exponent* Understand how to identify expressions with exponents

E.g., (x⁴)(x³)* Understand and use the properties of exponents to simplify algebraic expressions
* Understand the following formula: (a = initial value, b = the growth or decay factor, x = constant percentage change)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.5.7:](https://www.cpalms.org//PreviewStandard/Preview/15592) Solve and graph mathematical and real-world problems that are modeled with exponential functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; constant percent rate of change; end behavior and asymptotes.

*Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.

*Clarification 3*: Instruction includes understanding that when the logarithm of the dependent variable is taken and graphed, the exponential function will be transformed into a linear function.

*Clarification 4*: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business. **Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.5.AP.7:](https://www.cpalms.org/PreviewAccessPoint/Preview/18315)  | Given a mathematical and/or real-world problem that is modeled with exponential functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: *x*-axis, *y*-axis, *x*-value, *y*-value, left, right, increase, decrease, growth, decay, exponential function, exponential, standard form, graph, constant, common ratio, initial value, definable point, properties of exponents
* Understand and use the properties of exponents to simplify algebraic expressions
* Understand when given the exponential equation the variable *a* represents the initial value and the variable *b* represents the ratio between the *y*-values (
* Understand that an exponential function that represents growth will quickly increase from left to right
* Understand that an exponential function that represents decay will quickly decrease from left to right
* Understand that growth can be represented by a pandemic, rabbits, mice, fleas, population, etc.
* Understand that decay can be represented by radioactive materials, population, something that cools (coffee, soup), etc.
* Understand when a graph of the exponential function crosses the *y*-axis at a definable point the *y*-intercept is the initial value variable *a*
* Understand that the standard form of an exponential function that represents growth is where a is the initial value (a > 0), r is the rate of growth (r > 0), x is time
* Understand for exponential growth, as x increases, y grows exponentially
* Understand that the standard form of an exponential function that represents decay is where a is the initial value (a > 0), r is the rate of decay (0 < r < 1), x is time
* Understand for exponential decay, as x increases, y decreases exponentially
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.5.8:](https://www.cpalms.org//PreviewStandard/Preview/15593) Given a table, equation or written description of a logarithmic function, graph that function and determine its key features.

**Clarifications:**
*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes.

*Clarification 2:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.5.AP.8:](https://www.cpalms.org/PreviewAccessPoint/Preview/18316)  | Given an equation of a logarithmic function, select the graph of that function. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: parent function, logarithmic function, base number, domain, increase, decrease, positive real numbers, range, asymptote, graph, stretch, shrink, shift, horizontal, vertical, reflect, *x*-axis, *y*-axis
* Understand the parent function for a logarithmic function is
* Understand the key features for the parent function: The graph of the function crosses the *x*-axis at (1,0)

The base number is b (if b > 1, the graph increases, if 0 < b < 1, the graph decreases)The domain is all positive real numbers (not including zero)The range is all real numbersThe graph has an asymptote at the *y*-axis* Understand the following formula for log transformations.

If , the graph reflects over the *x*-axis If the graph stretchesIf the graph shrinks *h* shifts the graph horizontally right and left*k* shifts the graph vertically up and down |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.5.9:](https://www.cpalms.org//PreviewStandard/Preview/15594) Solve and graph mathematical and real-world problems that are modeled with logarithmic functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes.

*Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.5.AP.9:](https://www.cpalms.org/PreviewAccessPoint/Preview/18317) | Given a mathematical and/or real-world problem that is modeled with logarithmic functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: parent function, logarithmic function, base number, domain, increase, decrease, positive real numbers, range, asymptote, graph, stretch, shrink, shift, horizontal, vertical, reflect, *x*-axis, *y*-axis, extraneous solution, rules for logarithms
* Understand the rules for logarithms
* Understand that the rules for logarithms will need to be applied to simplify expressions to find the solutions
* Understand the following would result in an extraneous solution: and

Both solutions are undefined* Understand the parent function for a logarithmic function is
* Understand the key features for the parent function:

The graph of the function crosses the *x*-axis at (1,0)The base number is b (if b > 1, the graph increases, if 0 < b < 1, the graph decreases)The domain is all positive real numbers (not including zero)The range is all real numbersThe graph has an asymptote at the *y*-axis* Understand the following formula for log transformations.

If , the graph reflects over the *x*-axisIf the graph stretchesIf the graph shrinks *h* shifts the graph horizontally right and left*k* shifts the graph vertically up and down |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.6.1:](https://www.cpalms.org//PreviewStandard/Preview/15595) Given a mathematical or real-world context, when suitable factorization is possible, solve one-variable polynomial equations of degree 3 or higher over the real and complex number systems.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.6.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18318)  | Solve one-variable polynomial equations of degree 3 or higher in factored form, over the real number system. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: one-variable polynomial equations, factored form, real number system, degree 3, exponent, solution, zeros
* Understand a degree 3 of a one-variable polynomial equation could have three solutions, a degree 4 of a one-variable polynomial equation could have four solutions, etc. (a degree 3 means the largest exponent is a 3)
* Understand the following:

f(x) = (x−a)(x−b)(x−c), *a*, *b*, and *c* are the zeros or solutions to the polynomial |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.6.5:](https://www.cpalms.org//PreviewStandard/Preview/15599) Sketch a rough graph of a polynomial function of degree 3 or higher using zeros, multiplicity and knowledge of end behavior.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.6.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18319) | Create a rough graph of a polynomial function of degree 3 or higher (in factored form) using zeros, multiplicity and knowledge of end behavior. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: polynomial equations, factored form, real number system, even, odd, zeros, crosses, graph, *x*-axis, *y*-axis, end behavior, solutions, exponent, leading coefficient, , positive, negative
* Understand a degree 3 of a polynomial equation could have three solutions, a degree 4 of a polynomial equation could have four solutions, etc. (a degree 3 means the largest exponent is a 3)
* Understand the following: f(x) = (x−a)(x−b)(x−c), *a*, *b*, and *c* are the zeros or solutions to the polynomial
* Understand the following:

If *n* is even, the graph touches the *x*-axis at *r*If *n* is odd, the graph crosses the *x*-axis at *r** Understand the following end behavior:

If the degree is even, and the leading coefficient is positive as, and If the degree is even, and the leading coefficient is negative as, and If the degree is odd, and the leading coefficient is positive as, and If the degree is odd, and the leading coefficient is negative as, and  |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.7.1:](https://www.cpalms.org//PreviewStandard/Preview/15600) Solve one-variable radical equations. Interpret solutions as viable in terms of context and identify any extraneous solutions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.7.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18320) | Solve one-variable radical equations and identify any extraneous solutions. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: one-variable radical equation, extraneous solutions, square root, cube root, isolate
* Understand when solving a one-variable radical equation, the first step is to isolate the radical on one side of the equal sign
* Understand when solving a one-variable radical equation, the second step is to square both sides if the radical is a square root, cube both sides if the radical is a cube root, etc.
* Understand when solving a one-variable radical equation, the third step is to solve for the variable *x*
* Understand the last step for solving a one-variable radical equation is to check the for extraneous solutions
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.7.2:](https://www.cpalms.org//PreviewStandard/Preview/15601) Given a table, equation or written description of a square root or cube root function, graph that function and determine its key features.

**Clarifications:**
*Clarification 1:* Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and relative maximums and minimums.

*Clarification 2:* Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.7.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18321) | Given a table, equation or written description of a square root or cube root function, select the graph that represents the function. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: square root function, cube root function, graph, *x*-axis, *y*-axis, radicand, parent function, flip, domain, range, *x*-intercept, *y*-intercept, infinity , shift, left, right, up, down, increase, negative number, positive number
* Understand the parent graph of the square root of a function is
* Understand the key features for the parent function of a square root function:

The domain is The range is The *x*-intercept and *y*-intercept is The graph increases from left to right* Understand that the general equation for a square root function is
* Understand that the graph of a square root function will flip over the *x*-axis when *a* is a negative number

Ex. * Understand that the graph of a square root function will flip over the y-axis when *b* is a negative number

Ex. * Understand that *h* will shift the graph right or left
* Understand that *k* will shift the graph up or down
* Understand a table of values may be created to assist in graphing the square root function
* Understand the parent function of a cube root is
* Understand the key features for the parent function of a cube root function:

The domain is The range is The *x*-intercept and *y*-intercept is The graph increases from left to right* Understand that the general equation for a cube root function is
* Understand that the graph of a cube root function will flip over the *x*-axis when *a* is a negative number

Ex. * Understand that *h* will shift the graph right or left
* Understand that *k* will shift the graph up or down
* Understand a table of values may be created to assist in graphing the cube root function
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.7.3:](https://www.cpalms.org//PreviewStandard/Preview/15602) Solve and graph mathematical and real-world problems that are modeled with square root or cube root functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and relative maximums and minimums.

*Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.7.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18322) | Given a mathematical and/or real-world problem that is modeled with square root or cube root functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: square root function, cube root function, graph, *x*-axis, *y*-axis, radicand, parent function, flip, domain, range, *x*-intercept, *y*-intercept, infinity , shift, left, right, up, down, increase, negative number, positive numberUnderstand the parent graph of the square root of a function is Understand the key features for the parent function of a square root function: The domain is The range is The *x*-intercept and *y*-intercept is The graph increases from left to rightUnderstand that the general equation for a square root function is Understand that the graph of a square root function will flip over the *x*-axis when *a* is a negative numberEx. Understand that the graph of a square root function will flip over the y-axis when *b* is a negative numberEx. Understand that *h* will shift the graph right or leftUnderstand that *k* will shift the graph up or downUnderstand a table of values may be created to assist in graphing the square root functionUnderstand the parent function of a cube root is Understand the key features for the parent function of a cube root function: The domain is The range is The *x*-intercept and *y*-intercept is The graph increases from left to rightUnderstand that the general equation for a cube root function is Understand that the graph of a cube root function will flip over the *x*-axis when *a* is a negative numberEx. Understand that *h* will shift the graph right or leftUnderstand that *k* will shift the graph up or down Understand a table of values may be created to assist in graphing the cube root function |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.8.1:](https://www.cpalms.org//PreviewStandard/Preview/15603) Write and solve one-variable rational equations. Interpret solutions as viable in terms of the context and identify any extraneous solutions.

**Clarifications:**
*Clarification 1*: Within the Algebra 2 course, numerators and denominators are limited to linear and quadratic expressions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.8.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18323)  | Solve one-variable rational equations and identify any extraneous solutions. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: one-variable, least common denominator, extraneous solution, numerator, denominator, rational equation, like terms Understand that a rational equation is one where a variable could be in the numerator or denominatorUnderstand when solving a rational equation, the first step is to find the least common denominatorUnderstand how to combine like terms. Understand how to solve for the variable* Understand how to check for extraneous solutions which are solutions that produce a zero in the denominator
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.8.2:](https://www.cpalms.org//PreviewStandard/Preview/15604) Given a table, equation or written description of a rational function, graph that function and determine its key features.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes.

*Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.

*Clarification 3*: Within the Algebra 2 course, numerators and denominators are limited to linear and quadratic expressions. **Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.8.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18324)  | Given a table, equation or written description of a rational function, select the graph that represents the function. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: rational function, factors, factoring, numerator, denominator, horizontal asymptote, vertical asymptote, coefficient, long division, domain, slant asymptote, holeUnderstand that a hole in the graph occurs when, after factoring, the same factors is in the numerator and denominatorUnderstand that the graph will have vertical asymptotes where the denominator equals zeroUnderstand that the graph will have horizontal asymptotes where the graph: If the degree of the numerator and denominator are the same, the horizontal asymptote is equal to the leading coefficient of the numerator over the leading coefficient of the denominatorEx: The horizonal asymptote is )If the degree in the numerator is larger than the degree in the denominator, there is no horizontal asymptoteIf the degree in the denominator is larger than the degree in the numerator, the horizontal asymptote is at Understand that a slant asymptote will occur when the degree in the numerator is exactly one larger than the degree in the denominatorLong division may be required to find the equation of the asymptoteUnderstand the domain of a rational function is all real numbers except where x makes a zero in the denominator* Understand a table of values may be created to assist in graphing rational functions
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.8.3:](https://www.cpalms.org//PreviewStandard/Preview/15605) Solve and graph mathematical and real-world problems that are modeled with rational functions. Interpret key features and determine constraints in terms of the context.

**Clarifications:**
*Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes.

*Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.

*Clarification 3*: Instruction includes using rational functions to represent inverse proportional relationships.

*Clarification 4*: Within the Algebra 2 course, numerators and denominators are limited to linear and quadratic expressions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.8.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18325) | Given a mathematical and/or real-world problem that is modeled with rational functions, solve the mathematical problem, or select the graph using key features (in terms of context) that represents this model. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: one-variable, least common denominator, extraneous solution, numerator, denominator, rational equation, like terms, rational function, factors, factoring, horizontal asymptote, vertical asymptote, coefficient, long division, domain, slant asymptote, hole Understand that a rational equation is one where a variable could be in the numerator or denominator Understand when solving a rational equation, the first step is to find the least common denominatorUnderstand how to combine like terms Understand how to solve for the variableUnderstand how to check for extraneous solutions which are solutions that produce a zero in the denominatorUnderstand that a hole in the graph occurs when, after factoring, the same factors is in the numerator and denominatorUnderstand that the graph will have vertical asymptotes where the denominator equals zero Understand that the graph will have horizontal asymptotes where the graph: If the degree of the numerator and denominator are the same, the horizontal asymptote is equal to the leading coefficient of the numerator over the leading coefficient of the denominatorEx: The horizonal asymptote is If the degree in the numerator is larger than the degree in the denominator, there is no horizontal asymptote If the degree in the denominator is larger than the degree in the numerator, the horizontal asymptote is at Understand that a slant asymptote will occur when the degree in the numerator is exactly one larger than the degree in the denominator. Long division may be required to find the equation of the asymptoteUnderstand the domain of a rational function is all real numbers except where x makes a zero in the denominatorUnderstand a table of values may be created to assist in graphing rational functions |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.9.2:](https://www.cpalms.org//PreviewStandard/Preview/15607) Given a mathematical or real-world context, solve a system consisting of a two-variable linear equation and a non-linear equation algebraically or graphically.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.9.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18327) | Solve a system consisting of a two-variable linear equation and a quadratic equation algebraically or graphically. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: slope, *y*-intercept, *x*-intercept, quadratic function, calculate graphically, calculate algebraically, linear equation, vertex, variableUnderstand how to graph a linear equation by using slope and *y*-interceptUnderstand how to graph a quadratic function by graphing the key features (Ex. vertex, *y*-intercept, *x*-intercept, etc.) Understand solving a system consisting of linear and quadratic functions can be calculated either graphically or algebraically where the two functions cross* Understand to solve a system consisting of linear and quadratic functions algebraically, set the two equations equal to each other and solve for the variables
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.9.3:](https://www.cpalms.org//PreviewStandard/Preview/15608) Given a mathematical or real-world context, solve a system consisting of two-variable linear or non-linear equations algebraically or graphically.

**Clarifications:**
*Clarification 1*: Within the Algebra 2 course, non-linear equations are limited to quadratic equations.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.9.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18328)  | Solve a system consisting of two-variable linear or quadratic equations algebraically or graphically. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: slope, *y*-intercept, *x*-intercept, quadratic function, calculate graphically, calculate algebraically, linear equation, vertex, variable,
* Understand how to graph a linear equation by using slope and *y*-intercept
* Understand how to graph a quadratic function by graphing the key features (Ex. vertex, *y*-intercept, *x*-intercept, etc.)
* Understand solving a system consisting of linear or quadratic functions can be calculated either graphically or algebraically where the two functions cross
* Understand to solve a system consisting of linear or quadratic functions algebraically, set the two equations equal to each other and solve for the variables
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.9.5:](https://www.cpalms.org//PreviewStandard/Preview/15884) Graph the solution set of a system of two-variable inequalities.

**Clarifications:**
*Clarification 1:* Within the Algebra 2 course, two-variable inequalities are limited to linear and quadratic.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.9.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18330)  | Select the graph of the solution set of a system of two-variable inequalities. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: boundary line, two-variable inequality, graph, shading a graph, Greater than (>), Less than (<), greater than or equal to (≥), less than or equal to (≤), variables, coordinate point, *x*-axis, *y*-axis, horizontal, vertical, solutionUnderstand key features are used to graph an inequality functionUnderstand that a dotted boundary line on a graph of a two-variable inequality represents less than (<) or greater than (>)Understand that a solid boundary line on a graph of a two-variable inequality represents less than or equal to or greater than or equal to Understand if the graph of a two-variable inequality is shaded above the boundary line, the graph represents greater than or greater than or equal toUnderstand if the graph of a two-variable inequality is shaded below the boundary line, the graph represents less than or less than or equal toUnderstand that an inequality divides the coordinate plane into two parts by a boundary line where one represents the solutions of the inequality (Any coordinate point that falls in the shaded region or on the boundary line if it is solid line, is the solution.) Understand when given more than one two-variable inequalities, the solution is where the two shaded regions overlap* Understand when given more than one two-variable inequalities, if the two inequalities do not overlap, there is no solution
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.AR.9.7:](https://www.cpalms.org//PreviewStandard/Preview/15611) Given a real-world context, represent constraints as systems of linear and non-linear equations or inequalities. Interpret solutions to problems as viable or non-viable options.

**Clarifications:**
*Clarification 1*: Instruction focuses on analyzing a given function that models a real-world situation and writing constraints that are represented as non-linear equations or non-linear inequalities.

*Clarification 2*: Within the Algebra 2 course, non-linear equations and inequalities are limited to quadratic.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.AR.9.AP.7:](https://www.cpalms.org/PreviewAccessPoint/Preview/18332)  | Given a real-world context, as systems of linear and non-linear equations or inequalities with identified constraints, select a solution as a viable or non-viable option. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: viable, non-viable, system, solution to the system, linear equation, inequality, inside shaded region, outside shaded region, Greater than (>), Less than (<), greater than or equal to (≥), less than or equal to (≤), variables Understand what makes a solution viable.Ex. If you are selling sodas and popcorn, the solution to the system cannot be a negative value nor can it be larger than the number of sodas and popcorn available to be viable. Understand what makes a solution non-viableEx. If you are selling sodas and popcorn, if the solution to the system is less than zero or greater than the number of sodas and popcorn available, then the solution is non-viable* Understand that for a system of inequalities the solution must fall in the shaded region to be viable and outside the shaded region to be non-viable
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.DP.2.8:](https://www.cpalms.org//PreviewStandard/Preview/15756) Fit a quadratic function to bivariate numerical data that suggests a quadratic association and interpret any intercepts or the vertex of the model. Use the model to solve real-world problems in terms of the context of the data.

**Clarifications:**
*Clarification 1*: Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.DP.2.AP.8:](https://www.cpalms.org/PreviewAccessPoint/Preview/18392) | Given a scatter plot, select a quadratic function that fits the data the best. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: scatter plot, quadratic function, graph, ordered pairs, data
* Understand that a quadratic function uses the following rule
* Understand to determine which function fits the data that is graphed, choose ordered pairs from the graph to plug into the given functions to determine which function is true
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.DP.2.9:](https://www.cpalms.org//PreviewStandard/Preview/15901) Fit an exponential function to bivariate numerical data that suggests an exponential association. Use the model to solve real-world problems in terms of the context of the data.

**Clarifications:**
*Clarification 1*: Instruction focuses on determining whether an exponential model is appropriate by taking the logarithm of the dependent variable using spreadsheets and other technology.

*Clarification 2*: Instruction includes determining whether the transformed scatterplot has an appropriate line of best fit, and interpreting the y-intercept and slope of the line of best fit.

*Clarification 3*: Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.DP.2.AP.9:](https://www.cpalms.org/PreviewAccessPoint/Preview/18393)  | Given a scatter plot, select an exponential function that fits the data the best. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: scatter plot, exponential function, graph, ordered pairs, data
* Understand that an exponential function uses the following rule:
* Understand to determine which function fits the data that is graphed, choose ordered pairs from the graph to plug into the given functions to determine which function is true
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.1.1:](https://www.cpalms.org//PreviewStandard/Preview/15621) Given an equation or graph that defines a function, determine the function type. Given an input-output table, determine a function type that could represent it.

**Clarifications:**
*Clarification 1:* Within the Algebra 1 course, functions represented as tables are limited to linear, quadratic and exponential.

*Clarification 2:* Within the Algebra 1 course, functions represented as equations or graphs are limited to vertical or horizontal translations or reflections over the x-axis of the following parent functions:  and .

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.1.AP.1a:](https://www.cpalms.org/PreviewAccessPoint/Preview/18333) | Given an equation or graph that defines a function, identify the function type as either linear, quadratic, or exponential. |  |  |  |
| Essential Understanding | * Understand the following terms and vocabulary: linear function, quadratic function, exponential function, graph, x-axis, y-axis, rapidly increase, rapidly decrease, y-intercept, variable, slope, ratio, constant, parabola, line, curve
* Understand that a linear function is in the form of where m is the slope and b is the y-intercept
* Understand that a quadratic function is in the form of where the variable and the variable *c* is the constant
* Understand that an exponential function in is the form where the variable *a* represents the initial value and the variable *b* represents the ratio between the *y*-values (
* Understand that the graph of a quadratic function is a parabola
* Understand that the graph of a linear function is a line
* Understand that the graph of an exponential function is a curve that increases rapidly from left to right or decreases rapidly from left to right
 |  |  |  |
| Resources: |  |  |  |  |
| [MA.912.F.1.AP.1b:](https://www.cpalms.org/PreviewAccessPoint/Preview/18334)  | Given an input-output table with an accompanying graph, determine a function type, either linear, quadratic, or exponential that could represent it. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: graph, input-output table, linear function, x-values, y-values, common ratio, constant value, table, quadratic function, exponential function, 1st difference, 2nd difference, parabola, rapidly increase, rapidly decrease, line, curve
* Understand to determine that a given table is an exponential function, the *x*-values will increase by a constant value and the *y*-values will increase by a common ratio
* Understand to determine that a given table is a linear function, the x-values will increase by a constant value and the y-values will increase by a constant value
* Understand to determine that a given table is a quadratic function, the 1st difference when subtracting the y-values will be different numbers, then when subtracting the new differences, the 2nd difference will be the same number
* Chart illustrating quadratic funtion 1st and 2nd difference
* Understand that the graph of a quadratic function is a parabola
* Understand that the graph of a linear function is a line
* Understand that the graph of an exponential function is a curve that increases rapidly from left to right or decreases rapidly from left to right
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.1.7:](https://www.cpalms.org//PreviewStandard/Preview/15625) Compare key features of two functions each represented algebraically, graphically, in tables or written descriptions.

**Clarifications:**
*Clarification 1*: Key features include domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior and asymptotes.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.1.AP.7:](https://www.cpalms.org/PreviewAccessPoint/Preview/18339) | Compare key features of two functions each represented algebraically or graphically. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: linear function, quadratic function, graph, x-axis, y-axis, x-intercept, y-intercept, interval, increasing, decreasing, positive, negative, domain, range, positive infinity, negative infinity, slope, end behavior, vertex, maximum, minimum
* Understand a graph is read from left to right
* Understand key features can include some of the following depending on the function: *x*-intercept, *y*-intercept, slope, increasing/decreasing intervals, vertex, relative maximum/minimum values, end behavior, domain, range, etc.
* Understand the *y*-intercept is where the function crosses the *y*-axis
* Understand the *x*-intercept is where the function crosses the *x*-axis
* Understand that an interval always refers to the *x*-values
* Understand the function is increasing in the interval when the *x*-values increase, and the *y*-values increase
* Understand the function is decreasing in the interval when the *x*-values increase, and the *y*-values decrease
* Understand that the domain is the set of all the *x*-values
* Understand that the range is the set of all the *y*-values
* Understand that slope is how steep a linear function is
* Understand the vertex of a quadratic is the maximum or minimum point
* Understand that the relative maximums are where the function changes from increasing to decreasing
* Understand that the relative minimums are where the function changes from decreasing to increasing.
* Understand the end behavior refers to what the graph is doing as it approaches negative infinity or positive infinity
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.1.9:](https://www.cpalms.org//PreviewStandard/Preview/15627) Determine whether a function is even, odd or neither when represented algebraically, graphically or in a table.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.1.AP.9:](https://www.cpalms.org/PreviewAccessPoint/Preview/18341) | Select whether a function is even, odd or neither when represented algebraically. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: function, even, odd, algebraically, negative, positive, opposite sign
* Understand when the function is even

Ex. is even because plugging in a negative *x* will not change the function* Understand when the function is odd

Ex. is odd because plugging in a negative *x* will change all the signs to the opposite sign* Understand the function is neither if it does not fit the rule for even or odd

Ex. is neither because plugging in a negative *x* will change some of the signs but not all |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.2.2:](https://www.cpalms.org//PreviewStandard/Preview/15630) Identify the effect on the graph of a given function of two or more transformations defined by adding a real number to the x- or y- values or multiplying the x- or y- values by a real number.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.2.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18343) | Identify the effect on the graph of a given function of two or more transformations defined by adding a real number to the 𝑥- or *y*-values. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: function, transformation, real number, positive, negative, up, down, left, right, *x*-value, *y*-value
* Understand that adding a positive real number to the *x*-values will move the graph left
* Understand that adding a negative real number to the *x*-values will move the graph to the right
* Understand that adding a positive real number to the *y*-values will move the graph up
* Understand that adding a negative real number to the *y*-values will move the graph down
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.2.3:](https://www.cpalms.org//PreviewStandard/Preview/15631) Given the graph or table of f(x) and the graph or table of f(x)+k,kf(x), f(kx) and f(x+k), state the type of transformation and find the value of the real number k.

**Clarifications:**
*Clarification 1:* Within the Algebra 1 course, functions are limited to linear, quadratic and absolute value.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.2.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18344) | Given the graph of a given function after replacing 𝑓(𝑥) by 𝑓(𝑥) + 𝑘 and 𝑓(𝑥 + 𝑘), 𝑘𝑓(𝑥), for specific values of 𝑘 select the type of transformation and find the value of the real number 𝑘. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: function, transformation, real number, positive, negative, up, down, left, right, *x*-value, *y*-value, *k*-value, horizontally, vertically, shrink, stretch, adding, multiplying
* Understand that adding a positive *k*-value to the *x*-values will move the graph left
* Understand that adding a negative *k*-value to the *x*-values will move the graph to the right
* Understand that adding a positive *k*-value to the *y*-values will move the graph up
* Understand that adding a negative *k*-value to the *y*-values will move the graph down
* Understand that multiplying by a *k*-value where will stretch the graph vertically
* Understand that multiplying by a *k*-value where will shrink the graph vertically
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.2.5:](https://www.cpalms.org//PreviewStandard/Preview/15633) Given a table, equation or graph that represents a function, create a corresponding table, equation or graph of the transformed function defined by adding a real number to the *x*- or *y*-values or multiplying the *x*- or *y*-values by a real number.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.2.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18345) | Given a table, equation or graph that represents a function, select a corresponding table, equation or graph of the transformed function defined by adding a real number to the *x*- or *y*-values. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: function, transformation, table, equation, graph, real number, positive, negative, up, down, left, right, *x*-value, *y*-value, horizontal, vertical
* Understand that adding a positive real number to the *x*-values will move the graph left
* Understand that adding a negative real number to the *x*-values will move the graph to the right
* Understand that adding a positive real number to the *y*-values will move the graph up
* Understand that adding a negative real number to the *y*-values will move the graph down
* Understand that is the rule for adding a real number to the *x*-values
* Understand when examining a table, to determine horizontal movement right and left, look at the *x*-values (Ex. shifts to the left 4.)
* Understand that is the rule for adding a real number to the *y*-values
* Understand when examining a table, to determine vertical movement up and down, look at the *y*-values

If the *y*-values decrease, *k* will be negativeIf the *y*-values increase, *k* will be positive |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.3.2:](https://www.cpalms.org//PreviewStandard/Preview/15636) Given a mathematical or real-world context, combine two or more functions, limited to linear, quadratic, exponential and polynomial, using arithmetic operations. When appropriate, include domain restrictions for the new function.

**Clarifications:**
*Clarification 1*: Instruction includes representing domain restrictions with inequality notation, interval notation or set-builder notation.

*Clarification 2*: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.3.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18346) | Given a mathematical and/or real-world context, combine two or more functions, limited to linear, quadratic, and polynomial, using arithmetic operations of addition, subtraction, or multiplication. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: function, linear, quadratic, polynomial, like terms, distributive property, product, sum, difference
* Understand the following rules:

Sum: Difference:Product: * Understand that when adding two or more functions, add or subtract like terms
* Understand when subtracting two or more functions, the distributive property will need to be applied to any function that is subtracted then add or subtract like terms
* Understand when multiplying two or more functions, the distributive property will need to be applied then add or subtract like terms
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.3.4:](https://www.cpalms.org//PreviewStandard/Preview/15638) Represent the composition of two functions algebraically or in a table. Determine the domain and range of the composite function.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.3.AP.4:](https://www.cpalms.org/PreviewAccessPoint/Preview/18347) | Given a composite function within a mathematical or real-world context, identify the domain and range of the composite function. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: composite function, inside function, domain, range, *x*-values, *y*-values, substitute
* Understand the following rule:
* Understand for composite functions, using the rule above, the function of *g* is substituted into every *x* in the function of *f*
* Understand the following rule:
* Understand for composite functions, using the rule above, the function of *f* is substituted into every *x* in the function of *g*
* Understand the domain is all the *x*-values and the range is all the *y*-values
* Understand that the domain of a composite function is where the domain of the composite function and the inside function overlap
* Understand for the rule , is the inside function
* Understand for the rule , f is the inside function
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.3.6:](https://www.cpalms.org//PreviewStandard/Preview/15640) Determine whether an inverse function exists by analyzing tables, graphs and equations.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.3.AP.6:](https://www.cpalms.org/PreviewAccessPoint/Preview/18348)  | Determine whether an inverse function exists by analyzing graphs and equations. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: inverse function, one-to-one relationship, reflect, horizontal line test, domain, graph
* Understand when analyzing a graph, a function and its inverse will reflect over the line
* Understand that a function and its inverse have a one-to-one relationship (Ex. because they reflect over the line , if x is 3, y is 3 etc.)
* Understand that a function and its inverse follow these rules:
* Understand that a function must pass the horizontal line test in order to have an inverse
* Understand that some functions will have an inverse if the domain is isolated (Ex. does not pass the horizontal line test unless the domain is isolated, or )
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.F.3.7:](https://www.cpalms.org//PreviewStandard/Preview/15641) Represent the inverse of a function algebraically, graphically or in a table. Use composition of functions to verify that one function is the inverse of the other.

**Clarifications:**
*Clarification 1*: Instruction includes the understanding that a logarithmic function is the inverse of an exponential function.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.F.3.AP.7:](https://www.cpalms.org/PreviewAccessPoint/Preview/18349) | Represent the inverse of a function algebraically. Use composition of functions to verify that one function is the inverse of the other. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: inverse function, one-to-one relationship, reflect, horizontal line test, domain, graph
* Understand when analyzing a graph, a function and its inverse will reflect over the line
* Understand that a function and its inverse have a one-to-one relationship (Ex. because they reflect over the line , if x is 3, y is 3 etc.)
* Understand that a function and its inverse follow these rules:
* Understand that a function must pass the horizontal line test in order to have an inverse
* Understand that some functions will have an inverse if the domain is isolated (Ex. does not pass the horizontal line test unless the domain is isolated, or )
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.FL.3.1:](https://www.cpalms.org//PreviewStandard/Preview/15650) Compare simple, compound and continuously compounded interest over time.

**Clarifications:**
*Clarification 1*: Instruction includes taking into consideration the annual percentage rate (APR) when comparing simple and compound interest.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.FL.3.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18350) | Compare simple and compound interest over time. |  |  |  |
| EssentialUnderstandings | * Understand the following terms and vocabulary: rate, interest, principal, time, number of times compounded, percentages, decimals, real numbers, multiplication (x), compound interest, simple interest, variables, formulas, final amount
* Understand that rate is always in decimal form.

Ex. 6% will be expressed in the formula as 0.06* Understand that simple interest is interest paid on the principal only over a period of time

Ex. Car loans, most bank loans* Understand to calculate simple interest use the formula (where I = interest, P = principal, r = rate, t = time)
* Understand that in a simple or a compound interest problem, time(t) is in terms of years

Ex. 3 months: * Understand that compound interest is interest paid on the initial principal plus interest on the interest charged previously

Ex. Credit cards, savings account* Understand to calculate compound interest use the formula (where A = final amount, P = principal, r = rate, t = time, n = number of times compounded)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.FL.3.2:](https://www.cpalms.org//PreviewStandard/Preview/15651) Solve real-world problems involving simple, compound and continuously compounded interest.

**Clarifications:**
*Clarification 1*: Within the Algebra 1 course, interest is limited to simple and compound.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.FL.3.AP.2:](https://www.cpalms.org/PreviewAccessPoint/Preview/18351) | Solve real-world problems involving simple and compound interest. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: rate, interest, principal, time, number of times compounded, percentages, decimals, real numbers, multiplication (x), compound interest, simple interest, variables, formulas, final amountUnderstand how to convert percentages to decimalsUnderstand how to multiply real numbers with a calculatorUnderstand in equations when variables are side by side with no sign between them it is implied that the values are multiplied (ex. means or P times r times t)Understand that rate is always in decimal form (ex. 6% will be expressed in the formula as 0.06.)Understand that simple interest is interest paid on the principal only over a period of time (ex. Car loans, most bank loans)Understand to calculate simple interest use the formula (where I = interest, P = principal, r = rate, t = time)Understand that in a simple or a compound interest problem, time(t) is in terms of years (ex. 3 months: )Understand that compound interest is interest paid on the initial principal plus interest on the interest charged previously (ex. Credit cards, savings account) * Understand to calculate compound interest use
* the formula (where A = final amount, P = principal, r = rate, t = time, n = number of times compounded)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.FL.3.4:](https://www.cpalms.org//PreviewStandard/Preview/15653) Explain the relationship between simple interest and linear growth. Explain the relationship between compound interest and exponential growth and the relationship between continuously compounded interest and exponential growth.

**Clarifications:**
*Clarification 1*: Within the Algebra 1 course, exponential growth is limited to compound interest.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.FL.3.AP.4:](https://www.cpalms.org/PreviewAccessPoint/Preview/18352)  | Identify the relationship between simple interest and linear growth. Identify the relationship between compound interest and exponential growth. |  |  |  |
| EssentialUnderstandings | Understand the following terms and vocabulary: linear growth, exponential growth, simple interest, compound interest, percentage, constant proportion, valueUnderstand that linear growth is a slow and steady growth and exponential growth is a rapid and steep growthUnderstand that simple interest problems show linear growthUnderstand that linear growth is growing by the same amount over a period of timeUnderstand that simple interest problems grow by the same percentage each year (linear growth)Understand that exponential growth is growth that increases quickly over timeUnderstand that compound interest problems show exponential growthUnderstand that exponential growth is growing in increasing value (constant proportion) over time* Understand that compound interest problems grow by a constant proportion over time (exponential growth)
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.NSO.1.3:](https://www.cpalms.org//PreviewStandard/Preview/15531) Generate equivalent algebraic expressions involving radicals or rational exponents using the properties of exponents.

**Clarifications:**
*Clarification 1*: Within the Algebra 2 course, radicands are limited to monomial algebraic expressions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.NSO.1.AP.3:](https://www.cpalms.org/PreviewAccessPoint/Preview/18272)  | Using properties of exponents, identify equivalent algebraic expressions involving radicals and rational exponents. Radicands are limited to monomial algebraic expression. |  |  |  |
| EssentialUnderstandings | Understand the following concepts, symbols, and vocabulary: base number, exponent, integer, variable, monomial algebraic expression, radical exponents, rational exponents, equivalent, radicandsAdd, subtract, and multiply integers (e.g., use manipulatives, a number line or calculator to add 2 + -5)Add, subtract, and multiply fractions (e.g., use manipulatives, online tools)Understand what the exponent represents in expanded form. (e.g., 8³ = 8 × 8 × 8)Understand the following properties of exponents:Quotient Rule Product RulePower of a Power RulePower of a Product RulePower of a RuleZero Exponent RuleNegative Exponent Rule |  |  |  |
| Resources: |  |  |  |  |

[MA.912.NSO.1.5:](https://www.cpalms.org//PreviewStandard/Preview/15533) Add, subtract, multiply and divide algebraic expressions involving radicals.

**Clarifications:**
*Clarification 1*: Within the Algebra 2 course, radicands are limited to monomial algebraic expressions.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.NSO.1.AP.5:](https://www.cpalms.org/PreviewAccessPoint/Preview/18274)  | Add and subtract algebraic expressions involving radicals. Radicands are limited to monomial algebraic expressions. |  |  |  |
| EssentialUnderstandings | Understand vocabulary: addition, subtraction, expression, radical expressions, radicands, monomial algebraic expressionsAdd and subtract integers (e.g., use manipulatives, a number line or calculator to add 2 + -5).Add and subtract algebraic expressionsRecognize the difference between algebraic expressions in radical form and not in radical form* Adding and subtracting radical expressions follows the same rules as adding and subtracting variables
 |  |  |  |
| Resources: |  |  |  |  |

[MA.912.NSO.1.6:](https://www.cpalms.org//PreviewStandard/Preview/15534) Given a numerical logarithmic expression, evaluate and generate equivalent numerical expressions using the properties of logarithms or exponents.

**Clarifications:**
*Clarification 1*: Within the Mathematics for Data and Financial Literacy Honors course, problem types focus on money and business.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.NSO.1.AP.6:](https://www.cpalms.org/PreviewAccessPoint/Preview/18275) | Given a numerical logarithmic expression, identify an equivalent numerical expression using the properties of logarithms or exponents. |  |  |  |
| EssentialUnderstandings | * Understand the concepts and vocabulary: numerical logarithmic expression, exponent, equivalent, logarithm, base, properties
* Identify expressions with exponents. E.g., (2⁴)
* Understand what the exponent represents in expanded form. (e.g., 24 = 2 × 2 × 2× 2)
* Understand what question a logarithm asks

image of logarithm * Use the properties of logarithms to rewrite the expression

Product rule Quotient rulePower ruleChange of base ruleEquality rule |  |  |  |
| Resources: |  |  |  |  |

[MA.912.NSO.1.7:](https://www.cpalms.org//PreviewStandard/Preview/15892) Given an algebraic logarithmic expression, generate an equivalent algebraic expression using the properties of logarithms or exponents.

**Clarifications:**
*Clarification 1*: Within the Mathematics for Data and Financial Literacy Honors course, problem types focus on money and business.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.NSO.1.AP.7:](https://www.cpalms.org/PreviewAccessPoint/Preview/18276) | Given an algebraic logarithmic expression, identify an equivalent algebraic expression using the properties of logarithms or exponents. |  |  |  |
| EssentialUnderstandings | * Understand the concepts and vocabulary: numerical logarithmic expression, exponent, equivalent, logarithm, base, properties
* Identify expressions with exponents. E.g., (2⁴)
* Understand what the exponent represents in expanded form. (e.g., 24 = 2 × 2 × 2× 2)
* Understand what question a logarithm asks

image of logarithm * Use the properties of logarithms to rewrite the expression

Product rule Quotient rulePower ruleChange of base ruleEquality rule |  |  |  |
| Resources: |  |  |  |  |

[MA.912.NSO.2.1:](https://www.cpalms.org//PreviewStandard/Preview/15535) Extend previous understanding of the real number system to include the complex number system. Add, subtract, multiply and divide complex numbers.

**Related Access Points**

| **Name** | **Description** | **Date(s) Instruction** | **Date(s) Assessment** | **Date Mastery** |
| --- | --- | --- | --- | --- |
| [MA.912.NSO.2.AP.1:](https://www.cpalms.org/PreviewAccessPoint/Preview/18277)  | Extend previous understanding of the real number system to include the complex number system. Add and subtract complex numbers. |  |  |  |
| EssentialUnderstandings | Understand the following concepts and vocabulary: real number system, complex number system, complex numbers, real numbers, coefficientUnderstand how to add and subtract real numbersUnderstand the parts of a complex number, real and imaginaryUnderstand when adding and subtracting complex numbers, the real part of the complex number can be added and subtracted together, and the imaginary part or the complex number can be added and subtracted togetherEx.  |  |  |  |
| Resources: |  |  |  |  |

[MA.K12.MTR.1.1:](https://www.cpalms.org//PreviewStandard/Preview/15875) Actively participate in effortful learning both individually and collectively. Mathematicians who participate in effortful learning both individually and with others:

* Analyze the problem in a way that makes sense given the task.
* Ask questions that will help with solving the task.
* Build perseverance by modifying methods as needed while solving a challenging task.
* Stay engaged and maintain a positive mindset when working to solve tasks.
* Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:

* Cultivate a community of growth mindset learners.
* Foster perseverance in students by choosing tasks that are challenging.
* Develop students’ ability to analyze and problem solve.
* Recognize students’ effort when solving challenging problems.

[MA.K12.MTR.2.1:](https://www.cpalms.org//PreviewStandard/Preview/15876) Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

* Build understanding through modeling and using manipulatives.
* Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
* Progress from modeling problems with objects and drawings to using algorithms and equations.
* Express connections between concepts and representations.
* Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

* Help students make connections between concepts and representations.
* Provide opportunities for students to use manipulatives when investigating concepts.
* Guide students from concrete to pictorial to abstract representations as understanding progresses.
* Show students that various representations can have different purposes and can be useful in different situations.

[MA.K12.MTR.3.1:](https://www.cpalms.org//PreviewStandard/Preview/15877) Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

* Select efficient and appropriate methods for solving problems within the given context.
* Maintain flexibility and accuracy while performing procedures and mental calculations.
* Complete tasks accurately and with confidence.
* Adapt procedures to apply them to a new context.
* Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:

* Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
* Offer multiple opportunities for students to practice efficient and generalizable methods.

Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

[MA.K12.MTR.4.1:](https://www.cpalms.org//PreviewStandard/Preview/15878) Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

* Communicate mathematical ideas, vocabulary and methods effectively.
* Analyze the mathematical thinking of others.
* Compare the efficiency of a method to those expressed by others.
* Recognize errors and suggest how to correctly solve the task.
* Justify results by explaining methods and processes.
* Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

* Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
* Create opportunities for students to discuss their thinking with peers.
* Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
* Develop students’ ability to justify methods and compare their responses to the responses of their peers.

[MA.K12.MTR.5.1:](https://www.cpalms.org//PreviewStandard/Preview/15879) Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

* Focus on relevant details within a problem.
* Create plans and procedures to logically order events, steps or ideas to solve problems.
* Decompose a complex problem into manageable parts.
* Relate previously learned concepts to new concepts.
* Look for similarities among problems.
* Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

* Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
* Support students to develop generalizations based on the similarities found among problems.
* Provide opportunities for students to create plans and procedures to solve problems.
* Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

[MA.K12.MTR.6.1:](https://www.cpalms.org//PreviewStandard/Preview/15880) Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

* Estimate to discover possible solutions.
* Use benchmark quantities to determine if a solution makes sense.
* Check calculations when solving problems.
* Verify possible solutions by explaining the methods used.
* Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

* Have students estimate or predict solutions prior to solving.
* Prompt students to continually ask, “Does this solution make sense? How do you know?”
* Reinforce that students check their work as they progress within and after a task.
* Strengthen students’ ability to verify solutions through justifications.

[MA.K12.MTR.7.1:](https://www.cpalms.org//PreviewStandard/Preview/15881) Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

* Connect mathematical concepts to everyday experiences.
* Use models and methods to understand, represent and solve problems.
* Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**

Teachers who encourage students to apply mathematics to real-world contexts:

* Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
* Challenge students to question the accuracy of their models and methods.
* Support students as they validate conclusions by comparing them to the given situation.
* Indicate how various concepts can be applied to other disciplines.

[ELA.K12.EE.1.1:](https://www.cpalms.org//PreviewStandard/Preview/15201) Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

[ELA.K12.EE.2.1:](https://www.cpalms.org//PreviewStandard/Preview/15202) Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See [Text Complexity](https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/best/la/appendixb.pdf) for grade-level complexity bands and a text complexity rubric.

[ELA.K12.EE.3.1:](https://www.cpalms.org//PreviewStandard/Preview/15203) Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

[ELA.K12.EE.4.1:](https://www.cpalms.org//PreviewStandard/Preview/15204) Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.

In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think \_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

[ELA.K12.EE.5.1:](https://www.cpalms.org//PreviewStandard/Preview/15205) Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

[ELA.K12.EE.6.1:](https://www.cpalms.org//PreviewStandard/Preview/15206) Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

[ELD.K12.ELL.MA.1:](https://www.cpalms.org//PreviewStandard/Preview/8642) English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

[ELD.K12.ELL.SI.1](https://cpalms.org/PreviewStandard/Preview/8640) English language learners communicate for social and instructional purposes within the school setting.