

# Algebra 2 Honors   (#1200340)

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| **Course Number:** 1200340  | **Course Path: Section:** Grades PreK to 12 Education Courses > **Grade Group:** Grades 9 to 12 and Adult Education Courses > **Subject:** Mathematics > **SubSubject:** Algebra >  |
| **Course Section:** Grades PreK to 12 Education Courses  | **Abbreviated Title:** ALG 2 HON  |
| **Honors?** Yes  |  |
| **Number of Credits:** One credit (1)  | **Course Length:** Year (Y)  |
| **Course Type:** Core Course  | **Course Level:** 3  |
| **Course Status :** Course Approved  |  |
| **Keywords:** PreK to 12 Education, Pre K to 12 Education, Grades 9 to 12 and Adult Education, 9 to 12, 9-12, High School, Mathematics, Math, Algebra, Algebra 2 Honors, ALG 2 HON, Algebra 2  |  |
| **Grade Level(s):** 9, 10, 11, 12  |  |
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|  | **Graduation Requirement:** Mathematics  |
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#### VERSION DESCRIPTION

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include polynomial, rational, and radical functions.2 Students work closely with the expressions that define the functions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas for this course, organized into four units, are as follows:

**Unit 1- Polynomial, Rational, and Radical Relationships:** This unit develops the structural similarities between the system of polynomials and the system of integers. Students draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Students connect multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The unit culminates with the fundamental theorem of algebra. A central theme of this unit is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers.

**Unit 2- Trigonometric Functions:** Building on their previous work with functions, and on their work with trigonometric ratios and circles in Geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena.

**Unit 3- Modeling with Functions:** In this unit students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as â€œthe process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisionsâ€ is at the heart of this unit. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

**Unit 4- Inferences and Conclusions from Data:** In this unit, students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting dataâ€” including sample surveys, experiments, and simulationsâ€”and the role that randomness and careful design play in the conclusions that can be drawn.

**Unit 5- Applications of Probability:** Building on probability concepts that began in the middle grades, students use the languages of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability. Students should make use of geometric probability models wherever possible. They use probability to make informed decisions.

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#### GENERAL NOTES

**Fluency Recommendations**

 **A-APR.6** This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases. For example, one can view the rational expression ![fraction numerator x plus 4 over denominator x plus 3 end fraction space a s space fraction numerator x plus 4 over denominator x plus 3 end fraction equals fraction numerator left parenthesis x plus 3 right parenthesis plus 1 over denominator x plus 3 end fraction equals 1 plus fraction numerator 1 over denominator x plus 3 end fraction](data:None;base64...).

 **A-SSE.2** The ability to see structure in expressions and to use this structure to rewrite expressions is a key skill in everything from advanced factoring (e.g., grouping) to summing series to the rewriting of rational expressions to examine the end behavior of the corresponding rational function.

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**F-IF.3** Fluency in translating between recursive definitions and closed forms is helpful when dealing with many problems involving sequences and series, with applications ranging from fitting functions to tables to problems in finance.

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**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Mathematics. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourseÂ to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELLâ€™s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
[http://www.cpalms.org/uploads/docs/standards/eld/MA.pdf](file:///C%3A%5CUsers%5Cuploads%5Cdocs%5Cstandards%5Celd%5CMA.pdf)

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

**Additional Instructional Resources:**
A.V.E. for Success Collection: <http://www.fasa.net/iTunesU/index.cfm>

#### ****Course Standards****

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| **Name** | **Description** |
| [ELD.K12.ELL.MA.1:](http://www.cpalms.org/Public/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:](http://www.cpalms.org/Public/PreviewStandard/Preview/8640) | English language learners communicate for social and instructional purposes within the school setting. |
| [LAFS.1112.RST.1.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/6206) | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. |
| [LAFS.1112.RST.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/6207) | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. |
| [LAFS.1112.RST.3.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/6210) | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. |
| [LAFS.1112.SL.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6114) | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. 1. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
2. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
3. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
4. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
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| [LAFS.1112.SL.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/6115) | Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| [LAFS.1112.SL.1.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/6116) | Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. |
| [LAFS.1112.SL.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/6117) | Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| [LAFS.1112.WHST.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6242) | Write arguments focused on *discipline-specific content.* 1. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
2. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
3. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
4. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
5. Provide a concluding statement or section that follows from or supports the argument presented.
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| [LAFS.1112.WHST.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/6244) | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| [LAFS.1112.WHST.3.9:](http://www.cpalms.org/Public/PreviewStandard/Preview/6250) | Draw evidence from informational texts to support analysis, reflection, and research. |
| [MAFS.912.A-APR.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5547) | Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

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| **Remarks/Examples:****Algebra 1 - Fluency Recommendations**Fluency in adding, subtracting, and multiplying polynomials supports students throughout their work in algebra, as well as in their symbolic work with functions. Manipulation can be more mindful when it is fluent.  |

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| [MAFS.912.A-APR.2.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5548) | Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). |
| [MAFS.912.A-APR.2.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5549) | Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. |
| [MAFS.912.A-APR.3.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5550) | Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x² + y²)² = (x² – y²)² + (2xy)² can be used to generate Pythagorean triples. |
| [MAFS.912.A-APR.3.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5551) | Know and apply the Binomial Theorem for the expansion of (xhttp://www.cpalms.org/Uploads/Benchmark/5551/img/Capture1.PNG in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal’s Triangle. |
| [MAFS.912.A-APR.4.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5552) | Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. |
| [MAFS.912.A-APR.4.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5553) | Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. |
| [MAFS.912.A-CED.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5554) | Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational, absolute, and exponential functions. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.A-CED.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5555) | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.A-CED.1.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5556) | Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.A-CED.1.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5557) | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm’s law V = IR to highlight resistance R.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.A-REI.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5558) | Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.  |
| [MAFS.912.A-REI.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5559) | Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |
| [MAFS.912.A-REI.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5561) | Solve quadratic equations in one variable. 1. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)² = q that has the same solutions. Derive the quadratic formula from this form.
2. Solve quadratic equations by inspection (e.g., for x² = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as *a ± bi* for real numbers a and b.
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| [MAFS.912.A-REI.3.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5563) | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. |
| [MAFS.912.A-REI.3.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5564) | Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line y = –3x and the circle x² + y² = 3.* |
| [MAFS.912.A-REI.4.11:](http://www.cpalms.org/Public/PreviewStandard/Preview/5568) | Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.A-SSE.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5543) | Interpret expressions that represent a quantity in terms of its context. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) 1. Interpret parts of an expression, such as terms, factors, and coefficients.
2. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret http://www.cpalms.org/Uploads/Benchmark/5543/img/Capture1.PNG as the product of P and a factor not depending on P.*
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| [MAFS.912.A-SSE.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5544) | Use the structure of an expression to identify ways to rewrite it. *For example, see x4- y4 as (x²)² – (y²)², thus recognizing it as a difference of squares that can be factored as (x² – y²)(x² + y²).* |
| [MAFS.912.A-SSE.2.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5545) | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx)1. Factor a quadratic expression to reveal the zeros of the function it defines.
2. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
3. Use the properties of exponents to transform expressions for exponential functions. *For example the expression http://www.cpalms.org/Uploads/Benchmark/5545/img/Capture1.PNG can be rewritten as http://www.cpalms.org/Uploads/Benchmark/5545/img/Capture2.PNG ≈ http://www.cpalms.org/Uploads/Benchmark/5545/img/Capture3.PNG to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
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| [MAFS.912.A-SSE.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5546) | Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-BF.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5579) | Write a function that describes a relationship between two quantities. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) 1. Determine an explicit expression, a recursive process, or steps for calculation from a context.
2. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
3. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*
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| [MAFS.912.F-BF.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5580) | Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-BF.2.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5581) | Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* |
| [MAFS.912.F-BF.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5582) | Find inverse functions. 1. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, f(x) =2 x³ or f(x) = (x+1)/(x–1) for x ≠ 1.*
2. Verify by composition that one function is the inverse of another.
3. Read values of an inverse function from a graph or a table, given that the function has an inverse.
4. Produce an invertible function from a non-invertible function by restricting the domain.
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| [MAFS.912.F-BF.2.a:](http://www.cpalms.org/Public/PreviewStandard/Preview/8471) | Use the change of base formula. |
| [MAFS.912.F-IF.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5573) | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-IF.2.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5574) | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble engines in a factory, then the positive integers would be an appropriate domain for the function.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-IF.2.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5575) | Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-IF.3.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5576) | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx)1. Graph linear and quadratic functions and show intercepts, maxima, and minima.
2. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
3. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
4. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
5. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.
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| [MAFS.912.F-IF.3.8:](http://www.cpalms.org/Public/PreviewStandard/Preview/5577) | Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. 1. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
2. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y = http://www.cpalms.org/Uploads/Benchmark/5577/img/Capture.PNG, y = http://www.cpalms.org/Uploads/Benchmark/5577/img/Capture1.PNG, y = http://www.cpalms.org/Uploads/Benchmark/5577/img/Capture4.PNG, y = http://www.cpalms.org/Uploads/Benchmark/5577/img/Capture3.PNG, and classify them as representing exponential growth or decay.*
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| [MAFS.912.F-IF.3.9:](http://www.cpalms.org/Public/PreviewStandard/Preview/5578) | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)*. For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* |
| [MAFS.912.F-LE.1.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5587) | For exponential models, express as a logarithm the solution to http://www.cpalms.org/Uploads/Benchmark/5587/img/Capture1.PNG = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. ★ |
| [MAFS.912.F-LE.2.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5588) | Interpret the parameters in a linear or exponential function in terms of a context. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-TF.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5589) | Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle; Convert between degrees and radians. |
| [MAFS.912.F-TF.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5590) | Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. |
| [MAFS.912.F-TF.2.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5593) | Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.F-TF.3.8:](http://www.cpalms.org/Public/PreviewStandard/Preview/5596) | Prove the Pythagorean identity sin²(θ) + cos²(θ) = 1 and use it to calculate trigonometric ratios. |
| [MAFS.912.G-GPE.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5628) | Derive the equation of a parabola given a focus and directrix. |
| [MAFS.912.N-CN.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5522) | Know there is a complex number i such that i² = –1, and every complex number has the form a + bi with a and b real. |
| [MAFS.912.N-CN.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5523) | Use the relation i² = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. |
| [MAFS.912.N-CN.3.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5528) | Solve quadratic equations with real coefficients that have complex solutions. |
| [MAFS.912.N-CN.3.8:](http://www.cpalms.org/Public/PreviewStandard/Preview/5529) | Extend polynomial identities to the complex numbers. *For example, rewrite x² + 4 as (x + 2i)(x – 2i).* |
| [MAFS.912.N-CN.3.9:](http://www.cpalms.org/Public/PreviewStandard/Preview/5530) | Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. |
| [MAFS.912.N-Q.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5520) | Define appropriate quantities for the purpose of descriptive modeling. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx)

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| **Remarks/Examples:****Algebra 1 Content Notes:**Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions. |

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| [MAFS.912.N-RN.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5516) | Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define http://www.cpalms.org/Uploads/Benchmark/5516/img/Capture2.PNG to be the cube root of 5 because we want http://www.cpalms.org/Uploads/Benchmark/5516/img/Capture1.PNG = http://www.cpalms.org/Uploads/Benchmark/5516/img/Capture3.PNG to hold, so http://www.cpalms.org/Uploads/Benchmark/5516/img/Capture1.PNG must equal 5.* |
| [MAFS.912.N-RN.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5517) | Rewrite expressions involving radicals and rational exponents using the properties of exponents. |
| [MAFS.912.S-CP.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5656) | Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5657) | Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.1.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5658) | Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.1.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5659) | Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.1.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5660) | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.2.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5661) | Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A, and interpret the answer in terms of the model. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.2.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5662) | Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.2.8:](http://www.cpalms.org/Public/PreviewStandard/Preview/5663) | Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-CP.2.9:](http://www.cpalms.org/Public/PreviewStandard/Preview/5664) | Use permutations and combinations to compute probabilities of compound events and solve problems. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-IC.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/5650) | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-IC.1.2:](http://www.cpalms.org/Public/PreviewStandard/Preview/5651) | Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?* |
| [MAFS.912.S-IC.2.3:](http://www.cpalms.org/Public/PreviewStandard/Preview/5652) | Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-IC.2.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5653) | Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-IC.2.5:](http://www.cpalms.org/Public/PreviewStandard/Preview/5654) | Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-IC.2.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5655) | Evaluate reports based on data. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-ID.1.4:](http://www.cpalms.org/Public/PreviewStandard/Preview/5644) | Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-MD.2.6:](http://www.cpalms.org/Public/PreviewStandard/Preview/5670) | Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.912.S-MD.2.7:](http://www.cpalms.org/Public/PreviewStandard/Preview/5671) | Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). [★](http://www.cpalms.org/Standards/mafs_modeling_standards.aspx) |
| [MAFS.K12.MP.1.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6327) | **Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. |
| [MAFS.K12.MP.2.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6328) | **Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. |
| [MAFS.K12.MP.3.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6329) | **Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. |
| [MAFS.K12.MP.4.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6331) | **Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose. |
| [MAFS.K12.MP.5.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6332) | **Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. |
| [MAFS.K12.MP.6.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6333) | **Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.  |
| [MAFS.K12.MP.7.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6334) | **Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. |
| [MAFS.K12.MP.8.1:](http://www.cpalms.org/Public/PreviewStandard/Preview/6335) | **Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. |

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