Algebra 1 - Major and Supporting Clusters

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, and Supporting Clusters for this grade.

~Achieve the Core

Arizona considers **Major Clusters** as groups of related standards that require greater emphasis than some of the others due to the depth of the ideas and the time it takes to master these groups of related standards.

Arizona considers **Supporting Clusters** as groups of related standards that support standards within the major cluster in and across grade levels. Supporting clusters also encompass pre-requisite knowledge and extensions of grade level and course content.

Based on the Publishers' Criteria for the Common Core State Standards and the critical areas highlighted at each grade level, Arizona is suggesting instructional time encompass a range of at least 65%-75% for Major Clusters and a range of 25%-35% for Supporting Cluster instruction. See the publisher's criteria at: www.achievethecore.org/publisherscriteria.

Algebra I Course Content

Course content indicated by: ● major content; ▲ supporting content. Numerals in parentheses designate individual content standards that are eligible for assessment in whole or in part. Bolded numerals (e.g., **1**) indicate standards included in more than one course. See Course Content Boundaries Table.

The Real Number System (N-RN)

▲ Use properties of rational and irrational numbers

Quantities * (N-Q)

● Reason quantitatively and use units to solve problems (1, **2**, 3)

Seeing Structure in Expressions (A-SSE)

● Interpret the structure of expressions (1, **2**)

● Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions (A-APR)

● Perform arithmetic operations on polynomials (1)

▲ Understand the relationship between zeros and factors of polynomials (**3**)

Creating Equations * (A-CED)

● Create equations that describe numbers or relationships (**1**, 2, 3, 4)

Reasoning with Equations and Inequalities (A-REI)

● Understand solving equations as a process of reasoning and explain the reasoning (**1**)

● Solve equations and inequalities in one variable (3, **4**)

▲ Solve systems of equations (5, **6**)

● Represent and solve equations and inequalities graphically (10, **11**, 12)

Interpreting Functions (F-IF)

● Understand the concept of a function and use function notation (1, 2, **3**)

● Interpret functions that arise in applications in terms of the context (**4**, 5, **6**)

● Analyze functions using different representations (**7**, **8**, **9**)

Building Functions (F-BF)

- ● Build a function that models a relationship between two quantities (**1**)
- ▲ Build new functions from existing functions (**3**)

Linear, Quadratic, and Exponential Models * (F-LE)

- ● Construct and compare linear, quadratic, and exponential models and solve problems (1, **2**, 3)
- ● Interpret expressions for functions in terms of the situation they model (**5**)

Interpreting categorical and quantitative data (S-ID)

- ▲ Summarize, represent, and interpret data on a single count or measurement variable (1, 2, 3)
- ▲ Summarize, represent, and interpret data on two categorical and quantitative variables (5, **6**)
- ● Interpret linear models (7, 8, 9)

COURSE CONTENT BOUNDARIES: AI-G-AII PATHWAY

Table 1. Course content boundaries for standards included in more than one course.

AZCCRS-M Cluster	AZCCRS-M Code	AZCCRS-M Standard	Algebra I Course Content Boundaries	Algebra II Course Content Boundaries
Reason quantitatively and use units to solve problems.	N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.	This standard will be assessed in Algebra I by ensuring that some modeling tasks (involving Algebra I content or securely held content from grades 6-8) require the student to create a quantity of interest in the situation being described (i.e., a quantity of interest is not selected for the student by the task). For example, in a situation involving data, the student might autonomously decide that a measure of center is a key variable in a situation, and then choose to work with the mean.	This standard will be assessed in Algebra II by ensuring that some modeling tasks (involving Algebra II content or securely held content from previous grades and courses) require the student to create a quantity of interest in the situation being described (i.e., this is not provided in the task). For example, in a situation involving periodic phenomena, the student might autonomously decide that amplitude is a key variable in a situation, and then choose to work with peak amplitude.
Interpret the structure of expressions.	A-SSE.2	Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.	i) Tasks are limited to numerical expressions and polynomial expressions in one variable. ii) Examples: Recognize $53^2 - 47^2$ as a difference of squares and see an opportunity to rewrite it in the easier-to-evaluate form $(53+47)(53-47)$. See an opportunity to rewrite $a^2 + 9a + 14$ as $(a+7)(a+2)$.	i) Tasks are limited to polynomial, rational, or exponential expressions. ii) Examples: see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. In the equation $x^2 + 2x + 1 + y^2 = 9$, see an opportunity to rewrite the first three terms as $(x+1)^2$, thus recognizing the equation of a circle with radius 3 and center $(-1, 0)$. See $(x^2 + 4)/(x^2 + 3)$ as $((x^2+3) + 1)/(x^2+3)$, thus recognizing an opportunity to write it as $1 + 1/(x^2 + 3)$.

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AZCCRS-M Cluster	AZCCRS-M Code	AZCCRS-M Standard	Algebra I Course Content Boundaries	Algebra II Course Content Boundaries
Write expressions in equivalent forms to solve problems.	A-SSE.3c	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.↔ (c) Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	i) Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation. ii) Tasks are limited to exponential expressions with integer exponents.	i) Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation. ii) Tasks are limited to exponential expressions with rational or real exponents.
Understand the relationship between zeros and factors of polynomials.	A-APR.3	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.	i) Tasks are limited to quadratic and cubic polynomials in which linear and quadratic factors are available. For example, find the zeros of $(x - 2)(x^2 - 9)$.	i) Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of $(x^2 - 1)(x^2 + 1)$
Create equations that describe numbers or relationships.	A-CED.1	Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	i) Tasks are limited to linear, quadratic, or exponential equations with integer exponents.	i) Tasks are limited to exponential equations with rational or real exponents and rational functions. ii) Tasks have a real-world context.
Understand solving equations as a process of reasoning and explain the reasoning.	A-REI.1	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.	i) Tasks are limited to quadratic equations.	i) Tasks are limited to simple rational or radical equations.

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Solve equations and inequalities in one variable.	A-REI.4b	Solve quadratic equations in one variable. b) Solve quadratic equations by inspection (e.g., for x^2 = 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.	i) Tasks do not require students to write solutions for quadratic equations that have roots with nonzero imaginary parts. However, tasks can require the student to recognize cases in which a quadratic equation has no real solutions. *Note, solving a quadratic equation by factoring relies on the connection between zeros and factors of polynomials (cluster A-APR.B). Cluster A-APR.B is formally assessed in A2.*	i) In the case of equations that have roots with nonzero imaginary parts, students write the solutions as a ± bi for real numbers a and b.
Solve systems of equations.	A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	i) Tasks have a real-world context. ii) Tasks have hallmarks of modeling as a mathematical practice (less defined tasks, more of the modeling cycle, etc.).	i) Tasks are limited to 3x3 systems.
Represent and solve equations and inequalities graphically.	A-REI.11	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. ★	i) Tasks that assess conceptual understanding of the indicated concept may involve any of the function types mentioned in the standard except exponential and logarithmic functions. ii) Finding the solutions approximately is limited to cases where f(x) and g(x) are polynomial functions.	i) Tasks may involve any of the function types mentioned in the standard.

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AZCCRS-M Cluster	AZCCRS-M Code	AZCCRS-M Standard	Algebra I Course Content Boundaries	Algebra II Course Content Boundaries
Understand the concept of a function and use function notation.	F-IF.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*	i) This standard is part of the Major work in Algebra I and will be assessed accordingly.	i) This standard is Supporting work in Algebra II. This standard should support the Major work in F-BF.2 for coherence.
Interpret functions that arise in applications in terms of a context.	F-IF.4	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.* ★	i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers. *Compare note (ii) with standard F-IF.7.* *The function types listed here are the same as those listed in the Algebra I column for standards F-IF.6 and F-IF.9.*	i) Tasks have a real-world context ii) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions. *Compare note (ii) with standard F-IF.7.* *The function types listed here are the same as those listed in the Algebra II column for standards F-IF.6 and F-IF.9.*

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Interpret functions that arise in applications in terms of a context.	F-IF.6	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. ★	i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers. *The function types listed here are the same as those listed in the Algebra I column for standards F-IF.4 and F-IF.9.*	i) Tasks have a real-world context. ii) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions. *The function types listed here are the same as those listed in the Algebra II column for standards F-IF.4 and F-IF.9.*
Analyze functions using different representations.	F-IF.9	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.*	i) Tasks are limited to linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers. *The function types listed here are the same as those listed in the Algebra I column for standards F-IF.4 and F-IF.6.*	i) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions. *The function types listed here are the same as those listed in the Algebra II column for standards F-IF.4 and F-IF.6.*
Build a function that models a relationship between two quantities.	F-BF.1a	Write a function that describes a relationship between two quantities.★ a) Determine an explicit expression, a recursive process, or steps for calculation from a context.	i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, and exponential functions with domains in the integers.	i) Tasks have a real-world context ii) Tasks may involve linear functions, quadratic functions, and exponential functions.

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Build new functions from existing functions.	F-BF.3	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.*	i) Identifying 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) is limited to linear and quadratic functions. ii) Experimenting with cases and illustrating an explanation of the effects on the graph using technology is limited to linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the integers. iii) Tasks do not involve recognizing even and odd functions. *The function types listed in note (ii) are the same as those listed in the Algebra I column for standards F-IF.4, F-IF.6, and F-IF.9.*	i) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions ii) Tasks may involve recognizing even and odd functions. *The function types listed in note (i) are the same as those listed in the Algebra II column for standards F-IF.4, F-IF.6, and F-IF.9.*
Construct and compare linear, quadratic, and exponential models and solve problems.	F-LE.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	i) Tasks are limited to constructing linear and exponential functions in simple context (not multi-step).	i) Tasks will include solving multi-step problems by constructing linear and exponential functions.
Interpret expressions for functions in terms of the situation they model.	F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context.	i) Tasks have a real-world context. ii) Exponential functions are limited to those with domains in the integers.	i) Tasks have a real-world context. ii) Tasks are limited to exponential functions with domains not in the integers.

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AZCCRS-M Cluster	AZCCRS-M Code	AZCCRS-M Standard	Algebra I Course Content Boundaries	Algebra II Course Content Boundaries
Summarize, represent, and interpret data on two categorical and quantitative variables.	S-ID.6a	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a) Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*	i) Tasks have a real-world context. ii) Exponential functions are limited to those with domains in the integers.	i) Tasks have a real-world context. ii) Tasks are limited to exponential functions with domains not in the integers and trigonometric functions.