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| **Common Core Standards** | **Common Core Standards** | **Mathematic Practices** |
| N = Number and Quantity Overview N-RN = The Real Number System N-Q = Quantities N-CN = The Complex Number System N-VM = Vector and Matrix QuantitiesA= Algebra Overview A-SSE = Seeing Structure in Expressions A-APR= Arithmetic with Polynomials and Rational Expressions A-CED= Creating Equations A-REI = Reasoning with Equations  and inequalitiesF= Functions Overview  F-IF = Interpreting Functions F-BF = Building Functions F-LE = Linear and Exponential ModelsF-TF = Trigonometric Functions | G = Geometry Overview G-CO = Congruence G-SRT = Similarity, Right Triangles and Trigonometry G-C = Circles G-GPE = Expressing Geometric Properties with Equations G-GMD = Geometric Measurement and Dimension G-MG = Modeling with GeometryS=Statistics and Probability S-ID = Categorical and Quantitative Data S-IC = Inferences and Justifying Conclusions S-CP = Conditional Probability and Rules of Probability S-MD = Using Probability to Make Decisions | 1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
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| **Common Core Standards** | **Converted/Unpacked Standards** |  |
| CC.9-12.A.SSE.1 Interpret the structure of expressions. Interpret expressions that represent a quantity in terms of its context.\* |  |  |
| CC.9-12.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.\* | A.SSE.1a Identify the different parts of the expression and explain their meaning within the context of a problem.  |  |
| CC.9-12.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P.\* | A.SSE.1b Decompose expressions and make sense of the multiple factors and terms by explaining the meaning ofthe individual parts. |  |
| CC.9-12.A.SSE.2 Interpret the structure of expressions. 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). | A.SSE.2 Rewrite algebraic expressions in different equivalent forms such as factoring or combining like terms.Use factoring techniques such as common factors, grouping, the difference of two squares, the sum or difference of two cubes, or a combination of methods to factor completely. Simplify expressions including combining like terms, using the distributive property and other operations with polynomials. |  |
| CC.9-12.A.SSE.3 Write expressions in equivalent forms to solve problems. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.\* |  |  |
| CC.9-12.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines.\* | A.SSE.3a Write expressions in equivalent forms by factoring to find the zeros of a quadratic function and explain the meaning of the zeros.Given a quadratic function explain the meaning of the zeros of the function. That is if f(x) = (x – c) (x – a) then f(a) = 0 and f(c) = 0. Given a quadratic expression, explain the meaning of the zeros graphically. That is for an expression (x –a) (x – c), a and c correspond to the x-intercepts (if a and c are real). |  |
| CC.9-12.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.\* | A.SSE.3b Write expressions in equivalent forms by completing the square to convey the vertex form, to find the maximum or minimum value of a quadratic function, and to explain the meaning of the vertex. |  |
| CC.9-12.A.SSE.3c 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) ≈ 1.012^(12t) to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.\* | A.SSE.3c Use properties of exponents (such as power of a power, product of powers, power of a product, and rational exponents, etc.) to write an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay. |  |
| CC.9-12.A.SSE.4 Write expressions in equivalent forms to solve problems. 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.\* | A.SSE.4 Develop the formula for the sum of a finite geometric series when the ratio is not 1.A.SSE.4 Use the formula to solve real world problems such as calculating the height of a tree after n years given the initial height of the tree and the rate the tree grows each year. Calculate mortgage payments. |  |
| CC.9-12.A.APR.1 Perform arithmetic operations on polynomials. 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. | A.APR.1 Understand the definition of a polynomial. A.APR.1 Understand the concepts of combining like terms and closure. A.APR.1 Add, subtract, and multiply polynomials and understand how closure applies under these operations. |  |
| CC.9-12.A.APR.2 Understand the relationship between zeros and factors of polynomial. 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). | A.APR.2 Understand and apply the Remainder Theorem. A.APR.2 Understand how this standard relates to A.SSE.3a. A.APR.2 Understand that a is a root of a polynomial function if and only if x-a is a factor of the function. |  |
| CC.9-12.A.APR.3 Understand the relationship between zeros and factors of polynomials. 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. | A.APR.3 Find the zeros of a polynomial when the polynomial is factored. A.APR.3 Use the zeros of a function to sketch a graph of the function. |  |
| CC.9-12.A.APR.4 Use polynomial identities to solve problems. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 can be used to generate Pythagorean triples. | A.APR.4 Understand that polynomial identities include but are not limited to the product of the sum and difference of two terms, the difference of two squares, the sum and difference of two cubes, the square of a binomial, etc .A.APR.4 Prove polynomial identities by showing steps and providing reasons. A.APR.4 Illustrate how polynomial identities are used to determine numerical relationships such as |  |
| CC.9-12.A.APR.5 (+) Know and apply the Binomial Theorem for the expansion of (x + y)n 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.1 | A.APR.5 For small values of n, use Pascal’s Triangle to determine the coefficients of the binomial expansion. A.APR.5 Use the Binomial Theorem to find the nth term in the expansion of a binomial to a positive power. |  |
| CC.9-12.A.APR.6 Rewrite rational expressions. 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. | A.APR.6 Rewrite rational expressions, , in the form by using factoring, long division, orsynthetic division. Use a computer algebra system for complicated examples to assist with building a broader conceptual understanding. |  |
| CC.9-12.A.APR.7 (+) Rewrite rational expressions. 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. | A.APR.7 Simplify rational expressions by adding, subtracting, multiplying, or dividing.A.APR.7 Understand that rational expressions are closed under addition, subtraction, multiplication, and division (by a nonzero expression). |  |
| CC.9-12.A.CED.1 Create equations that describe numbers or relationship. 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.\* | A.CED.1 Create linear, quadratic, rational and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems. |  |
| CC.9-12.A.CED.2 Create equations that describe numbers or relationship. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.\* | A.CED.2 Create equations in two or more variables to represent relationships between quantities. A.CED.2 Graph equations in two variables on a coordinate plane and label the axes and scales. |  |
| CC.9-12.A.CED.3 Create equations that describe numbers or relationship. 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.\* | A.CED.3 Write and use a system of equations and/or inequalities to solve a real world problem. Recognize that the equations and inequalities represent the constraints of the problem. Use the Objective Equation and the Corner Principle to determine the solution to the problem. (Linear Programming) |  |
| CC.9-12.A.CED.4 Create equations that describe numbers or relationship. 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.\* | A.CED.4 Solve multi-variable formulas or literal equations, for a specific variable. |  |
| CC.9-12.A.REI.1 Understand solving equations as a process of reasoning and explain the reasoning. 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. | A.REI.1 Assuming an equation has a solution, construct a convincing argument that justifies each step in the solution process. Justifications may include the associative, commutative, and division properties, combining like terms, multiplication by 1, etc. |  |
| CC.9-12.A.REI.2 Understand solving equations as a process of reasoning and explain the reasoning. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. | A.REI.2 Solve simple rational and radical equations in one variable and provide examples of how extraneous solutions arise. |  |
| CC.9-12.A.REI.3 Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  | A.REI.3 Solve linear equations in one variable, including coefficients represented by letters. A.REI.3 Solve linear inequalities in one variable, including coefficients represented by letters. |  |
| CC.9-12.A.REI.4 Solve equations and inequalities in one variable. Solve quadratic equations in one variable.  |  |  |
| CC.9-12.A.REI.4a 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.  | A.REI.4a Transform a quadratic equation written in standard form to an equation in vertex form - by completing the square.A.REI.4a Derive the quadratic formula by completing the square on the standard form of a quadratic equation. |  |
| CC.9-12.A.REI.4b 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. | A.REI.4b Solve quadratic equations in one variable by simple inspection, taking the square root, factoring, and completing the square.A.REI.4b Understand why taking the square root of both sides of an equation yields two solutions. A.REI.4b Use the quadratic formula to solve any quadratic equation, recognizing the formula produces all complex solutions. Write the solutions in the form , where a and b are real numbers. A.REI.4b Explain how complex solutions affect the graph of a quadratic equation. |  |
| CC.9-12.A.REI.5 Solve systems of equations. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. | A.REI.5 Solve systems of equations using the elimination method (sometimes called linear combinations).A.REI.5 Solve a system of equations by substitution (solving for one variable in the first equation and substitution it into the second equation). |  |
| CC.9-12.A.REI.6 Solve systems of equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. | A.REI.6 Solve systems of equations using graphs. |  |
| CC.9-12.A.REI.7 Solve systems of equations. 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 x^2 + y^2 = 3. | A.REI.7 Solve a system containing a linear equation and a quadratic equation in two variables (conic sections possible) graphically and symbolically. |  |
| CC.9-12.A.REI.8 (+) Solve systems of equations. Represent a system of linear equations as a single matrix equation in a vector variable. | A.REI.8 Write a system of linear equations as a single matrix equation. |  |
| CC.9-12.A.REI.9 (+) Solve systems of equations. Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). | A.REI.9 Find the inverse of the coefficient matrix in the equation, if it exits. Use the inverse of the coefficient matrix to solve the system. Use technology for matrices with dimensions 3 by 3 or greater.* Find the dimension of matrices.
* Understand when matrices can be multiplied.
* Understand that matrix multiplication is not commutative.
* Understand the concept of an identity matrix.
* Understand why multiplication by the inverse of the coefficient matrix yields a solution to the system (if it exists).
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| CC.9-12.A.REI.10 Represent and solve equations and inequalities graphically. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). | A.REI.10 Understand that all solutions to an equation in two variables are contained on the graph of that equation. |  |
| CC.9-12.A.REI.11 Represent and solve equations and inequalities graphically. 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.\* | A.REI.11 Explain why the intersection of y = f(x) and y = g(x) is the solution of f(x) = g(x) for any combination of linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Find the solution(s) by:•Using technology to graph the equations and determine their point of intersection, •Using tables of values, or •Using successive approximations that become closer and closer to the actual value. |  |
| CC.9-12.A.REI.12 Represent and solve equations and inequalities graphically. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. | A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary for non-inclusive inequalities.A.REI.12 Graph the solution set to a system of linear inequalities in two variables as the intersection of their corresponding half-planes. |  |