ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Operations on Numbers and Expressions: ***Real Numbers***	O1a	Convert between and among radical and exponential forms of numerical expressions	N.RN.1: **Extend the properties of exponents to rational exponents**. *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* $5^{1/3}$ *to be the cube root of 5 because we want* $[5^{1/3}]^3 = 5^{[(1/3) \times 3]}$ *to hold, so* $[5^{1/3}]^3$ *must equal 5.* N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	2	The expectation that students will perform the skill (i.e., convert and rewrite) is very similar between both the ADP and the CC standards. However, the taxonomic level of the CC standard is different. The expectation is that students will be able to explain the connection between how to work with integer exponents and rational exponents.
Operations on Numbers and Expressions: ***Real Numbers***	O1b	Simplify and perform operations on numerical expressions containing radicals	N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	3	
Operations on Numbers and Expressions: ***Real Numbers***	O1c	Apply the laws of exponents to numerical expressions with rational and negative exponents to order and rewrite them in alternative forms	N.RN.1: **Extend the properties of exponents to rational exponents**. *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* $5^{1/3}$ *to be the cube root of 5 because we want* $[5^{1/3}]^3 = 5^{[(1/3) \times 3]}$ *to hold, so* $[5^{1/3}]^3$ *must equal 5.* N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	2	The expectation that students will perform the skill (i.e., convert and rewrite) is very similar between both the ADP and the CC standards. However, the taxonomic level of the CC standard is different. The expectation is that students will be able to explain the connection between how to work with integer exponents and rational exponents.
Operations on Numbers and Expressions: ***Complex Numbers***	O2a	Represent complex numbers in the form *a+bi,* where *a* and *b* are real; simplify powers of pure imaginary numbers	N.CN.1: **Perform arithmetic operations with complex numbers**. *Know there is a complex number i such that* $i^2 = -1$*, and every complex number has the form a + bi with a and b real.* N.CN.2: **Perform arithmetic operations with complex numbers**. *Use the relation* $i^2 = -1$ *and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.*	2	N.CN.2 goes a beyond the ADP benchmark. This ADP benchmark is limited to simplifying powers of pure imaginary numbers only.
Operations on Numbers and Expressions: ***Complex Numbers***	O2b	Perform operations on the set of complex numbers	N.CN.2: **Perform arithmetic operations with complex numbers**. *Use the relation* $i^2 = -1$ *and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.* N.CN.3 (+): **Perform arithmetic operations with complex numbers**. *Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.*	3	Any CC standard that is noted with a "+" designates that this learning expectation exceeds the minimum College and Career Readiness expectations.

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3a	Convert between and among radical and exponential forms of algebraic expressions	N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	3	
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3b	Simplify and perform operations on radical algebraic expressions	N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	3	
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3c	Apply the laws of exponents to algebraic expressions, including those involving rational and negative exponents, to order and rewrite them in alternative forms	N.RN.2: **Extend the properties of exponents to rational exponents**. *Rewrite expressions involving radicals and rational exponents using the properties of exponents.*	3	
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3d	Perform operations on polynomial expressions	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.*	2	The taxonomic levels are different. The ADP benchmark is focuses on performing the skill, whereas the CC standards further expects an understanding of the property of closure.
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3e	Perform operations on rational expressions, including complex fractions	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.*	1	The ADP benchmark limits expressions to linear and factorable quadratic denominators. Additionally, the CC standard goes further to focus more on division.
Operations on Numbers and Expressions: ***Algebraic Expressions***	O3f	Identify or write equivalent algebraic expressions in one or more variables to extract information	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* $(x^2 - y^2)(x^2 + y^2)$*.*	2	The ADP benchmark goes beyond the expectation of the CC standard by expecting students to extract information about the context that the expression is modeling.

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ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Equations and Inequalities: ***Linear Equations and Inequalities***	E1a	Solve equations and inequalities involving the absolute value of a linear expression	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.**	1	The CC standard does not specify absolute value and the taxonomic level is different as students are expected to create the equations and inequalities from context.
Equations and Inequalities: ***Linear Equations and Inequalities***	E1b	Express and solve systems of linear equations in three variables with and without the use of technology	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.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).*	1	The CC standards do not explicitly address systems in three variables. A.REI.9 exceeds the minimum College and Career Readiness expectations.
Equations and Inequalities: ***Linear Equations and Inequalities***	E1c	Solve systems of linear inequalities in two variables and graph the solution set	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.	3	
Equations and Inequalities: ***Linear Equations and Inequalities***	E1d	Recognize and solve problems that can be represented by single variable linear equations or inequalities or systems of linear equations or inequalities involving two or more variables. Interpret the solution(s) in terms of the context of the problem	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.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.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.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.**	2	The ADP benchmark focuses on setting up and solving **linear** equations, inequalities and systems from a given context, and explaining the meaning of the solutions in relation to the given context. The CC standards A.REI.11 and A.CED.1 go beyond the ADP benchmark to expect more than simply linear functions.

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Equations and Inequalities: ***Non-Linear Equations and Inequalities***	E2a	Solve single-variable quadratic, exponential, rational, radical, and factorable higher-order polynomial equations over the set of real numbers, including quadratic equations involving absolute value	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.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.4: **Solve equations and inequalities in one variable**. *Solve quadratic equations in one variable.* *a. Use the method of completing the square to transforms 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.* *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 $a \pm bi$ for real numbers a and b.*	1	The ADP learning expectation compacts many concepts into this one benchmark, and thus, goes far beyond the CC standards listed. This is a benchmark that would be addressed throughout the course as students worked with various classes of functions/equations.
Equations and Inequalities: ***Non-Linear Equations and Inequalities***	E2b	Solve single variable quadratic equations and inequalities over the complex numbers; graph real solution sets on a number line	A.REI.4: **Solve equations and inequalities in one variable**. *Solve quadratic equations in one variable.* *a. Use the method of completing the square to transforms 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.* *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 $a \pm bi$ for real numbers a and b.* N.CN.7: **Use complex numbers in polynomial identities and equations**. *Solve quadratic equations with real coefficients that have complex solutions.*	2	The ADP benchmark goes beyond the CC standards to include quadratic *inequalities*.
Equations and Inequalities: ***Non-Linear Equations and Inequalities***	E2c	Use the discriminant, $D = b^2 - 4ac$, to determine the nature of the solutions of the equation $ax^2 + bx - c = 0$	A.REI.4: **Solve equations and inequalities in one variable**. *Solve quadratic equations in one variable.* *a. Use the method of completing the square to transforms 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.* *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 $a \pm bi$ for real numbers a and b.*	1	The CC standard does not specifically mention a focus on using the discriminant.

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ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Equations and Inequalities: ***Non-Linear Equations and Inequalities***	E2d	Graph the solution set of a two-variable quadratic inequality in the coordinate plane	A.REI.12: **Solve equations and inequalities in one variable**. *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.*	1	This is a very weak match. Graphing the solution set of a quadratic inequality is not explicitly addressed in CCSS.
Equations and Inequalities: ***Non-Linear Equations and Inequalities***	E2e	Rewrite nonlinear equations and inequalities to express them in multiple forms in order to facilitate finding a solution set or to extract information about the relationships or graphs indicated	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.* *a. Factor a quadratic expression to reveal the zeros of the function it defines.* *b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.* *c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $[1.15^{(1/12)}]^{(12t)} = 1.012^{(12t)}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* 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.***	2	The focus of the ADP benchmark is on rewriting equations or expressions to find solutions and to extract information about what is being modeled by that equation/expression. For example, "rewrite $y = x^2 - 6x - 15$ to determine the vertex of the parabola," or "in the formula for the volume of a cone, solve for r."

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Polynomial and Rational Functions: ***Quadratic Functions***	P1a	Determine key characteristics of quadratic functions and their graphs	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *a. Graph linear and quadratic functions and show intercepts, maxima, and minima.* F.IF.8: **Analyze functions using different representations**. *Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.* *a. 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.* F.IF.4: **Interpret functions that arise in applications in terms of the context**. *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.**	2	The focus of both the ADP benchmark and the CC standards listed are closely aligned with respect to identifying "key characteristics." However, the ADP benchmark also includes the following expectations: • For graph of $y = ax^2 + bx + c$, o explain how the sign of the lead coefficient affects the graph o the coordinates of the vertex can be found by 2 methods: completing the square or computing "-b/2a" to find the x-coordinate and then computing "f(-b/2a)" to find the y-coordinate. • If a quadratic function has only complex solutions, its graph will not have any x-intercepts.
Polynomial and Rational Functions: ***Quadratic Functions***	P1b	Represent quadratic functions using tables, graphs, verbal statements, and equations, and translate among these representations	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.** F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *a. Graph linear and quadratic functions and show intercepts, maxima, and minima.* F.IF.8: **Analyze functions using different representations**. *Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.* *a. 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.* F.IF.9: **Analyze functions using different representations**. *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.*	2	The ADP benchmark focuses exclusively on quadratic functions, whereas the CC standards go beyond ADP expectation to include linear, rational and exponential functions.

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ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Polynomial and Rational Functions: ***Quadratic Functions***	P1c	Describe the effect that changes in the parameters of a quadratic function have on the shape and position of its graph	F.BF.3: **Build new functions from existing functions**. *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.* G.CO.2: **Experiment with transformations in the plane**. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	3	Both the ADP benchmark and the CC standards are excellent opportunities to strategically incorporate the use of technology to promote student understanding.
Polynomial and Rational Functions: ***Quadratic Functions***	P1d	Recognize, express, and solve problems that can be modeled using quadratic functions. Interpret their solutions in terms of the context	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.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.** F.IF.8: **Analyze functions using different representations**. *Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.* *a. 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.* F.IF.4: **Interpret functions that arise in applications in terms of the context**. *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.** F.IF.5: **Interpret functions that arise in applications in terms of the context**. *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 n engines in a factory, then the positive integers would be an appropriate domain for the function.**	3	This ADP benchmark includes an expectation that students will be able to set up, solve and interpret the solutions to contexts that involve the position, time and velocity of an object dropped or tossed from a given height (e.g., $h(t) = -16t^2 - v_0t - h_0$).

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2a	Determine key characteristics of power functions in the form $f(x) = ax^n$, $a \neq 0$, for positive integral values of n and their graphs	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*	3	The learning expectation includes understanding the type of symmetry and end behavior a basic power function exhibits and relating these ideas to whether the degree of the polynomial function is odd or even.
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2b	Determine key characteristics of polynomial functions and their graphs	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*	3	Key characteristics include domain and range, intercepts, end behavior and degree. Students should be able to identify and use the degree of a polynomial and/or its factors to interpret characteristics of the function or its graph. Students should know that every polynomial function of odd degree has at least one real zero. Students should understand the case of the multiplicity of a root and how it is represented in the graph.
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2c	Represent polynomial functions using tables, graphs, verbal statements, and equations. Translate among these representations	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*	2	The ADP benchmark specifically focuses upon using and translating between multiple representations of polynomial functions.
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2d	Determine key characteristics of simple rational functions and their graphs	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. (+)*	3	Key characteristics include domain and range, intercepts, type of symmetry, horizontal and vertical asymptotes and end behavior. CC standard F.IF.7**d** is a learning expectation that exceeds the minimum College and Career Readiness expectations.

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ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2e	Represent simple rational functions using tables, graphs, verbal statements, and equations. Translate among these representations	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.** F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. (+)*	2	The ADP benchmark defines "simple" rational functions as those with linear, quadratic or monomial denominators. CC standard F.IF.7**d** is a learning expectation that exceeds the minimum College and Career Readiness expectations.
Polynomial and Rational Functions: ***Higher-order Polynomial and Rational Functions***	P2F	Recognize, express, and solve problems that can be modeled using polynomial and simple rational functions. Interpret their solutions in terms of the context	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.** F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.* *d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. (+)* 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.*	2	Although not explicitly stated in the CC standard, with emphasis on mathematical modeling in the CCSS, interpreting solutions in terms of their context is actually an expectation of both the ADP benchmark and the CC standard. CC standard F.IF.7**d** is a learning expectation that exceeds the minimum College and Career Readiness expectations.

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Exponential Functions	X1a	Determine key characteristics of exponential functions and their graphs	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*	2	CCSS goes into more detail than what ADP requires. The ADP benchmark does not specify graphing logarithmic functions.
Exponential Functions	X1b	Represent exponential functions using tables, graphs, verbal statements, and equations. Represent exponential expressions in multiple forms. Translate among these representations	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.** F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.* 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.* *c. Use the properties of exponents to transform expressions for exponential functions. For example the expression* 1.15^t *can be rewritten as* $[1.15^{(1/12)}]^{(12t)} = 1.012^{(12t)}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	2	The ADP benchmark specifically focuses upon using and translating between multiple representations of polynomial functions.
Exponential Functions	X1c	Describe the effect that changes in the parameters of an exponential function have on the shape and position of its graph	F.BF.3: **Build new functions from existing functions**. *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.* G.CO.2: **Experiment with transformations in the plane**. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).	3	Both the ADP benchmark and the CC standards are excellent opportunities to strategically incorporate the use of technology to promote student understanding.

ADP Core Topic	ADP Code	ADP Algebra II Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Exponential Functions	X1d	Recognize, express, and solve problems that can be modeled using exponential functions, including those where logarithms provide an efficient method of solution. Interpret their solutions in terms of the context	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.** F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** *e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.* F.BF.5 (+): **Build new functions from existing functions**. *Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.*	3	Although not explicitly stated in the CC standard, with emphasis on mathematical modeling in the CCSS, interpreting solutions in terms of their context is actually an expectation of both the ADP benchmark and the CC standard. CC standard F.BF.5 is a learning expectation that exceeds the minimum College and Career Readiness expectations.

ADP Core Topic	ADP Code	ADP Algebra 2 Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Function Operations and Inverses: ***Function Operations***	F1a	Combine functions by addition, subtraction, multiplication, and division	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.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.*	3	
Function Operations and Inverses: ***Function Operations***	F1b	Determine the composition of two functions, including any necessary restrictions on the domain	F.BF.1: **Build a function that models a relationship between two quantities**. *Write a function that describes a relationship between two quantities.** *c. 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. (+)* F.IF.5: **Interpret functions that arise in applications in terms of the context**. *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 n engines in a factory, then the positive integers would be an appropriate domain for the function.**	3	CC standard F.BF.1**c** is a learning expectation that exceeds the minimum College and Career Readiness expectations.
Function Operations and Inverses: ***Inverse Operations***	F2a	Describe the conditions under which an inverse relation is a function	F.BF.4: **Build new functions from existing functions**. *Find inverse functions.* *a. 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, $f(x) = 2x^3$ for x > 0, or f(x) = (x+1)/(x-1) for x ≠ 1 (x not equal to 1).* *b. Verify by composition that one function is the inverse of another. (+)* *c. Read values of an inverse function from a graph or a table, given that the function has an inverse. (+)* *d. Produce an invertible function from a non-invertible function by restricting the domain. (+)* F.BF.5 (+): **Build new functions from existing functions**. *Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.*	2	The ADP benchmark is a different taxonomic level than the CC standards because it expects students to "describe the conditions …" as opposed to merely performing the skill of determining inverse functions. CC standards F.BF.4**b**, F.BF.4**c**, F.BF.4**d** and F.BF.5 are learning expectations that exceed the minimum College and Career Readiness expectations.

ADP Core Topic	ADP Code	ADP Algebra 2 Benchmark	Matched Common Core CLUSTER and *Standard*	Degree of Match	Comment
Function Operations and Inverses: ***Inverse Operations***	F2b	Determine and graph the inverse relation of a function	F.BF.4: **Build new functions from existing functions**. *Find inverse functions.* a. *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, $f(x) = 2x^3$ for x > 0, or f(x) = (x+1)/(x-1) for $x \neq 1$ (x not equal to 1).* b. *Verify by composition that one function is the inverse of another. (+)* c. *Read values of an inverse function from a graph or a table, given that the function has an inverse. (+)* d. *Produce an invertible function from a non-invertible function by restricting the domain. (+)* F.BF.5 (+): **Build new functions from existing functions**. *Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.*	3	CC standards F.BF.4**b**, F.BF.4**c**, F.BF.4**d** and F.BF.5 are learning expectations that exceed the minimum College and Career Readiness expectations.
Function Operations and Inverses: ***Piecewise-defined Functions***	F3a	Determine key characteristics of absolute value, step, and other piecewise-defined functions	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** b. *Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*	2	Key characteristics include vertices, intercepts, end behavior, slope of linear sections and discontinuities.
Function Operations and Inverses: ***Piecewise-defined Functions***	F3b	Represent piecewise-defined functions using tables, graphs, verbal statements, and equations. Translate among these representations	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** b. *Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*	2	The ADP benchmark specifically focuses upon using and translating between multiple representations of polynomial functions.
Function Operations and Inverses: ***Piecewise-defined Functions***	F3c	Recognize, express, and solve problems that can be modeled using absolute value, step, and other piecewise-defined functions. Interpret their solutions in terms of the context	F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.** b. *Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*	2	Although not explicitly stated in the CC standard, with emphasis on mathematical modeling in the CCSS, interpreting solutions in terms of their context is actually an expectation of both the ADP benchmark and the CC standard.

* Degree of Match: 1 = WEAK (major aspect of the ADP benchmark not addressed in CCSS); 2 = GOOD (minor aspect of the ADP benchmark not addressed in CCSS); 3 = EXCELLENT