Submit comments on the draft NYS Algebra II Mathematics Learning Standards

NYS Algebra II Mathematics Learning Standards					
Number and Quantity **The Real Number System (N-RN)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Extend the properties of exponents to rational exponents.	**N-RN.A.1**	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 $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $5^{(1/3)3}$ must equal 5.	Explore how the meaning of rational exponents follows from extending the properties of integer exponents.	
		N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents. NYSED: Includes expressions with variable factors, such as $\sqrt[3]{27x^5y^3}$	Convert between radical expressions and expressions with rational exponents using the properties of exponents. Include expressions with variable factors, such as $\sqrt[3]{27x^5y^3}$, being equivalent to $(27x^5y^3)^{1/3}$ which equals $3x^{5/3}y$.	

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NYS Algebra II Mathematics Learning Standards					
Number and Quantity **Quantities (N-Q) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Reason quantitatively and use units to solve problems.	**N-Q.A.2**	2. Define appropriate quantities for the purpose of descriptive modeling. (Shared with AI). PARCC: 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.	REMOVE STANDARD	**The committee feels that this standard is addressed in the mathematical practices MP 2 and MP 4.**

NYS Algebra II Mathematics Learning Standards					
Number and Quantity **The Complex Number System (N-CN)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Perform arithmetic operations with complex numbers.	**N-CN.A.1**	1. 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.	Know there are imaginary numbers that cannot be represented on the real number line, and that i, derived from $i^2=-1$, is the imaginary unit. Know that there are complex numbers which have the form a +bi, where a and b are real.	**Emphasize that i cannot be represented on the real number line and a complex number has real and imaginary parts.**
		N-CN.A.2	2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	NO CHANGE	

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NYS Algebra II Mathematics Learning Standards					
Number and Quantity The Complex Number System (N-CN)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C.Use complex numbers in polynomial identities and equations.	**N-CN.C.7**	7. Solve quadratic equations with real coefficients that have complex solutions.	NO CHANGE	

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NYS Algebra II Mathematics Learning Standards					
Algebra Seeing Structure in Expressions (A-SSE)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Interpret the structure of expressions.	**A-SSE.A.2**	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 $(x^2$-$y^2)(x^2+y^2)$. (Shared with AI). NYSED: Includes factoring by grouping. PARCC: 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 recognizing the equation $x^2+2x+1+y^2=9$, see and 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 $1+1/(x^2+3)$.	**2b. Fluently** use the structure of an expression to identify ways to rewrite it, including factoring by grouping and factoring the sum and difference of cubes. Tasks are limited to polynomial, rational or exponential expressions. Examples include, but are not limited to: a) $81x^4 - 16y^4$ is equivalent to $(9x^2)^2 - (4y^2)^2$ or $(9x^2 - 4y^2)(9x^2 + 4y^2)$ or $(3x + 2y)(3x - 2y)(9x^2 + 4y^2)$ b) $x^2 + 4x + 4 + y^2 = 25$ is equivalent to $(x + 2)^2 + y^2 = 5^2$ c) $(x^2 + 4)/(x^2 + 3)$ is equivalent to $\frac{(x^2+3)+1}{x^2+3} = \frac{x^2+3}{x^2+3} + \left(\frac{1}{x^2+3}\right)$ or $1 + (1/(x^2 + 3))$	**Clarification emphasizing structure and types of factoring to be included. Standard is a fluency expectation for Algebra II.**

Submit comments on the draft NYS Algebra II Mathematics Learning Standards

NYS Algebra II Mathematics Learning Standards					
Algebra **Seeing Structure in Expressions (A-SSE)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Write expressions in equivalent forms to solve problems. ★			B. Write expressions in equivalent forms to reveal their characteristics. ★	**Change cluster heading, expressions cannot be solved.**
		A-SSE.B.3	3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (Shared with A1)	NO CHANGE	
		A-SSE.B.3a	3a. Factor quadratic expressions including leading coefficients other than 1 to reveal the zeros of the function it defines.	3a. Factor quadratic expressions including leading coefficients other than 1 to reveal the zeros of the function it defines.	**New Addition** **See revised A-SSE.B.3a limit for Algebra I.**
		A-SSE.B.3c	3c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t}$= 1.01212^{12t} to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. PARCC: i) Tasks have a real-world context. As described in the standard, there is 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.	c. Use the properties of exponents to rewrite exponential expressions. Exponents will be rational. 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 when the annual rate is 15%.	**Rational exponents are an expectation of Algebra II. Cleaned up the wording for more clarity.**

		A-SSE.B.4	4. 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. NYSED: Includes using summation notation.	MOVE STANDARD TO FUNCTIONS CLUSTER F-BF.B.7	**Remove from Expressions Cluster and move to Building Functions cluster (new label: F-BF.B.7)**

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NYS Algebra II Mathematics Learning Standards					
Algebra Arithmetic with Polynomials and Rational Expressions (A-APR)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Understand the relationship between zeros and factors of polynomials.	**A-APR.B.2**	2. 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).	2. Demonstrate knowledge of 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.B.3	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. (Shared with A1). PARCC: i) Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of $(x^2-1)(x^2+1)$.	3.Identify zeros of polynomials. 3b. i) Identify zeros of quadratic, cubic, and quartic polynomials when suitable factorizations are available; ii) use the zeros to construct a rough graph of the function defined by the polynomial; and iii) create an appropriate equation given the zeros and/or a graph.	

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NYS Algebra II Mathematics Learning Standards					
Algebra **Arithmetic with Polynomials and Rational Expressions (A-APR)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C. Use polynomial identities to solve problems.	**A-APR.C.4**	4. 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.	4. Prove polynomial identities. For example, prove the identity $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ or prove that the difference between squares of consecutive integers is odd.	

NYS Algebra II Mathematics Learning Standards					
Algebra Arithmetic with Polynomials and Rational Expressions (A-APR)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	D. Rewrite rational expressions.	**A-APR.D.6**	6. 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.	6. **Fluently**, rewrite 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).	**Standard is a fluency expectation for Algebra II.**

NYS Algebra II Mathematics Learning Standards					
Algebra **Creating Equations (A-CED) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Create equations that describe number or relationships. ★	**A-CED.A.1**	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. (Tasks are limited to linear, quadratic, or exponential equations with integer exponents.) (Shared with A1). PARCC: i) Tasks are limited to exponential equations with rational or real exponents and rational functions. ii) Tasks have a real-world context.	1b. Create equations and inequalities in one variable to represent a real world context. Include linear, quadratic, rational, and exponential functions.	**See A-CED.A.1a revised standard for Algebra I.**

NYS Algebra II Mathematics Learning Standards					
Algebra Reasoning with Equations and Inequalities (A-REI)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Understand solving equations as a process of reasoning and explain the reasoning.	**A-REI.A.1**	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. (Shared with A1). PARCC: i) Tasks are limited to simple rational or radical equations.	1b. Identify the property used in each step when solving rational or radical equations 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.	**See A-REI.A.1a revised standard for Algebra I.**
		A-REI.A.2	2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	2. Solve rational and radical equations in one variable, identify extraneous solutions, and explain how they arise.	

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NYS Algebra II Mathematics Learning Standards					
Algebra Reasoning with Equations and Inequalities (A-REI)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Solve equations and inequalities in one variable.	**A-REI.B.4**	4. Solve quadratic equations in one variable. (Shared with A1)	NO CHANGE	
		A-REI.B.4b	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. PARCC: 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.	4b. Solve quadratic equations by: i) inspection; ii) taking square roots; iii) factoring; iv) completing the square; and v) the quadratic formula. Recognize when the quadratic formula yields no real solutions. 4c. Recognize when the quadratic has complex solutions and write them in a + bi form.	

NYS Algebra II Mathematics Learning Standards					
Algebra **Reasoning with Equations and Inequalities (A-REI)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C. Solve systems of Equations	**A-REI.C.6**	6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (Shared with A1). PARCC/NYSED: i) Tasks are limited to 3x3 systems only. Systems of 3 linear equations with 3 variables only.	Remove standard and move to Plus Standards as A-REI.C.6b+	**PreCalc includes an emphasis on matrices and 3 by 3 systems is part of the study of matrices.**
		A-REI.C.7	7. 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 $x^2 + y^2 = 3$.	7b. Solve a 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 $x^2 + y^2 = 3$.	**See A-REI.C.7a revised standard for Algebra I.**

NYS Algebra II Mathematics Learning Standards					
Algebra Reasoning with Equations and Inequalities (A-REI)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	D.Represent and solve equations and inequalities graphically.	**A-REI.D.11**	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. (Shared with A1). PARCC: i) Tasks may involve any of the function types mentioned in the standard. ★	11. Given the equations y=f(x) and y=g(x): i) recognize that each x-coordinate of the intersection(s) is the solution to the equation f(x)=g(x); and ii) find the solutions approximately using technology to graph the functions or make tables of values; and iii) interpret the solution in context. ★ Note for Algebra II: Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	

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NYS Algebra II Mathematics Learning Standards					
Functions **Interpreting Functions (F-IF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Understand the concept of a function and use function notation.	**F-IF.A.3**	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. (Shared with A1). PARCC: i) This standard is supporting work in Algebra II. This standard should support the major work in F-BF.2 for coherence.	3b. **Fluently** recognize that sequences are functions, sometimes defined recursively in subscript notation, whose domain is a subset of the integers.	**See F-IF.A.3a revised standard for Algebra I.** **Functional notation for sequences and recursive forms should be introduced in Algebra II.** **Standard is a fluency expectation for Algebra II.**

NYS Algebra II Mathematics Learning Standards					
Functions **Interpreting Functions (F-IF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Interpret functions that arise in applications in terms of the context. ★	**F-IF.B.4**	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. (Shared with A1). PARCC: i) Tasks have a real-world context. ii) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.	4b. For a function that models a relationship between two quantities: i) interpret key features of graphs and tables in terms of the quantities; and ii) sketch graphs showing key features given a verbal description of the relationship. Algebra II Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior; and periodicity. Tasks may involve real-world context and may include polynomial, exponential, logarithmic, and trigonometric functions.	
		F-IF.B.6	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. (Shared with A1). PARCC: i) Tasks have a real-world context. ii)Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.	6b. Calculate and interpret the average rate of change of a function over a specified interval. Algebra II tasks have a real-world context and may involve polynomial, exponential, logarithmic, and trigonometric functions.	

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NYS Algebra II Mathematics Learning Standards					
Functions **Interpreting Functions (F-IF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C.Analyze functions using different representations.	**F-IF.C.7**	7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★	7. Graph functions expressed as an equation and show key features of the graph, by hand in simple cases and using technology in more complicated cases. ★	
		F-IF.C.7c	7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	NO CHANGE	
		F-IF.C.7e	7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	NO CHANGE	

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NYS Algebra II Mathematics Learning Standards					
Functions **Interpreting Functions (F-IF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C.Analyze functions using different representations.	**F-IF.C.8**	8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	8. Write a function in different but equivalent forms to reveal and explain different properties of the function.	
		F-IF.C.8b	8b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay. NYSED: Includes $A=Pe^{rt}$ and $A=P(1+(r/n))^{nt}$	8b. Use the properties of exponents to interpret exponential functions, and classify them as representing exponential growth or decay. Include real world problems involving compound and continuous interest.	
		F-IF.C.9	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. (Shared with A1). PARCC: Tasks may involve polynomial, exponential, logarithmic and trigonometric functions.	9b. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Algebra II tasks may involve polynomial, exponential, logarithmic and trigonometric functions.	

NYS Algebra II Mathematics Learning Standards					
Functions **Building Functions (F-BF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Build a function that models a relationship between two quantities. ★	**F-BF.A.1**	1. Write a function that describes a relationship between two quantities.	NO CHANGE	
		F-BF.A.1a	1a. Determine an explicit expression, a recursive process, or steps for calculation from a context. (Shared with AI). PARCC: i) Tasks have a real-world context ii) Tasks may involve linear functions, quadratic functions, and exponential functions.	1a. Determine a function from context. Algebra II: Determine an explicit expression, a recursive process, or steps for calculation from a context. Tasks may involve linear functions, quadratic functions, and exponential functions.	
		F-BF-A.1b	1b. 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.	NO CHANGE	
		F-BF-A.2	2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	NO CHANGE	

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NYS Algebra II Mathematics Learning Standards					
Functions **Building Functions (F-BF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Build new functions from existing functions.	**F-BF.B.3**	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. (Shared with AI). PARCC: i) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions ii) Tasks may involve recognizing even and odd functions.	3b. Using f(x) + k, k f(x), f(kx) and f(x + k): i) Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x + k) for specific values of k (both positive and negative); ii) Find the value of k given the graphs; iii) Write a new function using the value of k; and iv) Use technology to experiment with cases and explore the effects on the graph. A2 Course: Include recognizing even and odd functions from their graphs. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions.	
		F-BF.B.4	4. Find inverse functions.	NO CHANGE	
		F-BF.B.4a	4a. 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, $f(x) = 2x^3$ or f(x) = (x+1)/(x–1) for x ≠ 1.	4a. Find the inverse of a one-to-one function both algebraically and graphically.	
		F.BF.B.5a	NEW ADDITION	5a. Understand inverse relationships between exponents and logarithms algebraically and graphically.	**See plus standards F-BF.B.5b and F-BF.B.5c, exponential equations are solved with logs in F-LE.A.4 for Algebra II.**

		F-BF.B.6	NEW STANDARD	6a. Convert between the expanded form of a series and summation notation for the series and evaluate. 6b. Write arithmetic and geometric series in summation notation.	
		F-BF.B.7	USED TO BE A-SSE.B.4	7. Explore the derivation of the formulas for arithmetic and finite geometric series. Use the series to solve problems. For example, calculate mortgage payments. ★	

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NYS Algebra II Mathematics Learning Standards					
Functions **Linear, Quadratic and Exponential Models (F-LE) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Construct and compare linear, quadratic, and exponential models and solve problems.	**F-LE.A.2**	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). (Shared with A1). PARCC: Tasks will include solving multi-step problems by constructing linear and exponential functions.	2b. Construct a linear, exponential, arithmetic or geometric function rule given: i) a graph; ii) a description of the relationship; and iii) two input-output pairs (include reading these from a table).	
		F-LE.A.4	4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	4. Use common or natural logarithms to solve exponential equations, such as $ab^{ct} = d$ where a,b, c, and d are real numbers. Evaluate the logarithm using technology.	

NYS Algebra II Mathematics Learning Standards					
Functions **Linear, Quadratic and Exponential Models (F-LE) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Interpret expressions for functions in terms of the situation they model.	**F-LE.B.5**	5. Interpret the parameters in a linear or exponential function in terms of a context. (Shared with A1). PARCC: i) Tasks have a real world context. ii) Tasks are limited to exponential functions with domains not in the integers.	5. Interpret the parameters in a linear or exponential function in terms of a context.	

NYS Algebra II Mathematics Learning Standards					
Functions Trigonometric Functions (F-TF)					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Extend the domain of trigonometric functions using the unit circle.	**F-TF.A.1**	1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	NO CHANGE	
		F-TF.A.2	2. 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. NYSED: Includes the reciprocal trigonometric functions.	2. Apply concepts of the unit circle in the coordinate plane to calculate the values of the six trigonometric functions given angles in radian measure.	
		F-TF.A.4+	NEW ADDITION 4+. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	4. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	**Move plus standard into Algebra II.**

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NYS Algebra II Mathematics Learning Standards					
Functions **Trigonometric Functions (F-TF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Model periodic phenomena with trigonometric functions. ★	**F-TF.B.5**	5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	NO CHANGE	

NYS Algebra II Mathematics Learning Standards					
Functions **Trigonometric Functions (F-TF)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	C. Prove and apply trigonometric identities.	**F-TF.C.8**	8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	8a. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$.	
				8b. Find the value of any of the six trigonometric functions given any other trigonometric function value.	

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NYS Algebra II Mathematics Learning Standards					
Geometry **Expressing Geometric Properties with Equations (G-GPE)**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Translate between the geometric description and the equation for a conic section.	**G-GPE.A.2**	2. Derive the equation of a parabola given a focus and directrix.	REMOVE STANDARD TO PLUS STANDARDS	**The committee feels that this standard is not appropriate for this course, ties better with the study of conics in higher level math courses.**

Submit comments on the draft NYS Algebra II Mathematics Learning Standards

NYS Algebra II Mathematics Learning Standards					
Statistics and Probability ★ **Interpreting categorical and quantitative data (S-ID) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	A. Summarize, represent, and interpret data on a single count or measurement variable.	**S-ID.A.4**	4. 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.	NO CHANGE	

NYS Algebra II Mathematics Learning Standards					
Statistics and Probability ★ **Interpreting categorical and quantitative data (S-ID) ★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Summarize, represent, and interpret data on two categorical and quantitative variables.	**S-ID.B.6**	6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	NO CHANGE	
		S-ID.B.6a	6a. 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. (Shared with A1). PARCC: i) Tasks have a real-world context. ii) Tasks are limited to exponential functions with domains not in the integers and trigonometric functions.	6a. Fit a function to real-world 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. Algebra II emphasis is on exponential and sinusoidal models and includes the regression capabilities of the calculator.	

NYS Algebra II Mathematics Learning Standards

Statistics and Probability ★
Making Inferences and Justifying Conclusions (S-IC) ★

Cluster		Standard Code	Current Standard	Revised Standard Recommendation for 2018-19	Additional Information/Notes
Cluster	A. Understand and evaluate random processes underlying statistical experiments.	**S-IC.A.1**	1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	REMOVE STANDARD. RENDUNDANT WITH TITLE OF CLUSTERS.	**Not necessary with language clarification of following IC standards.**
		S-IC.A.2	2. 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?	2. Determine if a statistic (i.e. sample proportion, difference of sample proportions, sample mean, and difference of sample means) is likely to occur based on a given simulation. For the purposes of this course, if the statistic falls within two standard deviations of the mean (95% interval centered on the mean), then the statistic is considered likely (plausible, usual).	

NYS Algebra II Mathematics Learning Standards					
Statistics and Probability ★ Making Inferences and Justifying Conclusions (S-IC) ★					
		Standard Code	Current Standard	Revised Standard Recommendation for 2018-19	Additional Information/Notes
Cluster	B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	**S-IC.B.3**	3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	3. Recognize the purposes of and differences among surveys, experiments, and observational studies. Explain how randomization relates to each.	
		S-IC.B.4	4. 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.	4. Given a simulation model based on a sample, construct the 95% interval centered on the mean (mean +/- two standard deviations) and determine if a suggested parameter is plausible.	
		S-IC.B.5	5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences	REMOVE STANDARD	**Standard is incorporated in S-IC.A.2.**
		S-IC.B.6	6. Evaluate reports based on data.	6a. Use the language of statistics to draw conclusions from numerical summaries.	**Clarification and limiting the scope of the standard.**
				6b. Use the language of statistics to critique claims from informational texts. For example, cause and effect vs correlation, bias, measures of center and spread.	

NYS Algebra II Mathematics Learning Standards					
Statistics and Probability ★ Conditional Probability and the Rules of Probability (S-CP)★					
		Standard Code	Current Standard	Revised Standard Recommendation for 2018-19	Additional Information/Notes
Cluster	A. Understand independence and conditional probability and use them to interpret data.	S-CP.A.1	1. 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”).	NO CHANGE	
		S-CP.A.2	2. 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.	2.Within a given context, determine if two events A and B are independent by showing: i) the probability of A and B occurring together is the product of their probabilities (P(A and B)=P(A) x P(B)); ii) the probability of A given B is same as the probability of A (P(A|B)=P(A)); or iii) the probability of B given A is the same as the probability of B (P(B|A)=P(B)).	
		S-CP.A.3	3. 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.	3. Calculate and determine the conditional probability of A given B in the context of a model.	
		S-CP.A.4	4. 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.	4. 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 calculate conditional probabilities.	

		S-CP.A.5	5. 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.	REMOVE STANDARD. COMBINED WITH OTHER STANDARDS IN CLUSTER FOR CLARITY.	

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NYS Algebra II Mathematics Learning Standards					
Statistics and Probability ★ **Conditional Probability and the Rules of Probability (S-CP)★**					
		Standard Code	**Current Standard**	**Revised Standard Recommendation for 2018-19**	**Additional Information/Notes**
Cluster	B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.	**S-CP.B.6**	6. 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.	REMOVE	Combined into other standards in cluster for clarity.
		S-CP.B.7	7. 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.	NO CHANGE	