Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
The Real Number System				
A2.N-RN.A.1	Identify how the properties of integer exponents extend to rational exponents, allowing for a notation for radicals in terms of rational exponents.	Understand how the definition 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.	Explain how the definition 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.	Show how the definition 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.
A2.N-RN.A.2	Identify expressions involving radicals and rational exponents using the properties of exponents.	Evaluate expressions involving radicals and rational exponents using the properties of exponents.	Rewrite expressions involving radicals and rational exponents using the properties of exponents.	Show that two expressions involving radicals and rational exponents are equivalent using the properties of exponents.

Quantities				
A2.N-Q.A.1	Identify units as a way to understand problems and to guide the solution of multi-step problems; identify units consistently in formulas; identify the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and use units consistently in formulas; determine the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to justify the solution of multi-step problems; choose and justify units consistently in formulas; choose and justify the scale and the origin in graphs and data displays, include utilizing real-world context.
A2.N-Q.A.2	Identify appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.	Define and use appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.
A2.N-Q.A.3	Identify a level of accuracy appropriate to be reported quantities utilizing real-world context.	Identify a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Compare levels of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.

The Complex Number System				
A2.N-CN.A.1	Know the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, or multiply complex numbers. Identify complex numbers in the form $(a+bi)$ with a and b real.	Apply the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, or multiply complex numbers. Identify complex numbers in the form $(a+bi)$ with a and b real.	Apply the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the form $(a+bi)$ with a and b real.	Explain the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the form $(a+bi)$ with a and b real.
A2.N-CN.C.7	Identify quadratic equations with real coefficients that have complex solutions.	Interpret quadratic equations with real coefficients that have complex solutions.	Solve quadratic equations with real coefficients that have complex solutions.	Create quadratic equations with real coefficients that have complex solutions.

Seeing Structure in Expressions				
A2.A-SSE.A.2	Use structure to identify one way to rewrite polynomials. Focus on polynomial operations.	Use structure to identify one way to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns.	Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns.	Use structure to assess ways to rewrite complex polynomial and rational expressions. Focus on polynomial operations and factoring patterns.
A2.A-SSE.B.3	Select an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to identify transformed expressions for exponential functions given graphs.	Produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to identify transformed expressions for exponential functions.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform expressions for exponential functions.	Justify an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform and justify expressions for exponential functions.
A2.A-SSE.B.4	Identify the formula for the sum of a finite geometric series (when the common ratio is not 1).	Interpret the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula 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.*	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve complex/multi-step problems in real-world context.

Arithmetic with Polynomials and Rational Expressions				
A2.A-APR.B.2	Know the Remainder and Factor 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 $p(x)$.	Know and understand the Remainder and Factor 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 $p(x)$.	Know and apply the Remainder and Factor 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 $p(x)$.	Know and explain the Remainder and Factor 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 $p(x)$.
A2.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to identify a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to complete a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	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. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	Interpret zeros of polynomials when suitable factorizations are available, and use the zeros to– construct a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.
A2.A-APR.C.4	Identify polynomial identities and use them to identify numerical relationships.	Identify polynomial identities and use them to interpret numerical relationships.	Prove polynomial identities and use them to describe numerical relationships.	Prove polynomial identities and use them to create numerical relationships.
A2.A-APR.D.6	Identify rational expressions in different forms; identify $a(x)/b(x)$ 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.	Interpret 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.	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 $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.	Create 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.

Creating Equations				
A2.A-CED.A.1	Identify equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Interpret equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Justify equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.

Reasoning with Equations and Inequalities				
A2.A-REI.A.1	Identify each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Identify a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	Show each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Evaluate a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	Explain each step in solving an 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. Extend from quadratic equations to rational and radical equations.	Prove each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Justify a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.
A2.A-REI.A.2	Identify rational and radical equations in one variable, and identify examples showing how extraneous solutions may arise.	Interpret rational and radical equations in one variable, and identify examples showing how extraneous solutions may arise.	Solve rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	Create rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
A2.A-REI.B.4	Fluently solve quadratic equations in one variable. Identify quadratic equations that can be solved by inspection (e.g., for x^2 = 49) and taking square roots, as appropriate to the initial form of the equation.	Fluently solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x^2 = 49), and taking square roots, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	Fluently solve quadratic equations in one variable. 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.	Fluently solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, explaining why it is appropriate to the initial form of the equation. Explain when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
A2.A-REI.C.7	Identify the solutions of a system consisting of a linear equation and a quadratic equation in two variables graphically.	Identify the solutions of a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	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 x2+ y2 = 3.*	Solve and justify the solution of a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
A2.A-REI.D.11	Find the solutions approximately to *f* (*x*) = *g* (*x*) given graphs of the functions. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial functions.	Identify that 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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where f(x) and/or g(x) are polynomial, rational, exponential, and logarithmic functions.	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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions.	Prove 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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions.

Interpreting Functions				
A2.F-IF.B.4	For a function that models a relationship between two quantities, identify key features of graphs and tables in terms of the quantities, and match 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; and relative maximums and minimums. Functions include linear, quadratic, exponential, and polynomial.	For a function that models a relationship between two quantities, define key features of graphs and tables in terms of the quantities, and identify 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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	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. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and construct graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.
A2.F-IF.B.6	Identify the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Identify the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Calculate the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Calculate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Interpret and explain the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.
A2.F-IF.C.7	Identify the graph of functions expressed symbolically. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and identify key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and show and interpret key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

A2.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Identify exponential functions and classify those functions as exponential growth or decay using graphs.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Identify the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Explain the properties of exponents that are used to interpret expressions for exponential functions and explain why those functions model exponential growth or decay.
A2.F-IF.C.9	Identify properties of two functions each represented in a different way (graphically or numerically in tables). Functions include linear, quadratic, exponential, and polynomial functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, and polynomial functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Create functions given comparisons about the properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

Building Functions				
A2.F-BF.A.1	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Identify an explicit expression. b. Combine function types using addition and subtraction.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, or steps for calculation from a context. b. Combine function types using arithmetic operations.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Justify an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using a combination of arithmetic operations and function composition.
A2.F-BF.A.2	Identify arithmetic sequences both recursively and with an explicit formula.	Write arithmetic sequences both recursively and with an explicit formula, and translate between the two forms.	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	Create arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
A2.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ and $f(x+k)$ for specific values of k (both positive and negative); identify the value of k given the graphs. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Include recognizing even and odd functions from their graphs. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Justify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); justify 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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

A2.F-BF.B.4	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, given visual representations. b. Understand that if a function contains a point (*a,b*), then the graph of the inverse relation of the function contains the point (*b,a*) given visual representations. c. Identify the meaning of a function and its inverse.	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another. b. Understand that if a function contains a point (*a,b*), then the graph of the inverse relation of the function contains the point (*b,a*) in concrete situations. c. Identify the meaning of and relationship between a function and its inverse utilizing real-world context.	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$ for all values of x in the domain of f and all values of y in the domain of g . b. Understand that if a function contains a point (*a,b*), then the graph of the inverse relation of the function contains the point (*b,a*). c. Interpret the meaning of and relationship between a function and its inverse utilizing real-world context.	Find inverse functions. a. Explain that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$ for all values of x in the domain of f and all values of y in the domain of g . b. Explain that if a function contains a point (*a,b*), then the graph of the inverse relation of the function contains the point (*b,a*). c. Explain the meaning of and relationship between a function and its inverse utilizing real-world context.

Linear, Quadratic, and Exponential Models				
A2.F-LE.A.4	For exponential models, identify 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.*	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* ; identify the logarithms that are not readily found by hand or observation using technology.	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 logarithms that are not readily found by hand or observation using technology.	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* in a real-world context; evaluate the logarithms that are not readily found by hand or observation using technology in a real-world context.
A2.F-LE.B.5	Identify the intercepts in an exponential function with rational exponents utilizing real-world context.	Identify the parameters in an exponential function with rational exponents utilizing real-world context.	Interpret the parameters in an exponential function with rational exponents utilizing real-world context.	Explain the parameters in an exponential function with rational exponents utilizing real-world context.

Trigonometric Functions				
A2.F-TF.A.1	Identify angles given radian measures.	Use radian measures to describe central angles of a circle.	Understand radian measure of an angle as the length of the arc on any circle subtended by the angle, measured in units of the circle's radius.	Use the fact that a radian measure of an angle is the length of the arc on any circle subtended by the angle, measured in units of the circle's radius, to solve problems.
A2.F-TF.A.2	Identify how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Show how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
A2.F-TF.B.5	Match sine, cosine and tangent functions that model periodic phenomena with specified amplitude, and midline.	Identify sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.	Create and interpret sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.	Create and compare sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.
A2.F-TF.C.8	Identify the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ as sufficient for finding sin(θ), cos(θ), or tan(θ) given sin(θ) or cos(θ).	Use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to identify sin(θ), cos(θ), or tan(θ) given sin(θ) or cos(θ).	Use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to find sin(θ), cos(θ), or tan(θ) given sin(θ) or cos(θ).	Create problems that use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to find sin(θ), cos(θ), or tan(θ) given sin(θ) or cos(θ).

Interpreting Categorical and Quantitative Data				
A2.S-ID.A.4	Identify the mean and standard deviation of a data set from a normal curve.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages. Explain why there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve.
A2.S-ID.B.6a	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Use functions fitted to data given scatter plots and the graphs of the functions to solve problems in the context of the data.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data given scatter plots to solve problems in the context of the data. Use given functions or choose a function suggested by the context.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose and justify a function suggested by the context.
A2.S-ID.C.10	Match parameters of exponential models.	Identify parameters of exponential models.	Interpret parameters of exponential models.	Compare parameters of exponential models.

Making Inferences and Justifying Conclusions				
A2.S-IC.A.1	Understand that random sampling is necessary for making inferences about population parameters.	Understand statistics as a process for making inferences about population parameters.	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	Understand that inferences about population parameters can only be generalized based on a random sample from that population.
A2.S-IC.A.2	Identify whether a specified model is consistent with results from a given data-generating process.	State whether a specified model is consistent with results from a given data-generating process.	Explain whether a specified model is consistent with results from a given data-generating process.	Explain whether a specified model is consistent with results from a given data-generating process.
A2.S-IC.B.3	Identify examples of designed experiments, sample surveys, and observational studies.	Recognize situations where designed experiments, sample surveys, and observational studies are the most appropriate.	Recognize the purposes of and differences between designed experiments, sample surveys, and observational studies.	Compare the purposes of and differences between designed experiments, sample surveys, and observational studies.
A2.S-IC.B.4	Recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to estimate a population mean; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to estimate a population mean or proportion; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to compare population mean or proportion; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.

Conditional Probability and the Rules of Probability				
A2.S-CP.A.3	Identify a conditional probability as *A* given *B*.	Understand the conditional probability of *A* given *B* as *P* (*A* and *B*)/*P* (*B*), and identify 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* .	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* .	Evaluate the conditional probability of *A* given *B* as *P* (*A* and *B*)/*P* (*B*), and show 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.
A2.S-CP.A.4	Identify a missing value in two-way frequency tables of data when two categories are associated with each object being classified.	Complete 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 approximate conditional probabilities.	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.	Construct and compare 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.
A2.S-CP.A.5	Identify the concepts of conditional probability and independence utilizing real-world context.	Recognize and interpret the concepts of conditional probability and independence utilizing real-world context.	Recognize and explain the concepts of conditional probability and independence utilizing real-world context.	Create examples of and explain the concepts of conditional probability and independence utilizing real-world context.
A2.S-CP.B.6	Recognize Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B* 's outcomes that also belong to *A.*	Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B* 's outcomes that also belong to *A* given visual models.	Use Bayes Rule to 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.	Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B* 's outcomes that also belong to *A* , and justify the answer in terms of the model.
A2.S-CP.B.7	Recognize the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.	Calculate probabilities using the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and justify the answer in terms of the model.
A2.S-CP.B.8	Recognize the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$.	Calculate probabilities using the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$.	Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$, and interpret the answer in terms of the model.	Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$, and justify the answer in terms of the model.