AMSCO Algebra 2

Next Generation New York Math Standards	Algebra 2 Lesson
Number and Quantity	
The Real Number System	
Extend the properties of exponents to rational exponents. **N-RN.A.1** Explore how the meaning of rational exponents follows from extending the properties of integer exponents.	5.3
N-RN.A.2 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 $(27x^5y^3)^{\frac{1}{3}}$ which equals $3x^{\frac{5}{3}}y$.	5.3
Quantities*	
Reason quantitatively and use units to solve problems. **N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.	1.3
The Complex Number System	
Perform arithmetic operations with complex numbers. **N-CN.A.1** 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.	2.5
N-CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	2.5, 5.1
Use complex numbers in polynomial identities and equations. **N-CN.C.7** Solve quadratic equations with real coefficients that have complex solutions.	2.6
Algebra	
Seeing Structure in Expressions	
Interpret the structure of expressions. **A-SSE.A.2** 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.	R.5, 1.4, 2.1, 2.2, 2.3, 4.1, 7.6
Write expressions in equivalent forms to solve problems. **A-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by that expression.	1.4, 3.3, 3.4, 6.2

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A-SSE.B.3a Factor quadratic expressions, including leading coefficients other than 1, to reveal the zeros of the function it defines.	2.3, 3.3, 3.4
A-SSE.B.3c Use the properties of exponents to rewrite exponential expressions. Exponents will be rational.	6.2
Arithmetic with Polynomials & Rational Expressions	
Understand the relationship between zeros and factors of polynomials. **A-APR.B.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 $p(x)$.	3.3
A-APR.B.3 Identify zeros of polynomials.	3.5, 3.6
A-APR.B.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.	3.5
Use polynomial identities to solve problems. **A-APR.C.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.	2.3
Rewrite rational expressions. **A-APR.D.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 $b(x)$.	3.2, 4.1
Creating Equations*	
Create equations that describe numbers or relationships. **A-CED.A.1b** Create equations and inequalities in one variable to represent a real world context. Include linear, quadratic, rational, and exponential functions.	R.1, 1.3, 2.7, 4.3, 6.2
Reasoning with Equations & Inequalities	
Understand solving equations as a process of reasoning and explain the reasoning. **A-REI.A.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.	4.3, 5.4
A-REI.A.2 Solve rational and radical equations in one variable, identify extraneous solutions, and explain how they arise.	4.3, 5.4

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Solve equations and inequalities in one variable. **A-REI.B.4** Solve quadratic equations in one variable.	2.3, 2.4, 2.6
A-REI.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.	2.3, 2.4, 2.6
A-REI.B.4c Recognize when the quadratic has complex solutions and write them in $a + bi$ form.	2.6
Solve systems of equations. **A-REI.C.6** Solve systems of linear equations in three variables.	1.4
A-REI.C.7b Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	3.9
Represent and solve equations and inequalities graphically. **A-REI.D.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.	R.4, 3.9, 4.4, 6.1, 7.2
Functions	
Interpreting Functions	
Understand the concept of a function and use function notation. **F-IF.A.3b** Fluently recognize that sequences are functions, sometimes defined recursively in subscript notation, whose domain is a subset of the integers.	8.1, 8.3
Interpret functions that arise in applications in terms of the context. **F-IF.B.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 2 key features include: intercepts, intervals where the function is increasing, decreasing, positive, negative, relative maxima and minima, symmetries, end behavior, and periodicity. Tasks may involve real-world contexts and may include polynomials, exponential, logarithmic, and trigonometric functions.	2.7, 2.8, 3.5, 3.8, 6.1, 6.2, 7.5, 9.5
F-IF.B.6b Calculate and interpret the average rate of change of a function over a specified interval. Algebra II tasks have real-world context and may involve polynomial, exponential, logarithmic, and trigonometric functions.	1.1, 3.8, 6.1, 7.5

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Analyze functions using different representations. **F-IF.C.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.	3.8, 4.4, 5.5, 6.2
F-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	3.5, 3.8
F-IF.C.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions showing period, midline, and amplitude.	6.1, 6.2, 7.2, 7.5, 9.5, 9.6
F-IF.C.8 Write a function in different but equivalent form to reveal and explain different properties of the function.	1.4, 2.3, 3.5
F-IF.C.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.	6.1, 6.2, 7.3
F-IF.C.9 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.	3.8, 7.5
Building Functions	
Build a function that models a relationship between two quantities. **F-BF.A.1** Write a function that describes a relationship between two quantities.	1.2, 1.3, 2.7, 4.3, 6.2, 7.5
F-BF.A.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.	8.1, 8.3
F-BF-A.1b Combine standard function types using arithmetic operations.	6.3, 6.4
F-BF-A.2 Write arithmetic and geometric sequences both recursively and with an explicit formulas, use them to model situations, and translate between the two forms.	8.1, 8.3
Build new functions from existing functions. **F-BF.B.3** Using $f(x) + k$, $kf(x)$, $f(kx)$ and $f(x + k)$: i) Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, 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. Algebra II Course: Include recognizing even and odd functions from their graphs. Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions."	R.6, 1.1, 3.7, 6.1, 7.2, 9.5
F-BF.B.4 Find inverse functions.	6.4

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F-BF.B.4a Find the inverse of a one-to-one function both algebraically and graphically.	6.4
F.BF.B.5a Understand inverse relationships between exponents and logarithms algebraically and graphically.	7.1, 7.2
F-BF.B.6 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.	8.2, 8.4
F-BF.B.7 Explore the derivation of the formulas for arithmetic and finite geometric series. Use the series to solve problems.	8.2, 8.4
Linear, Quadratic, & Exponential Models*	
Construct and compare linear, quadratic, and exponential models and solve problems. **F-LE.A.2** Construct a linear, exponential, arithmetic or geometric function rules given: i) a graph; ii) a description of the relationship; and iii) two input-output pairs (include reading these froma table).	R.2, 6.2, 8.1, 8.3
F-LE.A.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.	7.4, 7.5
Interpret expressions for functions in terms of the situation they model. **F-LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context.	1.2, 1.3, 6.2
Trigonometric Functions	
Extend the domain of trigonometric functions using the unit circle. **F-TF.A.1** Understand radian measure of an angle as the length of the arc on a unit circle subtended by an angle.	9.3
F-TF.A.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.	9.4
F-TF.A.4(+) Use the unit circle to explain symmetry (odd and even) and periodicity of trig functions.	9.5
Model periodic phenomena with trigonometric functions. **F-TF.B.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	9.5, 9.7
Prove and apply trigonometric identities. **F-TF.C.8** 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.	9.4

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Statistics & Probability	
Interpreting Categorical & Quantitative Data	
Summarize, represent, and interpret data on a single count or measurement variable **S-ID.A.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.	10.5
Summarize, represent, and interpret data on two categorical and quantitative variables **S-ID.B.6** Represent data on two quantitative variables on a scatterplot, and describe how the variables are related.	1.2, 2.7, 3.8, 6.2, 7.5
S-ID.B.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.	6.2, 9.7
Making Inferences & Justifying Conclusions	
Understand and evaluate random processes underlying statistical experiments **S-IC.A.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).	10.5
Make inferences and justify conclusions from sample surveys, experiments, and observational studies **S-IC.B.3** Recognize the purposes of and differences among surveys, experiments, and observational studies. Explain how randomization relates to each.	10.6
S-IC.B.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.	10.5, 10.7
S-IC.B.6 6a. Use the language of statistics to draw conclusions from numerical summaries. 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.	10.5, 10.6, 10.7
Conditional Probability & the Rules of Probability	
Understand independence and conditional probability and use them to interpret data **S-CP.A.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").	10.1, 10.2, 10.3

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S-CP.A.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 ($P(A \text{ and } B) = P(A)P(B)$); 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* ($P(B\|A) = P(B)$).	10.2, 10.4
S-CP.A.3 Calculate and determine the conditional probability of *A* given *B* in the context of a model.	10.4
S-CP.A.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.	10.2, 10.4
Use the rules of probability to compute probabilities of compound events. **S-CP.B.7** 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.	10.3