Algebra 2 Mathematics *Standards of Learning* - 2023 Overview of Revisions

This overview includes a summary of the content embedded in four content strands.

Expressions and Operations
- Perform operations on and simplify rational expressions
- Perform operations on and simplify radical expressions
- Perform operations on and factor polynomial expressions in one and two variables
- Perform operations on complex numbers

Equations and Inequalities
- Represent, solve, and interpret the solution to absolute value equations and inequalities in one variable
- Represent, solve, and interpret the solution to quadratic equations in one variable over the set of complex numbers and solve quadratic, inequalities in one variable
- Represent, solve, and interpret the solution to an equation containing rational algebraic expressions
- Represent, solve, and interpret the solution to an equation containing a radical expression
- Solve systems of equations containing a quadratic expression
- Represent, solve, and interpret the solution to a polynomial equation

Functions
- Investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations
- Investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically

Statistics
- Apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on univariate quantitative data represented by a smooth curve, including a normal curve
- Apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on representing bivariate data in scatterplots and determining the curve of best fit using linear, quadratic, exponential, or a combination of these functions
- Compute and distinguish between permutations and combinations

Comparison of Algebra 2 Mathematics *Standards of Learning* – 2016 to 2023

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Expressions and Operations**	2023 *Standards of Learning* Knowledge and Skills (KS) **Expressions and Operations (EO)**
AII.1 The student will **a) add, subtract, multiply, divide, and simplify rational algebraic expressions;** • Add, subtract, multiply, and divide rational algebraic expressions. (a) • Simplify a rational algebraic expression with monomial or binomial factors. Algebraic expressions should be limited to linear and quadratic expressions. (a) • Recognize a complex algebraic fraction, and simplify it as a quotient or product of simple algebraic fractions. (a)	**A2.EO.1 The student will perform operations on and simplify rational expressions.** a) Add, subtract, multiply, or divide rational algebraic expressions, simplifying the result. b) Justify and determine equivalent rational algebraic expressions with monomial and binomial factors. Algebraic expressions should be limited to linear and quadratic expressions. c) Recognize a complex algebraic fraction and simplify it as a product or quotient of simple algebraic fractions. d) Represent and demonstrate equivalence of rational expressions written in different forms.
AII.1 The student will **b) add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents; and** • Simplify radical expressions containing positive rational numbers and variables. (b) • Convert between radical expressions and expressions containing rational exponents. (b) • Add and subtract radical expressions. (b) • Multiply and divide radical expressions. Simplification may include rationalizing denominators. (b)	**A2.EO.2 The student will perform operations on and simplify radical expressions.** a) Simplify and determine equivalent radical expressions that include numeric and algebraic radicands. b) Add, subtract, multiply, and divide radical expressions that include numeric and algebraic radicands, simplifying the result. Simplification may include rationalizing the denominator. c) Convert between radical expressions and expressions containing rational exponents.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Expressions and Operations**	2023 *Standards of Learning* Knowledge and Skills (KS) **Expressions and Operations (EO)**
AII.1 The student will **c) factor polynomials completely in one or two variables.** ● Factor polynomials in one or two variables with no more than four terms completely over the set of integers. Factors of the polynomial should be constant, linear, or quadratic. (c) ● Verify polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials. (c)	**A2.EO.3 The student will perform operations on polynomial expressions and factor polynomial expressions in one and two variables.** a) Determine sums, differences, and products of polynomials in one and two variables. b) Factor polynomials completely in one and two variables with no more than four terms over the set of integers. c) Determine the quotient of polynomials in one and two variables, using monomial, binomial, and factorable trinomial divisors. d) Represent and demonstrate equality of polynomial expressions written in different forms and verify polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials.
AII.2 The student will perform operations on complex numbers and express the results in simplest form using patterns of the powers of *i*. ● Recognize that the square root of –1 is represented as *i*. ● Simplify radical expressions containing negative rational numbers and express in $a + bi$ form. ● Simplify powers of *i*. ● Add, subtract, and multiply complex numbers.	**A2.EO.4 The student will perform operations on complex numbers.** a) Explain the meaning of *i*. b) Identify equivalent radical expressions containing negative rational numbers and expressions in $a + bi$ form. c) Apply properties to add, subtract, and multiply complex numbers.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Equations and Inequalities**	2023 *Standards of Learning* Knowledge and Skills (KS) **Equations and Inequalities (EI)**
AII.3 The student will solve **a) absolute value linear equations and inequalities;** ● Solve absolute value linear equations or inequalities in one variable algebraically. (a) ● Represent solutions to absolute value linear inequalities in one variable graphically. (a) ● Solve equations and verify algebraic solutions using a graphing utility. (a, b, c, d)	**A2.EI.1 The student will represent, solve, and interpret the solution to absolute value equations and inequalities in one variable.** a) Create an absolute value equation in one variable to model a contextual situation. b) Solve an absolute value equation in one variable algebraically and verify the solution graphically. c) Create an absolute value inequality in one variable to model a contextual situation. d) Solve an absolute value inequality in one variable and represent the solution set using set notation, interval notation, and using a number line. e) Verify possible solution(s) to absolute value equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
AII.3 The student will solve **b) quadratic equations over the set of complex numbers;** ● Solve a quadratic equation over the set of complex numbers algebraically. (b) ● Calculate the discriminant of a quadratic equation to determine the number and type of solutions. (b) ● Solve equations and verify algebraic solutions using a graphing utility. (a, b, c, d)	**A2.EI.2 The student will represent, solve, and interpret the solution to quadratic equations in one variable over the set of complex numbers and solve quadratic inequalities in one variable.** a) Create a quadratic equation or inequality in one variable to model a contextual situation. b) Solve a quadratic equation in one variable over the set of complex numbers algebraically. c) Determine the solution to a quadratic inequality in one variable over the set of real numbers algebraically.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Equations and Inequalities**	2023 *Standards of Learning* Knowledge and Skills (KS) **Equations and Inequalities (EI)**
	d) Verify possible solution(s) to quadratic equations or inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
AII.3 The student will solve **c) equations containing rational algebraic expressions;** ● Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions. ● Solve equations and verify algebraic solutions using a graphing utility.	**A2.EI.4 The student will represent, solve, and interpret the solution to an equation containing rational algebraic expressions.** a) Create an equation containing a rational expression to model a contextual situation. b) Solve rational equations with real solutions containing factorable algebraic expressions algebraically and graphically. Algebraic expressions should be limited to linear and quadratic expressions. c) Verify possible solution(s) to rational equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context. d) Justify why a possible solution to an equation containing a rational expression might be extraneous.
AII.3d The student will solve **d) equations containing radical expressions.** ● Solve an equation containing no more than one radical expression algebraically and graphically. (d) ● Solve equations and verify algebraic solutions using a graphing utility. (d)	**A2.EI.5 The student will represent, solve, and interpret the solution to an equation containing a radical expression.** a) Solve an equation containing no more than one radical expression algebraically and graphically. b) Verify possible solution(s) to radical equations algebraically, graphically, and with technology, to justify the reasonableness

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Equations and Inequalities**	2023 *Standards of Learning* Knowledge and Skills (KS) **Equations and Inequalities (EI)**
● Solve equations and verify algebraic solutions using a graphing utility. (a, b, c, d)	of answer(s). Explain the solution method and interpret solutions for problems given in context. c) Justify why a possible solution to an equation with a square root might be extraneous.
AII.4 The student will solve systems of linear-quadratic and quadratic-quadratic equations, algebraically and graphically. ● Determine the number of solutions to a linear-quadratic and quadratic-quadratic system of equations in two variables. ● Solve a linear-quadratic system of two equations in two variables algebraically and graphically. ● Solve a quadratic-quadratic system of two equations in two variables algebraically and graphically. ● Solve systems of equations and verify solutions of systems of equations with a graphing utility.	**A2.EI.3 The student will solve a system of equations in two variables containing a quadratic expression.** a) Create a linear-quadratic or quadratic-quadratic system of equations to model a contextual situation. b) Determine the number of solutions to a linear-quadratic and quadratic-quadratic system of equations in two variables. c) Solve a linear-quadratic and quadratic-quadratic system of equations algebraically and graphically, including situations in context. d) Verify possible solution(s) to linear-quadratic or quadratic-quadratic system of equations algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
AII.8 The student will investigate and describe the relationships among solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression. ● Define a polynomial function in factored form, given its zeros. ● Determine a factored form of a polynomial expression from the *x*-intercepts of the graph of its corresponding function.	**A2.EI.6 The student will represent, solve, and interpret the solution to a polynomial equation.** a) Determine a factored form of a polynomial equation, of degree three or higher, given its zeros or the *x*-intercepts of the graph of its related function.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Equations and Inequalities**	2023 *Standards of Learning* Knowledge and Skills (KS) **Equations and Inequalities (EI)**
• For a function, identify zeros of multiplicity greater than 1 and describe the effect of those zeros on the graph of the function. • Given a polynomial equation, determine the number and type of solutions.	b) Determine the number and type of solutions (real or imaginary) of a polynomial equation of degree three or higher. c) Solve a polynomial equation over the set of complex numbers. d) Verify possible solution(s) to polynomial equations of degree three or higher algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and interpret solutions in context.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Functions**	2023 *Standards of Learning* Knowledge and Skills (EK) **Functions (F)**
AII.5 The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first *n* terms, determining the nth term, and evaluating summation formulas. Notation will include $\sum$ and a_n. • Distinguish between a sequence and a series. • Generalize patterns in a sequence using explicit and recursive formulas. • Use and interpret the notations $\sum$, n, n^{th} term, and a_n. • Given the formula, determine a_n (the nth term) for an arithmetic or a geometric sequence. • Given formulas, write the first *n* terms and determine the sum, S_n, of the first *n* terms of an arithmetic or geometric series.	**[Moved to Mathematical Analysis]**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Functions**	2023 *Standards of Learning* Knowledge and Skills (EK) **Functions (F)**
• Given the formula, determine the sum of a convergent infinite series. • Model practical situations using sequences and series.	
AII.6 For absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic functions, the student will **a) recognize the general shape of function families; and** **b) use knowledge of transformations to convert between equations and the corresponding graphs of functions.** • Recognize the general shape of function families. (a) • Recognize graphs of parent functions. (a) • Identify the graph of a function from the equation. (b) • Write the equation of a function given the graph. (b) • Graph a transformation of a parent function, given the equation. (b) • Identify the transformation(s) of a function. Transformations of exponential and logarithmic functions, given a graph, should be limited to a single transformation. (b) • Investigate and verify transformations of functions using a graphing utility. (a, b)	**A2.F.1 The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations.** a) Distinguish between the graphs of parent functions for square root, cube root, rational, exponential, and logarithmic function families. b) Write the equation of a square root, cube root, rational, exponential, and logarithmic function, given a graph, using transformations of the parent function, including $f(x) + k$; $f(kx)$; $f(x + k)$; and $kf(x)$, where k is limited to rational values. Transformations of exponential and logarithmic functions, given a graph, should be limited to a single transformation. c) Graph a square root, cube root, rational, exponential, and logarithmic function, given the equation, using transformations of the parent function including $f(x) + k$; $f(kx)$; $f(x + k)$; and $kf(x)$, where k is limited to rational values. Use technology to verify transformations of the functions.
AII.7 The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include **a) domain, range, and continuity;**	**A2.F.2 The student will investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically.**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Functions**	2023 *Standards of Learning* Knowledge and Skills (EK) **Functions (F)**
b) intervals in which a function is increasing or decreasing; **c) extrema;** **d) zeros;** **e) intercepts;** - Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically, including graphs with discontinuities. (a, d, e) - Describe a function as continuous or discontinuous. (a) - Given the graph of a function, identify intervals on which the function (linear, quadratic, absolute value, square root, cube root, polynomial, exponential, and logarithmic) is increasing or decreasing. (b) - Identify the location and value of absolute maxima and absolute minima of a function over the domain of the function graphically or by using a graphing utility. (c) - Identify the location and value of relative maxima or relative minima of a function over some interval of the domain graphically or by using a graphing utility. (c)	a) Determine and identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically, including graphs with discontinuities. b) Compare and contrast the characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions. c) Determine the intervals on which the graph of a function is increasing, decreasing, or constant. d) Determine the location and value of absolute (global) maxima and absolute (global) minima of a function. e) Determine the location and value of relative (local) maxima or relative (local) minima of a function.
AII.7 The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include **f) values of a function for elements in its domain;** **h) end behavior;** **i) vertical and horizontal asymptotes;** For any x value in the domain of f, determine f(x). (f)	**A2.F.2 The student will investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically.** f) For any value, x, in the domain of f, determine $f(x)$ using a graph or equation. Explain the meaning of x and $f(x)$ in context, where applicable. g) Describe the end behavior of a function given a graph.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Functions**	2023 *Standards of Learning* Knowledge and Skills (EK) **Functions (F)**
- Describe the end behavior of a function. (h) - Determine the equations of vertical and horizontal asymptotes of functions (rational, exponential, and logarithmic). (i)	h) Determine the equations of any vertical and horizontal asymptotes of a function using a graph or equation (rational, exponential, and logarithmic).
AII.7 The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include **j) inverse of a function; and** **k) composition of functions, algebraically and graphically.** - Determine the inverse of a function (linear, quadratic, cubic, square root, and cube root). (j) - Graph the inverse of a function as a reflection over the line $y = x$. (j) - Determine the composition of two functions algebraically and graphically. (k)	**A2.F.2 The student will investigate and analyze characteristics of square root, cube root, rational, polynomial, exponential, logarithmic, and piecewise-defined functions algebraically and graphically.** i) Determine the inverse of a function algebraically and graphically, given the equation of a linear or quadratic function (linear, quadratic, and square root). Justify and explain why two functions are inverses of each other. j) Graph the inverse of a function as a reflection over the line $y = x$. k) Determine the composition of two functions algebraically and graphically.
AII.7 The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include **a) connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;**	**A2.F.1 The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations.** e) Compare and contrast the graphs, tables, and equations of square root, cube root, rational, exponential, and logarithmic functions.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Functions**	2023 *Standards of Learning* Knowledge and Skills (EK) **Functions (F)**
• Represent relations and functions using verbal descriptions, tables, equations, and graphs. Given one representation, represent the relation in another form. (g) • Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f, g, h, i, j, k)	
AII.8 The student will investigate and describe the relationships among solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression. • Define a polynomial function in factored form, given its zeros. • Determine a factored form of a polynomial expression from the *x*-intercepts of the graph of its corresponding function. • For a function, identify zeros of multiplicity greater than 1 and describe the effect of those zeros on the graph of the function. • Given a polynomial equation, determine the number and type of solutions.	**[Included in A2.EI.6]**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Statistics**	2023 *Standards of Learning* Knowledge and Skills (EK) **Statistics (ST)**
AII.9 The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and	**A2.ST.2 The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on representing bivariate data in scatterplots and determining the curve of best fit**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Statistics**	2023 *Standards of Learning* Knowledge and Skills (EK) **Statistics (ST)**
solve practical problems, using mathematical models of quadratic and exponential functions. ● Determine an equation of the curve of best fit, using a graphing utility, given a set of no more than 20 data points in a table, graph, or practical situation. ● Make predictions, using data, scatterplots, or the equation of the curve of best fit. ● Solve practical problems involving an equation of the curve of best fit. ● Evaluate the reasonableness of a mathematical model of a practical situation.	**using linear, quadratic, exponential, or a combination of these functions.** a) Formulate investigative questions that require the collection or acquisition of bivariate data and investigate questions using a data cycle. b) Collect or acquire bivariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires. c) Represent bivariate data with a scatterplot using technology. d) Determine whether the relationship between two quantitative variables is best approximated by a linear, quadratic, exponential, or a combination of these functions. e) Determine the equation(s) of the function(s) that best models the relationship between two variables using technology. Curves of best fit may include a combination of linear, quadratic, or exponential (piecewise-defined) functions. f) Use the correlation coefficient to designate the goodness of fit of a linear function using technology. g) Make predictions, decisions, and critical judgments using data, scatterplots, or the equation(s) of the mathematical model. h) Evaluate the reasonableness of a mathematical model of a contextual situation.
AII.10 The student will represent and solve problems, including practical problems, involving inverse variation, joint variation, and a combination of direct and inverse variations.	**A2.F.1 The student will investigate, analyze, and compare square root, cube root, rational, exponential, and logarithmic function families, algebraically and graphically, using transformations.**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Statistics**	2023 *Standards of Learning* Knowledge and Skills (EK) **Statistics (ST)**
- Given a data set or practical situation, write the equation for an inverse variation. - Given a data set or practical situation, write the equation for a joint variation. - Solve problems, including practical problems, involving inverse variation, joint variation, and a combination of direct and inverse variations.	d) Determine when two variables are directly proportional, inversely proportional, or neither, given a table of values. Write an equation and create a graph to represent a direct or inverse variation, including situations in context.
AII.11 The student will **b) interpret and compare z-scores for normally distributed data; and** **c) apply properties of normal distribution to determine probabilities associated with areas under the standard normal curve.** - Solve problems involving the relationship of the mean, standard deviation, and *z*-score of a normally distributed data set. (b) - Compare two sets of normally distributed data using a standard normal distribution and *z*-scores, given the mean and standard deviation. (b) - Represent probability as area under the curve of a standard normal distribution. (c) - Use the graphing utility or a table of Standard Normal Probabilities to determine probabilities associated with areas under the standard normal curve. (c)	**A2.ST.1 The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on univariate quantitative data represented by a smooth curve, including a normal curve.** a) Formulate investigative questions that require the collection or acquisition of a large set of univariate quantitative data or summary statistics of a large set of univariate quantitative data and investigate questions using a data cycle. b) Collect or acquire univariate data through research, or using surveys, observations, scientific experiments, polls, or questionnaires.

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Statistics**	2023 *Standards of Learning* Knowledge and Skills (EK) **Statistics (ST)**
• Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. (a, b, c)	
AII.11 The student will a) **identify and describe properties of a normal distribution;** b) **interpret and compare z-scores for normally distributed data; and** • Identify the properties of a normal distribution. (a) • Describe how the standard deviation and the mean affect the graph of the normal distribution. (a) • Solve problems involving the relationship of the mean, standard deviation, and *z*-score of a normally distributed data set. (b) • Compare two sets of normally distributed data using a standard normal distribution and *z*-scores, given the mean and standard deviation. (b) • Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. (a, b, c)	**A2.ST.1 The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on univariate quantitative data represented by a smooth curve, including a normal curve.** c) Examine the shape of a data set (skewed versus symmetric) that can be represented by a histogram, and sketch a smooth curve to model the distribution. d) Identify the properties of a normal distribution. e) Describe and interpret a data distribution represented by a smooth curve by analyzing measures of center, measures of spread, and shape of the curve. f) Calculate and interpret the *z*-score for a value in a data set. g) Compare two data points from two different distributions using *z*-scores. h) Determine the solution to problems involving the relationship of the mean, standard deviation, and *z*-score of a data set represented by a smooth or normal curve. j) Compare multiple data distributions using measures of center, measures of spread, and shape of the distributions.
AII.11 The student will	**A2.ST.1 The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze**

2016 *Standards of Learning* Essential Knowledge and Skills (EKS) **Statistics**	2023 *Standards of Learning* Knowledge and Skills (EK) **Statistics (ST)**
c) apply properties of normal distribution to determine probabilities associated with areas under the standard normal curve. ● Represent probability as area under the curve of a standard normal distribution. (c) ● Use the graphing utility or a table of Standard Normal Probabilities to determine probabilities associated with areas under the standard normal curve. (c) ● Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. (a, b, c)	**data and communicate results) with a focus on univariate quantitative data represented by a smooth curve, including a normal curve.** i) Apply the Empirical Rule to answer investigative questions. j) Compare multiple data distributions using measures of center, measures of spread, and shape of the distributions.
AII.12 The student will compute and distinguish between permutations and combinations. ● Compare and contrast permutations and combinations. ● Calculate the number of permutations of *n* objects taken *r* at a time. ● Calculate the number of combinations of *n* objects taken *r* at a time. ● Use permutations and combinations as counting techniques to solve practical problems. ● Calculate and verify permutations and combinations using a graphing utility.	**A2.ST.3 The student will compute and distinguish between permutations and combinations.** a) Compare and contrast permutations and combinations to count the number of ways that events can occur. b) Calculate the number of permutations of *n* objects taken *r* at a time. c) Calculate the number of combinations of *n* objects taken *r* at a time. d) Use permutations and combinations as counting techniques to solve practical problems. e) Calculate and verify permutations and combinations using technology.

2023 Algebra 2 Mathematics SOL – Summary of Changes

Algebra II (2016 SOL to 2023 SOL Numbering)	Parameter Changes/Clarifications (2023 SOL)
- AII.1a → A2.EO.1 - AII.1b → A2.EO.2 - AII.1c → A2.EO.3 - AII.2 → A2.EO.4 - AII.3a → A2.EI.1 - AII.3b → A2.EI.2 - AII.3c → A2.EI.4 - AII.3d → A2.EI.5 - AII.4 → A2.EI.3 - AII.5 → [Moved to Mathematical Analysis] - AII.6a,b → A2.F.1 - AII.7a-f, h-k → A2.F.2 - AII.7g → A2.F.1 - AII.8 → A2.EI.6 - AII.9 → A2.ST.2 - AII.10 → A2.F.1 - AII.11 → A2.ST.1 - AII.12 → A2.ST.3	- A2.EO.1 – Justify and determine equivalent rational algebraic expressions with monomial and binomial factors; represent and demonstrate equality of rational expressions written in different forms - A2.EO.2 – Simplify and determine equivalent radical expressions that include numeric and algebraic radicands - A2.EO.3 – Represent and demonstrate equality of polynomial expressions written in different forms - A2.EO.4 – Identify equivalent radical expressions containing negative rational numbers and expressions in $a + bi$ form - A2.EI.1 – Represent the solution set of an absolute value inequality using set notation, interval notation, and using a number line. - A2.EI.3 – Create a linear-quadratic or quadratic-quadratic system of equations to model a contextual situation - A2.EI.4 – Create an equation containing a rational expression to model a contextual situation; justify why a possible solution to an equation containing a rational expression might be extraneous - A2.EI.5 - Justify why a possible solution to an equation with a square root might be extraneous. - A2.F.1 - Transformation notation is specifically addressed and the constant, k, includes both integer and rational values. - A2.F.2 - Explain the meaning of x and $f(x)$ in context, where applicable; justify and explain why two functions are inverses of each other - A2.ST.1- Interpret the z-score; apply the Empirical Rule to answer investigative questions - A2.ST.2 – Curves of best fit may include a combination of linear, quadratic, or exponential (piecewise-defined) functions

Deletions from Algebra II (2016 SOL)	Additions to Algebra 2 (2023 SOL)
- AII.2 [EKS] – Simplify powers of *i* [Deleted] - AII.5 – Investigate and apply properties of arithmetic and geometric series; evaluate formulas in summation notation [Included in MA.FR.3] - AII.10 [EKS] – Solve problems involving joint variation and a combination of direct and inverse variation [Deleted] - AII.11 – [EKS] Determine probabilities associated with areas under the standard normal curve [Included in AFDA.DA.4 and PS.P.3]	- A2.EO.3 – Determine sums, differences, and products of polynomials in one and two variables; determine the quotient of polynomials in one and two variables, using monomial, binomial, and factorable trinomial divisors - A2.EI.1 – Create an absolute value equation and inequality in one variable to model a contextual situation - A2.EI.2 – Create a quadratic equation or inequality in one variable to model a contextual situation; determine the solution to a quadratic inequality in one variable over the set of real numbers algebraically - A2.EI.6 – Solve a polynomial equation over the set of complex numbers; verify solutions to polynomial equations of degree three or higher, algebraically, graphically, and with technology to justify answers; explain the solution method and interpret solutions in context - A2.F.2 - Investigate and analyze piecewise-defined functions - A2.ST.1 and A2.ST.2 – Includes data cycle process of collecting and acquiring data and formulating investigative questions that require the collection of the data - A2.ST.1 - Examine the shape of a data set that can be represented by a histogram and sketch a smooth curve to model the distribution; analyze measures of center and spread of a univariate data set represented by a smooth curve - A2.ST.2 - Use the correlation coefficient to designate goodness of fit of a linear function using technology

KEY: EO = Expressions and Operations; EI = Equations and Inequalities; F = Functions; ST = Statistics; EKS = Essential Knowledge and Skills (2016); KS = Knowledge and Skills (2023); US = Understanding the Standard