

Algebra 2 and Trigonometry

Number Sense and Operations Strand

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

- A2.N.1 Evaluate numerical expressions with negative and/or fractional exponents, without the aid of a calculator (when the answers are rational numbers)
- A2.N.2 Perform arithmetic operations (addition, subtraction, multiplication, division) with expressions containing irrational numbers in radical form
- A2.N.3 Perform arithmetic operations with polynomial expressions containing rational coefficients
- A2.N.4 Perform arithmetic operations on irrational expressions
- A2.N.5 Rationalize a denominator containing a radical expression
- A2.N.6 Write square roots of negative numbers in terms of i
- A2.N.7 Simplify powers of i
- A2.N.8 Determine the conjugate of a complex number
- A2.N.9 Perform arithmetic operations on complex numbers and write the answer in the form $a + bi$ *Note: This includes simplifying expressions with complex denominators.*
- A2.N.10 Know and apply sigma notation

Algebra Strand

Students will represent and analyze algebraically a wide variety of problem solving situations.

Equations and Inequalities

- A2.A.1 Solve absolute value equations and inequalities involving linear expressions in one variable
- A2.A.2 Use the discriminant to determine the nature of the roots of a quadratic equation
- A2.A.3 Solve systems of equations involving one linear equation and one quadratic equation algebraically *Note: This includes rational equations that result in linear equations with extraneous roots.*
- A2.A.4 Solve quadratic inequalities in one and two variables, algebraically and graphically
- A2.A.5 Use direct and inverse variation to solve for unknown values
- A2.A.6 Solve an application which results in an exponential function

Students will perform algebraic procedures accurately.

Variables and Expressions

- A2.A.7 Factor polynomial expressions completely, using any combination of the following techniques: common factor extraction, difference of two perfect squares, quadratic trinomials
- A2.A.8 Apply the rules of exponents to simplify expressions involving negative and/or fractional exponents
- A2.A.9 Rewrite algebraic expressions that contain negative exponents using only positive exponents
- A2.A.10 Rewrite algebraic expressions with fractional exponents as radical expressions
- A2.A.11 Rewrite algebraic expressions in radical form as expressions with fractional exponents
- A2.A.12 Evaluate exponential expressions, including those with base e
- A2.A.13 Simplify radical expressions
- A2.A.14 Perform addition, subtraction, multiplication, and division of radical expressions
- A2.A.15 Rationalize denominators involving algebraic radical expressions
- A2.A.16 Perform arithmetic operations with rational expressions and rename to lowest terms
- A2.A.17 Simplify complex fractional expressions
- A2.A.18 Evaluate logarithmic expressions in any base
- A2.A.19 Apply the properties of logarithms to rewrite logarithmic expressions in equivalent forms

Equations and Inequalities

- A2.A.20 Determine the sum and product of the roots of a quadratic equation by examining its coefficients
- A2.A.21 Determine the quadratic equation, given the sum and product of its roots
- A2.A.22 Solve radical equations
- A2.A.23 Solve rational equations and inequalities
- A2.A.24 Know and apply the technique of completing the square
- A2.A.25 Solve quadratic equations, using the quadratic formula
- A2.A.26 Find the solution to polynomial equations of higher degree that can be solved using factoring and/or the quadratic formula
- A2.A.27 Solve exponential equations with and without common bases
- A2.A.28 Solve a logarithmic equation by rewriting as an exponential equation

Students will recognize, use, and represent algebraically patterns, relations, and functions.

Patterns, Relations, and Functions

- A2.A.29 Identify an arithmetic or geometric sequence and find the formula for its n th term
- A2.A.30 Determine the common difference in an arithmetic sequence

- A2.A.31 Determine the common ratio in a geometric sequence
- A2.A.32 Determine a specified term of an arithmetic or geometric sequence
- A2.A.33 Specify terms of a sequence, given its recursive definition
- A2.A.34 Represent the sum of a series, using sigma notation
- A2.A.35 Determine the sum of the first n terms of an arithmetic or geometric series
- A2.A.36 Apply the binomial theorem to expand a binomial and determine a specific term of a binomial expansion
- A2.A.37 Define a relation and function
- A2.A.38 Determine when a relation is a function
- A2.A.39 Determine the domain and range of a function from its equation
- A2.A.40 Write functions in functional notation
- A2.A.41 Use functional notation to evaluate functions for given values in the domain
- A2.A.42 Find the composition of functions
- A2.A.43 Determine if a function is one-to-one, onto, or both
- A2.A.44 Define the inverse of a function
- A2.A.45 Determine the inverse of a function and use composition to justify the result
- A2.A.46 Perform transformations with functions and relations: $f(x+a)$, $f(x)+a$, $f(-x)$, $-f(x)$, $af(x)$

Coordinate Geometry

- A2.A.47 Determine the center-radius form for the equation of a circle in standard form
- A2.A.48 Write the equation of a circle, given its center and a point on the circle
- A2.A.49 Write the equation of a circle from its graph
- A2.A.50 Approximate the solution to polynomial equations of higher degree by inspecting the graph
- A2.A.51 Determine the domain and range of a function from its graph
- A2.A.52 Identify relations and functions, using graphs
- A2.A.53 Graph exponential functions of the form $y = b^x$ for positive values of b , including $b = e$
- A2.A.54 Graph logarithmic functions, using the inverse of the related exponential function

Trigonometric Functions

- A2.A.55 Express and apply the six trigonometric functions as ratios of the sides of a right triangle
- A2.A.56 Know the exact and approximate values of the sine, cosine, and tangent of 0° , 30° , 45° , 60° , 90° , 180° , and 270° angles
- A2.A.57 Sketch and use the reference angle for angles in standard position
- A2.A.58 Know and apply the co-function and reciprocal relationships between trigonometric ratios

- A2.A.59 Use the reciprocal and co-function relationships to find the value of the secant, cosecant, and cotangent of 0° , 30° , 45° , 60° , 90° , 180° , and 270° angles
- A2.A.60 Sketch the unit circle and represent angles in standard position
- A2.A.61 Determine the length of an arc of a circle, given its radius and the measure of its central angle
- A2.A.62 Find the value of trigonometric functions, if given a point on the terminal side of angle
- A2.A.63 Restrict the domain of the sine, cosine, and tangent functions to ensure the existence of an inverse function
- A2.A.64 Use inverse functions to find the measure of an angle, given its sine, cosine, or tangent
- A2.A.65 Sketch the graph of the inverses of the sine, cosine, and tangent functions
- A2.A.66 Determine the trigonometric functions of any angle, using technology
- A2.A.67 Justify the Pythagorean identities
- A2.A.68 Solve trigonometric equations for all values of the variable from 0° to 360°
- A2.A.69 Determine amplitude, period, frequency, and phase shift, given the graph or equation of a periodic function
- A2.A.70 Sketch and recognize one cycle of a function of the form $y = A\sin Bx$ or $y = A\cos Bx$
- A2.A.71 Sketch and recognize the graphs of the functions $y = \sec(x)$, $y = \csc(x)$, $y = \tan(x)$, and $y = \cot(x)$
- A2.A.72 Write the trigonometric function that is represented by a given periodic graph
- A2.A.73 Solve for an unknown side or angle, using the Law of Sines or the Law of Cosines
- A2.A.74 Determine the area of a triangle or a parallelogram, given the measure of two sides and the included angle
- A2.A.75 Determine the solution(s) from the SSA situation (ambiguous case)
- A2.A.76 Apply the angle sum and difference formulas for trigonometric functions
- A2.A.77 Apply the double-angle and half-angle formulas for trigonometric functions

Measurement Strand

Students will determine what can be measured and how, using appropriate methods and formulas.

Units of Measurement

- A2.M.1 Define radian measure
- A2.M.2 Convert between radian and degree measures

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

Collection of Data

A2.S.1 Understand the differences among various kinds of studies (e.g., survey, observation, controlled experiment)

A2.S.2 Determine factors which may affect the outcome of a survey

Students will collect, organize, display, and analyze data.

Organization and Display of Data

A2.S.3 Calculate measures of central tendency with group frequency distributions

A2.S.4 Calculate measures of dispersion (range, quartiles, interquartile range, standard deviation, variance) for both samples and populations

A2.S.5 Know and apply the characteristics of the normal distribution

Students will make predictions that are based upon data analysis.

Predictions from Data

A2.S.6 Determine from a scatter plot whether a linear, logarithmic, exponential, or power regression model is most appropriate

A2.S.7 Determine the function for the regression model, using appropriate technology, and use the regression function to interpolate and extrapolate from the data

A2.S.8 Interpret within the linear regression model the value of the correlation coefficient as a measure of the strength of the relationship

Students will understand and apply concepts of probability.

Probability

A2.S.9 Differentiate between situations requiring permutations and those requiring combinations

A2.S.10 Calculate the number of possible permutations of n items taken r at a time

A2.S.11 Calculate the number of possible combinations of n items taken r at a time

A2.S.12 Use permutations, combinations, and the Fundamental Principle of Counting to determine the number of elements in a sample space and a specific subset (event)

A2.S.13 Calculate theoretical probabilities, including geometric applications

A2.S.14 Calculate empirical probabilities

A2.S.15 Know and apply the binomial probability formula to events involving the terms exactly, at least, and at most

A2.S.16 Use the normal distribution as an approximation for binomial probabilities

