Essential Standard Extended Guide

Foundational Standards High School Mathematics

GUIDING INFORMATION

In response to requests from schools and districts for guidance on essential standards, committees of educators from around Idaho collaborated in the summer of 2024 to categorize mathematics standards into four groups:

- **Essential standards** are explicitly taught, assessed multiple times, and receive targeted interventions for students who have not yet reached proficiency.
- **Supporting standards** are taught to reinforce essential standards and may or may not be formally assessed.
- **Additional standards** extend learning and are incorporated as time allows within course units, with assessment being optional.
- **Mathematical Big Ideas** are overarching mathematical concepts that are central to the learning of mathematics and link numerous mathematical understandings into a coherent whole. They are difficult to assess.

This guidance helps LEAs prioritize the most critical standards, recognizing that not all standards are of equal importance. This document serves as a resource—not a mandate—to assist local efforts. Importantly, this work did not remove or revise any of the adopted Idaho Content Standards and is intended to refocus time and effort.

The *2022 Idaho Content Standards for Mathematics* list the standards for each grade level by domain and provide clarification statements and examples of individual standards. The *9-12 Course Planning Guide for High School Mathematics* categorizes high school mathematics standards into foundational, advanced and college standards. These foundational standards would typically be taught in the first and second years of high school mathematics instruction. This *Essential Standards Extended Guide* provides examples of how teachers can group standards for mathematics instruction. Appendix A provides planning templates for using these instructional groupings to plan instructional calendars and units.

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Instructional Grouping 1: Solving Equations and Inequalities

Mathematical Big Ideas:

- **N.RN.A. Extend the properties of exponents to rational exponents.**
- **N.RN.B. Use properties of rational and irrational numbers.**
- **A.REI.A. Understand solving equations as a process of reasoning and explain the reasoning.**
- **A.REI.B. Solve equations and inequalities in one variable.**
- **A.REI.D. Represent and solve equations and inequalities graphically.**
- **A.CED.A. Create equations that describe numbers or relationships.**
- **A.APR.A. Perform arithmetic operations on polynomials**

Teacher note: For the foundational standards, focus on linear and exponential functions. Other functions mentioned in the standards below may be prioritized in the advanced standards, depending on students' pathways.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.APR.A.1a. Perform operations on polynomial expressions (addition, subtraction, multiplication, division) and compare the system of polynomials to the system of integers when performing operations.
A.CED.A.1. Create one-variable equations and inequalities to solve problems, including linear, quadratic, rational, and exponential functions.
A.CED.A.2a. Define variables to represent the quantities and write equations to show the relationship.
A.CED.A.2b. Use graphs to show a visual representation of the relationship while adhering to appropriate labels and scales.
A.REI.A.1. Create one-variable equations and inequalities to solve problems, including linear, quadratic, rational, and exponential functions.
A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
N.RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
N.Q.A.1. 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.
N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.
A.SSE.A.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
Teacher note: Factoring quadratics can be introduced to all students at the foundational level with an emphasis on models such as algebra tiles and arrays. A.SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.
A.SSE.B.3c. Use the properties of exponents to transform expressions for exponential functions.
A.APR.A.1. Perform arithmetic operations on polynomials.
A.CED.A.5. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
A.REI.D.10. Demonstrate understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Show that any point on the graph of an equation in two variables is a solution to the equation.
F.IF.A.1. Demonstrate understanding that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range: If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
F.IF.A.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
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.
F.BF.A.1. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.
F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.IF.B.5. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.LE.A.1a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.LE.A.1b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.1c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F.LE.B.5. Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.
G.MG.A.4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.
S.ID.B.6. Represent data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.C.8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
N.RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
N.RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
N.RN.B.3. Explain why the sum or product of two rational numbers is rational; why the sum of a rational number and an irrational number is irrational; and why the product of a nonzero rational number and an irrational number is irrational.
A.SSE.B.3b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Instructional Grouping 2: Functions

Mathematical Big Ideas:

- **F.IF.A. Understand the concept of a function and use function notation.**

Teacher note: For the foundational standards, focus on linear and exponential functions. Other functions mentioned in the standards below may be prioritized in the advanced standards, depending on students' pathways.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
A.CED.A.2. Interpret the relationship between two or more quantities.
F.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.LE.A.1a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
F.LE.A.1b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.1c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
G.CO.A.6. Specify a sequence of transformations that will carry a given figure onto another.
S.ID.B.7a. Fit a linear function to data where a scatter plot suggests a linear relationship and use the fitted function to solve problems in the context of the data.

Instructional Grouping 3: Linear Functions

Mathematical Big Ideas:

- **A.SSE.A. Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions.**
- **F.BF.A. Build a function that models a relationship between two quantities.**
- **F.IF.B. Interpret functions that arise in applications in terms of the context. Include linear, quadratic, exponential, rational, polynomial, square root and cube root, trigonometric, and logarithmic functions.**
- **F.IF.C. Analyze functions using different representations.**
- **F.LE.B. Interpret expressions for functions in terms of the situation they model.**
- **S.ID.C. Interpret linear models.**

Teacher note: For the foundational standards, focus on linear and exponential functions. Other functions mentioned in the standards below may be prioritized in the advanced standards, depending on students' pathways.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context. ★
A.CED.A.1. Create one-variable equations and inequalities to solve problems, including linear, quadratic, rational, and exponential functions.
A.CED.A.2. Interpret the relationship between two or more quantities.
A.CED.A.2a. Define variables to represent the quantities and write equations to show the relationship.
A.CED.A.2b. Use graphs to show a visual representation of the relationship while adhering to appropriate labels and scales.
A.CED.A.3. Represent constraints using equations or inequalities and interpret solutions as viable or non-viable options in a modeling context.
F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior; and periodicity.
F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★
F.IF.C.7. Graph functions expressed symbolically and show key features of the graphs, by hand in simple cases and using technology for more complicated cases.★

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
F.BF.A.1. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.
F.LE.A.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table).★
S.ID.B.7. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
N.Q.A.1. 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.
N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.
A.REI.D.10. Demonstrate understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Show that any point on the graph of an equation in two variables is a solution to the equation.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.IF.A.1. Demonstrate understanding that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range: If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of ff is the graph of the equation $y = f(x)$.
F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
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.
F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.BF.A.1a. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.LE.A.1a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
F.LE.A.1b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.1c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F.LE.B.5. - Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.
S.ID.B.6. Represent data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data
S.ID.B.7. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
S.ID.B.7a. Fit a linear function to data where a scatter plot suggests a linear relationship and use the fitted function to solve problems in the context of the data
S.ID.C.8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Instructional Grouping 4: Exponential Functions

Mathematical Big Ideas:

- **A.SSE.A. Interpret the structure of linear, quadratic, exponential, polynomial, and rational expressions.**
- **F.BF.A. Build a function that models a relationship between two quantities.**
- **F.IF.B. Interpret functions that arise in applications in terms of the context. Include linear, quadratic, exponential, rational, polynomial, square root and cube root, trigonometric, and logarithmic functions.**
- **F.IF.C. Analyze functions using different representations.**
- **F.LE.A. Construct and compare linear, quadratic, and exponential models and solve problems.**
- **F.LE.B. Interpret expressions for functions in terms of the situation they model.**

Teacher note: For the foundational standards, focus on linear and exponential functions. Other functions mentioned in the standards below may be prioritized in the advanced standards, depending on students' pathways.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context.
A.CED.A.1. Create one-variable equations and inequalities to solve problems, including linear, quadratic, rational, and exponential functions.
A.CED.A.2. Interpret the relationship between two or more quantities.
A.CED.A.2a. Define variables to represent the quantities and write equations to show the relationship.
A.CED.A.2b. Use graphs to show a visual representation of the relationship while adhering to appropriate labels and scales.
A.CED.A.3. Represent constraints using equations or inequalities and interpret solutions as viable or non-viable options in a modeling context.
F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior; and periodicity.
F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

F.IF.C.7. Graph functions expressed symbolically and show key features of the graphs, by hand in simple cases and using technology for more complicated cases.★
F.BF.A.1. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.
F.LE.A.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table).★

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
N.Q.A.1. 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.
N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.
A.REI.D.10. Demonstrate understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Show that any point on the graph of an equation in two variables is a solution to the equation.
A.SSE.A.1a. Interpret parts of an expression, such as terms, factors, and coefficients.
F.IF.A.1. Demonstrate understanding that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range: If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of ff is the graph of the equation $y = f(x)$.
F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
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.
F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
F.BF.A.1. Write a function that describes a relationship between two quantities. Functions could include linear, exponential, quadratic, simple rational, radical, logarithmic, and trigonometric.
F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.LE.A.1a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.LE.A.1b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.1c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F.LE.B.5. Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.
G.MG.A.4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.
S.ID.B.6. Represent data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.C.8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Instructional Grouping 5: Systems of Equations

Mathematical Big Ideas:

- **A.REI.C Solve systems of equations.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context. ★
A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.APR.A.1. Demonstrate understanding that polynomials form a system analogous to the integers; namely, they are closed under certain operations.
A.CED.A.4. Represent constraints using systems of equations and/or inequalities and interpret solutions as viable or non-viable options in a modeling context.
A.REI.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
A.SSE.A.1a. Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.A.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
A.SSE.A.2. Use the structure of an expression to identify ways to rewrite it.
A.CED.A.5. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
A.REI.D.10. Demonstrate understanding that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Show that any point on the graph of an equation in two variables is a solution to the equation.
F.IF.A.1. Demonstrate understanding that a function is a correspondence from one set (called the domain) to another set (called the range) that assigns to each element of the domain exactly one element of the range: If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.LE.A.1a. Demonstrate that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
F.LE.B.5. Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.
G.GPE.B.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
G.MG.A.4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.
S.ID.C.8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
A.APR.A.1b. Factor and/or expand polynomial expressions, identify and combine like terms, and apply the distributive property.

Instructional Grouping 6: Statistics & Probability

Mathematical Big Ideas:

- **S.ID.A. Summarize, represent, and interpret data on a single count or measurement variable. Use calculators, spreadsheets, and other technology as appropriate.**
- **S.ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables**
- **S.IC.A. Understand and evaluate random processes underlying statistical studies. Use calculators, spreadsheets, and other technology as appropriate.**
- **S.CP.A Understand independence and conditional probability and use them to interpret data from simulations or experiments.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
S.ID.A.3. Compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different variables, using statistics appropriate to the shape of the distribution foreach measurement variable.★
S.ID.B.7. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
S.IC.A.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.★

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
F.LE.B.5. Interpret the parameters in a linear or exponential function (of the form $f(x) = b^x + k$) in terms of a context.
S.ID.A.1. Differentiate between count data and measurement variable.★
S.ID.A.2. Represent measurement data with plots on the real number line (dot plots, histograms, and box plots).★
S.ID.B.6. Represent data on two categorical variables on a clustered bar chart and describe how the variables are related. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.C.8. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.★

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
S.ID.C.10. Distinguish between (linear) correlation and causation.★

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
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”).★

Instructional Grouping 7: Similarity and Congruence

Mathematical Big Ideas:

- **G.CO.A Experiment with transformations in the plane.**
- **G.CO.B Understand congruence in terms of rigid motions.**
- **G.SRT.A Understand similarity in terms of similarity transformations.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
G.CO.B.7. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
G.SRT.A.2. Use the definition of similarity to decide if two given figures are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
G.SRT.C.7. Explain and use the relationship between the sine and cosine of complementary angles.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
G.CO.A.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G.CO.A.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.A.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.CO.A.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
G.CO.A.6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
G.CO.B.8. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G.CO.B.9. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
G.SRT.A.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.SRT.C.6. Demonstrate understanding that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
G.SRT.A.1. Verify experimentally the properties of dilations given by a center and a scale factor.
G.SRT.A.1a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
G.SRT.A.1b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.GPE.B.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Instructional Grouping 8: Trigonometry

Mathematical Big Ideas:

- **G.SRT.C Define trigonometric ratios and solve problems involving right triangles.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
G.SRT.C. Define trigonometric ratios and solve problems involving right triangles.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
G.SRT.A.2. Use the definition of similarity to decide if two given figures are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
G.SRT.B.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
G.SRT.C.6. Demonstrate understanding that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.GPE.B.4. Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). ★
G.GPE.B.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
G.SRT.A.1. Verify experimentally the properties of dilations given by a center and a scale factor:
G.SRT.A.1a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
G.SRT.A.1b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.GPE.B.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Instructional Grouping 9: Geometric Modeling

Mathematical Big Ideas:

- **N.Q.A. Reason quantitatively and use units to solve problems.**
- **G.GMD.A Explain volume formulas and use them to solve problems.**
- **G.MG.A Apply geometric concepts in modeling situations.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
G.GMD.A.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
N.Q.A.1. 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.
N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.
G.GMD.A.1. Give an informal argument for the formulas for the circumference of a circle; area of a circle; volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
G.MG.A.1. Use geometric shapes, their measures, and their properties to describe objects.★
G.MG.A.2. Apply concepts of density based on area and volume in modeling situations.★
G.MG.A.3. Apply geometric methods to solve design problems.★

Additional Instructional Grouping 10: Geometric Constructions

Teacher Note: This Additional Standards Instructional Grouping will support the learning of essential standards in advanced mathematics courses. It can be included as time allows and may or may not be formally assessed. It is beneficial to introduce all students to this topic.

Mathematical Big Ideas:

- **G.CO.D. Make geometric constructions.**

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
G.CO.A.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
G.CO.D.13. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.) Constructions include: copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.CO.D.14. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Additional Instructional Grouping 11: Geometric Proofs

Teacher Note: This Additional Standards Instructional Grouping will support the learning of essential standards in advanced mathematics courses. It can be included as time allows and may or may not be formally assessed. It is beneficial to introduce all students to this topic.

Mathematical Big Ideas:

- **G.C.A. Understand and apply theorems about circles.**
- **G.CO.C. Prove geometric theorems and, when appropriate, the converse of theorems.**
- **G.SRT.B. Prove theorems involving similarity.**
- **G.GPE.B. Use coordinates to prove simple geometric theorems algebraically.**

Additional Standards Standards that deepen learning and may be included as time allows throughout course units of study and may or may not be assessed.
G.CO.C.10. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent, and conversely prove lines are parallel; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.CO.C.11. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent, and conversely prove a triangle is isosceles; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.CO.C.12. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.
G.CO.C.12a. Prove theorems about polygons. Theorems include: the measures of interior and exterior angles; apply properties of polygons to the solutions of mathematical and contextual problems.
G.C.A.2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

Appendix A: Planning Templates

Instructional Calendar Template

Use this template to sequence your instructional units onto a Year At-A-Glance calendar. This template can be adapted to show semesters or trimesters.

Month	Instructional Grouping
August	
September	
October	
November	
December	
January	
February	
March	
April	
May	

Unit Planning Template

Use this template to plan and collaborate around an instructional grouping. This template facilitates identifying curricular and assessment resources to teach and assess the content in one instructional grouping.

Instructional Grouping #:	**Unit Topic:**
Time Allotment: *How many instructional days do you plan to spend on this topic?*	
Learning Activities: *What common lessons will we teach from our curricular resources?*	
Common Assessments: *What common assessments will we give?* *Consider IAB and FIAB assessments in the ISAT portal if appropriate and common teacher created assessments.*	
Team Collaboration Notes: *What did we learn about teaching this topic from analyzing our student work samples?* *What intervention do we need to do on essential standards? Who is ready for learning additional standards?*	