Essential Standards Extended Guide

Grade 8 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. 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: Properties of Numbers

Mathematical Big Ideas:

- **△ 8.NS.A. Know that there are numbers that are not rational and approximate them by rational numbers.**
- **☐ 8.EE.A. Work with radicals and integer exponents.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions.
8.EE.A.2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. *Teacher Note: Students first need to understand the difference between rational and irrational numbers to identify √2 as irrational, which is standard 8.NS.A.1.*
8.EE.A.3. Use numbers expressed in the form of a single digit multiplied by an integer power of ten (scientific notation) to estimate very large or very small quantities, and express how many times as much one is than the other.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.EE.A.4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology. *Teacher Note: this standard can also be taught in science. This and 8.EE.A.3 are is the only math standards related to scientific notation*.

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.
8.NS.A.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
8.NS.A.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

Instructional Grouping 2: Introduction to Linear Equations

Mathematical Big Ideas:

- ☐ **8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.EE.C.7. Solve linear equations in one variable.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.EE.C.7a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$ (1 solution), $a = a$ (infinitely many solutions), or $a = b$ (no solution) results (where a and b are different numbers
8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
8.EE.C.8c. Solve real-world and mathematical problems leading to two linear equations in two variables.

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.
8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.
8.EE.C.8a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously
8.EE.C.8b. Solve systems of two linear equations in two variables algebraically (including but not limited to using substitution and elimination strategies), and estimate solutions by graphing the equations; solve simple cases by inspection.

Instructional Grouping 3: Application of Linear Equations

Mathematical Big Ideas:

- ☐ **8.EE.B. Understand the connections between proportional relationships, lines, and linear equations.**

Teacher Note: This instructional grouping is a critical grouping for future success in high school mathematics. Focus on deepening student understanding of features of linear relationships, not whether a relation is a function. Extended function understanding will become a larger focus in high school.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.EE.B.6. Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
8.F.A.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *Teacher Note: This standard is central to the understanding of the application of linear equations. Students will develop deeper understanding of this concept through working with function concepts in the "Introduction to Functions" Instructional Grouping.*
8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

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.
8.EE.B.6. Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

Instructional Grouping 4: Introduction to Functions

Mathematical Big Ideas:

- ☐ **8.F.A. Define, evaluate, and compare functions..**
- ☐ **8.F.B. Use functions to model relationships between quantities.**

Teacher Note: This instructional grouping is a critical grouping for future success in high school mathematics. Focus on deepening student understanding of features of linear relationships, not whether a relation is a function. Extended function understanding will become a larger focus in high school.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.F.A.2. 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.
8.F.A.1. Understand that a function is a rule that assigns to each input exactly one output and that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
8.F.A.3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
8.SP.A.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

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.
8.F.B.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.F.B.5. Describe qualitatively the functional relationship between two quantities by analyzing and sketching a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Instructional Grouping 4: Patterns in Data

Mathematical Big Ideas:

- △ **8.SP.A. Investigate patterns of association in bivariate data.**

Teacher Note: These concepts are best understood when integrated into other instructional groupings to reinforce the application of mathematics in real-world problems.

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.SP.A.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.A.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.SP.A.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

Instructional Grouping 6: Congruence and Similarity

Mathematical Big Ideas:

- ☐ **8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.**
- ○ **8.G.C Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.
8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are transformed to lines, and line segments to line segments of the same length. b. Angles are transformed to angles of the same measure. c. Parallel lines are transformed to parallel lines.
8.G.A.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

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.
8.EE.B.6. Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.
8.G.A.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Instructional Grouping 7: Pythagorean Theorem

Mathematical Big Ideas:

- ☐ **8.G.B. Understand and apply the Pythagorean Theorem**

Essential Standards Standards to be explicitly taught, assessed more than once, and intervened upon.
8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Supporting Standards Standards that support the learning of essential standards and may or may not be formally assessed.
8.G.B.6. Analyze and justify the Pythagorean Theorem and its converse using pictures, diagrams, narratives, or models.

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?*