8th grade Mathematics Considerations from Achieve the Core/CCSSO

2020–21 Priority Instructional Content in English Language Arts/Literacy and Mathematics

Grade 8 Mathematics Priority Instructional Content for the 2020–21 School Year

The Mathematics Priority Instructional Content for the 2020–21 School Year (Mathematics Instructional Priorities) is designed to support decisions about how to elevate some of the most important mathematics at each grade level in the coming school year while reducing time and intensity for topics that are less integral to the overall coherence of college- and career-ready standards.

At each grade level from kindergarten through grade 8, the Mathematics Instructional Priorities name the grade-level mathematics that is of highest priority at each grade; provide a framework for strategically drawing in prior grade-level content that has been identified as essential for supporting students' engagement with the most important grade-level work; and suggest ways to reduce or sometimes eliminate topics in a way that minimizes the impact to overall coherence. In using this guidance, decision makers should thoughtfully consider in their unique context the likely implications of the spring 2020 disruption as decisions are made to select supports to ensure that students are able to successfully engage with the grade-level content. Decision makers should also bear in mind that while this document articulates content priorities, elevating the Standards for Mathematical Practice in connection with grade-level content is always a priority.

At each grade level, recommendations are provided for facilitating social, emotional, and academic development (SEAD) in mathematics. These recommendations stress themes of discourse, belonging, agency and identity and can either be applied across grades (even if only listed in one) or they can be modified to fit different grades. These themes of discourse, belonging, agency, and identity are integral to the Standards of Mathematical Practice and the language in the recommendations reflects this connection.

The 2020–21 school year presents a unique set of opportunities and challenges due to the disruption to instruction in spring 2020 as well as the uncertainty associated with the 2020–2021 school year. The Mathematics Instructional Priorities are provided in response to these conditions. They are not criteria, and they do not revise the standards. Rather, they are potential ways, and not the only ways possible, to help students engage deeply with grade-level mathematics in the 2020–21 school year.

The Mathematics Instructional Priorities do not stand alone but are to be used in conjunction with college- and career-ready standards. One reason for this is that codes such as 8.EE.A must be traced back to the standards in order to see the language to which they refer. The Mathematics Instructional Priorities do not reiterate what the standards already say—even in cases where the specific language of a standard is fundamentally important to a high-quality aligned curriculum. Nor do the Mathematics Instructional Priorities mention every opportunity the standards afford to make coherent connections within a grade or between one grade and another—again, even when those connections are fundamentally important and are the basis for the guidance given. Therefore the Mathematics Instructional Priorities will be used most powerfully in cross-grade collaboration among educators who know the standards well and can use existing resources such as the *Progressions* documents and other resources listed in the Appendix.

While the grade-level guidance isn't specific to any math program or set of programs, an examination of a selection of curriculum scope and sequence documents informed the recommendations, especially recommendations about when and how to integrate prior-grade concepts into the current grade. The guidance does not list all possible prior-grade content relevant to the current grade, but instead concentrates the recommendations on the most critical prior-grade connections, with greater emphasis on that content which was likely taught during the last third of the 2019-20 school year based on the scope and sequence analysis.

Where to focus Grade 8 Mathematics?

College- and career-ready mathematics standards have important emphases at each grade level, which for grade 8 are highlighted in this Focus Document. The considerations for the 2020-21 school year that follow are intended to be a companion to the Focus Document. Users should have both documents in hand, as well as a copy of grade-level standards, when considering these recommendations.

For the 2020-21 school year, prioritization of grade-level mathematical concepts combined with some incorporation of prior-grade knowledge and skills will be essential to support all students in meeting grade-level expectations. For these unique times, Student Achievement Partners has developed additional guidance above and beyond what is communicated through the major work designations. As described at greater length on the previous page, the following tables:

- Name priority instructional content at each grade;
- Provide considerations for addressing grade-level content in a coherent way;
- Articulate selected content from the prior grade that may be needed to support students in fully engaging with grade-level mathematics;
- Suggest where adaptations can be made to allow for additional time on the most important topics; and
- Provide suggestions for ways to promote social, emotional, and academic development (SEAD) in grade-level mathematics learning, often through the Standards for Mathematical Practice.

The considerations repeatedly use several verbs, such as *combine*, *integrate*, etc. The verbs most commonly used in the considerations are italicized below and defined in a glossary in the Appendix. Note that content is designated at the cluster level when the guidance refers to the cluster and its standards, and at the standard level in cases where guidance varies within a cluster.

Considerations for Addressing PRIORITY Grade-Level Content	
The clusters and standards listed in this table name the priority instructional content for grade 8. The right-hand column contains approaches to shifting how time is dedicated to the clusters and standards in the left-hand column.	
Clusters/Standards	**Considerations**
8.EE.A.1	No special considerations for curricula well aligned to the work of integer exponents, as detailed by the standard. Time spent on instruction and practice should NOT be reduced.
8.EE.A.2	*Eliminate* lessons and problems about cube roots.
8.EE.B	No special considerations for curricula well aligned to the work of understanding the connections between proportional relationships, lines, and linear equations, as detailed by the cluster. Time spent on instruction and practice should NOT be reduced.
8.EE.C.7	*Incorporate* students' work on rewriting expressions (7.EE.A) and solving algebraic equations (7.EE.B.4) to support students in analyzing and solving one-variable linear equations.
8.EE.C.8	*Emphasize* the correspondences among: (1) a solution to a pair of simultaneous two-variable equations, (2) a point of intersection of the corresponding lines, and (3) the real-world context for which the equations were created. *Limit* the amount of required student practice in solving systems algebraically.
8.F.A 8.F.B	No special considerations for curricula well aligned to the domain of Functions, as detailed in the clusters and standards within the domain. Time spent on instruction and practice should NOT be reduced.

8.G.B	No special considerations for curricula well aligned to applying the Pythagorean Theorem to solve real-world and mathematical problems (as detailed by standard 8.G.B.7). Time spent on instruction and practice should NOT be reduced. *Eliminate* lessons and problems dedicated to applying the Pythagorean Theorem to find the distance between two points in a coordinate system. *Eliminate* lessons and problems that require students to develop and/or explain a proof of the Pythagorean Theorem (8.G.B.6). Lessons should present a proof of the theorem to students. *Eliminate* lessons about the converse of the Pythagorean Theorem.

Considerations for Addressing REMAINING Grade-Level Content	
The clusters and standards listed in this table represent the remainder of grade 8 grade-level content. The right-hand column contains approaches to shifting how time is dedicated to the clusters and standards in the left-hand column.	
Clusters/Standards	**Considerations**
8.NS.A	*Integrate* irrational numbers with students' work on square roots (8.EE.A.2) and the Pythagorean Theorem (8.G.B.7).
8.EE.A.3* 8.EE.A.4*	*Eliminate* lessons and practice dedicated to calculating with scientific notation, but include examples of numbers expressed in scientific notation in lessons about integer exponents, as examples of how integer exponents are applicable outside of mathematics classes (8.EE.A.1).
8.G.A*	*Combine* lessons to address key concepts in congruence and *combine* lessons to address key concepts in similarity of two-dimensional figures in order to reduce the amount of time on this topic.
8.G.C	*Combine* lessons to address key concepts with volume, with an emphasis on cylinders, in order to reduce the amount of time on this topic.
8.SP.A	*Emphasize* using linear functions to model association in bivariate measurement data that suggest a linear association, using the functions to answer questions about the data (8.SP.A.3). *Combine* lessons for 8.SP.A.1, 2, and 4 to address key statistical concepts in order to reduce the amount of time on this topic. *Limit* the amount of required student practice.

**While these standards or clusters are Major Work of the Grade, during the 2020–21 school year, it is recommended that they receive lighter treatment in favor of other priority instructional content.*

Facilitate Social, Emotional, and Academic Development (SEAD)[17] Through Grade-Level Content	
The left-hand column contains sample actions for how SEAD can be effectively integrated into grade-level mathematics instruction, in connection with Standards for Mathematical Practice named in the right-hand column. Efforts should be made to facilitate SEAD even in remote learning environments, using synchronous and asynchronous approaches and the capabilities afforded by remote learning technologies.	
Sample Actions	**Connection to Standards for Mathematical Practice (SMP)**
Promote student engagement and identity by embedding systems and routines such as "stronger and clearer each time" or other routines that allow students to engage in productive struggle and take ownership in their progress and growth toward intended learning outcomes.	MP3: Construct viable arguments and critique the reasoning of others.
Enhance students' mathematical agency by including regular collaborative opportunities for students to work together with others as a team on modeling tasks that provide multiple pathways for success and that require reasoning and problem solving.	MP4: Model with mathematics.
Provide opportunities for students to consider tools they may use to solve a problem and justify their appropriateness. For example, they may choose to graph a function defined by expressions to picture the way one quantity depends on the other or use graphing technology to approximate solutions to system of equations	MP5: Use appropriate tools strategically.

[17] Sample SEAD actions contribute to students' sense of belonging and safety, efficacy, value for effort and growth, as well as a sense of engagement in work that is relevant and culturally responsive. The actions can be modified to fit any grade, K–8, by considering the content of that grade level. See other grade-level Mathematics Instructional Priorities documents for additional samples.

8th Grade Math Important Prerequisites

Prerequisite Standard Address before or within grade-level instruction	Grade-Level Standard Major Supporting Additional	Standard Language	Instructional Time Preserve or reduce time in 20-21 as compared to a typical year, per SAP guidance
	8.EE.A.1 *Procedural*	Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	
	8.EE.A.2 *Conceptual, Procedural*	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 sqrt(2) is irrational.	*Eliminate lessons and problems about cube roots.*
	8.EE.A.3 *Conceptual, Application*	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as* 3×10^8 *and the population of the world as* 7×10^9*, and determine that the world population is more than 20 times larger.*	*Eliminate lessons and practice dedicated to calculating with scientific notation, but include examples of numbers expressed in scientific notation in lessons about integer exponents, as examples of how integer exponents are applicable outside of mathematics classes (8.EE.A.1).*
7.EE.B.3	8.EE.A.4 *Conceptual, Procedural*	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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	
7.RP.A.1, 7.RP.A.2a-d	8.EE.B.5 *Conceptual, Application*	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	
7.G.A.1, 7.RP.A.1, 7.RP.A.2a-d	8.EE.B.6 *Conceptual, Procedural*	Use similar triangles to explain why the slope m 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.EE.C.7 *Procedural*	Solve linear equations in one variable.	

7.EE.A.1, 7.NS.A.1a-d, 7.NS.A.2a-d	■8.EE.C.7a *Conceptual*	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, a = a, or a = b results (where a and b are different numbers).	
	■8.EE.C.7b *Procedural*	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	
7.EE.B.4a	■8.EE.C.8 *Conceptual, Procedural*	Analyze and solve pairs of simultaneous linear equations.	
	■8.EE.C.8a *Conceptual*	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 *Conceptual, Procedural*	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*	*Limit the amount of required student practice in solving systems algebraically.*
	■8.EE.C.8c *Procedural, Application*	Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*	
	■8.F.A.1 *Conceptual*	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	
	■8.F.A.2 *Conceptual*	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	
	■8.F.A.3 *Conceptual*	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. *For example, the function A = s^2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*	
	■8.F.B.4 *Conceptual, Application*	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 *Conceptual, Application*	Describe qualitatively the functional relationship between two quantities by analyzing 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.	

	8.G.A.1 *Conceptual, Application*	Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	*Combine lessons to address key concepts in congruence and combine lessons to address key concepts in similarity of two-dimensional figures in order to reduce the amount of time on this topic.*
	8.G.A.1a *Conceptual*	Lines are taken to lines, and line segments to line segments of the same length.	
	8.G.A.1b *Conceptual*	Angles are taken to angles of the same measure.	
	8.G.A.1c *Conceptual*	Parallel lines are taken to parallel lines.	
	8.G.A.2 *Conceptual*	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; given two congruent figures, describe a sequence that exhibits the congruence between them.	
	8.G.A.3 *Conceptual*	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	
	8.G.A.4 *Conceptual*	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; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	
7.G.B.5	8.G.A.5 *Conceptual*	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. For *example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	
	8.G.B.6 *Conceptual*	Explain a proof of the Pythagorean Theorem and its converse.	
7.G.B.6	8.G.B.7 *Procedural, Application*	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 *Procedural, Application*	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	*Eliminate lessons and problems dedicated to applying the Pythagorean Theorem to find the distance between two points in a coordinate system.*
7.G.B.4, 7.G.B.6	8.G.C.9 *Conceptual, Procedural, Application*	Know the formulas for the volume of cones, cylinders, and spheres and use them to solve real world and mathematical problems.	*Combine lessons to address key concepts with volume, with an emphasis on cylinders, in order to reduce the*

			amount of time on this topic.
7.NS.A.1a-d, 7.NS.A.2a-d	8.NS.A.1 *Conceptual, Procedural*	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.	*Integrate irrational numbers with students' work on square roots (8.EE.A.2) and the Pythagorean Theorem (8.G.B.7).*
	8.NS.A.2 *Conceptual*	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 (e.g., pi^2). *For example, by truncating the decimal expansion of sqrt(2), show that sqrt(2) is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*	
	8.SP.A.1 *Conceptual, Application*	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.	*Combine lessons for 8.SP.A.1, 2, and 4 to address key statistical concepts in order to reduce the amount of time on this topic. Limit the amount of required student practice.*
	8.SP.A.2 *Conceptual, Application*	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 *Application*	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*	*Emphasize using linear functions to model association in bivariate measurement data that suggest a linear association, using the functions to answer questions about the data.*
	8.SP.A.4 *Conceptual, Application*	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. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*	*Combine lessons for 8.SP.A.1, 2, and 4 to address key statistical concepts in order to reduce the amount of time on this topic. Limit the amount of required student practice.*

- **What should we make of standards that have an important prerequisite that needs to be addressed, but a reduction in instructional time is also recommended?** These considerations should be weighed together, along with the needs of your group of students. For example, the time spent on a standard might be reduced from five days to three days by de-emphasizing one part of the standard, but prior-grade needs might be addressed within the first lesson through strategic choice of tasks.

Category	Meaning	Example	Actions to take
Address **before** grade-level instruction	Without this prior knowledge, students most likely do not have a way to access the grade-level standard.	A 7th-grader who has not learned how to divide positive fractions (6.NS.A.1) needs to build that understanding before beginning to divide negative fractions (7.NS.A.2c).	Students may require **dedicated instruction** on prerequisite standards before the grade level instruction is taught. (Not every standard needs its own full lesson; multiple standards may be addressed at once, or a standard might be taught as a short mini-lesson.)
Address **within** grade-level instruction	Students will have an entry point into grade-level content, but will benefit from instruction that weaves in this prior-grade content.	A 4th-grader who struggles with recalling multiplication facts (3.OA.C.7) can still access grade-level, multi-step application problems (4.OA.A.3) when given a multiplication table, but will need small doses of continued support to attain fluency.	**Individual tasks or strategies** from these standards can be incorporated into grade-level lessons to address important content that was missed in the prior grade.

See Complete K-8 Documents here:

2020–21 Priority Instructional Content from Achieve the Core
https://achievethecore.org/content/upload/2020%E2%80%9321%20Priority%20Instructional%20Content%20in%20ELA%20Literacy%20and%20Mathematics_June%202020.pdf

Math Important prerequisite skills list from CCSSO:
https://docs.google.com/document/d/1mcApF1n7sPI7Xsrlx29Ab_tmAAvne4A-VuJKSWb_qSg/edit