Common Core Georgia Performance Standards CCGPS

Mathematics

Comprehensive Course Guide

CCGPS 8th Grade

Dr. John D. Barge, State School Superintendent
"Making Education Work for All Georgians"

The contents of this guide were developed under a grant from the U. S. Department of Education. However, those contents do not necessarily represent the policy of the U. S. Department of Education, and you should not assume endorsement by the Federal Government.

The Course Guides are designed to provide teachers with clarification of CCGPS Mathematics, grounded in GPS language when appropriate. The resource documents provided reflect teacher input from the original implementation, unit writers and resource revision team. We deeply appreciate the efforts of those who provided comments, feedback, and time during the resource revision process.

Mathematics | Grade 8

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem. Descriptions of the three critical areas follow:

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

(2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

(3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Implementation: 2013-2014

Teach CCGPS

The Number System 8.NS

Know that there are numbers that are not rational, and approximate them by rational numbers.

MCC8.NS.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.

MCC8.NS.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 (e.g., π^2). *For example, by truncating the decimal expansion of √2 (square root of 2), show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Expressions and Equations 8.EE

Work with radicals and integer exponents.

MCC8.EE.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{(-5)} = 3^{(-3)} = 1/(3^3) = 1/27$.*

MCC8.EE.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.

MCC8.EE.3. 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.*

MCC8.EE.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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Understand the connections between proportional relationships, lines, and linear equations.

MCC8.EE.5. 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.*

MCC8.EE.6. 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.

Analyze and solve linear equations and pairs of simultaneous linear equations.

MCC8.EE.7. Solve linear equations in one variable.

MCC8.EE.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 $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

MCC8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

MCC8.EE.8. Analyze and solve pairs of simultaneous linear equations.

MCC8.EE.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.

MCC8.EE.8b 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.*

- Solve systems of equations graphically and algebraically, using technology as appropriate

MCC8.EE.8c 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.*

Functions 8.F

Define, evaluate, and compare functions.

MCC8.F.1. 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.

MCC8.F.2. 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.*

MCC8.F.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. *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.*

Use functions to model relationships between quantities.

MCC8.F.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.

MCC8.F.5. 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.

Geometry 8.G

Understand congruence and similarity using physical models, transparencies, or geometry software.

MCC8.G.1. 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.

MCC8.G.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; given two congruent figures, describe a sequence that exhibits the congruence between them.

MCC8.G.3. Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

- Given a figure in the coordinate plane, determine the coordinates resulting from a translation, dilation, rotation, or reflection

MCC8.G.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; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

MCC8.G.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. *For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.*

Understand and apply the Pythagorean Theorem.

MCC8.G.6. Explain a proof of the Pythagorean Theorem and its converse.

MCC8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

MCC8.G.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

MCC8.G.9. Know the formulas for the volume of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability 8.SP

Investigate patterns of association in bivariate data.

MCC8.SP.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.

MCC8.SP.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.

MCC8.SP.3. 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.***

MCC8.SP.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. ***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?***

Mathematics | Standards for Mathematical Practice

Mathematical Practices are listed with each grade's mathematical content standards to reflect the need to connect the mathematical practices to mathematical content in instruction.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1 Make sense of problems and persevere in solving them.
In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

2 Reason abstractly and quantitatively.
In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3 Construct viable arguments and critique the reasoning of others.
In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.

4 Model with mathematics.
In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical

representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5 Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6 Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7 Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

8 Look for and express regularity in repeated reasoning.
In grade 8, students use repeated reasoning to understand algorithms and make generalizations about patterns. Students use iterative processes to determine more precise rational approximations for irrational numbers. During multiple opportunities to solve and model problems, they notice that the slope of a line and rate of change are the same value. Students flexibly make connections between covariance, rates, and representations showing the relationships between quantities.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content
The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

CLASSROOM ROUTINES

The importance of continuing the established classroom routines cannot be overstated. Daily routines must include such obvious activities as estimating, analyzing data, describing patterns, and answering daily questions. They should also include less obvious routines, such as how to select materials, how to use materials in a productive manner, how to put materials away, how to access classroom technology such as computers and calculators. An additional routine is to allow plenty of time for children to explore new materials before attempting any directed activity with these new materials. The regular use of routines is important to the development of students' number sense, flexibility, fluency, collaborative skills and communication. These routines contribute to a rich, hands-on standards based classroom and will support students' performances on the tasks in this unit and throughout the school year.

STRATEGIES FOR TEACHING AND LEARNING

- Students should be actively engaged by developing their own understanding.
- Mathematics should be represented in as many ways as possible by using graphs, tables, pictures, symbols and words.
- Interdisciplinary and cross curricular strategies should be used to reinforce and extend the learning activities.
- Appropriate manipulatives and technology should be used to enhance student learning.
- Students should be given opportunities to revise their work based on teacher feedback, peer feedback, and metacognition which includes self-assessment and reflection.
- Students should write about the mathematical ideas and concepts they are learning.
- Consideration of all students should be made during the planning and instruction of this unit. Teachers need to consider the following:
  - What level of support do my struggling students need in order to be successful with this unit?
  - In what way can I deepen the understanding of those students who are competent in this unit?
  - What real life connections can I make that will help my students utilize the skills practiced in this unit?

TYPES OF TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all eighth grade students. These tasks, or tasks of similar depth and rigor, should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them. While some tasks are identified as a performance task, they may also be used for teaching and learning (learning/scaffolding task).

Scaffolding Task	Tasks that build up to the learning task.
Learning Task	Constructing understanding through deep/rich contextualized problem solving tasks.
Practice Task	Tasks that provide students opportunities to practice skills and concepts.
Performance Task	Tasks which may be a formative or summative assessment that checks for student understanding/misunderstanding and or progress toward the standard/learning goals at different points during a unit of instruction.
Culminating Task	Designed to require students to use several concepts learned during the unit to answer a new or unique situation. Allows students to give evidence of their own understanding toward the mastery of the standard and requires them to extend their chain of mathematical reasoning.
Achieve CCSS- CTE	Designed to demonstrate how the Common Core and Career and Technical

Classroom Tasks	Education knowledge and skills can be integrated. The tasks provide teachers with realistic applications that combine mathematics and CTE content.
Short Cycle Task	Designed to exemplify the performance targets that the standards imply. The tasks, with the associated guidance, equip teachers to monitor overall progress in their students' mathematics.
Formative Assessment Lesson (FAL)	Lessons that support teachers in formative assessment which both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards.

FORMATIVE ASSESSMENTS LESSONS (FALs) OVERVIEW

What is a Formative Assessment Lesson (FAL)? The Formative Assessment Lesson is designed to be part of an instructional unit typically implemented approximately two-thirds of the way through the instructional unit. The results of the tasks should then be used to **inform** the instruction that will take place for the remainder of the unit.

Formative Assessment Lessons are intended to support teachers in formative assessment. They both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards. They assess students' understanding of important concepts and problem solving performance, and help teachers and their students to work effectively together to move each student's mathematical reasoning forward.

What does a Formative Assessment Lesson look like in action? Videos of Georgia Teachers implementing FALs can be accessed HERE and a sample of a FAL lesson may be seen HERE

Where can I find more information on FALs? More information on types of Formative Assessment Lessons, their use, and their implementation may be found on the Math Assessment Project's guide for teachers.

Where can I find samples of FALs?

Formative Assessment Lessons can also be found at the following sites:
Mathematics Assessment Project
Kenton County Math Design Collaborative
MARS Tasks by grade level

A **sample FAL** with extensive dialog and suggestions for teachers may be found HERE. This resource will help teachers understand the flow and purpose of a FAL.

Where can I find more training on the use of FALs? The Math Assessment Project has developed Professional Development Modules that are designed to help teachers with the practical and pedagogical challenges presented by these lessons.

Module 1 introduces the model of *formative assessment* used in the lessons, its theoretical background and practical implementation. Modules 2 & 3 look at the two types of *Classroom Challenges* in detail. Modules 4 & 5 explore two crucial pedagogical features of the lessons: asking probing questions and collaborative learning.

All of our Georgia RESAs have had a math specialist trained to provide instruction on the use of formative assessment lessons in the classroom. The request should be made through the teacher's local RESA and can be referenced by asking for more information on the Mathematics Design Collaborative (MDC).
Also, if done properly, these lessons should take about 120-150 minutes, 2-3 classroom periods.

Sources of Information: Vicki Mixon, Former MDC (Math Design Collaborative) trainer, http://www.reneeyates2math.com/ and from The Mathematics Assessment Project and http://melissatabor.wikispaces.com/Formative+Assessment+Lessons+%28FALs%29

INTERNET RESOURCES

WEBINAR INFORMATION

Several webinars are available to support your instruction of Coordinate Algebra. All webinars may be accessed via https://www.georgiastandards.org/Common-Core/Pages/default.aspx. Each of the CCGPS two-hour professional learning grade level/course overviews is available for archived viewing at the original broadcast link http://www.gpb.org/education/common-core and includes closed captioning. You can also choose to access the GPB links, along with resource packets, and presentation slides from the GeorgiaStandards.org Common Core GPS Professional Learning Session landing page. Unit by Unit CCGPS Professional Learning WEBINARS and recordings of archived WEBINARS may be accessed at Mathematics CCGPS landing page. Follow up webinars are slated for the 2013-14 school year to address focus areas for each unit.

GENERAL RESOURCES

Mathematics in Movies
http://www.math.harvard.edu/~knill/mathmovies/
Short movie clips related to a variety of math topics.

Mathematical Fiction
http://kasmana.people.cofc.edu/MATHFICT/browse.php
Plays, short stories, comic books and novels dealing with math.

The Shodor Educational Foundation
http://www.shodor.org/interactivate/lessons/byAudience/
This website has extensive notes, lesson plans and applets aligned with the standards.

NEA Portal Arkansas Video Lessons on-line
http://neaportal.k12.ar.us/index.php/9th-12th-grades-mathematics/
The NEA portal has short videos aligned to each standard. This resource may be very helpful for students who need review at home.

Learnzillion
http://learnzillion.com/common_core/math/hs
This is another good resource for parents and students who need a refresher on topics.

Math Words
http://www.mathwords.com/
This is a good reference for math terms.

National Library of Virtual Manipulatives
http://nlvm.usu.edu/en/nav/vlibrary.html
Java must be enabled for this applet to run. This website has a wealth of virtual manipulatives helpful for use in presentation. Listed by domain.

Geogebra Download
http://www.geogebra.org/cms/download
Free software similar to Geometer's Sketchpad. This program has applications for algebra, geometry & statistics.

Utah Resources
http://www.uen.org/core/core.do?courseNum=5600
Although the state of Utah followed an integrated approach in their adoption of CCGPS, many of their resources are applicable.

RESOURCES FOR PROBLEM-BASED LEARNING

Dan Meyer's Website http://blog.mrmeyer.com/
Dan Meyer has created many problem-based learning tasks. The tasks have great hooks for the students and are aligned to the standards in this spreadsheet:

Andrew Stadel
https://docs.google.com/spreadsheet/ccc?key=0AkLk45wwjYBudG9LeXRad0lHM0E0VFRyOEtRckVvM1E#gid=0
Andrew Stadel has created many problem-based learning tasks using the same format as Dan Meyer.

Robert Palinsky
Robert Palinsky has created many tasks that engage students with real life situations.
http://robertkaplinsky.com/lessons/

Geoff Krall's Emergent Math
http://emergentmath.com/my-problem-based-curriculum-maps/
Geoff Krall has created a curriculum map structured around problem-based learning tasks.

ASSESSMENT RESOURCES AND INSTRUCTIONAL SUPPORT RESOURCES

The resource sites listed below are designed to support the instructional and assessment needs of teachers. All BLUE links will direct teachers to the site mentioned.

- CCGPS Frameworks are "models of instruction" designed to support teachers in the implementation of the Common Core Georgia Performance Standards (CCGPS). The Georgia Department of Education, Office of Standards, Instruction, and Assessment has provided an example of the Curriculum Map for each grade level and examples of Frameworks aligned with the CCGPS to illustrate what can be implemented within the grade level. School systems and teachers are free to use these models as is; modify them to better serve classroom needs; or create their own curriculum maps, units and tasks.
- The Teacher Resource Link (TRL) is an application that delivers vetted and aligned digital resources to Georgia's teachers. TRL is accessible via the GaDOE "tunnel" in conjunction with SLDS using the single sign-on process. The content is aligned to Common Core Georgia Performance Standards, Georgia Performance Standards, and National Education Technology Standards and pushed to teachers based on course schedule.
- Georgia Virtual School content available on our Shared Resources Website is available for anyone to view. Courses are divided into modules and are aligned with the Georgia Performance Standards.
- Georgia Online Assessment System (OAS) Teachers can use the OAS as a tool for Assessment for Learning. Student results on assessments help teachers identify learner needs and strengths and inform instructional practices. Robust reports also allow teachers to communicate with students and parents about learner goals, intentions, and outcomes. The OAS helps with a cycle of assessments, instruction,

feedback, and communication that allows teachers, students, and parents to be confident with instructional success. Teachers will be particularly interested in the Formative Item Bank.

- Webinar support and links will direct teachers to archived webinars as well as links to join or view upcoming webinars.
- Course/Grade Level WIKI spaces are available to post questions about a unit, a standard, the course, or any other CCGPS math related concern. Shared resources and information are also available at the site.
- EOCT study guides are available to provide more information for the ECOT (end of course test)
- Georgiastandards.org provides a gateway to a wealth of instruction links and information. Open the Common Core GPS tab at the top to access specific math resources for CCGPS.

Georgia Department of Education

Common Core Georgia Performance Standards
Middle School Mathematics
Eighth Grade – At a Glance

Common Core Georgia Performance Standards: Curriculum Map							
1st Semester				2nd Semester			
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Transformations, Congruence and Similarity	**Exponents and Equations**	**Geometric Applications of Exponents**	**Functions**	**Linear Functions**	**Linear Models and Tables**	**Solving Systems of Equations**	**Show What We Know**
MCC8.G.1 **MCC8.G.2** **MCC8.G.3** **MCC8.G.4** **MCC8.G.5**	**MCC8.EE.1** **MCC8.EE.2 (evaluating)** **MCC8.EE.3** **MCC8.EE.4** **MCC8.EE.7a** **MCC8.EE.7b** **MCC8.NS.1** **MCC8.NS.2**	**MCC8.G.6** **MCC8.G.7** **MCC8.G.8** **MCC8.G.9** **MCC8.EE.2 (equations)**	**MCC8.F.1** **MCC8.F.2**	**MCC8.EE.5** **MCC8.EE.6** **MCC8.F.3**	**MCC8.F.4** **MCC8.F.5** **MCC8.SP.1** **MCC8.SP.2** **MCC8.SP.3** **MCC8.SP.4**	**MCC8.EE.8a** **MCC8.EE.8b** **MCC8.EE.8c**	**ALL** **PLUS** **High School Prep Review** ❖ **inequalities** ❖ **exponent rules** ❖ **word problems** ❖ **expressions** ❖ **exponential graphs** ❖ **graphing calculators**
Incorporated Standards							
		MCC8.EE.7		***MCC8.EE.7***	***MCC8.EE.7***	***MCC8.EE.7***	
These units were written to build upon concepts from prior units, so later units contain tasks that depend upon the concepts addressed in earlier units. All units will include the Mathematical Practices and indicate skills to maintain.							

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grades 6-8 Key: NS = The Number System, RP = Ratios and Proportional Relationships, EE = Expressions and Equations, G = Geometry, SP = Statistics and Probability

Georgia Department of Education

Common Core Georgia Performance Standards

Eighth Grade – 1st Semester

Common Core Georgia Performance Standards: Curriculum Map

Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.	**5** Use appropriate tools strategically.
2 Reason abstractly and quantitatively.	**6** Attend to precision.
3 Construct viable arguments and critique the reasoning of others.	**7** Look for and make use of structure.
4 Model with mathematics.	**8** Look for and express regularity in repeated reasoning.

1st Semester

Unit 1	Unit 2	Unit 3	Unit 4
Transformations, Congruence and Similarity	**Exponents and Equations**	**Geometric Applications of Exponents**	**Functions**
Understand congruence and similarity using physical models, transparencies, or geometry software. **MCC8.G.1** 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. **MCC8.G.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; given two congruent figures, describe a sequence that exhibits the congruence between them. **MCC8.G.3** Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. **MCC8.G.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; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	**Work with radicals and integer exponents.** **MCC8.EE.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. **MCC8.EE.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. **MCC8.EE.3** 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. **MCC8.EE.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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **Analyze and solve linear equations and pairs**	**Understand and apply the Pythagorean Theorem.** **MCC8.G.6** Explain a proof of the Pythagorean Theorem and its converse. **MCC8.G.7** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. **MCC8.G.8** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** **MCC8.G.9** Know the formulas for the volume of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. **Work with radicals and integer exponents.** **MCC8.EE.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.	**Define, evaluate, and compare functions.** **MCC8.F.1** 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. **MCC8.F.2** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

MCC8.G.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.	**<u>of simultaneous linear equations.</u>** **MCC8.EE.7** Solve linear equations in one variable. **MCC8.EE.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 $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). **MCC8.EE.7b** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. **<u>Know that there are numbers that are not rational, and approximate them by rational numbers.</u>** **MCC8.NS.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. **MCC8.NS.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 (e.g., π^2).		
Incorporated Standards			
		MCC8.EE.7	

Georgia Department of Education

Common Core Georgia Performance Standards
Eighth Grade – 2nd Semester

Common Core Georgia Performance Standards: Curriculum Map

Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.	**5** Use appropriate tools strategically.
2 Reason abstractly and quantitatively.	**6** Attend to precision.
3 Construct viable arguments and critique the reasoning of others.	**7** Look for and make use of structure.
4 Model with mathematics.	**8** Look for and express regularity in repeated reasoning.

2nd Semester

Unit 5	Unit 6	Unit 7	Unit 8
Linear Functions	**Linear Models and Tables**	**Solving Systems of Equations**	**Show What We Know**
Understand the connections between proportional relationships, lines, and linear equations. **MCC8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. **MCC8.EE.6** 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. **Define, evaluate, and compare functions.** **MCC8.F.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.	**Use functions to model relationships between quantities.** **MCC8.F.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. **MCC8.F.5** 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. **Investigate patterns of association in bivariate data.** **MCC8.SP.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.	**Analyze and solve linear equations and pairs of simultaneous linear equations.** **MCC8.EE.8** Analyze and solve pairs of simultaneous linear equations. **MCC8.EE.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. **MCC8.EE.8b** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. **MCC8.EE.8c** Solve real-world and mathematical problems leading to two linear equations in two variables.	**ALL** **PLUS** **High School Prep** **Review** ❖ **inequalities** ❖ **exponent rules** ❖ **word problems** ❖ **expressions** ❖ **exponential graphs** ❖ **graphing calculators**

	MCC8.SP.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. **MCC8.SP.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. **MCC8.SP.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.		
Incorporated Standards			
MCC8.EE.7	***MCC8.EE.7***	***MCC8.EE.7***	