HCS LEARNING & PERFORMANCE | Instruction & Learning

MATHEMATICS

Kindergarten

Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSEK.CC.5 Count to answer "how many?" questions. **a.** Count to answer "how many?" questions about as many as 20 things arranged in a variety of ways or as many as 10 things in a scattered configuration. **MGSEK.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality. **a.** When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. **MGSEK.CC.5** Count to answer "how many?" questions. **b.** Given a number from 1-20, count out that many objects	**K.NR.1: Demonstrate and explain the relationship between numbers and quantities up to 20; connect counting to cardinality (the last number counted represents the total quantity in a set).** **K.NR.1.1** Count up to 20 objects in a variety of structured arrangements and up to 10 objects in a scattered arrangement.	**Continuation (K.NR.1.1 - K.NR.1.2)** ● Maintain teaching this content.
MGSEK.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality. **b.** Understand that the last number name said tells the number of objects counted (cardinality).	**K.NR.1.2** When counting objects, explain that the last number counted represents the total quantity in a set (cardinality), regardless of the arrangement and order.	
MGSEK.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality. **c.** Understand that each successive number name refers to a quantity that is one larger.	**K.NR.1.3** Given a number from 1-20, identify the number that is one more or **one less**.	**Modification (K. NR 1.3)** ● The new expectation includes quantities that are **one less**.

MGSEK.CC.5 Count to answer "how many?" questions. c. Identify and be able to count pennies within 20.	**K.NR.1.4** Identify pennies, **nickels, and dimes** and know their name and value.	**Modification (K. NR 1.4)** ● The new expectation includes **nickels and dimes** and values of the coins.
MGSEK.CC.1 Count to 100 by ones and by tens.	**K.NR.2: Use count sequences within 100 to count forward and backward in sequence.** **K.NR.2.1** Count forward to 100 by tens and ones and **backward** from 20 by ones.	**Modification (K. NR.2.1)** ● The new standard requires students to **count backwards from 20** by ones.
MGSEK.CC.2 Count forward beginning from a given number.	**K.NR.2.2** Count forward beginning from any number within 100 and **count backward** from any number within 20.	**Modification (K. NR.2.2)** ● The new standard requires students to **count backward** from any number within 20.
MGSEK.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones to understand that these numbers are composed of ten ones and one, two, three, four, five, six , seven, eight, or nine ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8).	**K.NR.3: Use place value understanding to compose and decompose numbers from 11–19.** **K.NR.3.1** Describe numbers from 11 to 19 by composing (putting together) and decomposing (breaking apart) the numbers into ten ones and some more ones.	**Continuation (K.NR.3)** ● Maintain teaching this content.
MGSEK.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).	**K.NR.4: Identify, write, represent, and compare numbers up to 20.** **K.NR.4.1** Identify written numerals 0- 20 and	**Continuation (K.NR.4.1)** ● Maintain teaching this content.

MGSEK.CC.7 Compare two numbers between 1 and 10 presented as written numerals.	represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).	
MGSEK.CC.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group,	**K.NR.4.2** Compare two sets of up to 10 objects and identify whether the number of objects in one group is more or less than the other group, using the words “greater than,” “less than,” or “the same as”.	**Continuation (K.NR.4.1)** ● Maintain teaching this content.
MGSEK.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way.	**K.NR.5: Explain the concepts of addition, subtraction, and equality and use these concepts to solve real-life problems within 10.**	**Continuation (K.NR.5.1)** ● Maintain teaching this content.
	K.NR.5.1 Compose (put together) and decompose (break apart) numbers up to 10 using objects and drawings.	
MGSEK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings , sounds, acting out situations, verbal explanations, expressions, or equations.	**K.NR.5.2** Represent addition and subtraction within 10 from a given authentic situation using a variety of representations and strategies.	**Continuation (K.NR.5.2)** ● Maintain teaching this content.
MGSEK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10.	**K.NR.5.3** Use a variety of strategies to solve addition and subtraction problems within 10.	**Continuation (K.NR.5.3)** ● Maintain teaching this content.
MGSEK.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number.		**Subtraction** ● The standard was removed from Kindergarten
MGSEK.OA.5 Fluently add and subtract within 5.	**K.NR.5.4** Fluently add and subtract within 5 using a variety of strategies to solve practical,	**Continuation (K.NR.5.4)** ● Maintain teaching this content.

	mathematical problems.	
	K.PAR.6: Explain, extend, and create repeating patterns with a repetition, not exceeding 4 and describe patterns involving the passage of time.	**Addition (K.PAR.6.1- 6.2)** ● This standard and expectations are new.
	K.PAR.6.1 Create, extend, and describe repeating patterns with numbers and shapes, and explain the rationale for the pattern.	
	K.PAR.6.2 Describe patterns involving the passage of time using words and phrases related to actual events.	
MGSEK.MD.1 Describe several measurable attributes of an object, such as length or weight. **MGSEK.MD.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.	**K.MDR.7: Observe, describe, and compare the physical and measurable attributes of objects and analyze graphical displays of data to answer relevant questions.**	**Continuation (K.MDR 7.1-7.2)** ● Maintain teaching this content with focus on using data to answer relevant questions.
	K.MDR.7.1 Directly compare, describe, and order common objects, using measurable attributes (length, height, width, or weight) and describe the difference.	
MGSEK.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.	**K.MDR.7.2** Classify and sort up to ten objects into categories by an attribute; count the number of objects in each category and sort the categories by count.	

	K.MDR.7.3 Ask questions and answer them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.	**Addition (K.MDR.7.3)** ● This expectation is new.
MGSEK.G.2 Correctly name shapes regardless of their orientations or overall size. **MGSEK.G.3** Identify shapes as two-dimensional or three-dimensional. **MGSEK.G.4** Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts and other attributes .	**K.GSR.8: Identify, describe, and compare basic shapes encountered in the environment, and form two-dimensional shapes and three-dimensional figures.**	**Continuation (K.GSR.8.1 - 8.4)** ● Maintain teaching this content.
	K.GSR.8.1 Identify, sort, classify, analyze, and compare two dimensional shapes and three-dimensional figures, in different sizes and orientations, using informal language to describe their similarities, differences, number of sides and vertices, and other attributes.	
MGSEK.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	**K.GSR.8.2** Describe the relative location of an object using positional words.	
MGSEK.G.5 Model shapes in the world by building shapes from components and drawing shapes.	**K.GSR.8.3** Use basic shapes to represent specific shapes found in the environment by creating models and drawings.	
MGSEK.G.6 Compose simple shapes to form larger shapes.	K.GSR.8.4 Use two or more basic shapes to form larger shapes.	
SMP 1 Make sense of problems and persevere in solving them.	**K.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies	**Continuation (K.MP.1-8)** ● Maintain teaching this content

	needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

HCS LEARNING & PERFORMANCE | Instruction & Learning

MATHEMATICS

1st Grade
Companion Guide for
Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE1.NBT.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	**1.NR.1** Extend the count sequence to 120. Read, write, and represent numerical values to 120 and compare numerical values to 100. **1.NR.1.1** Count within 120, forward and **backward**, starting at any number. In this range, read and write numerals and represent a number of objects with a written numeral.	**Modification (1.NR.1.1)** ● Students will **count backwards** from any number less than 120.
MGSE1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: a. 10 can be thought of as a bundle of ten ones — called a "ten." b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	**1.NR.1.2 Explain** that the two digits of a 2-digit number represent the amounts of tens and ones.	**Modification (1.NR.1.2)** ● Students will **reason about the place value** and structure of two digit numbers.
MGSE1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.	**1.NR.1.3** Compare and order whole numbers up to 100 using **concrete models, drawings,** and the symbols >, =, and <.	**Modification (1.NR.1.3)** ● Students will **utilize concrete models and drawings** to compare and order whole numbers.
MGSE1.OA.5 Relate counting to addition and subtraction. **MGSE1.OA.6** Add and subtract within 20.	**1.NR.2:** Explain the relationship between addition and subtraction and apply the properties of operations to solve real-life addition and subtraction problems within 20.	**Modification (1.NR.2.1)** ● Students will utilize a **variety of strategies** to solve addition and subtraction problems.

a. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). b. Fluently add and subtract within 10.	**1.NR.2.1** Use a **variety of strategies** to solve addition and subtraction problems within 20**.**	
MGSE1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	**1.NR.2.2** Use pictures, drawings, and equations to develop strategies for addition and subtraction within 20 by **exploring strings of related problems**.	**Modification (1.NR.2.2)** ● Students will **utilize number strings** to construct strategies for addition and subtraction problems.
MGSE1.OA.6 Add and subtract within 20. a. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). b. Fluently add and subtract within 10.	**1.NR.2.3 Recognize the inverse relationship** between subtraction and addition within 20 and **use this inverse relationship** to solve authentic problems.	**Modification (1.NR.2.3)** ● Students will **utilize the inverse** relationship between addition and subtraction to solve problems.

MGSE1.OA.6 Add and subtract within 20. a. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). b. Fluently add and subtract within 10.	**1.NR.2.4 Fluently** add and subtract **within 10** using a variety of strategies.	**Modification (1.NR.2.4)** ● Students will use **accurate and efficient** strategies to add and subtract.
MGSE1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.	**1.NR.2.5** Use the meaning of the equal sign to determine whether equations involving addition and subtraction are true or false.	**Continuation (1.NR.2.5)** ● Maintain teaching this content.
MGSE1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. **MGSE1.OA.2** Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. **MGSE1.OA.4** Understand subtraction as an unknown-addend problem.	**1.NR.2.6** Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers.	**Continuation (1.NR.2.6)** ● Maintain teaching this content.
MGSE1.OA.3 Apply properties of operations as strategies to add and subtract.	**1.NR.2.7** Apply properties of operations as strategies to solve **addition and subtraction problem situations within 20.**	**Modification (1.NR.2.7)** ● Students will utilize strategies to solve **real-world** addition and subtraction

		problems.
MGSE3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. **MGSE4.OA.5** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Explain informally why the pattern will continue to develop in this way.	**1.PAR.3** Identify, describe, extend, and create repeating patterns, growing patterns, and shrinking patterns found in real-life situations. **1.PAR.3.1** Investigate, create, and make predictions about repeating patterns with a core of up to 3 elements resulting from repeating an operation, as a series of shapes, or a number string. **1.PAR.3.2** Identify, describe, and create growing, shrinking, and repeating patterns based on the repeated addition or subtraction of 1s, 2s, 5s, and 10s.	**Addition (1.PAR.3.1-3.2)** ● This standard partially moved from 3rd and 4th Grade Georgia Standards of Excellence to Georgia's K-12 Mathematics Standards.
MGSE1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three sided) versus non-defining attributes (e.g., color, orientation, overall size) ; build and draw shapes to possess defining attributes.	**1.GSR.4** Compose shapes, analyze the attributes of shapes, and relate their parts to the whole. **1.GSR.4.1 Identify common two dimensional shapes and three dimensional figures**, **sort and classify** them by their attributes and build and draw shapes that possess defining attributes.	**Modification (1.GSR.4.1)** ● Students will **reason about the shapes they sort and classify, the composed shapes they create, and the shapes they partition**.
MGSE1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shapes.	**1.GSR.4.2** Compose two-dimensional shapes (rectangles, squares, triangles, half-circles, and quarter-circles) and three-dimensional figures (cubes, rectangular prisms, cones, and cylinders) to create a shape formed of two or more common shapes and compose new shapes from the composite shape.	**Continuation (1.GSR.4.2)** ● Maintain teaching this content.
MGSE1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the	**1.GSR.4.3** Partition circles and rectangles into two and four equal shares.	**Continuation (1.GSR.4.3)** ● Maintain teaching this content.

words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares		
MGSE1.NBT.4 Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of ten (e.g., 24 + 9, 13 + 10, 27 + 40), using concrete models or drawings and strategies based on place value, properties of operations, and/or relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	**1.NR.5** Use concrete models, the base ten structure, and properties of operations to add and subtract within 100. **1.NR.5.1 Use** a variety of strategies to solve applicable, mathematical addition and **subtraction problems** with one- and two-digit whole numbers.	**Modification (1.NR.5.1)** ● Students will **utilize** strategies to **subtract one and two-digit whole numbers**.
MGSE1.NBT.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	**1.NR.5.2** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	**Continuation (1.NR.5.2)** ● Maintain teaching this content.
MGSE1.NBT.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range of 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (e.g.,70 – 30, 30 – 10, 60 – 60)	**1.NR.5.3 Add** and subtract multiples of 10 within 100.	**Modification (1.NR.5.3)** ● Students will **extend their understanding of the base ten structure** to add and subtract 10 within 100 to solve problems.
MGSE1.NBT.7 Identify dimes, and understand ten pennies can be thought of as a dime. (Use dimes as manipulatives in multiple mathematical contexts.)	**1.MDR.6.3** Identify the value of **quarters** and **compare the values** of pennies, nickels, dimes, and **quarters.**	**Modification** ● Dimes will now be introduced in kindergarten. Students will focus on **comparing the value of pennies, nickels,**

		dimes and quarters.
MGSE1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. **MGSE1.MD.2** Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.	**1.MDR.6:** Use appropriate tools to measure, order, and compare intervals of length and time, as well as denominations of money to solve real-life, mathematical problems and answer relevant questions. **1.MDR.6.1** Estimate, measure, and record lengths of objects using **non-standard units,** and compare and order up to three objects using the recorded measurements. Describe the objects compared.	**Modification (1.MDR.6.1)** ● Standard will use **non-standard tools** to measure, order, and compare length.
MGSE1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.	**1.MDR.6.2** Tell and write time in hours and half-hours using analog and digital clocks, and **measure elapsed time to the hour on the hour using a predetermined number line**.	**Modification (1.MDR.6.2)** ● Standard will **determine elapsed time to the nearest hour using a number line clock.**
MGSE2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?	**1.MDR.6.3** Identify the value of quarters and compare the values of pennies, nickels, dimes, and quarters.	**Addition (1.MDR.6.3)** ● This standard partially moved from 2nd Grade Georgia Standards of Excellence to 1st grade Georgia's K-12 Mathematics Standards.
MGSE1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	**1.MDR.6.4** Ask questions and answer them based on **gathered information, observations, and appropriate graphical displays to compare** and **order whole numbers**.	**Modification (1.MDR.6.4)** ● Standard will utilize **statistical reasoning to include a study of categorical data while asking and answering investigative questions that matter to them**.
SMP 1 Make sense of problems and persevere in solving them.	**1.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies	**Continuation (1.MP.1-8)** ● Maintain teaching this content

	needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

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MATHEMATICS

2nd Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE2.NBT.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones.	**2.NR.1:** Using the place value structure, explore the count sequences to represent, read, write, and compare numerical values to 1000 and describe basic place-value relationships and structures.	**Continuation (2.NR.1.1)** ● Maintain teaching this content.
	2.NR.1.1 Explain the value of a three digit number using hundreds, tens, and ones in a variety of ways.	
MGSE2.NBT.2 Count within 1000; skip-count by 5s, 10s, and 100s.	**2.NR.1.2** Count forward and **backward by ones** from any number within 1000. Count forward by fives from multiples of 5 within 1000. Count forward and **backward by 10s and 100s** from any number within 1000. **Count forward by 25s from 0**.	**Modification (2.NR.1.2)** ● Students will count forward and **backwards** and **count forward by 25s from 0.**
MGSE2.NBT.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.	**2.NR.1.3** Represent, compare, and order whole numbers to 1000 with an emphasis on place value and equality. Use >, =, and < symbols to record the results of comparisons.	**Continuation (2.NR.1.3)** ● Maintain teaching this content with focus on place value to compare numbers.
MGSE2.NBT.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.		**Subtraction** ● Standards will no longer be addressed in the 2nd grade Georgia K-12 Mathematics Standards. Partially moved to 3rd grade 3.NR.1.
MGSE2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method.	**2.NR.2:** Apply multiple part-whole strategies, properties of operations and place value understanding to solve real-life, mathematical problems involving addition and subtraction within 1,000.	**Modification (2.NR.2.1)** ● Students solve **real-life, mathematical problems** by adding and subtracting within 1000 using **multiple part-whole strategies, properties of operations and place value understanding**.

2nd Grade Companion Guide for Standards Interpretation

MGSE2.OA.2 Fluently add and subtract within 20 using mental strategies.8 By end of Grade 2, know from memory all sums of two one-digit numbers.	**2.NR.2.1** Fluently add and subtract within 20 using a variety of mental, **part-whole strategies**.	**Modification (2.NR.2.1)** ● Students fluently add and subtract within 20 using a variety of mental, **part-whole strategies.**
MGSE2.NBT.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.	**2.NR.2.2** Find 10 more or 10 less than a given three-digit number and find 100 more or 100 less than a given three-digit number.	**Continuation (2.NR.2.2)** ● Maintain teaching this content.
MGSE2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.	**2.NR.2.3** Solve problems involving the addition and subtraction of two-digit numbers using **part whole strategies.**	**Modification (2.NR.2.3)** ● Students will **solve problems** by adding and subtracting two-digit numbers **using part whole strategies.**
MGSE2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	**2.NR.2.4** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	**Continuation (2.NR.2.2)** ● Maintain teaching this content.
MGSE2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems by using drawings and equations with a symbol for the unknown number to represent the problem. Problems include contexts that involve adding to, taking from, putting together/taking apart (part/part/whole) and comparing with unknowns in all positions. **MGSE2.NBT.9** Explain why addition and subtraction strategies work, using place value and the properties of operations.		**Subtraction** ● Standards will no longer be addressed in the Georgia K-12 Mathematics Standards
MGSE2.OA.3 Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.	**2.NR.3:** Work with equal groups to gain foundations for multiplication through real-life, mathematical problems. **2.NR.3.1** Determine whether a group (up to 20) has an odd or even number of objects. Write an	**Continuation (2.NR.3.1-2)** ● Maintain teaching this content.

	equation to express an even number as a sum of two equal addends.	
MGSE2.OA.4 Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends. **MGSE2.G.2** Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.	**2.NR.3.2** Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	
MGSE3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. **MGSE3.OA.9** Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. **MGSE4.OA.5** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Explain informally why the pattern will continue to develop in this way. **MGSE5.OA.3** Generate two numerical patterns using a given rule. Identify apparent relationships between corresponding terms by completing a	**2.PAR.4:** Identify, describe, extend, and create repeating patterns, growing patterns, and shrinking patterns. **2.PAR.4.1** Identify, describe, and create a numerical pattern resulting from repeating an operation such as addition and subtraction. **2.PAR.4.2** Identify, describe, and create growing patterns and shrinking patterns involving addition and subtraction up to 20.	**Addition (2.PAR.4.1-2)** ● Standard partially moved from 3rd, 4th and 5th Grade Georgia Standards of Excellence to Georgia's K-12 Mathematics Standards.

function table or input/output table. Using the terms created, form and graph ordered pairs on a coordinate plane.		
MGSE1.MD.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. (Iteration)	**2.MDR.5:** Estimate and measure the lengths of objects and distance to solve problems found in real-life using standard units of measurement, including inches, feet, and yards. **2.MDR.5.1** Construct simple measuring instruments using unit models. Compare unit models to rulers.	**Addition (2.PAR.4.1-2)** ● Standard partially moved from 1st Grade Georgia Standards of Excellence to Georgia's K-12 Mathematics Standards.
MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. **MGSE2.MD.3** Estimate lengths using units of inches, feet, centimeters, and meters. **MGSE2.MD.9** Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.	**2.MDR.5.2** Estimate and measure the length of an object or distance to the nearest whole unit using appropriate units and **standard measuring tools**.	**Modification (2.NR.2.4)** ● Students estimate and measure length to the nearest whole unit **using standard measuring tools.**
MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.	**2.MDR.5.3** Measure to determine how much longer one object is than another and express the length difference in terms of a standard-length unit.	**Continuation (2.MDR.5.3)** ● Maintain teaching this content.

MGSE2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	**2.MDR.5.4 Ask questions and answer them** based on gathered information, observations, and appropriate graphical displays to **solve problems relevant to everyday life**.	**Modification (2.MDR.5.4)** ● Standard will utilize **statistical reasoning to include a study of categorical data while asking and answering statistical investigative questions that matter to them**.
MGSE2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. **MGSE2.MD.6** Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.	**2.MDR.5.5** Represent **whole-number sums and differences** within a standard unit of measurement on a number line diagram.	**Modification (2.MDR.5.4)** ● Standard combines two standards. Students **represent whole-number sums and differences within a standard unit of measurement** on a number line diagram.
MGSE2.MD.2 Measure the length of an object twice, using length units of different measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. For example, an inch is longer than a centimeter. (Students are not expected to convert between systems of measurement.)		**Subtraction** ● Standard will no longer be addressed in the Georgia K-12 Mathematics Standards
MGSE2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using	**2.MDR.6:** Solve real-life problems involving time and money	

a.m. and p.m.	**2.MDR.6.1** Tell and write time from analog and digital clocks to the nearest five minutes, and **estimate and measure elapsed time** using a timeline, **to the hour or half hour on the hour or half hour**.	**Modification (2.MDR.5.4)** ● Students **estimate and measure elapsed time using a timeline, to the hour or half hour on the hour or half hour.**
MGSE2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.	**2.MDR.6.2 Find the value of a group of coins and determine combinations of coins that equal a given amount that is less than one hundred cents**, and solve problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.	**Modification (2.MDR.5.4)** ● Students **find the value of a group of coins and determine combinations of coins that equal a given amount that is less than one hundred cents.**
MGSE2.G.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.	**2.GSR.7:** Draw and partition shapes and other objects with specific attributes and conduct observations of everyday items and structures to identify how shapes exist in the world. **2.GSR.7.1 Describe, compare and sort** 2-D shapes including polygons, triangles, quadrilaterals, pentagons, hexagons, and 3-D shapes **including rectangular prisms and cones**, given a set of attributes.	**Modification (2.MDR.5.4)** ● Students **describe and compare and sort** shapes including polygons, triangles, quadrilaterals, pentagons, hexagons and 3-D shapes **including rectangular prisms and cones** based on attributes.
MGSE4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**2.GSR.7.2** Identify at least one line of symmetry in everyday objects to describe each object as a whole.	**Addition (2.PAR.4.1-2)** ● Standard partially moved from 4th Grade Georgia Standards of Excellence to Georgia's K-12 Mathematics Standards.
MGSE2.G.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves,	**2.GSR.7.3** Partition circles and rectangles into two, three, or four equal shares. Identify and describe equal-sized parts of the whole using fractional names ("halves," "thirds," "fourths", "half of,"	**Continuation (2.GSR.7.3-4)** ● Maintain teaching this content.

three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.	"third of," "quarter of," etc.).	
	2.GSR.7.4 Recognize that equal shares of identical wholes may be different shapes within the same whole.	
SMP 1 Make sense of problems and persevere in solving them.	**2.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (2.MP.1-8)** ● Maintain teaching this content
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

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MATHEMATICS

3rd Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**3.NR.1:** Use place value reasoning to represent, read, write, and compare numerical values up to 10,000 and round whole numbers up to 1,000.	**Addition (3.NR.1.1-2)** ● Standard partially moved from 4th Grade Georgia Standards of Excellence to 3rd Grade Georgia's K-12 Mathematics Standards.
	3.NR.1.1 Read and write multi-digit whole numbers up to 10,000 using base-ten numerals and expanded form.	
	3.NR.1.2 Use place value reasoning to compare multi-digit numbers up to 10,000, using >, =, and < symbols to record the results of comparisons.	
MGSE3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.	**3.NR.1.3** Use place value understanding to round whole numbers **up to 1000** to the nearest 10 or 100.	**Modification (3.NR.1.3)** ● Students round whole numbers **up to 1000** to the nearest 10 or 100.
MGSE3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	**3.PAR.2:** Use part-whole strategies to represent and solve real-life problems involving addition and subtraction with whole numbers within 10,000.	**Continuation (3.PAR.2.1)** ● Maintain teaching this content.
	3.PAR.2.1 Fluently add and subtract within 1000 to solve problems.	
MGSE3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**3.PAR.2.2** Apply **part-whole strategies**, properties of operations and place value understanding, to solve problems involving addition and subtraction **within 10,000**. Represent these problems using equations with a letter standing for the unknown quantity. **Justify solutions.**	**Modification (2.PAR.2.2)** ● Students **apply part-whole strategies,** properties of operations and place value understanding to add and subtract **within 10,000** and represent these problems using equations with a letter standing for the unknown quantity. **Justify solutions.**

MGSE3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. **MGSE3.OA.8** Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**3.PAR.3:** Use part-whole strategies to solve real-life, mathematical problems involving multiplication and division with whole numbers within 100. **3.PAR.3.1 Describe, extend, and create** numeric patterns related to multiplication. **Make predictions** related to the patterns.	**Modification (3.PAR.3.1)** ● Students **describe, extend, and create** numeric patterns related to multiplication, and **make predictions** related to the patterns.
MGSE3.OA.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7. **MGSE3.OA.2** Interpret whole number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares (How many in each group?), or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each (How many groups can you make?). For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8. **MGSE3.OA.7** Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or	**3.PAR.3.2** Represent single digit multiplication and **division facts using a variety of strategies**. **Explain** the relationship between multiplication and division.	**Modification (3.PAR.3.2)** ● Students should know single digit multiplication and **division facts using a variety of strategies.** Students must **explain** the relationship between multiplication and division.

properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers. **MGSE3.OA.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers using the inverse relationship of multiplication and division. **MGSE3.OA.6** Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8		
MGSE3.OA.5 Apply properties of operations as strategies to multiply and divide.	**3.PAR.3.3** Apply properties of operations (i.e., commutative property, associative property, distributive property) to multiply and divide within 100.	**Continuation (3.PAR.3.3)** ● Maintain teaching this content.
MGSE1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.	**3.PAR.3.4** Use the meaning of the equal sign to determine whether expressions involving addition, subtraction, and multiplication are equivalent.	**Addition (3.PAR.3.4)** ● Standard partially moved from 1st Grade Georgia Standards of Excellence to 3rd Grade Georgia's K-12 Mathematics Standards.
MGSE3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.	**3.PAR.3.5** Use place value reasoning and properties of operations to multiply one-digit whole numbers by multiples of 10, in the range 10-90.	**Continuation (3.PAR.3.5)** ● Maintain teaching this content.

MGSE3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities,e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	**3.PAR.3.6** Solve practical, relevant problems involving multiplication and division within 100 using part-whole strategies, visual representations, and/or concrete models.	**Continuation (3.PAR.3.6)** ● Maintain teaching this content.
	3.PAR.3.7 Use multiplication and division to solve problems involving whole numbers to 100. Represent these problems using equations with a letter standing for the unknown quantity. **Justify solutions.**	**Modification (3.PAR.3.7)** ● Students must **justify** their **solutions** after solving problems using multiplication and division involving whole numbers to 100**.**
MGSE3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts (unit fraction); understand a fraction a/b as the quantity formed by a parts of size 1/b . For example, 3/4 means there are three 1/4 parts, so 3/4 = 1/4 + 1/4 + 1/4. **MGSE3.NF.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram. **MGSE3.G.2** Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.	**3.NR.4:** Represent fractions with denominators of 2, 3, 4, 6 and 8 in multiple ways within a framework using visual models.	**Modification (3.NR.4.1)** ● Students describe a unit fraction and explain how multiple copies of a unit fraction form a non-unit fraction. Students use parts of a whole, **parts of a set**, points on a number line, distances on a number line and **area models**.
	3.NR.4.1 Describe a unit fraction and explain how multiple copies of a unit fraction form a non-unit fraction. Use parts of a whole, **parts of a set**, points on a number line, distances on a number line and **area models**.	
MGSE3.NF.3 Explain equivalence of fractions through reasoning with visual fraction models. Compare fractions by reasoning about their size. conclusions, e.g., by using a visual fraction model.	**3.NR.4.2** Compare two **unit fractions** by **flexibly using a variety of tools and strategies.** **3.NR.4.3** Represent fractions, including fractions	**Modification (3.NR.4.2-4)** ● Students compare **unit fractions** by **flexibility using a variety of tools and strategies**, represent fractions **in multiple**

	greater than one, **in multiple ways.** **3.NR.4.4** Recognize and generate **simple equivalent fractions.**	**ways** and generate **simple equivalent fractions.**
MGSE3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	**3.MDR.5:** Solve real-life, mathematical problems involving length, liquid volume, mass, and time. **3.MDR.5.1 Ask questions and answer them based on gathered information, observations**, and appropriate graphical displays to solve problems relevant to everyday life.	**Modification (3.MDR.5.1)** ● Standard will utilize **statistical reasoning to include a study of categorical data while asking and answering statistical investigative questions that matter to them**.
MGSE3.MD.1 Tell and write time to the nearest minute and measure elapsed time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram, drawing a pictorial representation on a clock face, etc.	**3.MDR.5.2** Tell and write time to the nearest minute and **estimate time to the nearest fifteen minutes (quarter hour)** from the analysis of an analog clock. **3.MDR.5.3** Solve meaningful problems involving elapsed time, including intervals of time to the hour, half hour, **and quarter hour** where the **times presented** are only on the hour, half hour, **or quarter hour** within **a.m. or p.m.** only.	**Modification (3.MDR.5.2-3)** ● Students tell and write time to the nearest **estimated time to the nearest fifteen minutes** and solve problems involving elapsed time to the hour, half hour, **and quarter hour** with **a.m. or p.m**.
MGSE3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.	**3.MDR.5.4** Use rulers to measure lengths in halves and fourths (quarters) of an inch and a whole inch.	**Modification (3.MDR.5.4)** ● Students use rulers to measure lengths in halves and fourths of an inch and a whole inch. **Standard no longer requires students to show measurement data on a line plot**.

MGSE3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.	**3.MDR.5.5** Estimate and measure liquid volumes, lengths and masses of objects **using customary units.** Solve problems involving mass, length, and volume given in the same unit, and reason about the relative sizes of measurement units within the customary system.	**Modification (2.MDR.5.5)** ● Students measure and estimate liquid volumes, lengths and masses of objects **using customary units**.
MGSE4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**3.GSR.6:** Identify the attributes of polygons, including parallel segments, perpendicular segments, right angles, and symmetry. **3.GSR.6.1** Identify perpendicular line segments, parallel line segments, and right angles, identify these in polygons, and solve problems involving parallel line segments, perpendicular line segments, and right angles.	**Addition (3.GSR.6.1)** ● Standard partially moved from 4th Grade Georgia Standards of Excellence to Georgia's K-12 Mathematics Standards.
MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	**3.GSR.6.2 Classify, compare, and contrast** polygons, with a **focus on quadrilaterals,** based on properties. **Analyze specific 3-dimensional figures to identify and describe quadrilaterals as faces of these figures.**	**Modification (3.GSR.6.2)** ● Standard requires students to c**lassify, compare, and contrast** polygons, with a **focus on quadrilaterals** and also **analyze specific 3-dimensional figures to identify and describe quadrilateral faces**.

MGSE4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**3.GSR.6.3 I**dentify lines of symmetry in polygons	**Addition (3.GSR.6.3)** ● Standard partially moved from 4th Grade Georgia Standards of Excellence to 3rd Grade Georgia's K-12 Mathematics Standards.
MGSE3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. **MGSE3.MD.6** Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	**3.GSR.7:** Identify area as a measurable attribute of rectangles and determine the area of a rectangle presented in real-life, mathematical problems. **3.GSR.7.1** Investigate area by covering the space of rectangles presented in realistic situations using multiple copies of the same unit, with no gaps or overlaps, and determine the total area (total number of units that covered the space). **3.GSR.7.2** Determine the area of rectangles (or shapes composed of rectangles) presented in relevant problems by tiling and counting.	**Continuation (3.PAR.7.1-2)** ● Maintain teaching this content.
MGSE3.MD.7 Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side	**3.GSR.7.3 Discover and explain** how area can be found by multiplying the dimensions of a rectangle.	**Modification (3.GSR.7.3)** ● Standard requires students to **discover and explain** how area can be found using multiplication.

lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.		
MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.	**3.GSR.8:** Determine the perimeter of a polygon presented in real-life, mathematical problems.	**Continuation (3.GSR.8.1-2)** ● Maintain teaching this content.
	3.GSR.8.1 Determine the perimeter of a polygon and explain that the perimeter represents the distance around a polygon. Solve problems involving perimeters of polygons. **3.GSR.8.2** Investigate and describe how rectangles with the same perimeter can have different areas or how rectangles with the same area can have different perimeters.	
SMP 1 Make sense of problems and persevere in solving them.	**3.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (3.MP.1-8)** ● Maintain teaching this content
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	

SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

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MATHEMATICS

4th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**4.NR.1** Recognize patterns within the base ten place value system with quantities presented in real-life situations to compare and round multi-digit whole numbers through the hundred-thousands place.	**Modification (4.NR.1.1)** ● Students are **not** expected to write numbers in **word form.**
	4.NR.1.1 Read and **write** multi-digit whole numbers to the hundred thousands place using base ten numerals and expanded form.	
MGSE4.NBT.1 Recognize that in a multi-digit whole number, a digit in any one place represents ten times what it represents in the place to its right.	**4.NR.1.2** Recognize and show that a digit in one place has a value ten times greater than what it represents in the place to its right and extend this understanding to determine the value of a digit when it is shifted to the left or right, **based on the relationship between multiplication and division**.	**Modification (4.NR.1.2)** ● Students should explore rounding and patterns within the base ten place value system with **quantities presented in real-life situations.** Additionally, students should **use numerical reasoning to build a deeper understanding** of the patterns within the base-ten system.
MGSE4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**4.NR.1.3** Use place value reasoning to represent, compare, and **order multi-digit numbers**, using >, =, and < symbols to record the results of comparisons.	**Modification (4.NR.1.3)** ● Students should be able to **order up to 5 whole numbers less than 1,000,000 through the hundred-thousands place.**
MGSE4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.	**4.NR.1.4** Use place value understanding to round multi-digit whole numbers.	**Continuation (4.NR.1.4)** ● Maintain teaching this content

MGSE4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	**4.NR.2** Using part-whole strategies, solve problems involving addition and subtraction through the hundred thousands place, as well as multiplication and division of multi-digit whole numbers presented in real life, mathematical situations. **4.NR.2.1** Fluently add and subtract multi-digit numbers to solve practical, mathematical problems **using place value understanding, properties of operations, and relationships between operations**.	**Modification (4.NR.2.1)** ● The **standard algorithm** is no longer written in the standard.
MGSE4.OA.1 Understand that a multiplicative comparison is a situation in which one quantity is multiplied by a specified number to get another quantity. **MGSE4.OA.2** Multiply or divide to solve word problems involving multiplicative comparison. Use drawings and equations with a symbol or letter for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.	**4.NR.2.2 Interpret, model, and solve** problems involving multiplicative comparison.	**Modification (4.NR.2.2)** ● Students will **interpret, model, and solve** problems involving multiplicative comparisons.
MGSE4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**4.NR.2.3** Solve relevant problems involving multiplication of a number with up to four digits by a 1-digit whole number or involving multiplication of two two-digit numbers using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**Continuation (4.NR.2.3)** ● Maintain teaching this content with focus on solving relevant problems.

MGSE4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**4.NR.2.4** Solve authentic division problems involving up to 4-digit dividends and 1-digit divisors (including whole number quotients with remainders) using **strategies** based on place-value understanding, properties of operations, and the relationships between operations.	**Modification (4.NR.2.4)** ● The **strategy arrays** are no longer written in the standard.
MGSE4.OA.3 Solve multistep word problems with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a symbol or letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**4.NR.2.5** Solve multi-step problems using addition, subtraction, multiplication, and division involving whole numbers. Use mental computation and estimation strategies to justify the reasonableness of solutions.	**Continuation (4.NR.2.5)** ● Maintain teaching this content.
MGSE4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Explain informally why the pattern will continue to develop in this way.	**4.PAR.3:** Generate and analyze patterns, including those involving shapes, input/output diagrams, factors, multiples, prime numbers, and composite numbers. **4.PAR.3.1** Generate **both** number and shape patterns that follow a provided rule.	**Modification (4.PAR.3.1)** ● Students will generate **both** number and shape patterns.
MGSE5.OA.3 Generate two numerical patterns using a given rule. Identify apparent relationships between corresponding terms by completing a function table or input/output table. Using the terms created, form and graph ordered pairs on a coordinate plane.	**4.PAR.3.2** Use input-output rules, tables, and charts to represent and describe patterns, find relationships, and solve problems.	**Addition (4.PAR.3.2)** ● MGSE5.OA.3 was partially moved from 5th Grade Georgia Standards of Excellence to 4th Grade Georgia's K-12 Mathematics Standards.

MGSE4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	**4.PAR.3.3** Find factor pairs in the range 1–100 and find multiples of single-digit numbers up to 100. **4.PAR.3.4** Identify composite numbers and prime numbers and explain the relationship with the factor pairs.	**Continuation (4.PAR.3.3-4)** ● Maintain teaching this content with focus on explaining the relationship with the factor pairs.
MGSE4.NF.1 Explain why two or more fractions are equivalent $a/b = n \times a/n \times b$ ex: 1/4 = 3 × 1/3 × 4 by using visual fraction models. Focus attention on how the number and size of the parts differ even though the fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	**4.NR.4:** Solve real-life problems involving addition, subtraction, equivalence, and comparison of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100 using part-whole strategies and visual models. **4.NR.4.1** Using **concrete materials, drawings, and number lines**, demonstrate and explain the relationship between equivalent fractions, including fractions greater than one, and **explain the identity property of multiplication as it relates to equivalent fractions.** Generate equivalent fractions using these relationships.	**Modification (4.NR.4.1)** ● Students will **use concrete materials, drawing and number lines** to explain the relationship between equivalent fractions and **identity property of multiplication as it relates to fractions.**
MGSE4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by using visual fraction models, by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2 . Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.	**4.NR.4.2** Compare two fractions with the same numerator or the same denominator by **reasoning about their size** and recognize that comparisons are valid only when the two fractions refer to the same whole. **4.NR.4.3** Compare two fractions with different numerators and/or different denominators by **flexibly using a variety of tools and strategies** and recognize that comparisons are valid only when the two fractions refer to the same whole.	**Modification (4.NR.4.2-3)** ● Students compare fractions by **reasoning about their size** and **flexibly using a variety of tools and strategies.**

MGSE4.NF.3 Understand a fraction a/b with a numerator >1 as a sum of unit fractions $1/b$.	**4.NR.4.4** Represent whole numbers and fractions as the sum of unit fractions. **4.NR.4.5** Represent a fraction as a sum of fractions with the same denominator in more than one way, recording with an equation. **4.NR.4.6** Add and subtract fractions and mixed numbers with like denominators **using a variety of tools.**	**Continuation (4.NR.4.4-5)** ● Maintain teaching this content **Modification (4.NR.6)** ● Students **will use a variety of tools** to add and subtract fractions and mixed numbers with like denominators.
MGSE4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number e.g., by using a visual such as a number line or area model.		**Subtraction (MGSE 4.NF.4)** ● This standard has been moved to 5th Grade Georgia's K-12 Mathematics Standards**.**
MGSE4.NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.	**4.NR.5:** Solve real-life problems involving addition, equivalence, comparison of fractions with denominators of 10 and 100, and comparison of decimal numbers as tenths and hundredths using part-whole strategies and visual models. **4.NR.5.1 Demonstrate and explain** the concept of equivalent fractions with denominators of 10 and 100, **using concrete materials and visual models**. Add two fractions with denominators of 10 and 100.	**Modifications (4.NR.5.1)** ● Students will **explain** equivalent fractions with denominators of 10 and 100**, using concrete materials and visual models.**
MGSE4.NF.6 Use decimal notation for fractions with denominators 10 or 100.	**4.NR.5.2** Represent, read, and **write** fractions with denominators of 10 or 100 using decimal notation, and decimal numbers to the hundredths place as fractions, using concrete materials and drawings.	**Modifications (4.NR.5.2)** ● Students are **not** expected to write word names of decimal numbers.
MGSE4.NF.7 Compare two decimals to hundredths	**4.NR.5.3** Compare two decimal numbers to the	**Continuation (4.NR.5.3)**

by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.	hundredths place by reasoning about their size. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions.	• Maintain teaching this content
MGSE4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. **MGSE4.MD.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	**4.MDR.6:** Measure time and objects that exist in the world to solve real-life, mathematical problems and analyze graphical displays of data to answer relevant questions. **4.MDR.6.1** Use the four operations to solve problems involving elapsed time to the nearest minute, intervals of time, **metric measurements of liquid volumes, lengths, distances, and masses of objects**, including problems involving fractions with like denominators, and also problems that require expressing measurements given in a larger unit in terms of a smaller unit, and expressing a smaller unit in terms of a larger unit based on the idea of equivalence.	**Modification (4.MDR.6.1)** • Students reason about the relative sizes of measurement units within the **metric system only and solve problems involving metric measurements of liquid volume, length, distance, and mass**.
MGSE4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2 , 1/4 , 1/8). Solve problems involving addition and subtraction of fractions with common denominators by using information presented in line plots.	**4.MDR.6.2 Ask questions and answer them based on gathered information,** observations, and appropriate graphical displays to solve problems relevant to everyday life. **4.MDR.6.3** Create **dot plots** to display a distribution of numerical (quantitative) measurement data.	**Modification (4.MDR.6.2)** • Students will **ask** and **answer questions** based on gathered information. **Modification (4.MDR.6.3)** • There is a change in terminology from line plot to **dot plot**.

MGSE4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. **MGSE4.MD.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	**4.GSR.7:** Investigate the concepts of angles and angle measurement to estimate and measure angles. **4.GSR.7.1** Recognize angles as geometric shapes formed when two rays share a common endpoint. Draw right, acute, and obtuse angles based on the relationship of the angle measure to 90 degrees. **4.GSR.7.2** Measure angles in reference to a circle with the center at the common endpoint of two rays. Determine an angle's measure in relation to the 360 degrees in a circle through division or as a missing factor problem.	**Continuation (4.GSR.7.1-2)** ● Maintain teaching this content
MGSE4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol or letter for the unknown angle measure.		**Subtraction (MGSE 4.MD 7)** ● This standard has been moved to 7th Grade Georgia's K-12 Mathematics Standards**.**
MGSE4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**4.GSR.8:** Identify and draw geometric objects, classify polygons based on properties, and solve problems involving area and perimeter of rectangular figures. **4.GSR.8.1 Explore, investigate,** and draw points, lines, line segments, rays, angles (right, acute,	**Modification(4.GSR.8.1)** ● Students will **explore and investigate** attributes of shapes including **lines of symmetry.**

	obtuse), perpendicular lines, parallel lines, and **lines of symmetry**. Identify these in two dimensional figures.	
MGSE4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	**4.GSR.8.2** Classify, **compare, and contrast** polygons based on **lines of symmetry**, the presence or absence of parallel or perpendicular line segments, or the presence or absence of angles of a specified size and based on side lengths.	**Modification(4.GSR.8.2)** ● Students should utilize **lines of symmetry to classify shapes.**
MGSE4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. **MGSE4.MD.8** Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.	**4.GSR.8.3** Solve problems involving area and perimeter of composite rectangles involving whole numbers **with known side lengths.**	**Modification(4.GSR.8.3)** ● Students will **not be expected to find unknown side lengths** when exploring composite rectangles.
MGSE4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.		**Subtraction (MGSE4.G.3)** ● This standard has been moved to 3rd Grade Georgia's K-12 Mathematics Standards**.**
SMP 1 Make sense of problems and persevere in solving them.	**4.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies	**Continuation (4.MP.1-8)** ● Maintain teaching this content

	needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

HCS LEARNING & PERFORMANCE | Instruction & Learning

MATHEMATICS

Accelerated Math 4th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**4.NR.1** Recognize patterns within the base ten place value system with quantities presented in real-life situations to compare and round multi-digit whole numbers through the hundred-thousands place.	**Modification (4.NR.1.1)** ● Students are **not** expected to write numbers in **word form.**
	4.NR.1.1 Read and **write** multi-digit whole numbers to the hundred thousands place using base ten numerals and expanded form.	
MGSE4.NBT.1 Recognize that in a multi-digit whole number, a digit in any one place represents ten times what it represents in the place to its right.	**4.NR.1.2** Recognize and show that a digit in one place has a value ten times greater than what it represents in the place to its right and extend this understanding to determine the value of a digit when it is shifted to the left or right, **based on the relationship between multiplication and division.**	**Modification (4.NR.1.2)** ● Students should explore rounding and patterns within the base ten place value system with **quantities presented in real-life situations.** Additionally, students should **use numerical reasoning to build a deeper understanding** of the patterns within the base-ten system.
MGSE4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**4.NR.1.3** Use place value reasoning to represent, compare, and **order multi-digit numbers**, using >, =, and < symbols to record the results of comparisons.	**Modification (4.NR.1.3)** ● Students should be able to **order up to 5 whole numbers less than 1,000,000 through the hundred-thousands place.**
MGSE4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.	**4.NR.1.4** Use place value understanding to round multi-digit whole numbers.	**Continuation (4.NR.1.4)** ● Maintain teaching this content
MGSE5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as	**5.NR.1** Use place value understanding to solve real-life, mathematical problems.	**Modification (5.NR.1.1)** ● Students need to **explain** recognizing

much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	**5.NR.1.1 Explain** that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	patterns in the base-ten place value system and using these patterns to solve real-life problems.
MGSE5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	**5.NR.1.2** Explain patterns in the placement of digits when multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10, up to 10^3.	**Continuation (5.NR.1.2)** ● Maintain teaching this content.
MGSE4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	**4.NR.2** Using part-whole strategies, solve problems involving addition and subtraction through the hundred thousands place, as well as multiplication and division of multi-digit whole numbers presented in real life, mathematical situations.	**Modification (4.NR.2.1)** ● The **standard algorithm** is no longer written in the standard.
	4.NR.2.1 Fluently add and subtract multi-digit numbers to solve practical, mathematical problems **using place value understanding, properties of operations, and relationships between operations**.	
MGSE4.OA.1 Understand that a multiplicative comparison is a situation in which one quantity is multiplied by a specified number to get another quantity. **MGSE4.OA.2** Multiply or divide to solve word problems involving multiplicative comparison. Use drawings and equations with a symbol or letter for the unknown number to represent the problem, distinguishing multiplicative comparison from	**4.NR.2.2 Interpret, model, and solve** problems involving multiplicative comparison.	**Modification (4.NR.2.2)** ● Students will **interpret, model, and solve** problems involving multiplicative comparisons.

additive comparison.		
MGSE4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**4.NR.2.3** Solve relevant problems involving multiplication of a number with up to four digits by a 1-digit whole number or involving multiplication of two two-digit numbers using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**Continuation (4.NR.2.3)** ● Maintain teaching this content with focus on solving relevant problems.
MGSE4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**4.NR.2.4** Solve authentic division problems involving up to 4-digit dividends and 1-digit divisors (including whole number quotients with remainders) **using strategies** based on place-value understanding, properties of operations, and the relationships between operations.	**Modification (4.NR.2.4)** ● The **strategy arrays** are no longer written in the standard.
MGSE4.OA.3 Solve multistep word problems with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a symbol or letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**4.NR.2.5** Solve multi-step problems using addition, subtraction, multiplication, and division involving whole numbers. Use mental computation and estimation strategies to justify the reasonableness of solutions.	**Continuation (4.NR.2.5)** ● Maintain teaching this content
MGSE5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm (or other strategies demonstrating understanding of multiplication) up to a 3 digit by 2 digit factor.	**5.NR.2** Multiply and divide multi-digit whole numbers to solve relevant, mathematical problems.	**Modification (5.NR.2.1)** ● Students will choose a strategy (i.e: area model, standard algorithm, etc.) that makes sense to them to **solve authentic problems involving multiplication of**

	5.NR.2.1 Fluently multiply multi-digit (up to 3 digit by 2-digit) whole numbers to **solve authentic problems.**	**multi-digit whole numbers**. The focus should always be on efficiency.
MGSE5.NBT.6 Fluently divide up to 4-digit dividends and 2-digit divisors by using at least one of the following methods: strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations or concrete models. (e.g., rectangular arrays, area models)	**5.NR.2.2** Fluently divide multi-digit whole numbers (up to 4-digit dividends and 2-digit divisors no greater than 25) to **solve practical problems.**	**Modification (5.NR.2.2)** ● Students will focus on **solving relevant contextual problems to build fluency with multi-digit division of whole numbers** up to 4 digit dividends and 2-digit divisors no greater than 25.
MGSE4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Explain informally why the pattern will continue to develop in this way.	**4.PAR.3:** Generate and analyze patterns, including those involving shapes, input/output diagrams, factors, multiples, prime numbers, and composite numbers. **4.PAR.3.1** Generate **both** number and shape patterns that follow a provided rule.	**Modification (4.PAR.3.1)** ● Students will generate **both** number and shape patterns.
MGSE5.OA.3 Generate two numerical patterns using a given rule. Identify apparent relationships between corresponding terms by completing a function table or input/output table. Using the terms created, form and graph ordered pairs on a coordinate plane.	**4.PAR.3.2** Use input-output rules, tables, and charts to represent and describe patterns, find relationships, and solve problems.	**Addition (4.PAR.3.2)** ● MGSE5.OA.3 was partially moved from 5th Grade Georgia Standards of Excellence to 4th Georgia's K-12 Mathematics Standards..
MGSE4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number	**4.PAR.3.3** Find factor pairs in the range 1–100 and find multiples of single-digit numbers up to 100. **4.PAR.3.4** Identify composite numbers and prime numbers and explain the relationship with the factor pairs.	**Continuation (4.NR.3.3-4)** ● Maintain teaching this content with focus on explaining the relationship with the factor pairs.

in the range 1–100 is prime or composite.		
MGSE5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	**5.NR.3** Describe fractions and perform operations with fractions to solve relevant, mathematical problems using part-whole strategies and visual models. **5.NR.3.1** Explain the meaning of a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.	**Continuation (5.NR3.1)** ● Maintain teaching this content with focus on solving relevant problems.
MGSE4.NF.1 Explain why two or more fractions are equivalent $a/b = n \times a/n \times b$ ex: 1/4 = 3 × 1/3 × 4 by using visual fraction models. Focus attention on how the number and size of the parts differ even though the fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	**4.NR.4:** Solve real-life problems involving addition, subtraction, equivalence, and comparison of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100 using part-whole strategies and visual models. **4.NR.4.1** Using **concrete materials, drawings, and number lines**, demonstrate and explain the relationship between equivalent fractions, including fractions greater than one, and **explain the identity property of multiplication as it relates to equivalent fractions**. Generate equivalent fractions using these relationships.	**Modification (4.NR.4)** ● Students will **use concrete materials, drawing and number lines** to explain the relationship between equivalent fractions and **identity property of multiplication as it relates to fractions.**
MGSE4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by using visual fraction models, by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1 2 . Recognize that comparisons are valid only when the two fractions	**4.NR.4.2** Compare two fractions with the same numerator or the same denominator by **reasoning about their size** and recognize that comparisons are valid only when the two fractions refer to the same whole. **4.NR.4.3** Compare two fractions with different	**Modification (4.NR.4)** ● Students compare fractions by **reasoning about their size** and **flexibly using a variety of tools and strategies.**

refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.	numerators and/or different denominators by **flexibly using a variety of tools and strategies** and recognize that comparisons are valid only when the two fractions refer to the same whole.	
MGSE4.NF.3 Understand a fraction a/b with a numerator >1 as a sum of unit fractions $1/b$. problem.	**4.NR.4.4** Represent whole numbers and fractions as the sum of unit fractions. **4.NR.4.5** Represent a fraction as a sum of fractions with the same denominator in more than one way, recording with an equation. **4.NR.4.6** Add and subtract fractions and mixed numbers with like denominators **using a variety of tools.**	**Continuation (4.NR.4.4-5)** ● Maintain teaching this content **Modification (4.NR.6)** ● Students **will use a variety of tools** to add and subtract fractions and mixed numbers with like denominators.
MGSE4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number e.g., by using a visual such as a number line or area model.		**Subtraction (MGSE 4.NF.4)** ● This standard has been moved to 5th Grade Georgia's K-12 Mathematics Standards**.**
MGSE4.NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.	**4.NR.5:** Solve real-life problems involving addition, equivalence, comparison of fractions with denominators of 10 and 100, and comparison of decimal numbers as tenths and hundredths using part-whole strategies and visual models.	**Modifications (4.NR.5.1)** ● Students will **explain equivalent fractions with denominators of 10 and 100, using concrete materials and visual models.**
	4.NR.5.1 Demonstrate and **explain the concept of equivalent fractions with denominators of 10 and 100**, using concrete materials and visual models. Add two fractions with denominators of 10 and 100.	

MGSE4.NF.6 Use decimal notation for fractions with denominators 10 or 100.	**4.NR.5.2** Represent, read, and **write** fractions with denominators of 10 or 100 using decimal notation, and decimal numbers to the hundredths place as fractions, using concrete materials and drawings.	**Modifications (4.NR.5.2)** ● Students are **not** expected to write word names of decimal numbers
MGSE4.NF.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.	**4.NR.5.3** Compare two decimal numbers to the hundredths place by reasoning about their size. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions.	**Continuation (4.NR.3.3-4)** ● Maintain teaching this content
MGSE4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. **MGSE4.MD.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	**4.MDR.6:** Measure time and objects that exist in the world to solve real-life, mathematical problems and analyze graphical displays of data to answer relevant questions. **4.MDR.6.1** Use the four operations to solve problems involving elapsed time to the nearest minute, intervals of time, **metric measurements of liquid volumes, lengths, distances, and masses of objects**, including problems involving fractions with like denominators, and also problems that require expressing measurements given in a larger unit in terms of a smaller unit, and expressing a smaller unit in terms of a larger unit based on the idea of equivalence.	**Modification (4.MDR.6.3)** ● Students reason about the relative sizes of measurement units within the **metric system only and solve problems involving metric measurements of liquid volume, length, distance, and mass**.
MGSE4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2 , 1/4 , 1/8). Solve problems involving addition and subtraction of fractions with common denominators by using information presented in line plots.	**4.MDR.6.2 Ask questions and answer them based on gathered information**, observations, and appropriate graphical displays to solve problems relevant to everyday life. **4.MDR.6.3** Create **dot plots** to display a	**Modification (4.MDR.6.2)** ● Students will **ask** and **answer questions** based on gathered information. **Modification (4.MDR.6.3)** ● Change in terminology from line plot to

	distribution of numerical (quantitative) measurement data.	**dot plot**.
MGSE5.OA.3 Generate two numerical patterns using a given rule. Identify apparent relationships between corresponding terms by completing a function table or input/output table. Using the terms created, form and graph ordered pairs on a coordinate plane.	**5.PAR.6** Solve relevant problems by creating and analyzing numerical patterns using the given rule(s). **5.PAR.6.1** Generate two numerical patterns using **two given rules**. Identify apparent relationships between corresponding terms by completing a table.	**Modification (5.PAR.6.1)** ● Students will generate two numerical patterns using **two given rules**.
MGSE5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). **MGSE5.G.2** Represent real world and mathematical problems by graphing points in the first quadrant of	**5.PAR.6.2** Represent problems by plotting ordered pairs and **explain** coordinate values of points in the first quadrant of the coordinate plane.	**Modification (5.PAR.6.2)** ● Students **will interpret and explain** coordinate values of points based on the problem or situation presented.

the coordinate plane, and interpret coordinate values of points in the context of the situation.		
MGSE4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. **MGSE4.MD.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	**4.GSR.7:** Investigate the concepts of angles and angle measurement to estimate and measure angles. **4.GSR.7.1** Recognize angles as geometric shapes formed when two rays share a common endpoint. Draw right, acute, and obtuse angles based on the relationship of the angle measure to 90 degrees. **4.GSR.7.2** Measure angles in reference to a circle with the center at the common endpoint of two rays. Determine an angle's measure in relation to the 360 degrees in a circle through division or as a missing factor problem.	**Continuation (4.GSR.7.1-2)** ● Maintain teaching this content
MGSE4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol or letter for the unknown angle measure.		**Subtraction (MGSE 4.MD 7)** ● This standard has been moved to 7th Grade Georgia's K-12 Mathematics Standards**.**
MGSE5.MD.1 Convert among different-sized standard measurement units (mass, weight, length, time, etc.) within a given measurement system	**5.MDR.7** Solve problems involving customary measurements, metric measurements, and time and analyze graphical displays of data to answer	**Modification (5.MDR.7.1)** ● Students will **explore** realistic problems involving different units of measurement

(customary and metric).	relevant questions. **5.MDR.7.1 Explore** realistic problems involving different units of measurement, including distance, mass, weight, volume, and time. **5.MDR.7.3** Convert among units within the metric system and then **apply** these conversions to solve multistep, practical problems. **5.MDR.7.4** Convert among units within relative sizes of measurement units within the customary measurement system.	and **apply** to solve multistep, practical problems. **Modification (5.MDR.7.3)** ● Students will **apply** conversions to solve multistep, practical problems. **Continuation (5.MDR.7.4)** ● Maintain teaching this content with focus on applying conversions to solve practical problems.
MGSE6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. **MGSE5.MD.2** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.	**5.MDR.7.2 Ask questions and answer** them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.	**Addition (5.MDR.7.2)** ● **MGSE6.SP.3** was moved from 6th Grade Georgia Standards of Excellence to 5th Grade Georgia's K-12 Mathematics Standards. **Continuation (5.MDR.7.2)** ● Maintain teaching **MGSE5.MD.2**. **Modification (5.MDR.7.2)** ● Students will **ask** and **answer questions** based on gathered information.
MGSE4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**4.GSR.8:** Identify and draw geometric objects, classify polygons based on properties, and solve problems involving area and perimeter of rectangular figures.	**Modification(4.GSR.8.1)** ● Students will **explore and investigate** attributes of shapes including **lines of symmetry.**

	4.GSR.8.1 Explore, investigate, and draw points, lines, line segments, rays, angles (right, acute, obtuse), perpendicular lines, parallel lines, and **lines of symmetry**. Identify these in two dimensional figures.	
MGSE4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	**4.GSR.8.2** Classify, **compare, and contrast** polygons based on **lines of symmetry**, the presence or absence of parallel or perpendicular line segments, or the presence or absence of angles of a specified size and based on side lengths.	**Modification(4.GSR.8.2)** ● Students should utilize **lines of symmetry to classify shapes.**
MGSE4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. **MGSE4.MD.8** Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.	**4.GSR.8.3** Solve problems involving area and perimeter of composite rectangles involving whole numbers **with known side lengths.**	**Modification(4.GSR.8.3)** ● Students will **not be expected to find unknown side lengths** when exploring composite rectangles.
MGSE4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.		**Subtraction (MGSE4.G.3)** ● This standard has been moved to 3rd Grade Georgia's K-12 Mathematics Standards**.**

SMP 1 Make sense of problems and persevere in solving them.	**4.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (4.MP.1-8)** ● Maintain teaching this content
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

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MATHEMATICS

5th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	**5.NR.1** Use place value understanding to solve real-life, mathematical problems. **5.NR.1.1 Explain** that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	**Modification (5.NR.1.1)** ● Students need to **explain** recognizing patterns in the base-ten place value system and using these patterns to solve real-life problems.
MGSE5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	**5.NR.1.2** Explain patterns in the placement of digits when multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10, up to 10^3.	**Continuation (5.NR.1.2)** ● Maintain teaching this content.
MGSE5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm (or other strategies demonstrating understanding of multiplication) up to a 3 digit by 2 digit factor.	**5.NR.2** Multiply and divide multi-digit whole numbers to solve relevant, mathematical problems. **5.NR.2.1** Fluently multiply multi-digit (up to 3 digit by 2-digit) whole numbers to **solve authentic problems.**	**Modification (5.NR.2.1)** ● Students will choose a strategy (i.e: area model, standard algorithm, etc.) that makes sense to them to **solve authentic problems involving multiplication of multi-digit whole numbers**. The focus should always be on efficiency.
MGSE5.NBT.6 Fluently divide up to 4-digit dividends and 2-digit divisors by using at least one of the following methods: strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations or concrete models. (e.g., rectangular arrays, area models)	**5.NR.2.2** Fluently divide multi-digit whole numbers (up to 4-digit dividends and 2-digit divisors no greater than 25) to **solve practical problems.**	**Modification (5.NR.2.2)** ● Students will focus on **solving relevant contextual problems to build fluency with multi-digit division of whole numbers** up to 4 digit dividends and 2-digit divisors no greater than 25.

MGSE5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	**5.NR.3** Describe fractions and perform operations with fractions to solve relevant, mathematical problems using part-whole strategies and visual models. **5.NR.3.1** Explain the meaning of a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.	**Continuation (5.NR.3.1)** ● Maintain teaching this content with focus on solving relevant problems.
MGSE5.NF.5 Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	**5.NR.3.2 Compare** and order up to three fractions with different numerators and/or different denominators by flexibly using a variety of tools and strategies.	**Modification (5.NR.3.2)** ● Students will **compare all types of fractions**, including fractions greater than one using a variety of tools and strategies.
MGSE5.NF.1 Add and subtract fractions and mixed numbers with unlike denominators by finding a common denominator and equivalent fractions to produce like denominators. **MGSE5.NF.2** Solve word problems involving addition and subtraction of fractions, including cases of unlike denominators (e.g., by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.	**5.NR.3.3 Model** and **solve** problems involving addition and subtraction of fractions and mixed numbers with unlike denominators.	**Modification (5.NR.3.3)** ● Students will use numerical reasoning to **model** and **solve** problems involving addition and subtraction of fractions and mixed numbers with unlike denominators in authentic, mathematical problems by finding a common denominator and equivalent fractions to produce like denominators using a variety of tools and strategies.
MGSE5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.	**5.NR.3.4** Model and solve problems involving multiplication of a fraction and a whole number.	**Modification (5.NR.3.4)** ● Students will be presented with a variety of practical, mathematical problems involving

a. Apply and use understanding of multiplication to multiply a fraction or whole number by a fraction. b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths.		multiplication of a fraction (less than 1, greater than 1, and equal to 1) and a whole number. ● **Simplifying fractions is not an expectation of this grade level.**
MGSE5.NF.5 Interpret multiplication as scaling (resizing), by: b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.	**5.NR.3.5 Explain** why multiplying a whole number by a fraction greater than one results in a product greater than the whole number, and why multiplying a whole number by a fraction less than one results in a product less than the whole number and multiplying a whole number by a fraction equal to one results in a product equal to the whole number.	**Modification (5.NR.3.5)** ● Students will **explain** why when presented with a variety of realistic, mathematical situations involving multiplication as scaling (resizing) that include fractions and whole numbers.
MGSE5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. b. Interpret division of a whole number by a unit fraction, and compute such quotients. c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.	**5.NR.3.6 Model** and **solve** problems involving division of a unit fraction by a whole number and a whole number by a unit fraction.	**Modification (5.NR.3.6)** ● Students will **model** and **solve** when presented with a variety of authentic problems involving division of a whole number by a unit fraction and division of a unit fraction by a whole number.

MGSE5.NBT.3 Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**5.NR.4** Read, write, and compare decimal numbers to the thousandths place, and round and perform operations with decimal numbers to the hundredths place to solve relevant, mathematical problems. **5.NR.4.1** Read and **write decimal numbers** to the thousandths place using base ten numerals written in standard form and expanded form. **5.NR.4.2 Represent, compare, and order** decimal numbers to the thousandths place based on the meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**Modification (5.NR.4.1)** ● Students are **not expected to write decimal numbers in word form**. **Modification (5.NR.4.2)** ● Students will **represent**, **compare and order** decimal numbers to the thousandths place in a meaningful context. ● Students will have opportunities to determine and explain comparisons using a variety of tools such as concrete materials, drawings, number lines, other visual representations, and strategies.
MGSE5.NBT.4 Use place value understanding to round decimals up to the hundredths place.	**5.NR.4.3** Use place value understanding to round decimal numbers to the hundredths place.	**Continuation (5.NR.4.3)** ● Maintain teaching this content with focus on the use of place value understanding to round decimal numbers to the hundredths place in practical, mathematical problems using visual aids, such as a number line.
MGSE5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	**5.NR.4.4 Solve** problems involving addition and subtraction of decimal numbers to the hundredths place using a variety of strategies.	**Modification (5.NR.4.4)** ● Students will **solve** addition and subtraction of decimal numbers using numerical reasoning and efficient strategies. **Subtraction** ● The concept of multiplying and dividing decimals to the hundredths place is covered in Grade 6 Georgia's K-12 Mathematics Standards.

MGSE5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. **MGSE5.OA.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.	**5.NR.5** Write, interpret, and evaluate numerical expressions within authentic problems. **5.NR.5.1** Write, **interpret,** and **evaluate** simple numerical expressions involving whole numbers with or without grouping symbols to represent actual situations.	**Modification (5.NR.5.1)** ● Students will **interpret** and **evaluate** simple expressions (no more than 2 operations) to represent authentic problems.
MGSE5.OA.3 Generate two numerical patterns using a given rule. Identify apparent relationships between corresponding terms by completing a function table or input/output table. Using the terms created, form and graph ordered pairs on a coordinate plane.	**5.PAR.6** Solve relevant problems by creating and analyzing numerical patterns using the given rule(s). **5.PAR.6.1** Generate two numerical patterns using **two given rules**. Identify apparent relationships between corresponding terms by completing a table.	**Modification (5.PAR.6.1)** ● Students will generate two numerical patterns using **two given rules**.
MGSE5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and	**5.PAR.6.2** Represent problems by plotting ordered pairs and **explain** coordinate values of points in the first quadrant of the coordinate plane.	**Modification (5.PAR.6.2)** ● Students **will interpret and explain** coordinate values of points based on the problem or situation presented.

x-coordinate, y-axis and y-coordinate). **MGSE5.G.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.		
MGSE5.MD.1 Convert among different-sized standard measurement units (mass, weight, length, time, etc.) within a given measurement system (customary and metric).	**5.MDR.7** Solve problems involving customary measurements, metric measurements, and time and analyze graphical displays of data to answer relevant questions. **5.MDR.7.1 Explore** realistic problems involving different units of measurement, including distance, mass, weight, volume, and time. **5.MDR.7.3** Convert among units within the metric system and then **apply** these conversions to solve multistep, practical problems. **5.MDR.7.4** Convert among units within relative sizes of measurement units within the customary measurement system.	**Modification (5.MDR.7.1)** ● Students will **explore** realistic problems involving different units of measurement and **apply** to solve multistep, practical problems. **Modification (5.MDR.7.3)** ● Students will **apply** conversions to solve multistep, practical problems. **Continuation (5.MDR.7.4)** ● Maintain teaching this content with focus on applying conversions to solve practical problems.
MGSE6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. **MGSE5.MD.2** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to	**5.MDR.7.2 Ask questions and answer** them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.	**Addition (5.MDR.7.2)** ● **MGSE6.SP.3** was moved from 6th Grade Georgia Standards of Excellence to 5th Grade Georgia's K-12 Mathematics Standards. **Continuation (5.MDR.7.2)**

solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.		• Maintain teaching **MGSE5.MD.2**. **Modification (5.MDR.7.2)** • Students will **ask** and **answer questions** based on gathered information.
MGSE5.G.4 Classify two-dimensional figures in a hierarchy based on properties (polygons, triangles, and quadrilaterals).	**5.GSR.8** Examine properties of polygons and rectangular prisms, classify polygons by their properties, and discover volume of right rectangular prisms. **5.GSR.8.1** Classify, **compare**, and **contrast** polygons based on properties.	**Modification (5.GSR.8.1)** • Students will classify, **compare**, and **contrast** polygons based on properties such as angles, side lengths, symmetry, congruence, and the presence or absence of parallel or perpendicular lines. • This objective **does not require students to create a hierarchy**.
MGSE5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.	**5.GSR.8.2 Determine**, through **exploration** and **investigation**, that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category.	**Modification (5.GSR.8.2)** • Students will **determine** through **exploration** and **investigation** by using a variety of tools to measure angles and side lengths to make sense of the attributes of two dimensional figures.
MGSE5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. **MGSE5.MD.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. **MGSE5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.	**5.GSR.8.3 Investigate** volume of right rectangular prisms by packing them with unit cubes without gaps or overlaps. Then, **determine** the total volume to solve problems.	**Modification (5.GSR.8.3)** • Students will **investigate** the volume of solid figures from realistic situations by packing them with unit cubes with no gaps or overlaps. • Students should **determine** that a solid figure packed with *n* unit cubes is said to have a volume of *n* cubic units.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.		
MGSE5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. b. Apply the formulas V = l × w × h and V = b × h for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.	**5.GSR.8.4 Discover** and **explain** how the volume of a right rectangular prism can be found by multiplying the area of the base times the height to solve authentic, mathematical problems.	**Modification (5.GSR.8.4)** ● Students will **discover** and **explain** using geometric and spatial reasoning to determine the volume, given the area of the base and the height. ● The focus of this expectation is for students to **understand the concept of volume rather than the formula**.
MGSE5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.		**Subtraction** This standard is covered in Georgia's K-12 Mathematics Standards, Grade 6 Mathematics.
SMP 1 Make sense of problems and persevere in solving them.	**5.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (5.MP.1-8)** ● Maintain teaching this content

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

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MATHEMATICS

Accelerated 5th Grade Companion Guide for Standards Interpretation

MGSE.5.NF.2 Solve word problems involving addition and subtraction of fractions, including cases of unlike denominators (e.g., by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result 2/5 + ½ = 3/7, by observing that 3/7 < ½.	**6.NR.1** Solve relevant, mathematical problems involving operations with whole numbers, fractions and decimal numbers. **6.NR.1.1** Fluently add and subtract any combination of fractions to solve problems.	**Addition (6.NR.1.1)** ● This standard was moved from GSE 5th grade to Georgia's K-12 6th Grade Mathematics Standards.
MGSE6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, including reasoning strategies such as using visual fraction models and equations to represent the problem.	**6.NR.1.2 Multiply** and divide any combination of whole numbers, fractions, and mixed numbers using a **student-selected strategy**. Interpret products and quotients of fractions and solve word problems.	**Modification (6.NR.1.2)** ● Students will **multiply** and divide **using a strategy of their choice.**
MGSE6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	**6.NR.1.3** Perform operations with multi-digit decimal numbers fluently using models and **student-selected strategies.**	**Modification (6.NR.1.3)** ● The **long division algorithm** is no longer written in the standard.
MGSE6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.		**Subtraction** ● This standard was moved from GSE 6th grade GSE to Georgia's K-12 5th Grade Mathematics Standards.
MGSE6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	**6.NR.2** Apply operations with whole numbers, fractions and decimals within relevant applications. **6.NR.2.1** Describe and interpret the center of the distribution by the equal share value (mean).	**Continuation (6.NR.2.1)** ● Maintain teaching this content

MGSE6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	**6.NR.2.2** Summarize categorical and quantitative (numerical) data sets in relation to the context: display the distributions of quantitative (numerical) data in plots on a number line, including dot plots, histograms, and box plots and display the distribution of categorical data using **bar graphs**.	**Modification (6.NR.2.2)** ● Students are extending their understanding of analyzing categorical data using **bar graphs.**
MGSE6.SP.5 Summarize numerical data sets in relation to their context, such as by giving quantitative measures of center (median and/or mean) and variability (interquartile range).	**6.NR.2.3** Interpret numerical data to answer a statistical investigative question created. Describe the distribution of a quantitative (numerical) variable collected, including its center, **variability**, and overall shape.	**Modification (6.NR.2.3)** ● Students describe variability with range, interquartile range and **mean absolute deviation (MAD)**.
MGSE6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.	**6.NR.2.4** Design simple experiments and collect data. Use data gathered from realistic scenarios and simulations to determine quantitative measures of center (median and/or mean) and variability (interquartile range and range). Use these quantities to draw conclusions about the data, compare different numerical data sets, and make predictions.	**Continuation (6.NR.2.4-6)** ● Maintain teaching this content with a focus on designing experiments, collecting and interpreting data from realistic scenarios.
MGSE6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	**6.NR.2.5** Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	
	6.NR.2.6 Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Create data displays using a dot plot or box plot to examine this impact.	
MGSE5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole	**5.NR.3** Describe fractions and perform operations with fractions to solve relevant, mathematical problems using part-whole strategies and visual	**Continuation (5.NR.3.1)** ● Maintain teaching this content with a focus on solving relevant problems.

numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	models. **5.NR.3.1** Explain the meaning of a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.	
MGSE5.NF.5 Interpret multiplication as scaling (resizing), by comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	**5.NR.3.2 Compare** and order up to three fractions with different numerators and/or different denominators by flexibly using a variety of tools and strategies.	**Modification (5.NR.3.2)** ● Students will **compare all types of fractions**, including fractions greater than one using a variety of tools and strategies.
MGSE5.NF.1 Add and subtract fractions and mixed numbers with unlike denominators by finding a common denominator and equivalent fractions to produce like denominators. **MGSE5.NF.2** Solve word problems involving addition and subtraction of fractions, including cases of unlike denominators (e.g., by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.	**5.NR.3.3 Model** and **solve** problems involving addition and subtraction of fractions and mixed numbers with unlike denominators.	**Modification (5.NR.3.3)** ● Students will use numerical reasoning to **model** and **solve** problems involving addition and subtraction of fractions and mixed numbers with unlike denominators in authentic, mathematical problems by finding a common denominator and equivalent fractions to produce like denominators using a variety of tools and strategies.
MGSE5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.	**5.NR.3.4** Model and solve problems involving multiplication of a fraction and a whole number.	**Modification (5.NR.3.4)** ● Students will be presented with a variety of practical, mathematical problems involving multiplication of a fraction (less than 1, greater than 1, and equal to 1) and a whole number. ● **Simplifying fractions is not an expectation**

		of this grade level.
MGSE5.NF.5 Interpret multiplication as scaling (resizing), by explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.	**5.NR.3.5 Explain** why multiplying a whole number by a fraction greater than one results in a product greater than the whole number, and why multiplying a whole number by a fraction less than one results in a product less than the whole number and multiplying a whole number by a fraction equal to one results in a product equal to the whole number.	**Modification (5.NR.3.5)** ● Students will **explain** why when presented with a variety of realistic, mathematical situations involving multiplication as scaling (resizing) that include fractions and whole numbers.
MGSE5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.	**5.NR.3.6 Model** and **solve** problems involving division of a unit fraction by a whole number and a whole number by a unit fraction.	**Modification (5.NR.3.6)** ● Students will **model** and **solve** when presented with a variety of authentic problems involving division of a whole number by a unit fraction and division of a unit fraction by a whole number.
MGSE6.NS.5 (Integers) Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	**6.NR.3** Solve a variety of problems involving whole numbers and their opposites; model rational numbers on a number line to describe problems presented in relevant, mathematical situations.	**Continuation (6.NR.3.1-6)** ● Maintain teaching this content
	6.NR.3.1 Identify and compare integers and explain the meaning of zero based on multiple authentic situations	
MGSE6.NS.6 (Integers on the number line) Understand a rational number as a point on the	**6.NR.3.2** Order and plot integers on a number line and use distance from zero to discover the	

number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	connection between integers and their opposites. **6.NR.3.3** Recognize and explain that opposite signs of integers indicate locations on opposite sides of zero on the number line; recognize and explain that the opposite of the opposite of a number is the number itself.	
MGSE6.NS.7 (Inequality & Absolute value) Understand ordering and absolute value of rational numbers.	**6.NR.3.4** Write, interpret, and explain statements of order for rational numbers in authentic, mathematical situations. Compare rational numbers, including integers, using equality and inequality symbols. **6.NR.3.5** Explain the absolute value of a rational number as its distance from zero on the number line; interpret absolute value as distance for a positive or negative quantity in a relevant situation. **6.NR.3.6** Distinguish comparisons of absolute value from statements about order.	
MGSE5.NBT.3 Read, write, and compare decimals to thousandths.	**5.NR.4** Read, write, and compare decimal numbers to the thousandths place, and round and perform operations with decimal numbers to the hundredths place to solve relevant, mathematical problems. **5.NR.4.1** Read and **write decimal numbers** to the thousandths place using base ten numerals written in standard form and expanded form. **5.NR.4.2 Represent, compare, and order** decimal	**Modification (5.NR.4.1)** ● Students are **not expected to write decimal numbers in word form**. **Modification (5.NR.4.2)** ● Students will **represent**, **compare and order** decimal numbers to the thousandths place in a meaningful context. ● Students will have opportunities to determine and explain comparisons using a variety of tools such as concrete materials,

	numbers to the thousandths place based on the meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	drawings, number lines, other visual representations, and strategies.
MGSE5.NBT.4 Use place value understanding to round decimals up to the hundredths place.	**5.NR.4.3** Use place value understanding to round decimal numbers to the hundredths place.	**Continuation (5.NR.4.3)** ● Maintain teaching this content with a focus on the use of place value understanding to round decimal numbers to the hundredths place in practical, mathematical problems using visual aids, such as a number line.
MGSE5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	**5.NR.4.4 Solve** problems involving addition and subtraction of decimal numbers to the hundredths place using a variety of strategies.	**Modification (5.NR.4.4)** ● Students will **solve** addition and subtraction of decimal numbers using numerical reasoning and efficient strategies. **Subtraction** ● The concept of multiplying and dividing decimals to the hundredths place is covered in Grade 6 Georgia's K-12 Mathematics Standards.
MGSE6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.	**6.NR.4** Solve a variety of contextual problems involving ratios, unit rates, equivalent ratios, percentages, and conversions within measurement systems using proportional reasoning. **6.NR.4.1 Explain** the concept of a ratio, represent ratios, and use ratio language to describe a relationship between two quantities.	**Modification (6.NR.4.1)** ● The students will **explain** the concept of a ratio.
MGSE6.RP.2 Understand the concept of a unit rate	**6.NR.4.2** Make tables of equivalent ratios relating	**Continuation (6.NR.4.2-7)**

a/b associated with a ratio a:b with b ≠ 0 (b not equal to zero), and use rate language in the context of a ratio relationship. **MGSE6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems utilizing strategies such as tables of equivalent ratios, tape diagrams (bar models), double number line diagrams, and/or equations. **MGSE6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another.	quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. **6.NR.4.3** Solve problems involving proportions using a variety of student-selected strategies. **6.NR.4.4** Describe the concept of rates and unit rate in the context of a ratio relationship. **6.NR.4.5** Solve unit rate problems including those involving unit pricing and constant speed. **6.NR.4.6** Calculate a percent of a quantity as a rate per 100 and solve everyday problems given a percent. **6.NR.4.7** Use ratios to convert within measurement systems (customary and metric) to solve authentic problems that exist in everyday life.	• Maintain teaching this content.
MGSE5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. **MGSE5.OA.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.	**5.NR.5** Write, interpret, and evaluate numerical expressions within authentic problems. **5.NR.5.1** Write, **interpret,** and **evaluate** simple numerical expressions involving whole numbers with or without grouping symbols to represent actual situations.	**Modification (5.NR.5.1)** • Students will **interpret** and **evaluate** simple expressions (no more than 2 operations) to represent authentic problems.

MGSE6.G.1 Find area of right triangles, other triangles, quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	**6.GSR.5** Solve relevant problems involving area, surface area and volume.	**Continuation (6.GSR.5.1-2)** ● Maintain teaching this content
	6.GSR.5.1 Explore area as a measurable attribute of triangles, quadrilaterals, and other polygons conceptually by composing or decomposing into rectangles, triangles, and other shapes. Find the area of these geometric figures to solve problems.	
MGSE6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	**6.GSR.5.2** Given the net of three-dimensional figures with rectangular and triangular faces, determine the surface area of these figures.	
MGSE6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths (1/2 u), and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = (length) x (width) x (height) and V= (area of base) x (height) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	**6.GSR.5.3** Calculate the **volume** of right rectangular prisms with fractional edge lengths by applying the formula, V = (area of base) x (height).	**Modification (6.GSR.5.3)** ● Students will need to understand that the **formula for volume is *V = Bh.***
MGSE6.EE.1 Write and evaluate expressions involving whole-number exponents.	**6.PAR.6** Identify, write, evaluate, and interpret numerical and algebraic expressions as mathematical models to explain authentic situations.	**Continuation (6.PAR.6.1-6)** ● Maintain teaching this content
	6.PAR.6.1 Write and evaluate numerical expressions involving rational bases and whole-number exponents.	

MGSE6.NS.4 (GCF & LCM) Find the common multiples of two whole numbers less than or equal to 12 and the common factors of two whole numbers less than or equal to 100.	**6.PAR.6.2** Determine greatest common factors and least common multiples using a variety of strategies to make sense of applicable problems	
MGSE6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.	**6.PAR.6.3** Write and read expressions that represent operations with numbers and variables in realistic situations. **6.PAR.6.4** Evaluate expressions when given values for the variables, including expressions that arise in everyday situations.	
MGSE6.EE.3 Apply the properties of operations to generate equivalent expressions. **MGSE6.EE.4** Identify when two expressions are equivalent.	**6.PAR.6.5** Apply the properties of operations to identify and generate equivalent expressions.	
MGSE6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	**6.PAR.7** Write and solve one-step equations and inequalities as mathematical models to explain authentic, realistic situations.	**Continuation (6.PAR.7.1-2)** ● Maintain teaching this content
	6.PAR.7.1 Solve one-step equations and inequalities involving variables when values for the variables are given. Determine whether an equation and inequality involving a variable is true or false for a given value of the variable.	
MGSE6.EE.6 Use variables to represent numbers and write expressions when solving a real world or mathematical problem; understand that a variable can represent an unknown number, or, depending	**6.PAR.7.2** Write one-step equations and inequalities to represent and solve problems; explain that a variable can represent an unknown number or any number in a specified set.	

on the purpose at hand, any number in a specified set.		
MGSE6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	**6.PAR.7.3** Solve problems by writing and solving **equations** of the form $x \pm p = q$, $px = q$, $\frac{x}{p} = q$ for cases in which p, q and x are all nonnegative rational numbers.	**Modification (6.PAR.7.3)** ● Students must be able to write and solve one step equations for all four operations (addition, **subtraction**, multiplication and **division**).
MGSE6.EE.8 Write an inequality of the form $x < c$ or $x > c$ represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x < c$ or $x > c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	**6.PAR.7.4** Recognize and generate **inequalities** of the form $x > c$, $x \geq c$, $x < c$, $or\ x \leq c$ to explain situations that have infinitely many solutions; represent solutions of such inequalities on a number line.	**Modification (6.PAR.7.4)** ● Students must be able to write and represent constraints of all inequalities: <, >, **≤, ≥.**
MGSE5.G.4 Classify two-dimensional figures in a hierarchy based on properties (polygons, triangles, and quadrilaterals).	**5.GSR.8** Examine properties of polygons and rectangular prisms, classify polygons by their properties, and discover volume of right rectangular prisms. **5.GSR.8.1** Classify, **compare**, and **contrast** polygons based on properties.	**Modification (5.GSR.8.1)** ● Students will classify, **compare**, and **contrast** polygons based on properties such as angles, side lengths, symmetry, congruence, and the presence or absence of parallel or perpendicular lines. ● This objective **does not require students to create a hierarchy**.
MGSE5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.	**5.GSR.8.2 Determine**, through **exploration** and **investigation**, that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category.	**Modification (5.GSR.8.2)** ● Students will **determine** through **exploration** and **investigation** by using a variety of tools to measure angles and side lengths to make sense of the attributes of two dimensional figures.
MGSE5.MD.3 Recognize volume as an attribute of	**5.GSR.8.3 Investigate** volume of right rectangular	**Modification (5.GSR.8.3)**

solid figures and understand concepts of volume measurement. **MGSE5.MD.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. **MGSE5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.	prisms by packing them with unit cubes without gaps or overlaps. Then, **determine** the total volume to solve problems.	• Students will **investigate** the volume of solid figures from realistic situations by packing them with unit cubes with no gaps or overlaps. • Students should **determine** that a solid figure packed with *n* unit cubes is said to have a volume of *n* cubic units.
MGSE5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.	**5.GSR.8.4 Discover** and **explain** how the volume of a right rectangular prism can be found by multiplying the area of the base times the height to solve authentic, mathematical problems.	**Modification (5.GSR.8.4)** • Students will **discover** and **explain** using geometric and spatial reasoning to determine the volume, given the area of the base and the height. • The focus of this expectation is for students to **understand the concept of volume rather than the formula**.
MGSE5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.		**Subtraction** • This standard is covered in Georgia's K-12 Mathematics Standards, Grade 6 Mathematics.
MGSE6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	**6.PAR.8** Graph rational numbers as points on the coordinate plane to represent and solve contextual, mathematical problems, draw polygons using the coordinates for their vertices and find the length of a side of a polygon. **6.PAR.8.1** Locate and position rational numbers on a horizontal or vertical number line; find and position pairs of integers and other rational	**Continuation (6.PAR.8.1-4)** • Maintain teaching this content

	numbers on a coordinate plane.	
	6.PAR.8.2 Show and explain that signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane and determine how two ordered pairs may differ based only on the signs.	
MGSE6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	**6.PAR.8.3** Solve problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same x coordinate or the same y-coordinate.	
MGSE6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply those techniques in the context of solving real-world mathematical problems.	**6.PAR.8.4** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same x-coordinate or the same y-coordinate.	
SMP 1 Make sense of problems and persevere in solving them.	**5.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**<u>Continuation (6.MP.1-8)</u>** ● Maintain teaching this content
	MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**MP.2** Reason abstractly and quantitatively	

SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**MP.8** Look for and express regularity in repeated reasoning.	

HCS LEARNING & PERFORMANCE | Instruction & Learning

MATHEMATICS

6th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE.5.NF.2 Solve word problems involving addition and subtraction of fractions, including cases of unlike denominators (e.g., by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result 2/5 + ½ = 3/7, by observing that 3/7 < ½.	**6.NR.1** Solve relevant, mathematical problems involving operations with whole numbers, fractions and decimal numbers. **6.NR.1.1** Fluently add and subtract any combination of fractions to solve problems.	**Addition (6.NR.1.1)** ● This standard was moved from GSE 5th grade to Georgia's K-12 6th Grade Mathematics Standards.
MGSE6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, including reasoning strategies such as using visual fraction models and equations to represent the problem.	**6.NR.1.2 Multiply** and divide any combination of whole numbers, fractions, and mixed numbers using a **student-selected strategy**. Interpret products and quotients of fractions and solve word problems.	**Modification (6.NR.1.2)** ● Students will **multiply** and divide **using a strategy of their choice.**
MGSE6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	**6.NR.1.3** Perform operations with multi-digit decimal numbers fluently using models and **student-selected strategies.**	**Modification (6.NR.1.3)** ● The **long division algorithm** is no longer written in the standard.
MGSE6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.		**Subtraction** ● This standard was moved from GSE 6th grade GSE to Georgia's K-12 5th Grade Mathematics Standards.
MGSE6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	**6.NR.2** Apply operations with whole numbers, fractions and decimals within relevant applications. **6.NR.2.1** Describe and interpret the center of the distribution by the equal share value (mean).	**Continuation (6.NR.2.1)** ● Maintain teaching this content

MGSE6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	**6.NR.2.2** Summarize categorical and quantitative (numerical) data sets in relation to the context: display the distributions of quantitative (numerical) data in plots on a number line, including dot plots, histograms, and box plots and display the distribution of categorical data using **bar graphs**.	**Modification (6.NR.2.2)** ● Students are extending their understanding of analyzing categorical data using **bar graphs.**
MGSE6.SP.5 Summarize numerical data sets in relation to their context, such as by: c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range).	**6.NR.2.3** Interpret numerical data to answer a statistical investigative question created. Describe the distribution of a quantitative (numerical) variable collected, including its center, **variability**, and overall shape.	**Modification (6.NR.2.3)** ● Students describe variability with range, interquartile range and **mean absolute deviation (MAD)**.
MGSE6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.	**6.NR.2.4** Design simple experiments and collect data. Use data gathered from realistic scenarios and simulations to determine quantitative measures of center (median and/or mean) and variability (interquartile range and range). Use these quantities to draw conclusions about the data, compare different numerical data sets, and make predictions.	**Continuation (6.NR.2.4-6)** ● Maintain teaching this content with a focus on designing experiments, collecting, and interpreting data from realistic scenarios.
MGSE6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	**6.NR.2.5** Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	
	6.NR.2.6 Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Create data displays using a dot plot or box plot to examine this impact.	
MGSE6.NS.5 (Integers) Understand that positive and negative numbers are used together to describe quantities having opposite directions or	**6.NR.3** Solve a variety of problems involving whole numbers and their opposites; model rational numbers on a number line to describe problems	**Continuation (6.NR.3.1-6)** ● Maintain teaching this content

values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	presented in relevant, mathematical situations. **6.NR.3.1** Identify and compare integers and explain the meaning of zero based on multiple authentic situations.	
MGSE6.NS.6 (Integers on the number line) Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	**6.NR.3.2** Order and plot integers on a number line and use distance from zero to discover the connection between integers and their opposites. **6.NR.3.3** Recognize and explain that opposite signs of integers indicate locations on opposite sides of zero on the number line; recognize and explain that the opposite of the opposite of a number is the number itself.	
MGSE6.NS.7 (Inequality & Absolute value) Understand ordering and absolute value of rational numbers.	**6.NR.3.4** Write, interpret, and explain statements of order for rational numbers in authentic, mathematical situations. Compare rational numbers, including integers, using equality and inequality symbols. **6.NR.3.5** Explain the absolute value of a rational number as its distance from zero on the number line; interpret absolute value as distance for a positive or negative quantity in a relevant situation. **6.NR.3.6** Distinguish comparisons of absolute value from statements about order.	
MGSE6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship	**6.NR.4** Solve a variety of contextual problems involving ratios, unit rates, equivalent ratios,	**Modification (NR.4.1)** ● The students will **explain** the concept of a

between two quantities.	percentages, and conversions within measurement systems using proportional reasoning.	ratio.
	6.NR.4.1 Explain the concept of a ratio, represent ratios, and use ratio language to describe a relationship between two quantities.	
MGSE6.RP.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0 (b not equal to zero), and use rate language in the context of a ratio relationship. **MGSE6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems utilizing strategies such as tables of equivalent ratios, tape diagrams (bar models), double number line diagrams, and/or equations. **MGSE6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another.	**6.NR.4.2** Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	**Continuation (6.NR.4.2-7)** ● Maintain teaching this content
	6.NR.4.3 Solve problems involving proportions using a variety of student-selected strategies.	
	6.NR.4.4 Describe the concept of rates and unit rate in the context of a ratio relationship.	
	6.NR.4.5 Solve unit rate problems including those involving unit pricing and constant speed.	
	6.NR.4.6 Calculate a percent of a quantity as a rate per 100 and solve everyday problems given a percent.	
	6.NR.4.7 Use ratios to convert within measurement systems (customary and metric) to solve authentic problems that exist in everyday life.	
MGSE6.G.1 Find area of right triangles, other triangles, quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques	**6.GSR.5** Solve relevant problems involving area, surface area and volume.	**Continuation (6.GSR.5.1-2)** ● Maintain teaching this content

in the context of solving real-world and mathematical problems.	**6.GSR.5.1** Explore area as a measurable attribute of triangles, quadrilaterals, and other polygons conceptually by composing or decomposing into rectangles, triangles, and other shapes. Find the area of these geometric figures to solve problems.	
MGSE6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	**6.GSR.5.2** Given the net of three-dimensional figures with rectangular and triangular faces, determine the surface area of these figures.	
MGSE6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths (1/2 u), and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = (length) x (width) x (height) and V= (area of base) x (height) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	**6.GSR.5.3** Calculate the **volume** of right rectangular prisms with fractional edge lengths by applying the formula, V = (area of base) x (height).	**Modification (6.GSR.5.3)** ● Students will need to understand that the **formula for volume is *V = Bh.***
MGSE6.EE.1 Write and evaluate expressions involving whole-number exponents.	**6.PAR.6** Identify, write, evaluate, and interpret numerical and algebraic expressions as mathematical models to explain authentic situations.	**Continuation (6.PAR.6.1-6)** ● Maintain teaching this content with a focus on explaining authentic situations.
	6.PAR.6.1 Write and evaluate numerical expressions involving rational bases and whole-number exponents.	

MGSE6.NS.4 (GCF & LCM) Find the common multiples of two whole numbers less than or equal to 12 and the common factors of two whole numbers less than or equal to 100.	**6.PAR.6.2** Determine greatest common factors and least common multiples using a variety of strategies to make sense of applicable problems	
MGSE6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.	**6.PAR.6.3** Write and read expressions that represent operations with numbers and variables in realistic situations. **6.PAR.6.4** Evaluate expressions when given values for the variables, including expressions that arise in everyday situations.	
MGSE6.EE.3 Apply the properties of operations to generate equivalent expressions. **MGSE6.EE.4** Identify when two expressions are equivalent.	**6.PAR.6.5** Apply the properties of operations to identify and generate equivalent expressions.	
MGSE6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	**6.PAR.7** Write and solve one-step equations and inequalities as mathematical models to explain authentic, realistic situations.	**<u>Continuation (6.PAR.7.1-2)</u>** ● Maintain teaching this content
	6.PAR.7.1 Solve one-step equations and inequalities involving variables when values for the variables are given. Determine whether an equation and inequality involving a variable is true or false for a given value of the variable.	
MGSE6.EE.6 Use variables to represent numbers and write expressions when solving a real world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified	**6.PAR.7.2** Write one-step equations and inequalities to represent and solve problems; explain that a variable can represent an unknown number or any number in a specified set.	

set.		
MGSE6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	**6.PAR.7.3** Solve problems by writing and solving **equations** of the form $x \pm p = q$, $px = q$, $\frac{x}{p} = q$ for cases in which p, q and x are all nonnegative rational numbers.	**Modification (6.PAR.7.3)** ● Students must be able to write and solve one step equations for all four operations (addition, **subtraction**, multiplication and **division**).
MGSE6.EE.8 Write an inequality of the form $x < c$ or $x > c$ represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x < c$ or $x > c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	**6.PAR.7.4** Recognize and generate **inequalities** of the form $x > c$, $x \geq c$, $x < c$, $or\ x \leq c$ to explain situations that have infinitely many solutions; represent solutions of such inequalities on a number line.	**Modification (6.PAR.7.4)** ● Students must be able to write and represent constraints of all inequalities: <, >, **≤, ≥.**
MGSE6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.	**6.PAR.8** Graph rational numbers as points on the coordinate plane to represent and solve contextual, mathematical problems, draw polygons using the coordinates for their vertices and find the length of a side of a polygon.	**Continuation (6.PAR.8.1-4)** ● Maintain teaching this content
	6.PAR.8.1 Locate and position rational numbers on a horizontal or vertical number line; find and position pairs of integers and other rational numbers on a coordinate plane.	
	6.PAR.8.2 Show and explain that signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane and determine how two ordered pairs may differ based only on the signs.	

MGSE6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	**6.PAR.8.3** Solve problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same x coordinate or the same y-coordinate.	
MGSE6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply those techniques in the context of solving real-world mathematical problems.	**6.PAR.8.4** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same x-coordinate or the same y-coordinate.	
SMP 1 Make sense of problems and persevere in solving them.	**6.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking , reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (6.MP.1-8)** ● Maintain teaching this content
	6.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**6.MP.2** Reason abstractly and quantitatively	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**6.MP.3** Construct viable arguments and critique the reasoning of others	
SMP 4 Model with mathematics.	**6.MP.4** Model with mathematics	
SMP 5 Use appropriate tools strategically.	**6.MP.5** Use appropriate tools strategically.	

SMP 6 Attend to precision.	**6.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**6.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**6.MP.8** Look for and express regularity in repeated reasoning.	

7th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	**7.NR.1** Solve relevant, mathematical problems, including multi-step problems, involving the four operations with rational numbers and quantities in any form (integers, percentages, fractions, and decimal numbers). **7.NR.1.1** Show that a number and its opposite have a sum of 0 (are additive inverses). Describe situations in which opposite quantities combine to make 0. **7.NR.1.2** Show and explain p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Interpret sums of rational numbers by describing applicable situations. **7.NR.1.3** Represent addition and subtraction with rational numbers on a horizontal or a vertical number line diagram to solve authentic problems. **7.NR.1.4** Show and explain subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in contextual situations. **7.NR.1.5** Apply properties of operations, including part-whole reasoning, as strategies to add and subtract rational numbers.	**Continuation (7.NR.1-5)** ● Maintain teaching this content with a focus on relevant mathematical problems.

MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **MGSE7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.	**7.NR.1.6** Make sense of multiplication of rational numbers using realistic applications.	**Continuation (7.NR.6)** ● Maintain teaching this content using realistic applications.
MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **MGSE7.NS.2d** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. **MGSE7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.	**7.NR.1.7** Show and explain that integers can be **divided**, assuming the divisor is not zero, and every quotient of integers is a rational number. **7.NR.1.8** Represent the multiplication and **division of integers using a variety of strategies** and interpret products and quotients of rational numbers by describing them based on the relevant situation. **7.NR.1.9** Apply properties of operations as strategies to solve multiplication and **division** problems involving rational numbers represented in an applicable scenario. **7.NR.1.10** Convert rational numbers between forms to include fractions, decimal numbers and percentages, using understanding of the **part divided by the whole**. Know that the decimal form of a rational number terminates in 0s or eventually repeats.	**Modification (7.NR.7-10)** ● The **long division algorithm** is no longer written in the standard.
MGSE7.EE.3 Solve multistep real-life and mathematical problems posed with positive and	**7.NR.1.11** Solve multi-step, contextual problems involving rational numbers, converting between	**Continuation (7.NR.11)** ● Maintain teaching this content.

negative rational numbers in any form (whole numbers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.	forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.	
MGSE7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	**7.PAR.2** Use properties of operations, generate equivalent expressions and interpret the expressions to explain relevant situations.	**Continuation (7.PAR.2.1-2)** ● Maintain teaching this content using relevant situations.
	7.PAR.2.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	
MGSE7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.	**7.PAR.2.2** Rewrite an expression in different forms from a contextual problem to clarify the problem and show how the quantities in it are related.	
MGSE7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.	**7.PAR.3** Represent authentic situations using equations and inequalities with variables; solve equations and inequalities symbolically, using the properties of equality.	**Continuation (7.PAR.3.1-2)** ● Maintain teaching this content through authentic situations.
	7.PAR.3.1 Construct algebraic equations to solve practical problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Interpret the solution based on the situation.	

	7.PAR.3.2 Construct algebraic inequalities to solve problems, leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \leq r$, or $px + q \geq r$, where p, q, and r are specific rational numbers. Graph and interpret the solution based on the realistic situation that the inequalities represent.	
MGSE7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.	**7.PAR.4** Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations.	**Continuation (7.PAR.4.1-6)** ● Maintain teaching this content using relevant, mathematical problems.
	7.PAR.4.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units presented in realistic problems.	
MGSE7.RP.2 Recognize and represent proportional relationships between quantities.	**7.PAR.4.2** Determine the unit rate (constant of proportionality) in tables, graphs (1, r), equations, diagrams, and verbal descriptions of proportional relationships to solve realistic problems.	
	7.PAR.4.3 Determine whether two quantities presented in authentic problems are in a proportional relationship.	
	7.PAR.4.4 Identify, represent, and use proportional relationships.	
	7.PAR.4.5 Use context to explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to	
MGSE7.G.1 Solve problems involving scale	**7.PAR.4.6** Solve everyday problems involving scale	

drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
MGSE8.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.	**7.PAR.4.7** 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	**Addition (7.PAR.4.7-8)** ● This standard was moved from 8th grade to 7th grade.
MGSE8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	**7.PAR.4.8** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	
MGSE7.RP.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, and fees.	**7.PAR.4.9** Use proportional relationships to solve multi-step ratio and percent problems presented in applicable situations.	**Continuation (7.PAR.4.9-11)** ● Maintain teaching this content presented in applicable situations.
MGSE7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	**7.PAR.4.10** Predict characteristics of a population by examining the characteristics of a representative sample. Recognize the potential limitations and scope of the sample to the population. **7.PAR.4.11** Analyze sampling methods and conclude that random sampling produces and supports valid inferences.	
MGSE.7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the	**7.PAR.4.12** Use data from repeated random samples to evaluate how much a sample mean is expected to vary from a population mean. Simulate multiple samples of the same size.	

same size to gauge the variation in estimates or predictions.		
MGSE7.G.2 Explore various geometric shapes with given conditions. Focus on creating triangles from three measures of angles and/or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.		**Subtraction** ● This standard has been removed from Georgia's K-12 Mathematics Standards.
MGSE4.MD.6 Measure angles in whole number degrees using a protractor. Sketch angles of specified measure.	**7.GSR.5** Solve practical problems involving angle measurement, circles, area of circles, surface area of prisms and cylinders, and volume of cylinders and prisms composed of cubes and right prisms. **7.GSR.5.1** Measure angles in whole nonstandard units. **7.GSR.5.2** Measure angles in whole number degrees using a protractor.	**Addition (7.GSR.5.1-2)** ● This standard was moved from 4th grade to 7th grade.
MGSE7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	**7.GSR.5.3** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve equations for an unknown angle in a figure.	**Continuation (7.GSR.5.4-5)** ● Maintain teaching this content through exploration of problems that exist in everyday life.
MGSE7.G.4 Given the formulas for the area and circumference of a circle, use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	**7.GSR.5.4** Explore and describe the relationship between pi, radius, diameter, circumference, and area of a circle to derive the formulas for the circumference and area of a circle. **7.GSR.5.5** Given the formula for the area and circumference of a circle, solve problems that exist in everyday life.	

MGSE7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	**7.GSR.5.6** Solve realistic problems involving surface area of **right prisms and cylinders**. **7.GSR.5.8** Explore volume as a measurable attribute of **cylinders and right prisms**. Find the volume of these geometric figures using concrete problems.	**Modification (7.GSR.5.6, 8)** ● This standard has been changed to indicate that students will solve to determine surface area and volume of **only prisms and cylinders**.
MGSE7.G.3 Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.	**7.GSR.5.7** Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in the plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.	**Continuation (7.GSR.5.7)** ● Maintain teaching this content.
MGSE7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	**7.PR.6** Using mathematical reasoning, investigate chance processes and develop, evaluate, and use probability models to find probabilities of simple events presented in authentic situations.	**Continuation (7.PR.6.1-6)** ● Maintain teaching this content with events presented in authentic situations.
	7.PR.6.1 Represent the probability of a chance event as a number between 0 and 1 that expresses the likelihood of the event occurring. Describe that a probability near 0 indicates an unlikely event, a probability around 1 2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	
MGSE7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. Predict the approximate relative frequency given the probability.	**7.PR.6.2** Approximate the probability of a chance event by collecting data on an event and observing its long-run relative frequency will approach the theoretical probability.	

MGSE7.SP.7 Develop a probability model and use it to find probabilities of events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy.	**7.PR.6.3** Develop a probability model and use it to find probabilities of simple events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy. **7.PR.6.4** Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of Events. **7.PR.6.5** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.	
MGSE7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	**7.PR.6.6** Use appropriate graphical displays and numerical summaries from data distributions with categorical or quantitative (numerical) variables as probability models to draw informal inferences about two samples or populations.	
MGSE7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the medians by expressing it as a multiple of the interquartile range.		**Subtraction:** ● This standard has been removed from Georgia's K-12 Mathematics Standards.
MGSE7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.		**Subtraction:** ● This standard has been removed from Georgia's K-12 Mathematics Standards.

SMP 1 Make sense of problems and persevere in solving them.	**7.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (A.MP.1-8)** ● Maintain teaching this content
	7.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**7.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**7.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**7.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**7.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**7.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**7.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**7.MP.8** Look for and express regularity in repeated reasoning.	

Accelerated 7th Grade Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	**7.NR.1** Solve relevant, mathematical problems, including multi-step problems, involving the four operations with rational numbers and quantities in any form (integers, percentages, fractions, and decimal numbers). **7.NR.1.1** Show that a number and its opposite have a sum of 0 (are additive inverses). Describe situations in which opposite quantities combine to make 0. **7.NR.1.2** Show and explain p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Interpret sums of rational numbers by describing applicable situations. **7.NR.1.3** Represent addition and subtraction with rational numbers on a horizontal or a vertical number line diagram to solve authentic problems. **7.NR.1.4** Show and explain subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in contextual situations. **7.NR.1.5** Apply properties of operations, including part-whole reasoning, as strategies to add and subtract rational numbers.	**Continuation (7.NR.1-5)** ● Maintain teaching this content with a focus on relevant mathematical problems.

MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **MGSE7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.	**7.NR.1.6** Make sense of multiplication of rational numbers using realistic applications.	**Continuation (7.NR.6)** ● Maintain teaching this content using realistic applications.
MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. **MGSE7.NS.2d** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. **MGSE7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.	**7.NR.1.7** Show and explain that integers can be **divided**, assuming the divisor is not zero, and every quotient of integers is a rational number. **7.NR.1.8** Represent the multiplication and **division of integers using a variety of strategies** and interpret products and quotients of rational numbers by describing them based on the relevant situation. **7.NR.1.9** Apply properties of operations as strategies to solve multiplication and **division** problems involving rational numbers represented in an applicable scenario. **7.NR.1.10** Convert rational numbers between forms to include fractions, decimal numbers and percentages, using understanding of the **part divided by the whole**. Know that the decimal form of a rational number terminates in 0s or eventually repeats.	**Modification (7.NR.7-10)** ● The **long division algorithm** is no longer written in the standard.
MGSE7.EE.3 Solve multistep real-life and mathematical problems posed with positive and	**7.NR.1.11** Solve multi-step, contextual problems involving rational numbers, converting between	**Continuation (7.NR.11)** ● Maintain teaching this content.

negative rational numbers in any form (whole numbers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.	forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.	
MGSE7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	**7.PAR.2** Use properties of operations, generate equivalent expressions and interpret the expressions to explain relevant situations.	**Continuation (7.PAR.2.1-2)** ● Maintain teaching this content using relevant situations.
	7.PAR.2.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	
MGSE7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.	**7.PAR.2.2** Rewrite an expression in different forms from a contextual problem to clarify the problem and show how the quantities in it are related.	
MGSE7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.	**7.PAR.3** Represent authentic situations using equations and inequalities with variables; solve equations and inequalities symbolically, using the properties of equality.	**Continuation (7.PAR.3.1-2)** ● Maintain teaching this content through authentic situations.
	7.PAR.3.1 Construct algebraic equations to solve practical problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Interpret the solution based on the situation.	

	7.PAR.3.2 Construct algebraic inequalities to solve problems, leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \leq r$, or $px + q \geq r$, where p, q, and r are specific rational numbers. Graph and interpret the solution based on the realistic situation that the inequalities represent.	
MGSE7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.	**7.PAR.4** Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations.	**Continuation (7.PAR.4.1-6)** ● Maintain teaching this content using relevant, mathematical problems.
	7.PAR.4.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units presented in realistic problems.	
MGSE7.RP.2 Recognize and represent proportional relationships between quantities.	**7.PAR.4.2** Determine the unit rate (constant of proportionality) in tables, graphs (1, r), equations, diagrams, and verbal descriptions of proportional relationships to solve realistic problems.	
	7.PAR.4.3 Determine whether two quantities presented in authentic problems are in a proportional relationship.	
	7.PAR.4.4 Identify, represent, and use proportional relationships.	
	7.PAR.4.5 Use context to explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to	
MGSE7.G.1 Solve problems involving scale	**7.PAR.4.6** Solve everyday problems involving scale	

drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
MGSE8.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.	**7.PAR.4.7** 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	**Addition (7.PAR.4.7-8)** ● This standard was moved from 8th grade to 7th grade.
MGSE8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	**7.PAR.4.8** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	
MGSE7.RP.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, and fees.	**7.PAR.4.9** Use proportional relationships to solve multi-step ratio and percent problems presented in applicable situations.	**Continuation (7.PAR.4.9-11)** ● Maintain teaching this content presented in applicable situations.
MGSE7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	**7.PAR.4.10** Predict characteristics of a population by examining the characteristics of a representative sample. Recognize the potential limitations and scope of the sample to the population. **7.PAR.4.11** Analyze sampling methods and conclude that random sampling produces and supports valid inferences.	
MGSE.7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the	**7.PAR.4.12** Use data from repeated random samples to evaluate how much a sample mean is expected to vary from a population mean. Simulate multiple samples of the same size.	

same size to gauge the variation in estimates or predictions.		
MGSE7.G.2 Explore various geometric shapes with given conditions. Focus on creating triangles from three measures of angles and/or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.		**Subtraction** ● This standard has been removed from Georgia's K-12 Mathematics Standards.
MGSE4.MD.6 Measure angles in whole number degrees using a protractor. Sketch angles of specified measure.	**7.GSR.5** Solve practical problems involving angle measurement, circles, area of circles, surface area of prisms and cylinders, and volume of cylinders and prisms composed of cubes and right prisms. **7.GSR.5.1** Measure angles in whole nonstandard units. **7.GSR.5.2** Measure angles in whole number degrees using a protractor.	**Addition (7.GSR.5.1-2)** ● This standard was moved from 4th grade to 7th grade.
MGSE7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	**7.GSR.5.3** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve equations for an unknown angle in a figure.	**Continuation (7.GSR.5.4-5)** ● Maintain teaching this content through exploration of problems that exist in everyday life.
MGSE7.G.4 Given the formulas for the area and circumference of a circle, use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	**7.GSR.5.4** Explore and describe the relationship between pi, radius, diameter, circumference, and area of a circle to derive the formulas for the circumference and area of a circle. **7.GSR.5.5** Given the formula for the area and circumference of a circle, solve problems that exist in everyday life.	

MGSE7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	**7.GSR.5.6** Solve realistic problems involving surface area of **right prisms and cylinders**. **7.GSR.5.8** Explore volume as a measurable attribute of **cylinders and right prisms**. Find the volume of these geometric figures using concrete problems.	**Modification (7.GSR.5.6, 8)** ● This standard has been changed to indicate that students will solve to determine surface area and volume of **only prisms and cylinders**.
MGSE7.G.3 Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.	**7.GSR.5.7** Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in the plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.	**Continuation (7.GSR.5.7)** ● Maintain teaching this content.
MGSE7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	**7.PR.6** Using mathematical reasoning, investigate chance processes and develop, evaluate, and use probability models to find probabilities of simple events presented in authentic situations.	**Continuation (7.PR.6.1-6)** ● Maintain teaching this content with events presented in authentic situations.
	7.PR.6.1 Represent the probability of a chance event as a number between 0 and 1 that expresses the likelihood of the event occurring. Describe that a probability near 0 indicates an unlikely event, a probability around 1 2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	
MGSE7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. Predict the approximate relative frequency given the probability.	**7.PR.6.2** Approximate the probability of a chance event by collecting data on an event and observing its long-run relative frequency will approach the theoretical probability.	

MGSE7.SP.7 Develop a probability model and use it to find probabilities of events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy.	**7.PR.6.3** Develop a probability model and use it to find probabilities of simple events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy. **7.PR.6.4** Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of Events. **7.PR.6.5** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.	
MGSE7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	**7.PR.6.6** Use appropriate graphical displays and numerical summaries from data distributions with categorical or quantitative (numerical) variables as probability models to draw informal inferences about two samples or populations.	
MGSE7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the medians by expressing it as a multiple of the interquartile range.		**Subtraction:** ● This standard has been removed from Georgia's K-12 Mathematics Standards.
MGSE7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.		**Subtraction:** ● This standard has been removed from Georgia's K-12 Mathematics Standards.

SMP 1 Make sense of problems and persevere in solving them.	**7.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (A.MP.1-8)** ● Maintain teaching this content
	7.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**7.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**7.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**7.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**7.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**7.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**7.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**7.MP.8** Look for and express regularity in repeated reasoning.	

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Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE8.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.	**8.NR.1** Solve problems involving irrational numbers and rational approximations of irrational numbers to explain realistic applications.	**Continuation (8.NR.1.1-2)** ● Maintain teaching this content with a focus on realistic applications.
	8.NR.1.1 Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.	
MGSE8.NS.2 Use rational approximation of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expression.	**8.NR.1.2** Approximation irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.	
MGSE8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.	**8.NR.2** Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real phenomena.	**Continuation (8.NR.2.1-4)** ● Maintain teaching this content within relevant application situations.
	8.NR.2.1 Apply the properties of integer exponents to generate equivalent numerical expressions.	
MGSE8.EE.2 Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $\|x\| \leq 25$) has 2 solutions and $x^3 = p$ (where p is a negative or positive rational number and $\|x\| \leq 10$) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.	**8.NR.2.2** Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2=p$, (where p is a positive rational number) and has two solutions and $x^3 = p$ (where p is negative or positive) and has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.	

MGSE8.EE.3 Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.	**8.NR.2.3** Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.	
MGSE8.EE.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Understand 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 (e.g. calculators).	**8.NR.2.4** Add, subtract, multiply, and divide numbers expressed in scientific notation, including problems where both decimals and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools.)	
MGSE9-12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.	**8.PAR.3** Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena.	**Addition (8.PAR.3.1)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
	8.PAR.3.1 Interpret expressions and parts of an expression, in context, by utilizing formulas or expressions with multiple terms and/or factors.	
MGSE8.EE.7 Solve linear equations in one variable.	**8.PAR.3.2** Describe and solve linear equations in one variable with one solution (x = a), infinitely many solutions (a = a) or no solutions (a = b).	**Continuation (8.PAR.3.2)** ● Maintain teaching this content.
MGSE8.EE.7 Solve linear equations in one variable.	**8.PAR.3.3** Create and solve linear equations and **inequalities** in one variable within a **relevant application.**	**Modification (8.PAR.3.3)**

	8.PAR.3.4 Using algebraic properties and the properties of real numbers to **justify the steps** of a one-solution equation or **inequality**. **8.PAR.3.5** Solve linear equations and **inequalities** in one variable with coefficients represented by letters and explain the solution based on the **contextual, mathematical situation**.	• Students will now **solve inequalities** with one variable in addition to the linear equations. Students will **justify** solutions and solve problems in **context**.
MGSE9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.	**8.PAR.3.6** Use algebraic reasoning to fluently manipulate linear and literal equations expressed in various forms to solve relevant mathematical problems.	**Addition (8.PAR.3.6)** • This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.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.	**8.PAR.4** Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical mathematical models and use the graphical, mathematical model to explain real phenomena represented in the graph.	**Continuation (8.PAR.4.1-2)** • Maintain teaching this content using real phenomena.
	8.PAR.4.1 Use the equation y = mx (proportional) for a line through the origin to derive the equation y = mx + b (non-propotional) for a line intersecting the vertical axis (y-axis) at b.	
MGSE9-12.A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**8.PAR.4.2** Show and explain that the graph of an equation representing an applicable situation in two variables is the set of all its solutions plotted in the coordinate plane.	
MGSE8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the		**Subtraction** • This standard was moved from Georgia's

graph. Compare two different proportional relationships represented in different ways.		K-12 8th Grade Mathematics Standards to Georgia's K-12 7th Grade Mathematics Standards.
MGSE8.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.	**8.FGR.5** Describe the properties of functions to define, evaluate, and compare relationships, and use functions and graphs of functions to model and explain real phenomena. **8.FGR.5.1** Show and explain that a function is a rule that assigns to each input exactly one output.	**Continuation (8.FGR5.1-2 & 9)** ● Maintain teaching this content to model and explain real phenomena.
MGSE8.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.	**8.FGR.5.2** Within realistic situations, identify and describe examples of functions that are linear and nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **8.FGR.5.9** Graph and analyze linear functions expressed in various algebraic forms and show key characteristics of the graph to describe applicable situations.	
MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**8.FGR.5.3** Relate the domain of a linear function to its graph and where applicable to the quantitative relationship it describes.	**Addition (8.FGR.5.3)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**8.FGR.5.4** Compare properties (rate of change and initial value) of two functions used to model an authentic situation each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**Continuation (8.FGR.5.4)** ● Maintain teaching this content using an authentic situation.

MGSE8.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.	**8.FGR.5.5** Write and explain the equations y = mx + b (slope-intercept form), **Ax + By = C (standard form), and $(y - y_1) = m(x - x_1)$ (point-slope form)** as defining a linear function whose graph is a straight line to reveal and explain different properties of the function.	**Modification (8.FGR.5.5)** ● Students will write linear equations in **standard form** and **point-slope form.**
MGSE9-12.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**8.FGR.5.6** Write a linear function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**Addition (8.FGR.5.6)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.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.	**8.FGR.5.7** 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 values (x,y), including reading these from a table or from a graph. **8.FGR.5.8** Explain the meaning of 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.	**Continuation (8.FGR.5.7-8)** ● Maintain teaching this content with more emphasis on explaining the meaning.
MGSE8.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. **MGSE8.SP.2** Know that straight lines are widely	**8.FGR.6** Solve practical, linear problems involving situations using bivariate quantitative data. **8.FGR.6.1** Show that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, visually fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line of best fit.	**Continuation (8.FGR.6.1-4)** ● Maintain teaching this content to answer a statistical investigative question.

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.		
MGSE8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	**8.FGR.6.2** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts.	
MGSE8.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.	**8.FGR.6.3** Explain the meaning of the predicted slope (rate of change) and the predicted intercept (constant term) of a linear model in the context of the data. **8.FGR.6.4** Use appropriate graphical displays from data distributions involving lines of best fit to draw informal inferences and answer the statistical investigative question posed in an unbiased statistical study.	
MGSE8.EE.8 Analyze and solve pairs of simultaneous linear equations (systems of linear equations).	**8.FGR.7** Justify and use various strategies to solve systems of linear equations to model and explain realistic phenomena.	**Continuation (8.FGR.7.1-4)** ● Maintain teaching this content with a focus on explaining realistic phenomena.
	8.FGR.7.1 Interpret and solve relevant-mathematical problems leading to two linear equations in two variables.	
	8.FGR.7.2 Show and explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their	

	graphs, because the points of intersection satisfy both equations simultaneously.	
	8.FGR.7.3 Approximate solutions of two linear equations in two variables by graphing the equations and solving simple cases by inspection.	
	8.FGR.7.4 Analyze and solve systems of two linear equations in two variables algebraically to find exact solutions.	
MGSE8.EE.8 Analyze and solve pairs of simultaneous linear equations (systems of linear equations).	**8.FGR.7.5** Create and compare the equations of two lines that are either parallel to each other, **perpendicular to each other**, or neither parallel nor **perpendicular**.	**Modification (8.FGR.7.5)** ● Students must be able to compare equations that are parallel, **perpendicular**, or neither parallel nor **perpendicular**.
MGSE8.G.6 Explain a proof of the Pythagorean Theorem and its converse.	**8.GSR.8** Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real phenomena.	**Continuation (8.GSR.8.1-4)** ● Maintain teaching this content.
	8.GSR.8.1 Explain a proof of the Pythagorean Theorem and its converse using visual models.	
MGSE8.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.	**8.GSR.8.2** Apply the Pythagorean Theorem to determine unknown side length in right triangles within authentic, mathematical problems in two and three dimensions.	
MGSE8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**8.GSR.8.3** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system in practical mathematical problems.	
MGSE8.G.9 Apply the formulas for the volume of cones, cylinders, and spheres and use them to	**8.GSR.8.4** Apply the formulas for the volume of cones, cylinders, and spheres and use them to	

solve real-world and mathematical problems.	solve relevant problems.	
MGSE8.G.1 Verify experimentally the congruence properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines. **MGSE8.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. **MGSE8.G.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **MGSE8.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. **MGSE8.G.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angels created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.		**Subtraction** ● These standards were removed from GSE 8th Grade and will only be taught in Geometry CC.

MGSE8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies in a two-way table.		
SMP 1 Make sense of problems and persevere in solving them.	**8.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (8.SMP.1-8)** ● Maintain teaching this content.
	8.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**8.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**8.MP.3** Construct viable arguments and critique the reasoning of others.	
SMP 4 Model with mathematics.	**8.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**8.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**8.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**8.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**8.MP.8** Look for and express regularity in repeated reasoning.	

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Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
MGSE8.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.	**8.NR.1** Solve problems involving irrational numbers and rational approximations of irrational numbers to explain realistic applications.	**Continuation (8.NR.1.1-2)** ● Maintain teaching this content with a focus on realistic applications.
	8.NR.1.1 Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.	
MGSE8.NS.2 Use rational approximation of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expression.	**8.NR.1.2** Approximation irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.	
MGSE8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.	**8.NR.2** Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real phenomena.	**Continuation (8.NR.2.1-4)** ● Maintain teaching this content within relevant application situations.
	8.NR.2.1 Apply the properties of integer exponents to generate equivalent numerical expressions.	
MGSE8.EE.2 Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2 = p$ (where p is a positive rational number and $\|x\| \leq 25$) has 2 solutions and $x^3 = p$ (where p is a negative or positive rational number and $\|x\| \leq 10$) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.	**8.NR.2.2** Use square root and cube root symbols to represent solutions to equations. Recognize that $x^2=p$, (where p is a positive rational number) and has two solutions and $x^3 = p$ (where p is negative or positive) and has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.	

MGSE8.EE.3 Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.	**8.NR.2.3** Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.	
MGSE8.EE.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Understand 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 (e.g. calculators).	**8.NR.2.4** Add, subtract, multiply, and divide numbers expressed in scientific notation, including problems where both decimals and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools.)	
MGSE9-12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.	**8.PAR.3** Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena.	**Addition (8.PAR.3.1)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
	8.PAR.3.1 Interpret expressions and parts of an expression, in context, by utilizing formulas or expressions with multiple terms and/or factors.	
MGSE8.EE.7 Solve linear equations in one variable.	**8.PAR.3.2** Describe and solve linear equations in one variable with one solution (x = a), infinitely many solutions (a = a) or no solutions (a = b).	**Continuation (8.PAR.3.2)** ● Maintain teaching this content.
MGSE8.EE.7 Solve linear equations in one variable.	**8.PAR.3.3** Create and solve linear equations and **inequalities** in one variable within a **relevant application.**	**Modification (8.PAR.3.3)**

	8.PAR.3.4 Using algebraic properties and the properties of real numbers to **justify the steps** of a one-solution equation or **inequality**. **8.PAR.3.5** Solve linear equations and **inequalities** in one variable with coefficients represented by letters and explain the solution based on the **contextual, mathematical situation**.	• Students will now **solve inequalities** with one variable in addition to the linear equations. Students will **justify** solutions and solve problems in **context**.
MGSE9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.	**8.PAR.3.6** Use algebraic reasoning to fluently manipulate linear and literal equations expressed in various forms to solve relevant mathematical problems.	**Addition (8.PAR.3.6)** • This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.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.	**8.PAR.4** Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical mathematical models and use the graphical, mathematical model to explain real phenomena represented in the graph.	**Continuation (8.PAR.4.1-2)** • Maintain teaching this content using real phenomena.
	8.PAR.4.1 Use the equation y = mx (proportional) for a line through the origin to derive the equation y = mx + b (non-propotional) for a line intersecting the vertical axis (y-axis) at b.	
MGSE9-12.A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**8.PAR.4.2** Show and explain that the graph of an equation representing an applicable situation in two variables is the set of all its solutions plotted in the coordinate plane.	
MGSE8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the		**Subtraction** • This standard was moved from Georgia's

graph. Compare two different proportional relationships represented in different ways.		K-12 8th Grade Mathematics Standards to Georgia's K-12 7th Grade Mathematics Standards.
MGSE8.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.	**8.FGR.5** Describe the properties of functions to define, evaluate, and compare relationships, and use functions and graphs of functions to model and explain real phenomena. **8.FGR.5.1** Show and explain that a function is a rule that assigns to each input exactly one output.	**Continuation (8.FGR5.1-2 & 9)** ● Maintain teaching this content to model and explain real phenomena.
MGSE8.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.	**8.FGR.5.2** Within realistic situations, identify and describe examples of functions that are linear and nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **8.FGR.5.9** Graph and analyze linear functions expressed in various algebraic forms and show key characteristics of the graph to describe applicable situations.	
MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**8.FGR.5.3** Relate the domain of a linear function to its graph and where applicable to the quantitative relationship it describes.	**Addition (8.FGR.5.3)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**8.FGR.5.4** Compare properties (rate of change and initial value) of two functions used to model an authentic situation each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**Continuation (8.FGR.5.4)** ● Maintain teaching this content using an authentic situation.

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MGSE8.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.	**8.FGR.5.5** Write and explain the equations y = mx + b (slope-intercept form), **Ax + By = C (standard form), and $(y - y_1) = m(x - x_1)$ (point-slope form)** as defining a linear function whose graph is a straight line to reveal and explain different properties of the function.	**Modification (8.FGR.5.5)** ● Students will write linear equations in **standard form** and **point-slope form.**
MGSE9-12.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**8.FGR.5.6** Write a linear function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**Addition (8.FGR.5.6)** ● This standard was moved from GSE Algebra I to Georgia's K-12 8th Grade Mathematics Standards.
MGSE8.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.	**8.FGR.5.7** 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 values (x,y), including reading these from a table or from a graph. **8.FGR.5.8** Explain the meaning of 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.	**Continuation (8.FGR.5.7-8)** ● Maintain teaching this content with more emphasis on explaining the meaning.
MGSE8.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. **MGSE8.SP.2** Know that straight lines are widely	**8.FGR.6** Solve practical, linear problems involving situations using bivariate quantitative data. **8.FGR.6.1** Show that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, visually fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line of best fit.	**Continuation (8.FGR.6.1-4)** ● Maintain teaching this content to answer a statistical investigative question.

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.		
MGSE8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	**8.FGR.6.2** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts.	
MGSE8.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.	**8.FGR.6.3** Explain the meaning of the predicted slope (rate of change) and the predicted intercept (constant term) of a linear model in the context of the data. **8.FGR.6.4** Use appropriate graphical displays from data distributions involving lines of best fit to draw informal inferences and answer the statistical investigative question posed in an unbiased statistical study.	
MGSE8.EE.8 Analyze and solve pairs of simultaneous linear equations (systems of linear equations).	**8.FGR.7** Justify and use various strategies to solve systems of linear equations to model and explain realistic phenomena.	**Continuation (8.FGR.7.1-4)** ● Maintain teaching this content with a focus on explaining realistic phenomena.
	8.FGR.7.1 Interpret and solve relevant-mathematical problems leading to two linear equations in two variables.	
	8.FGR.7.2 Show and explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their	

	graphs, because the points of intersection satisfy both equations simultaneously.	
	8.FGR.7.3 Approximate solutions of two linear equations in two variables by graphing the equations and solving simple cases by inspection.	
	8.FGR.7.4 Analyze and solve systems of two linear equations in two variables algebraically to find exact solutions.	
MGSE8.EE.8 Analyze and solve pairs of simultaneous linear equations (systems of linear equations).	**8.FGR.7.5** Create and compare the equations of two lines that are either parallel to each other, **perpendicular to each other**, or neither parallel nor **perpendicular**.	**Modification (8.FGR.7.5)** ● Students must be able to compare equations that are parallel, **perpendicular**, or neither parallel nor **perpendicular**.
MGSE8.G.6 Explain a proof of the Pythagorean Theorem and its converse.	**8.GSR.8** Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real phenomena.	**Continuation (8.GSR.8.1-4)** ● Maintain teaching this content.
	8.GSR.8.1 Explain a proof of the Pythagorean Theorem and its converse using visual models.	
MGSE8.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.	**8.GSR.8.2** Apply the Pythagorean Theorem to determine unknown side length in right triangles within authentic, mathematical problems in two and three dimensions.	
MGSE8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**8.GSR.8.3** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system in practical mathematical problems.	
MGSE8.G.9 Apply the formulas for the volume of cones, cylinders, and spheres and use them to	**8.GSR.8.4** Apply the formulas for the volume of cones, cylinders, and spheres and use them to	

solve real-world and mathematical problems.	solve relevant problems.	
MGSE8.G.1 Verify experimentally the congruence properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines. **MGSE8.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. **MGSE8.G.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **MGSE8.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. **MGSE8.G.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angels created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.		**Subtraction** ● These standards were removed from GSE 8th Grade and will only be taught in Geometry CC.

MGSE8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies in a two-way table.		
SMP 1 Make sense of problems and persevere in solving them.	**8.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.	**Continuation (8.SMP.1-8)** ● Maintain teaching this content.
	8.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**8.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**8.MP.3** Construct viable arguments and critique the reasoning of others.	
SMP 4 Model with mathematics.	**8.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**8.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**8.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**8.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**8.MP.8** Look for and express regularity in repeated reasoning.	

GSE Algebra I to Algebra I Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	A.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (A.MM.1.1-2, 4-5)** ● This is a new standard.
	A.MM.1.1 Explain applicable, mathematical problems using a mathematical model. **A.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities domains. **A.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems. **A.MM.1.5** Define appropriate quantities for the purpose of descriptive modeling.	
MGSE9-12.N.Q.1 Use units of measure (linear, area, capacity, rates, and time) as a way to understand problems. **MGSE9-12.N.Q.2** Define appropriate quantities for the purpose of descriptive modeling. Given a situation, context, or problem, students will determine, identify, and use appropriate quantities for representing the situation. **MGSE9-12.N.Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**A.MM.1.3** Use units of measure (linear, area, capacity, rates, and time) as a way to make sense of conceptual problems; identify, use, and record appropriate units of measure within the given framework, within data displays, and on graphs; convert units and rates using proportional reasoning given a conversion factor; use units within multi-step problems and formulas; interpret units of input and resulting units of output.	**Modification (A.MM.1.3)** ● This expectation is a **combination** of the GSE N.Q standards from GSE Algebra I.

MGSE9-12.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **MGSE9-12.F.BF.2** Write arithmetic and geometric sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.	**A.FGR.2** Construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena. Use formal notation to represent linear functions and the key characteristics of graphs of linear functions, and informally compare linear and nonlinear functions using parent graphs.	**Continuation (A.FGR.2.1-4)** ● Maintain teaching this content.
	A.FGR.2.1 Use mathematically applicable situations algebraically and graphically to build and interpret arithmetic sequences as functions whose domain is a subset of the integers.	
MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.BF.1** Write a function that describes a relationship between two quantities.	**A.FGR.2.2** Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation.	

MGSE9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range. Graphically, the graph is y = f(x). **MGSE9-12.F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**A.FGR.2.3** Relate the domain and range of a linear function to its graph and, where applicable, to the quantitative relationship it describes. Use formal interval and set notation to describe the domain and range of linear functions.	
MGSE9-12.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**A.FGR.2.4** Use function notation to build and evaluate linear functions for inputs in their domains and interpret statements that use function notation in terms of a mathematical framework.	
MGSE9-12.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. **MGSE9-12.F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	**A.FGR.2.5** Analyze the difference between linear functions and nonlinear functions by informally analyzing the graphs of various **parent** functions (linear, quadratic, exponential, **absolute value, square root, and cube root parent** curves).	**Modification (A.FGR.2.5)** ● Compare the graphs of various **parent** functions (linear, quadratic, exponential, **absolute value, square root, and cube root parent curve**); students can discuss their similarities and differences.
MGSE9-12.GPE.4 Use coordinates to prove simple geometric theorems algebraically. (Focus on quadrilaterals, right triangles, and circles.) **MGSE9-12.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	**A.GSR.3** Solve problems involving distance, midpoint, slope, area, and perimeter to model and explain real-life phenomena. **A.GSR.3.1** Solve real-life problems involving slope, parallel lines, perpendicular lines, area, and perimeter.	**Addition (A.GSR.3.1-2)** ● This standard was moved from GSE Geometry to Algebra CC.

MGSE9-12.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. **MGSE9-12.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	**A.GSR.3.2** Apply the distance formula, midpoint formula, and slope of line segments to solve real-world problems.	
MGSE9-12.A.REI.3 Solve linear equations and inequalities in one variable including equations with coefficients represented by letters. **MGSE9-12.A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only). **MGSE9-12.A.CED.2** Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**A.PAR.4** Create, analyze, and solve linear inequalities in two variables and systems of linear inequalities to model real-life phenomena. **A.PAR.4.1** Create and solve **linear inequalities** in two variables to represent relationships between quantities including mathematically applicable situations; graph inequalities on coordinate axes with labels and scales.	**<u>Modification (A.PAR.4.1)</u>** ● This expectation now only refers to **linear inequalities**. **Linear equations are only included in 8th grade.**
MGSE9-12.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.	**A.PAR.4.2** Represent constraints of **linear inequalities** and interpret data points as possible or not possible.	**<u>Modification(A.PAR.4.2-3)</u>** ● This expectation now only refers to **linear inequalities**. **Linear equations are only included in 8th grade.**
MGSE9-12.A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**A.PAR.4.3** Solve systems of **linear inequalities** by graphing, including systems representing a mathematically applicable situation.	

MGSE9-12.REI.11 Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same.		
MGSE9-12.REI.12 Graph the solution set to a linear inequality in two variables.	**A.PAR.4.3** Solve systems of linear inequalities by graphing, including systems representing a mathematically applicable situation.	**Continuation (A.PAR.4.3)** ● Maintain teaching this content using a mathematically applicable situation.
MGSE9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.		**Subtraction** ● This standard was moved from GSE Algebra I to 8th Grade.
MGSE9-12.A.REI.1 Using algebraic properties and the properties of real numbers, justify the steps of a simple, one-solution equation. Students should justify their own steps, or if given two or more steps of an equation, explain the progression from one step to the next using properties.		**Subtraction** ● These standards were removed from GSE Algebra I and continue in 8th Grade.
MGSE9-12.A.REI.5 Show and explain why the elimination method works to solve a system of two-variable equations**.**		
MGSE9-12.A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		
MGSE9-12.N.RN.2 Rewrite expressions involving radicals	**A.NR.5** Investigate rational and irrational numbers and rewrite expressions involving square roots and cube roots	**Continuation (A.NR.5.1-2)** ● Maintain teaching this content.

	A.NR.5.1 Rewrite algebraic and numeric expressions involving radicals.	
MGSE9-12.N.RN.3 Explain why the sum or product of 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.NR.5.2** Using numerical reasoning, show and explain that the sum or product of rational numbers is rational, the sum of a rational number and an irrational number is irrational, and the product of a nonzero rational number and an irrational number is irrational.	
MGSE9-12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.	**A.PAR.6** Build quadratic expressions and equations to represent and model real-life phenomena; solve quadratic equations in mathematically applicable situations.	**Continuation (A.PAR.6.1-4)** ● Maintain teaching this content .
	A.PAR.6.1 Interpret quadratic expressions and parts of a quadratic expression that represent a quantity in terms of its context.	
MGSE9-12.A.SSE.2 Use the structure of an expression to rewrite it in different equivalent forms. **MGSE9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	**A. PAR.6.2** Fluently choose and produce an equivalent form of a quadratic expression to reveal and explain properties of the quantity represented by the expression.	
MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities. **MGSE9-12.A.CED.1** Create equations and	**A.PAR.6.3** Create and solve quadratic equations in one variable and explain the solution in the framework of applicable phenomena.	

inequalities in one variable and use them to solve problems. **MGSE9-12.A.REI.4** Solve quadratic equations in one variable.		
MGSE9-12.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.	**A.PAR.6.4** Represent constraints by quadratic equations and interpret data points as possible or not possible in a modeling framework.	
MGSE9-12.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**A.FGR.7** Construct and interpret quadratic functions from data points to model and explain real-life phenomena; describe key characteristics of the graph of a quadratic function to explain a mathematically applicable situation for which the graph serves as a model.	**Continuation (A.FGR.7.1-9)** ● Maintain teaching this content with a focus on explaining real-life phenomena.
	A.FGR.7.1 Use function notation to build and evaluate quadratic functions for inputs in their domains and interpret statements that use function notation in terms of a given framework.	
MGSE9-12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	**A.FGR.7.2** Identify the effect on the graph generated by a quadratic function when replacing f(x) with f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs.	

MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.IF.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **MGSE9-12.A.REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**A.FGR.7.3** Graph and analyze the key characteristics of quadratic functions. **A.FGR.7.9** Compare characteristics of two functions each represented in a different way.	
MGSE9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range. Graphically, the graph is y = f(x). **MGSE9-12.F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**A.FGR.7.4** Relate the domain and range of a quadratic function to its graph and, where applicable, to the quantitative relationship it describes.	
MGSE9-12.F.IF.8 Write a function defined by an	**A.FGR.7.5** Rewrite a quadratic function representing	

expression in different but equivalent forms to reveal and explain different properties of the function. **MGSE9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.	a mathematically applicable situation to reveal the maximum or minimum value of the function it defines. Explain what the value describes in context. **A.FGR.7.8** Write a function defined by a quadratic expression in different but equivalent forms to reveal and explain different properties of the function.	
MGSE9-12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only).	**A.FGR.7.6** Create quadratic functions in two variables to represent relationships between quantities; graph quadratic functions on the coordinate axes with labels and scales.	
MGSE9-12.A.CED.2 Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **MGSE9-12.F.IF.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.	**A.FGR.7.7** Estimate, calculate, and interpret the average rate of change of a quadratic function and make comparisons to the average rate of change of linear functions.	
MGSE9-12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context. **MGSE9-12.F.LE.5** Interpret the parameters in a linear (f(x) = mx + b) and exponential (f(x) = a•dx) function in terms of context.	**A.PAR.8** Create and analyze exponential expressions and equations to represent and model real-life phenomena; solve exponential equations in mathematically applicable situations.	**Continuation (A.PAR.8.1-4)** ● Maintain teaching this content with a focus on explaining real-life phenomena.
	A.PAR.8.1 Interpret exponential expressions and parts of an exponential expression that represent a quantity in terms of its framework.	

MGSE9-12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only).	**A.PAR.8.2** Create exponential equations in one variable and use them to solve problems, including mathematically applicable situations.	
MGSE9-12.A.CED.2 Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**A.PAR.8.3** Create exponential equations in two variables to represent relationships between quantities, including in mathematically applicable situations; graph equations on coordinate axes with labels and scales.	
MGSE9-12.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.	**A.PAR.8.4** Represent constraints by exponential equations and interpret data points as possible or not possible in a modeling environment.	
MGSE9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range, i.e. each input value maps to exactly one output value. If f is a function, x is the input (an element of the domain), and f(x) is the output (an element of the range). Graphically, the graph is y = f(x). **MGSE9-12.F.IF.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**FGR.9** Construct and analyze the graph of an exponential function to explain a mathematically applicable situation for which the graph serves as a model; compare exponential with linear and quadratic functions. **A.FGR.9.1** Use function notation to build and evaluate exponential functions for inputs in their domains and interpret statements that use function notation in terms of a context.	**Continuation (A.FGR.9.1-4)** ● Maintain teaching this content to explain mathematically applicable situations.

MGSE9-12.F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).		
MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **MGSE9-12.F.IF.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. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.A.REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**A.FGR.9.2** Graph and analyze the key characteristics of simple exponential functions based on mathematically applicable situations	
MGSE9-12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with	**A.FGR.9.3** Identify the effect on the graph generated by an exponential function when replacing f(x) with f(x) + k, and k f(x), for specific values of k (both positive and negative); find the value of k given the	

cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	graphs.	
MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities. **MGSE9-12.F.BF.1a** Determine an explicit expression and the recursive process (steps for calculation) from context. **MGSE9-12.F.BF.2** Write arithmetic and geometric sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions. **MGSE9-12.F.IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **MGSE9-12.F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	**A.FGR.9.4** Use mathematically applicable situations algebraically and graphically to build and interpret geometric sequences as functions whose domain is a subset of the integers.	
MGSE9-12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**A.FGR.9.5** Compare characteristics of two **functions** each represented in a different way.	**Modification (A.FGR.9.5)** ● Students will compare exponential with linear **and quadratic functions**.

MGSE9-12.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. **MGSE9-12.F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.		
MGSE9-12.S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, mean absolute deviation, standard deviation) of two or more different data sets.	**A.DSR.10** Collect, analyze, and interpret univariate quantitative data to answer statistical investigative questions that compare groups to solve real-life problems; Represent bivariate data on a scatter plot and fit a function to the data to answer statistical questions and solve real-life problems. **A.DSR.10.1** Use statistics appropriate to the shape of the data distribution to compare and represent center (median and mean) and variability (interquartile range, **standard deviation**) of two or more distributions by hand and using technology.	**Modification (A.DSR.10.1)** ● Students should **determine standard deviation** to solve problems and answer statistical investigative questions.
MGSE9-12.S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers)	**A.DSR.10.2** Interpret differences in shape, center, and variability of the distributions based on the investigation, accounting for possible effects of extreme data points (outliers).	**Continuation (A.DSR.10.2-7)** ● Maintain teaching this content with a focus on answering statistical investigative questions and solving real-life problems.
MGSE9-12.S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	**A.DSR.10.3** Represent data on two quantitative variables on a scatter plot and describe how the variables are related. **A.DSR.10.6** Decide which type of function is most appropriate by observing graphed data.	

MGSE9-12.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **MGSE9-12.F.IF.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.	**A.DSR.10.4** Interpret the slope (predicted rate of change) and the intercept (constant term) of a linear model based on the investigation of the data.	
MGSE9-12.S.ID.8 Compute (using technology) and interpret the correlation coefficient "r" of a linear fit. After calculating the line of best fit using technology, students should be able to describe how strong the goodness of fit of the regression is, using "r".	**A.DSR.10.5** Calculate the line of best fit and interpret the correlation coefficient, r, of a linear fit using technology. Use r to describe the strength of the goodness of fit of the regression. Use the linear function to make predictions and assess how reasonable the prediction is in context.	
MGSE9-12.S.ID.9 Distinguish between correlation and causation.	**A.DSR.10.7** Distinguish between correlation and causation.	
MGSE9-12.S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).		**Subtraction** ● This standard was removed from GSE Algebra I and remains in 6th grade.
MGSE9-12.S.ID.5 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.		**Subtraction** ● This standard was moved from GSE Algebra I to Geometry CC.
SMP 1 Make sense of problems and persevere in solving them.	**A.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical	**Continuation (A.MP.1-8)** ● Maintain teaching this content.

	thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	
	A.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**A.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**A.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**A.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**A.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**A.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**A.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**A.MP.8** Look for and express regularity in repeated reasoning.	

HCS LEARNING & PERFORMANCE | Instruction & Learning

MATHEMATICS

GSE Geometry to Geometry Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	G.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (G.MM.1.1-5)** ● This is a new standard.
	G.MM.1.1 Explain applicable, mathematical problems using a mathematical model. **G.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **G.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation. **G.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.	
MGSE9-12.A.APR.1 Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.	**G.PAR.2** Interpret the structure of polynomial expressions and perform operations with polynomials within a geometric framework.	**Addition (G.PAR.2)** ● This standard was moved from GSE Algebra I to Geometry CC.
	G.PAR.2.1 Interpret polynomial expressions of varying degrees that represent a quantity in terms of its given geometric framework. **G.PAR.2.2** Perform operations with polynomials and prove that polynomials form a system	

	analogous to the integers in that they are closed under these operations. **G.PAR.2.3** Using algebraic reasoning, add, subtract, and multiply single variable polynomials.	
MGSE9-12.G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	**G.GSR.3** Experiment with transformations in the plane to develop precise definitions for translations, rotations, and reflections and use these to describe symmetries and congruence to model and explain real-life phenomena.	**Continuation (G.GSR 3.1-4)** ● Maintain teaching this content to model and explain real-life phenomena.
	G.GSR.3.1 Use geometric reasoning and symmetries of regular polygons to develop definitions of rotations, reflections, and translations.	
MGSE912.G.CO.7 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. **MGSE9-12.G.CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. (Extend to include HL and AAS.)	**G.GSR.3.2** Verify experimentally the congruence properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines. **G.GSR.3.4** Explain how the criteria for triangle congruence follow from the definition of congruence in terms of rigid motions. Use congruency criteria for triangles to solve problems and to prove relationships in geometric figures.	

MGSE9-12.G.CO.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). **MGSE912.G.CO.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. **MGSE912.G.CO.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. **MGSE9-12.G.CO.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.GSR.3.3** Use geometric descriptions of rigid motions to draw the transformed figures and to predict the effect on a given figure. Describe a sequence of transformations from one figure to another and use transformation properties to determine congruence.	

MGSE9-12.G.CO.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.GSR.4** Establish facts between angle relations and generate valid arguments to defend facts established. Prove theorems and solve geometric problems involving lines and angles to model and explain real-life phenomena.	**Modification (G.GSR.4)** ● Students should be able to apply the **Segment Addition Postulate** and Angle Addition Postulate to solve real-life problems.
	G.GSR.4.1 Use the undefined notions of point, line, line segment, plane, distance along a line segment, and distance around a circular arc to develop and use precise definitions and symbolic notations to prove theorems and **solve geometric problems**.	
MGSE9-12.G.CO.11 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.GSR.4.2** Classify quadrilaterals in the coordinate plane by proving simple geometric theorems algebraically.	**Continuation (G.GSR 4.2-5)** ● Maintain teaching this content to model and explain real-life phenomena.
MGSE9-12.G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). 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.GSR.4.3** Make formal geometric constructions with a variety of tools and methods.	

MGSE9-12.G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon, each inscribed in a circle.		
MGSE9-12.G.CO.9 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; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. **MGSE9-12.GPE.4** Use coordinates to prove simple geometric theorems algebraically.	**G.GSR.4.4** Prove and apply theorems about lines and angles to solve problems.	
MGSE8.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. **MGSE9-12.G.CO.10** Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; 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.GSR.4.5** Use geometric reasoning 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.	
MGSE9-12.G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to		**Subtraction** ● These standards were moved from GSE

solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). **MGSE9-12-G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio. **MGSE9-12-G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.		Geometry to Algebra CC.
MGSE9-12-G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **MGSE9-12-G.C.4** Construct a tangent line from a point outside a given circle to the circle. **MGSE9-12-G.CO.13** Construct an equilateral triangle, a square, and a regular hexagon, each inscribed in a circle.		**Subtraction** ● These standards were removed from Georgia's K-12 Mathematics Standards.
MGSE9-12.G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor.	**G.GSR.5** Describe dilations in terms of center and scale factor and use these terms to describe properties of dilations; use the precise definition of a dilation to describe similarity and establish the criterion for triangles to be similar; use these terms, definitions, and criterion to prove similarity, model, and explain real-life phenomena.	**Continuation (G.GSR 5.1-4)** ● Maintain teaching this content to model and explain real-life phenomena.

	G.GSR.5.1 Verify experimentally the properties of dilations.	
MGSE9-12.G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they 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.GSR.5.2** Given two figures, use and apply the definition of similarity in terms of similarity transformations.	
MGSE9-12.G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	**G.GSR.5.3** Use the properties of similarity transformations to establish criterion for two triangles to be similar. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	
MGSE9-12.G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; 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. **MGSE9-12.G.SRT.4** Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, (and its converse); the Pythagorean Theorem using triangle similarity. **MGSE9-12.G.SRT.5** Use congruence and similarity	**G.GSR.5.4** Construct formal proofs to justify and apply theorems about triangles.	

criteria for triangles to solve problems and to prove relationships in geometric figures.		
MGSE9-12.G.C.1 Understand that all circles are similar.		**Subtraction** ● This standard was removed from Georgia's K-12 Mathematics Standards.
MGSE9-12.G.SRT.6 Understand 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.GSR.6** Examine side ratios of similar triangles; use the relationship between right triangles to develop an understanding of sine, cosine, and tangent to solve mathematically applicable geometric problems and to model and explain real-life phenomena.	**Continuation (G.GSR 6.1-3)** ● Maintain teaching this content to model and explain real-life phenomena.
	G.GSR.6.1 Explain 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.	
MGSE9-12.G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.	**G.GSR.6.2** Explain and use the relationship between the sine and cosine of complementary angles.	
MGSE9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	**G.GSR.6.3** Use trigonometric ratios and the Pythagorean Theorem to solve for sides and angles of right triangles in applied problems.	
MGSE9-12.F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	**G.GSR.7** Explore the concept of a radian measure and special right triangles.	**Addition (G.GSR.7.1-3)** ● This standard was moved from GSE Pre-Calculus to Geometry CC.
	G.GSR.7.1 Explore and interpret a radian as the ratio of the arc length to the radius of a circle.	

MGSE9-12.F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	**G.GSR.7.2** Explore and explain the relationship between radian measures and degree measures and convert fluently between degree and radian measures.	
MGSE9-12.F.TF.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.	**G.GSR.7.3** Use special right triangles on the unit circle to determine the values of sine, cosine, and tangent for 30° (π/ 6), 45° (π/ 4) and 60° (π/ 3) angle measures. Use reflections of triangles to determine reference angles and identify coordinate values in all four quadrants of the coordinate plane.	
MGSE9-12.G.C.2 Identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. 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.	**G.GSR.8** Examine and apply theorems involving circles; describe and derive arc length and area of a sector; and model and explain real-life situations involving circles.	**Continuation (G.GSR 8.1-3)** ● Maintain teaching this content to model and explain real-life phenomena.
	G.GSR.8.1 Identify and apply angle relationships formed by chords, tangents, secants and radii with circles.	
MGSE9-12.G.C.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	**G.GSR.8.2** Using similarity, derive the fact that the length of the arc (arc length) intercepted by an angle is proportional to the radius; derive the formula for the area of a sector. Solve mathematically applicable problems involving applications of arc length and area of sector.	
MGSE9-12.G.GPE.1 Derive the equation of a circle	**G.GSR.8.3** Write and graph the equation of circles	

of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	in standard form.	
MGSE9-12.G.GMD.1 Give informal arguments for geometric formulas. **MGSE9-12.G.GMD.2** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. **MGSE9-12.G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**G.GSR.9** Develop informal arguments for geometric formulas using dissection arguments, limit arguments, and Cavalieri's principle; solve mathematically applicable problems involving volume; explore and visualize relationships between two-dimensional and three-dimensional objects to model and explain real-life phenomena.	**Continuation (G.GSR 9.1-3)** ● Maintain teaching this content to model and explain real-life phenomena.
	G.GSR.9.1 Use volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems including right and oblique solids.	
MGSE9-12.G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	**G.GSR.9.2** Use geometric shapes, their measures, and their properties to describe objects and approximate volumes.	
MGSE9-12.G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	**G.GSR.9.3** Apply concepts of density based on area and volume in modeling situations.	
MGSE9-12.G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.		**Subtraction** ● These standards were removed from Georgia's K-12 Mathematics Standards.
MGSE9-12.G.MG.3 Apply geometric methods to		

solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).		
MGSE9-12.S.CP.1 Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events (or, and, not). **MGSE9-12.S.CP.7** Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answers in context.	**G.PR.10** Solve problems involving the probability of compound events to make informed decisions; interpret expected value and measures of variability to analyze probability distributions. **G.PR.10.1** Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events. Apply the Addition Rule conceptually, P(A or B)= P(A) + P(B)-P(A and B), and interpret the answers in context.	**Continuation (G.GPR 10.1)** ● Maintain teaching this content to make informed decisions.
MGSE9-12.S.CP.2 Understand that if two events A and B are independent, the probability of A and B occurring together is the product of their probabilities, and that if the probability of two events A and B occurring together is the product of their probabilities, the two events are independent. **MGSE9-12.S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. **MGSE9-12.S.CP.6** Find the conditional probability of A given B as the fraction of B's outcomes that	**G.PR.10.2** Apply and interpret the general Multiplication Rule conceptually to independent events of a sample space, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)] using contingency tables or tree diagrams.	**Addition (G.PR.10.2)** ● Standard CP.8 was moved from GSE Pre-Calculus to Geometry CC. ● Maintain teaching standards CP.2 & 5.

also belong to A, and interpret the answer in context. **MGSE9-12.S.CP.8** Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.		
MGSE9-12.S.CP.3 Understand the conditional probability of A given B as P (A and B)/P(B). Interpret independence of A and B in terms of conditional probability; that is the conditional probability of A given B is the same as the probability of A and the conditional probability of B given A is the same as the probability of B.	**G.PR.10.3** Use conditional probability to interpret risk in terms of decision-making and investigate questions such as those involving false positives or false negatives from screening tests.	**Continuation (G.GPR 10.3)** ● Maintain teaching this content.
MGSE9-12.S.CP.9 Use permutations and combinations to compute probabilities of compound events and solve problems.	**G.PR.10.4** Define permutations and combinations and apply this understanding to compute probabilities of compound events and solve meaningful problems.	**Addition (G.PR.10.4-7)** ● These expectations were moved from GSE Pre-Calculus to Geometry CC.
MGSE9-12.S.MD.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. **MGSE9-12.S.MD.4** Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.	**G.PR.10.5** Interpret the probability distribution for a given random variable and interpret the expected value. **G.PR.10.6** Develop a probability distribution for variables of interest using theoretical and empirical (observed) probabilities and calculate and interpret the expected value.	
MGSE9-12.S.MD.2 Calculate the expected value of a random variable; interpret it as the mean	**G.PR.10.7** Calculate the expected value of a random variable and interpret it as the mean of a	

of the probability distribution	given probability distribution.	
MGSE9-12.S.MD.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.	**G.PR.10.8** Compare the payoff values associated with the probability distribution for a random variable and make informed decisions based on expected value and measures of variability.	
MGSE9-12.S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. **MGSE9-12.S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.	**G.DSR.11** Examine real-life situations presented in a two-way frequency table to calculate probabilities, to model categorical data, and to explain real-life phenomena.	**Continuation (G.DSR 11.1-2)** ● Maintain teaching this content to model and explain real-life phenomena.
	G.DSR.11.1 Construct and summarize categorical data for two categories in two-way frequency tables. **G.DSR.11.2** Use categorical data in two-way frequency tables to calculate and interpret probabilities based on the investigation.	
SMP 1 Make sense of problems and persevere in solving them.	**G.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (A.MP.1-8)** ● Maintain teaching this content.
	G.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**G.MP.2** Reason abstractly and quantitatively.	

SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**G.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**G.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**G.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**G.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**G.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**G.MP.8** Look for and express regularity in repeated reasoning.	

GSE Algebra II to ALGEBRA II Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	AA.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (AA.MM.1.1-4)** ● This is a new standard.
	AA.MM.1.1 Explain applicable, mathematical problems using a mathematical model. **AA.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **AA.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a mathematical, applicable situation. **AA.MM.1.4** Use various mathematical representations and structures to represent and solve real-life problems.	
MGSE9-12.S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	**AA.DSR.2:** Communicate descriptive and inferential statistics by collecting, critiquing, analyzing, and interpreting real world data.	**Continuation (AA.DSR.2.1)** ● Maintain teaching this content.
	AA.DSR.2.1 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. Distinguish between primary and secondary data and how it affects the types of conclusions that can be drawn.	

MGSE9-12.S.IC.6 Evaluate reports based on data. For example, determining quantitative or categorical data; collection methods; biases or flaws in data	**AA.DSR.2.2** When collecting and considering data, critically evaluate **ethics, privacy, potential bias, and confounding variables** along with their implications for interpretation in answering a statistical investigative question. **Implement strategies for organizing and preparing big data sets.**	**Modification (AA.DSR.2.2)** ● Students should evaluate **ethics, privacy,** potential bias, and **confounding variables**. **Implement strategies for organizing and preparing big data sets.**
MGSE9-12.S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **MGSE9-12.S.IC.2** Decide if a specified model is consistent with results from a given datagenerating process, e.g., using simulation. **MGSE9-12.S.IC.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. **MGSE9-12.S.IC.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	**AA.DSR.2.3** Distinguish between population distributions, sample data distributions, and sampling distributions. Use sample statistics to make inferences about population parameters based on a random sample from that population and to communicate conclusions using appropriate statistical language.	**Continuation (AA.DSR.2.3-7)** ● Maintain teaching this content.
MGSE9-12.S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate	**AA.DSR.2.4** Calculate and interpret z-scores as a measure of relative standing and as a method of standardizing units. **AA.DSR.2.5** Given a normally distributed population, estimate percentages using the	

areas under the normal curve.	Empirical Rule, z-scores, and technology.	
MGSE9-12.S.IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	**AA.DSR.2.6** Model sample-to-sample variability in sampling distributions of a statistic using simulations taken from a given population. **AA.DSR.2.7** Given a margin of error, develop and compare confidence intervals of different models to make conclusions about reliability.	
	AA.DSR.2.8 Summarize and evaluate reports based on data for appropriateness of study design, analysis methods, and statistical measures used.	**Addition (AA.DSR.2.8)** ● This is a new expectation.
MGSE9-12.S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, mean absolute deviation, standard deviation) of two or more different data sets.		**Subtraction** ● This standard was moved from GSE Algebra II to Algebra CC.
MGSE9-12.F.BF.4 Find inverse functions. **MGSE9-12.F.BF.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **MGSE9-12.F.LE.4** For exponential models, express as a logarithm the solution to ab(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. **MGSE9-12.A.SSE.1** Interpret expressions that	**AA.FGR.3:** Explore and analyze structures and patterns for exponential and logarithmic functions and use exponential and logarithmic expressions, equations, and functions to model real-life phenomena. **AA.FGR.3.1** Find the inverse of exponential and logarithmic functions using equations, tables, and graphs, limiting the domain of inverses where necessary to maintain functionality, and **prove by composition or verify by inspection** that one function is the inverse of another. **AA.FGR.3.3** Use the definition of a logarithm,	**Modification (AA.FGR.3.1,3-5)** ● Students will **prove by composition and verify by inspection** that one function is the inverse of another.

represent a quantity in terms of its context.	logarithmic properties, and the inverse relationship between exponential and logarithmic functions to **solve problems in context**. **AA.FGR.3.4 Create** exponential equations and use logarithms to **solve mathematical, applicable problems** for which only one variable is unknown. **AA.FGR.3.5 Create** and interpret logarithmic equations in one variable and use them to solve problems.	
MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **MGSE9-12.F.IF.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. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to exponential and logarithmic functions.) **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.	**AA.FGR.3.2** Analyze, graph, and compare exponential and logarithmic functions.	**Continuation (AA.FGR.3.2)** ● Maintain teaching this content.
	AA.FGR.3.6 Create, interpret, and solve exponential equations to represent relationships between quantities and analyze the relationships numerically with tables, algebraically, and	**Addition (AA.FGR.3.6)** ● This is a new expectation.

	graphically.	
	AA.FGR.3.7 Create, interpret, and solve logarithmic equations in two or more variables to represent relationships between quantities.	**Addition (AA.FGR.3.7)** ● This is a new expectation.
MGSE9-12.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.		**Subtraction** ● This standard was removed from GSE Algebra II.
MGSE9-12.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.		**Subtraction** ● This standard was removed from GSE Algebra II.
MGSE9-12.N.RN.1. Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, allowing for a notation for radicals in terms of rational exponents. **MGSE9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**AA.FGR.4:** Explore and analyze structures and patterns for radical functions and use radical expressions, equations, and functions to model real-life phenomena. **AA.FGR.4.1** Rewrite radical expressions as expressions with rational exponents. Extend the properties of integer exponents to rational exponents.	**Continuation (AA.FGR.4.1)** ● Maintain teaching this content.
MGSE9-12.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.	**AA.FGR.4.2** Solve radical equations in one variable, and give examples showing how extraneous solutions may arise. **AA.FGR.4.4** Create, interpret and solve radical equations with one unknown value and use them to solve problems that model real-world situations.	**Continuation (AA.FGR.4.2,4)** ● Maintain teaching this content.

MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **MGSE9-12.F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **MGSE9-12.F.IF.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. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to radical and rational functions.)	**AA.FGR.4.3** Analyze and graph radical functions.	**Continuation (AA.FGR.4.3)** ● Maintain teaching this content.
MGSE9-12.A.CED.2 Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.	**AA.FGR.4.5** Create, interpret, and solve radical equations in two or more variables to represent relationships between quantities.	**Continuation (AA.FGR.4.5)** ● Maintain teaching this content.

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MGSE9-12.A.CED.2 Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which A = P(1 + r/n)nt has multiple variables.) **MGSE9-12.F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **MGSE9-12.F.IF.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.	**AA.FGR.5:** Extend exploration of quadratic solutions to include real and non-real numbers and explore how these numbers behave under familiar operations and within real-world situations; create polynomial expressions, solve polynomial equations, graph polynomial functions, and model real-world phenomena. **AA.FGR.5.1** Graph and analyze quadratic functions in contextual situations and include analysis of data sets **with regressions**.	**Modification (AA.FGR.5.1)** ● Students will analyze quadratic data sets **with regressions**.
MGSE9-12.N.CN.1 Understand there is a complex number i such that i2 = −1, and every complex number has the form a + bi where a and b are real numbers.	**AA.FGR.5.2** Define complex numbers i such that i 2 = –1 and show that every complex number has the form a + bi where a and b are real numbers and that the complex conjugate is a - bi.	**Continuation (AA.FGR.5.2-4)** ● Maintain teaching this content.
MGSE9-12.N.CN.2 Use the relation i2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers	**AA.FGR.5.3** Use the relation i 2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers	
MGSE9-12.A.SSE.2 Use the structure of an expression to rewrite it in different equivalent forms.	**AA.FGR.5.4** Use the structure of an expression to factor quadratics.	

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MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities. **MGSE9-12.N.CN.7** Solve quadratic equations with real coefficients that have complex solutions by (but not limited to) square roots, completing the square, and the quadratic formula. **MGSE9-12.N.CN.8** Extend polynomial identities to include factoring with complex numbers. For example, rewrite x2 + 4 as (x + 2i)(x – 2i). **MGSE9-12.A.REI.4** Solve quadratic equations in one variable.	**AA.FGR.5.5** Write and solve quadratic equations and **inequalities** with real coefficients and use the solution to explain a mathematical, applicable situation.	**Modification (AA.FGR.5.5)** ● Students will solve quadratic equations and **inequalities.**
MGSE9-12.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic polynomial equation in two variables algebraically and graphically. **MGSE9-12.A.REI.11** Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same.	**AA.FGR.5.6** Solve systems of quadratic and linear functions to determine points of intersection.	**Continuation (AA.FGR.5.6-10)** ● Maintain teaching this content.
MGSE9-12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions	**AA.FGR.5.7** Create and analyze quadratic equations to represent relationships between quantities as a model for contextual situations.	

MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to polynomial functions.) **MGSE9-12.F.IF.4** Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior. **MGSE9-12.A.APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **MGSE9-12.N.CN.9** Use the Fundamental Theorem of Algebra to find all roots of a polynomial equation.	**AA.FGR.5.8** Identify the number of zeros that exist for any polynomial based upon the greatest degree of the polynomial and the end behavior of the polynomial by observing the sign of the leading coefficient. **AA.FGR.5.9** Identify zeros of polynomial functions using technology or pre-factored polynomials and use the zeros to construct a graph of the function defined by the polynomial function. Analyze identify key features of these polynomial functions.	
MGSE9-12.A.APR.4 Prove polynomial identities and use them to describe numerical relationships	**AA.FGR.5.10** Use the structure of an expression to factor polynomials, including the sum of cubes, the difference of cubes, and higher-order polynomials that may be expressed as a quadratic within a quadratic.	

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MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. (Limit to polynomial functions.) **MGSE9-12.F.IF.4** Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior. **MGSE9-12.A.APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	**AA.FGR.5.11** Using all the zeros of a polynomial function, list all the factors and multiply to write a multiple of the polynomial function in **standard form**.	**Modification (AA.FGR.5.11)** ● Using the zeros, students will write the factors and then multiply to get **standard form**.
MGSE9-12.A.APR.1 Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.		**Subtraction** ● This standard was moved from GSE Algebra II to Geometry CC.
MGSE9-12.N.CN.3 Find the conjugate of a complex number; use the conjugate to find the quotient of complex numbers.		**Subtraction** ● This standard was removed from GSE Algebra II and is no longer in Georgia's K-12 Mathematics Standards.

MGSE9-12.A.APR.5 Know and apply that the Binomial Theorem gives the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined using Pascal's Triangle.		**Subtraction** ● This standard was removed from GSE Algebra II and is no longer in Georgia's K-12 Mathematics Standards.
MGSE9-12.A.APR.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).		**Subtraction** ● This standard was moved from GSE Algebra II to Precalculus.
MGSE9-12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.		**Subtraction** ● This standard was removed from GSE Algebra II and is still in Algebra CC.
MGSE9-12.N.VM.7 Multiply matrices by scalars to produce new matrices. **MGSE9-12.N.VM.8** Add, subtract, and multiply matrices of appropriate dimensions. **MGSE9-12.N.VM.9** Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	**AA.PAR.6:** Represent data with matrices, perform mathematical operations, and solve systems of linear equations leading to real-world linear programming applications. **AA.PAR.6.1** Use matrices to represent data, and perform mathematical operations with matrices and scalars, demonstrating that some properties of real numbers hold for matrices, but that others do not.	**Addition (AA.PAR.6.1-3)** ● These standards were moved from GSE Precalculus to Advanced Algebra CC.

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MGSE9-12.A.REI.8 Represent a system of linear equations as a single matrix equation in a vector variable.	**AA.PAR.6.2** Rewrite a system of linear equations using a matrix representation.	
MGSE9-12.A.REI.9 Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).	**AA.PAR.6.3** Use the inverse of an invertible matrix to solve systems of linear equations.	
MGSE9-12.A.CED.3 Represent constraints by equations or inequalities, and by systems of equation and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.	**AA.PAR.6.4** Utilize linear programming to represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as solutions or non-solutions under the established constraints in real-world problems.	**Continuation (AA.PAR.6.4)** ● Maintain teaching this content.
MGSE9-12.F.TF.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.	**AA.GSR.7**: Develop an introductory understanding of the unit circle; solve trigonometric equations using the unit circle.	**Addition (AA.GSR.7.1-2)** ● These standards were moved from GSE Precalculus to Advanced Algebra CC.
	AA.GSR.7.1 Define the three basic trigonometric ratios in terms of x, y, and r using the unit circle centered at the origin of the coordinate plane	
MGSE9-12.F.TF.7 Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.	**AA.GSR.7.2** Apply understanding of the angle measures and coordinates of the unit circle to solve practical, real-life problems involving trigonometric equations.	

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MGSE9-12.F.BF.1 Write a function that describes a relationship between two quantities. **MGSE9-12.A.APR.6** Rewrite simple rational expressions in different forms using inspection, long division, or a computer algebra system; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x).	**AA.FGR.8:** Analyze the behaviors of rational functions to model applicable, mathematical problems **AA.FGR.8.1** Rewrite simple rational expressions in equivalent forms.	**Continuation (AA.FGR.8.1)** ● Maintain teaching this content.
MGSE9-12.A.APR.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	**AA.FGR.8.2** Add, subtract, multiply and divide rational expressions, including **problems in context** and express rational expressions in **irreducible form**.	**Modification (AA.FGR.8.1-2)** ● Students should **simplify rational expressions**.
MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.	**AA.FGR.8.3** Graph rational functions, identifying key characteristics.	**Continuation (AA.FGR.8.3-4)** ● Maintain teaching this content.
MGSE9-12.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.	**AA.FGR.8.4** Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise.	

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MGSE9-12.A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.		**Subtraction** ● This standard was moved from GSE Algebra II to Precalculus.
MGSE9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations. Examples: Rearrange Ohm's law V = IR to highlight resistance R; Rearrange area of a circle formula A = π r2 to highlight the radius r.		**Subtraction** ● These standards were moved from GSE Algebra II to 8th grade.
MGSE9-12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).		
SMP 1 Make sense of problems and persevere in solving them.	**AA.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (AA.MP.1-8)** ● Maintain teaching this content.
	AA.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**AA.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**AA.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**AA.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**AA.MP.5** Use appropriate tools strategically.	

SMP 6 Attend to precision.	**AA.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**AA.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**AA.MP.8** Look for and express regularity in repeated reasoning.	

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MATHEMATICS

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Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	A.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (A.MM.1.1-4)** ● This is a new standard.
	A.MM.1.1 Explain contextual, mathematical problems using a mathematical model. **A.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **A.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. **A.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.	
MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	**PC.FGR.2:** Analyze the behaviors of rational and piecewise functions to model contextual mathematical problems.	**Addition (PC.FGR.2.1-2,4,5,8)** ● These standards were moved from GSE Algebra II to Precalculus.

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MGSE9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.	**PC.FGR.2.1** Graph piecewise-defined functions, including step functions and absolute value functions. **PC.FGR.2.2** Describe characteristics by interpreting the algebraic form and graph of a piecewise-defined function. **PC.FGR.2.5** Graph rational functions and identify key characteristics.	
MGSE9-12.A.APR.6 Rewrite simple rational expressions in different forms using inspection, long division, or a computer algebra system; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x).	**PC.FGR.2.4** Divide polynomials using various methods.	
MGSE9-12.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	**PC.FGR.2.8** Solve simple rational equations in one variable and give examples showing how extraneous solutions may arise.	
	PC.FGR.2.3 Represent the limit of a function using both the informal definition and the graphical interpretation in the context of piecewise-defined functions; interpret limits expressed in analytic notation.	**<u>Addition (PC.FGR.2.3, 6-9)</u>** ● These expectaions were not reflected in GSE but are now in Precalculus.
	PC.FGR.2.6 Represent the behavior of a rational function using limit notation for vertical and horizontal asymptotes and end behavior.	
	PC.FGR.2.7 Represent the limit of a function using both the informal definition and the graphical interpretation	

	in the context of rational functions; interpret limits expressed in analytic notation.	
	PC.FGR.2.9 Perform partial fraction decomposition of rational functions using non-repeated linear factors.	
MGSE9-12.F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	**PC.FGR.3:** Utilize trigonometric expressions to solve problems and model periodic phenomena with trigonometric functions.	**Continuation (PC.FGR.3.1-3.8)** ● Maintain teaching this content.
MGSE9-12.F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	**PC.FGR.3.1** Use the concept of a radian as the ratio of the arc length to the radius of a circle to establish the existence of 2π radians in one revolution.	
MGSE9-12.F.TF.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.	**PC.FGR.3.2** Utilize right triangles on the unit circle to determine the values of the six trigonometric ratios for $\pi/6$, $\pi/4$, and $\pi/3$. Use reflections of the triangles as reference angles to establish known values in all four quadrants of the coordinate plane.	
	PC.FGR.3.5 Determine the value(s) of trigonometric functions for a set of given conditions.	
MGSE9-12.F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	**PC.FGR.3.3** Define the six trigonometric ratios in terms of x, y, and r using the unit circle centered at the origin of the coordinate plane. Interpret radian measures of angles as a rotation both counterclockwise and clockwise around the unit circle.	
MGSE9-12.F.TF.8 Prove the Pythagorean identity (sin A)2 + (cos A)2 = 1 and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the	**PC.FGR.3.4** Derive the fundamental trigonometric identities.	

quadrant of the angle.		
MGSE9-12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **MGSE9-12.F.IF.7e** Graph trigonometric functions, showing period, midline, and amplitude.	**PC.FGR.3.6** Graph and write equations of trigonometric functions using period, phase shift, and amplitude in modeling contexts.	
	PC.FGR.3.7 Classify the six trigonometric functions as even or odd and describe the symmetry.	
MGSE9-12.F.TF.6 Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.	**PC.FGR.3.8** Restrict the domain of a trigonometric function to create an invertible function and graph the inverse function. Evaluate inverse trigonometric expressions.	
MGSE9-12.F.TF.8 Prove the Pythagorean identity (sin A)2 + (cos A)2 = 1 and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle. **MGSE9-12.F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them**.**	**PC.AGR.4:** Manipulate, prove, and apply trigonometric identities and equations to solve contextual mathematical problems.	**Continuation (PC.FGR.4.1-4.5)** ● Maintain teaching this content.
	PC.AGR.4.1 Apply the fundamental trigonometric identities to simplify expressions and verify other identities.	
	PC.AGR.4.3 Solve trigonometric equations arising in modeling contexts.	

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MGSE9-12.F.TF.9 Prove addition, subtraction, double, and half-angle formulas for sine, cosine, and tangent and use them to solve problems.	**PC.AGR.4.2** Use sum, difference, double-angle, and half-angle formulas for sine, cosine, and tangent to establish other identities and apply them to solve problems.	
MGSE9-12.G.SRT.10 Prove the Laws of Sines and Cosines and use them to solve problems. **MGSE9-12.G.SRT.11** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.	**PC.AGR.4.4** Prove and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.	
MGSE9-12.G.SRT.9 Derive the formula A = (1/2)ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	**PC.AGR.4.5** Determine the area of an oblique triangle.	
MGSE9-12.G.GPE.2 Derive the equation of a parabola given a focus and directrix. **MGSE9-12.G.GPE.3** Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.	**PC.GSR.5** Analyze the behaviors of conic sections and polar equations to model contextual mathematical problems.	**Modification (PC.GSR.5.1)** ● Explore types of conic graphs and **polar functions**; use both conics and **polar functions** in contexts.
	PC.GSR.5.1 Identify and graph different **conic sections** given the equations in standard form.	
	PC.GSR.5.2 Identify different conic sections in general form and complete the square to convert the equation of a conic section into standard form.	**Addition (PC.GSR.5.2-5)** ● This standard was not reflected in GSE but is now in Precalculus.
	PC.GSR.5.3 Define polar coordinates and relate polar coordinates to Cartesian coordinates.	
	PC.GSR.5.4 Classify special polar equations and apply to	

	contextual situations.	
	PC.GSR.5.5 Graph equations in the polar coordinate plane with and without the use of technology.	
MGSE9-12.N.VM.1 Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v).	**PC.AGR.6** Represent and model vector quantities to solve problems in contextual situations.	**Continuation (PC.AGR.6.1-6.6)** ● Maintain teaching this content.
	PC.AGR.6.1 Represent vector quantities as directed line segments; represent magnitude and direction of vectors in component form using appropriate mathematical notation.	
MGSE9-12.N.VM.4 Add and subtract vectors. **MGSE9-12.N.VM.5** Multiply a vector by a scalar	**PC.AGR.6.2** Add and subtract vectors and multiply vectors by a scalar to find the resultant vector.	
MGSE9-12.N.VM.2 Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	**PC.AGR.6.3** Add and subtract vectors on a coordinate plane using different methods.	
MGSE9-12.N.VM.3 Solve problems involving velocity and other quantities that can be represented by vectors.	**PC.AGR.6.4** Solve contextual vector problems, such as those involving velocity, force, and other quantities.	
	PC.AGR.6.5 Sketch the graph of a curve represented parametrically, indicating the direction of motion.	**Addition (PC.GSR.6.5-6)** ● This expectation was not reflected in GSE but is now in Precalculus.
	PC.AGR.6.6 Apply parametric equations to contextual problems.	
	PC.PAR.7 Demonstrate how sequences and series apply to mathematical models in real-life situations.	**Addition (PC.GSR.7.1-7.5)** ● These expectations were not

	PC.PAR.7.1 Demonstrate that sequences are functions whose domain is the set of natural numbers.	reflected in GSE but is now in Precalculus.
	PC.PAR.7.2 Represent sequences graphically, numerically, and symbolically.	
	PC.PAR.7.3 Determine the limit of a sequence if it exists.	
	PC.PAR.7.4 Demonstrate that a series is the sum of the sequence and represent series graphically, numerically, and symbolically.	
	PC.PAR.7.5 Describe the behavior of a series in terms of the limit of its partial sums.	
MGSE9-12.A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.	**PC.PAR.7.6** Derive and use the sum formula of a finite geometric series to solve contextual problems to model real-life situations.	**Addition (PC.PAR.7.6)** ● This expectation was moved from GSE Algebra II to Precalculus.
	PC.PAR.7.7 Derive and use the sum formula of an infinite geometric series to solve contextual problems to model real-life situations.	**Addition (PC.GSR.7.7)** ● This expectation was not reflected in GSE but is now in Precalculus.
MGSE9-12.S.CP.8 Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.		**Subtraction** ● These standards were moved from GSE Pre-calculus to Geometry CC.
MGSE9-12.S.CP.9 Use permutations and combinations to compute probabilities of compound events and solve problems.		

MGSE9-12.S.MD.1 Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.		
MGSE9-12.S.MD.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.		
MGSE9-12.S.MD.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.		
MGSE9-12.S.MD.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.		
MGSE9-12.S.MD.5 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.		
MGSE9-12.S.MD.6 Use probabilities to make fair decisions.		
MGSE9-12.S.MD.7 Analyze decisions and strategies using probability concepts.		
MGSE9-12.N.VM.6 Use matrices to represent and manipulate data, e.g., transformations of vectors.		**<u>Subtraction</u>** • These standards were moved from GSE Pre-calculus to Advanced Algebra
MGSE9-12.N.VM.7 Multiply matrices by scalars to		

produce new matrices.		CC.
MGSE9-12.N.VM.8 Add, subtract, and multiply matrices of appropriate dimensions.		
MGSE9-12.N.VM.9 Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.		
MGSE9-12.N.VM.10 Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers.		
MGSE9-12.A.REI.8 Represent a system of linear equations as a single matrix equation in a vector variable.		
MGSE9-12.A.REI.9 Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).		
MGSE9-12.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.		
MGSE9-12.N.VM.11 The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.		**Subtraction** ● These standards were removed from GSE Precalculus and are no longer reflected in the standards.
MGSE9-12.N.VM.12 Work with 2 X 2 matrices as		

transformations of the plane, and interpret the absolute value of the determinant in terms of area.		
SMP 1 Make sense of problems and persevere in solving them.	**A.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (A.MP.1-8)** ● Maintain teaching this content.
	A.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**A.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**A.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**A.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**A.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**A.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**A.MP.7** Look for and make use of structure.	

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GSE AMDM to AMDM Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	A.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (AMDM.MM.1.1-4)** ● This is a new standard.
	A.MM.1.1 Explain contextual, mathematical problems using a mathematical model. **A.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **A.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. **A.MM.1.4** Use relevant information to create various mathematical representations and structures to solve real-life problems.	
MAMDM.N.1 Students will extend the understanding of proportional reasoning, ratios, rates, and percents by applying them to various settings to include business, media, and consumerism.	**AMDM.QPR.2:** Make decisions and solve problems using ratios, rates, and percents in a variety of real-world applications.	**Continuation (AMDM.QPR.2.1-3)** ● Maintain teaching this content with a focus on mechanical and agricultural contexts.
	AMDM.QPR.2.1 Apply proportions, ratios, rates, and percentages to various settings, including business, media, and consumerism.	
MAMDM.N.1a Use proportional reasoning to solve problems involving ratios.	**AMDM.QPR.2.2** Solve problems involving ratios in mechanical and agricultural contexts.	
MAMDM.N.1c Solve problems involving large	**AMDM.QPR.2.3** Use proportions to solve problems	

quantities that are not easily measured.	involving large quantities that are not easily measured.	
MAMDM.N.1b Understand and use averages, weighted averages, and indices.	**AMDM.QPR.3:** Make predictions by analyzing averages and indices of large data sets through investigations of real-world contexts. **AMDM.QPR.3.1** Use averages and weighted averages to make decisions. **AMDM.QPR.3.2** Calculate and interpret indices.	**Continuation (AMDM.QPR.3.1-2)** ● Maintain teaching this content with a focus on making decisions in real world contexts.
MAMDM.N.1d Understand how identification numbers, such as UPCs, are created and verified. **MAMDM.A.4** Students will analyze and evaluate the mathematics behind various methods of voting and selection.	**AMDM.PAR.4:** Develop methods or algorithms to analyze discrete situations. **AMDM.PAR.4.1** Create and verify identification numbers. **AMDM.PAR.4.2** Analyze and evaluate the mathematics behind various methods of voting and selection. **AMDM.PAR.4.3** Evaluate various voting and selection processes to determine an appropriate method for a given situation. **AMDM.PAR.4.4** Apply various ranking algorithms to determine an appropriate method for a given situation.	**Continuation (AMDM.QPR.4.1-4)** ● Maintain teaching this content with an in depth focus on voting processes.
MAMDM.D.1 Students will determine probability and expected value to inform everyday decision making.	**AMDM.PR.5:** Analyze the chances for success or failure in order to make decisions	**Continuation (AMDM.PR.5.1-2)** ● Maintain teaching this content.

	AMDM.PR.5.1 Determine conditional probabilities and probabilities of compound events to make decisions in problem situations. **AMDM.PR.5.2** Use probabilities to make and justify decisions about risks in everyday life.	
MAMDM.D.1c Calculate expected value to analyze mathematical fairness, payoff, and risk.	**AMDM.PR.6** Model strategic interaction among rational decision-makers	**Continuation (AMDM.PR.6.1)** ● Maintain teaching this content.
	AMDM.PR.6.1 Calculate expected value to analyze mathematical fairness, payoff, and risk.	
	AMDM.PR.6.2 Analyze real-life situations involving strategic interactions using the mathematics of zero-sum games. **AMDM.PR.6.3** Constructs a mathematical model of probabilistic situations to make mathematical assumptions.	**Addition (AMDM.PR.6.2-3)** ● These are new learning expectations.
MAMDM.D.3 Students will apply statistical methods to design, conduct, and analyze statistical studies.	**AMDM.DSR.7:** Conduct investigative research to solve real-life problems and answer statistical investigative questions involved in business and financial decision-making.	**Continuation (AMDM.DSR.7.1-2)** ● Maintain teaching this content with a focus on a contextual real life problem that can be answered using investigative research.
	AMDM.DSR.7.1 Apply statistical methods to design, conduct, and analyze statistical studies. Identify a contextual, real-life problem that can be answered using investigative research.	
MAMDM.D.2 Students will build the skills and	**AMDM.DSR.7.2** Build the skills and vocabulary	

vocabulary necessary to analyze and critique reported statistical information, summaries, and graphical displays.	necessary to analyze and critique reported statistical information, summaries, and graphical displays. Develop statistical investigative questions that can help solve a real-life problem involved in business and financial decision-making.	
MAMDM.D.3 Students will apply statistical methods to design, conduct, and analyze statistical studies.	**AMDM.DSR.7.3** Create a statistical study using **sound methodology** to answer statistical investigative questions and to solve real-life problems. **AMDM.DSR.7.4** Explain how the **sample size** impacts the precision with which estimates of the population parameters can be made (i.e., the larger the sample size the more precision). **AMDM.DSR.7.5** Recognize that **random selection** from a population plays a different role than random assignment in an experiment. **AMDM.DSR.7.6** Incorporate **random designs** in data collection. **AMDM.DSR.7.7** Describe ways in which **big data** can be used to make decisions in various business enterprises and in the context of business and financial decision making. **AMDM.DSR.7.8** Use **distributions to identify the key features** of the data collected. **AMDM.DSR.7.9 Interpret results and make**	**Modification (AMDM.DSR.7.3-9)** ● The GSE standard has expanded to explicitly identify the components of **sound methodology**. This includes **sample size, random selection, random designs, big data, distributions to identify key features, and interpreting results and making connections.**

	connections to the original research question.	
MAMDM.A.3 Students will create and analyze mathematical models to make decisions related to earning, investing, spending, and borrowing money.	**AMDM.PAR.8:** Create and analyze mathematical models to make decisions related to earning, investing, spending, and borrowing money.	**Continuation (AMDM.PAR.8.1-2)** ● Maintain teaching this content.
	AMDM.PAR.8.1 Use exponential functions to model change in a variety of financial situations. **AMDM.PAR.8.2** Determine, represent, and analyze mathematical models for income, expenditures, and various types of loans and investments.	
MAMDM.D.4 Students will use functions to model problem situations in both discrete and continuous relationships.	**AMDM.FGR.9**: Use functions to model problem situations in both discrete and continuous relationships.	**Continuation (AMDM.FGR.9.1-2)** ● Maintain teaching this content with specific models identifed.
	AMDM.FGR.9.1 Determine whether a problem situation involving two quantities is best modeled by a discrete or continuous relationship. **AMDM.FGR.9.2** Use linear, exponential, logistic, and piecewise functions to construct a model.	
MAMDM.G.1 Students will create and use two- and three-dimensional representations of authentic situations.	**AMDM.GSR.10**: Use functions to model problem situations in both discrete and continuous relationships	**Continuation (AMDM.GSR.10.1-2)** ● Maintain teaching this content.

	AMDM.GSR.10.1 Create and use two-dimensional and three-dimensional representations to model authentic situations.	
MAMDM.G.2 Students will solve geometric problems involving inaccessible distances using basic trigonometric principles, including the Law of Sines and the Law of Cosines.	**AMDM.GSR.10.2** Solve problems involving inaccessible distances using basic trigonometric principles including extensions of right triangle trigonometry.	
MAMDM.A.1 Students will use vectors and matrices to organize and describe problem situations.	**AMDM.PAR.11:** Use functions to model problem situations in both discrete and continuous relationships.	**Continuation (AMDM.PAR.11.1-2)** ● Maintain teaching this content.
	AMDM.PAR.11.1 Represent situations and solve problems using vectors. in areas such as transportation, computer graphics, and the physics of force and motion. **AMDM.PAR.11.2** Represent geometric transformations and solve problems using matrices.	
MAMDM.A.2 Students will use a variety of network models to organize data in quantitative situations, make informed decisions, and solve problems.	**AMDM.PAR.12:** Make informed decisions and solve problems with a variety of network models in quantitative situations.	**Continuation (AMDM.PAR.12.1-4)** ● Maintain teaching this content.
MAMDM.A.2a Solve problems represented by a vertex-edge graph, and find critical paths, Euler paths, and minimal spanning trees.	**AMDM.PAR.12.1** Solve problems represented by vertex-edge graphs.	
MAMDM.A.2b Construct, analyze, and interpret	**AMDM.PAR.12.2** Construct, analyze, and interpret	

flow charts to develop an algorithm to describe processes such as quality control procedures.	flow charts to develop an algorithm to describe processes such as quality control procedures.	
MAMDM.A.2c Investigate the scheduling of projects using PERT.	**AMDM.PAR.12.3** Investigate the scheduling of projects using Program Evaluation Review Technique (PERT).	
MAMDM.A.2d Consider problems that can be resolved by coloring graphs.	**AMDM.PAR.12.4** Consider problems that can be resolved by coloring graphs.	
SMP 1 Make sense of problems and persevere in solving them.	**AMDM.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (AMDM.MP.1-8)** ● Maintain teaching this content
	AMDM.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**AMDM.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others.Set and monitor goals.	**AMDM.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	
SMP 4 Model with mathematics.	**AMDM.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**AMDM.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**AMDM.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**AMDM.MP.7** Look for and make use of structure.	

SMP 8 Look for and express regularity in repeated reasoning.	**AMDM.MP.8** Look for and express regularity in repeated reasoning.	

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GSE Statistical Reasoning to Statistical Reasoning Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	SR.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (SR.MM.1.1-4)** ● This is a new standard.
	SR.MM.1.1 Explain contextual, mathematical problems using a mathematical model. **SR.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or the humanities. **SR.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a real-life situation. **SR.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.	
MSR.FQ.1 Formulate questions to clarify the problem at hand and formulate one (or more) questions that can be answered with data. **MSR.FQ.2** Students will identify whether the data are categorical or quantitative (numerical).	**SR.DSR.2** Formulate statistical investigative questions of interest to students that can be answered with data.	**Continuation (SR.DSR.2.1-4)** ● Maintain teaching this content with a focus on investigative questions.
	SR.DSR.2.1 Formulate statistical investigative questions about a population using samples taken from the population.	
	SR.DSR.2.2 Formulate comparative and associative statistical investigative questions for surveys, observational studies, and experiments to compare two or more groups or to investigate the association of two or more variables.	

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	SR.DSR.2.3 Formulate multivariable statistical investigative questions.	
	SR.DSR.2.4 Formulate inferential statistical investigative questions regarding association and prediction.	
MSR.FQ.1 Collect data by designing a plan to collect appropriate data and employ the plan to collect the data.	**SR.DSR.3** Collect data by designing and implementing a plan to address the formulated statistical investigative question.	**Continuation (SR.DSR.3.1-5, 7)** ● Maintain teaching this content.
	SR.DSR.3.1 Apply an appropriate data-collection plan when collecting primary or secondary data for the statistical investigative question of interest.	
MSR.CD.1 Students will distinguish between a population distribution, a sample data distribution, and a sampling distribution. **MSR.CD.3** Students will distinguish between the three types of study designs for collecting data (sample survey, experiment, and observational study) and will know the scope of the interpretation for each design type.	**SR.DSR.3.2** Distinguish between surveys, observational studies, and experiments. **SR.DSR.3.3** Design sample surveys, experiments, and observational studies using accepted practices.	
MSR.CD.2 Students will understand that randomness should be incorporated into a sampling or experimental procedure.	**SR.DSR.3.4** Distinguish between random selection and random assignment and identify their impact on conclusions.	
MSR.CD.4 Students will distinguish between the role of randomness and the role of sample size with respect to using a statistic from a sample to estimate a population parameter.	**SR.DSR.3.5** Describe potential sources and effects of bias and confounding variables. **SR.DSR.3.7** Identify when data can be generalized to a target population.	

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	SR.DSR.3.6 Describe and adhere to the ethical use of data (e.g., sensitive information, privacy, and living subjects).	**Addition (SR.DSR.3.6)** ● This is a new learning expectation.
MSR.FQ.1 Analyze data by selecting appropriate graphical and numerical methods and using these methods to analyze the data. **MSR.AD.2** Students will use distributions to compare two or more groups.	**SR.DSR.4** Analyze data by selecting and using appropriate graphical and numerical methods.	**Continuation (SR.DSR.3.7)** ● Maintain teaching this content.
	SR.DSR.4.1 Summarize quantitative or categorical data using tables, graphical displays, and numerical summary statistics.	
MSR.AD.3 Students will determine if an association exists between two variables (pattern or trend in bivariate data) and use values of one variable to predict values of another variable.	**SR.DSR.4.2** Summarize and describe relationships among multiple variables. **SR.DSR.4.5** Describe the relationship between two quantitative variables by interpreting correlation (r) and a least-square regression line (using technology).	
MSR.AD.1 Students will use distributions to identify the key features of the data collected.	**SR.DSR.4.3** Use sampling distributions developed through simulation to describe the sample-to-sample variability of sample statistics.	
MSR.IR.2 Students will understand that when randomness is incorporated into a sampling or experimental procedure, probability provides a way to describe the 'long-run' behavior of a statistic as described by its sampling distribution.	**SR.DSR.4.4 U**se sampling distributions to compute simulated p-values.	
MSR.IR.1 Students will ask if the difference between two sample proportions or two sample means is due to random variation or if the difference is significant.	**SR.DSR.4.6** Use simulations to investigate associations between two categorical variables and to compare groups.	
MSR.FQ.1 Interpret results by interpreting the analysis and relating the interpretation to the original question.	**SR.DSR.5** Interpret the results of the analysis, making connections to the formulated statistical investigative question.	**Continuation (SR.DSR.5.1-5)** ● Maintain teaching this content.

	SR.DSR.5.1 Use statistical evidence from analyses to answer the formulated statistical investigative questions.	
MSR.IR.1 Students will ask if the difference between two sample proportions or two sample means is due to random variation or if the difference is significant.	**SR.DSR.5.2** Interpret the impact of outliers, missing values, or erroneous values on the results.	
MSR.IR.2 Students will understand that when randomness is incorporated into a sampling or experimental procedure, probability provides a way to describe the 'long-run' behavior of a statistic as described by its sampling distribution	**SR.DSR.5.3** Use and interpret the p-value to determine whether the estimate for a population characteristic is plausible. **SR.DSR.5.4** Interpret a given margin of error associated with an estimate of a population characteristic.	
MSR.AD.3 Students will determine if an association exists between two variables (pattern or trend in bivariate data) and use values of one variable to predict values of another variable.	**SR.DSR.5.5** Explain the impact of multiple variables on one another.	
SMP 1 Make sense of problems and persevere in solving them.	**SR.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (SR.MP.1-8)** ● Maintain teaching this content
	SR.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**SR.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**SR.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	

SMP 4 Model with mathematics.	**SR.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**SR.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**SR.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**SR.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**SR.MP.8** Look for and express regularity in repeated reasoning.	

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GSE CRM to College Readiness Mathematics Companion Guide for Standards Interpretation

Georgia Standards of Excellence	Georgia's K-12 Mathematics Standards	Description of Change
	CRM.MM.1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.	**Addition (CRM.MM.1.1-4)** ● This is a new standard.
	CRM.MM.1.1 Explain contextual, mathematical problems using a mathematical model. **CRM.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **CRM.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. **CRM.MM.1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems.	
	CRM.NR.2 Utilize exact and approximate calculations to quantify real-world phenomena and solve problems.	**Addition (CRM.NR.2.1,5)** ● These are new learning expectations.
	CRM.NR.2.1 Through multi-step/multi-operational problems, perform mathematical operations on real numbers demonstrating fluency using the order of operations.	

	CRM.NR.2.5 Estimate solutions to problems with real numbers and use the estimates to assess the reasonableness of results in the context of the problem.	
MGSE9-12.N.Q.1 Use units of measure (linear, area, capacity, rates, and time) as a way to understand problems.	**CRM.NR.2.2** Represent and solve problems using proportional reasoning with ratios, rates, proportions, and scaling.	**Continuation (NR.2.2)** ● Maintain teaching this content.
MGSE9-12.N.RN.1. Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, allowing for a notation for radicals in terms of rational exponents. **MGSE9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**CRM.NR.2.3** Apply the rules of exponents to simplify numerical expressions, extending the properties of exponents to rational exponents. **CRM.NR.2.4** Perform mathematical operations on real numbers to include numerical radical expressions and complex fractions.	**Addition (CRM.NR.2.3-4)** ● These learning expectations have been added from GSE Algebra II.
MGSE9-12.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. Given a situation, context, or problem, students will determine, identify, and use appropriate quantities for representing the situation.		**Subtraction** ● This standard has been removed from College Readiness Mathematics.
MGSE9-12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions (integer inputs only). **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.	**CRM.PAR.3** Construct expressions, equations, and inequalities, and use them to represent and solve problems by choosing appropriate procedures and interpreting solutions in context. **CRM.PAR.3.1** Create **equations** in one variable and use them to solve problems.	**Modification (CRM.PAR.3.1)** ● The following equations were added: **radical, absolute value, and logarithmic**.

MGSE9-12.A.SSE.2 Use the structure of an expression to rewrite it in different equivalent forms. **MGSE9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **MGSE9-12.F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **MGSE9-12.A.REI.1** Using algebraic properties and the properties of real numbers, justify the steps of a simple, one-solution equation. **MGSE9-12.A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **MGSE9-12.F.BF.1** Write a function that describes a relationship between two quantities.	**CRM.PAR.3.2** Create **inequalities** in one variable and use them to solve problems.	**Modification (CRM.PAR.3.2)** ● Include **absolute value** inequalities.
MGSE9-12.A.REI.3 Solve linear equations and inequalities in one variable including equations with coefficients represented by letters. **MGSE9-12.A.REI.12** Graph the solution set to a linear inequality in two variables.	**CRM.PAR.3.3** Using multiple representations, solve equations and inequalities and use the solutions to draw reasonable conclusions about a situation being modeled, including possible constraints. **CRM.PAR.3.6** Solve inequalities in one variable graphically and algebraically.	**Continuation (CRM.PAR.3.3-6)** ● Maintain teaching this content.

MGSE9-12.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.		
MGSE9-12.A.REI.4 Solve quadratic equations in one variable.	**CRM.PAR.3.4** Solve quadratic equations using a variety of methods.	
MGSE9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.	**CRM.PAR.3.5** Rearrange literal equations to highlight a specified variable using the same reasoning as in solving equations.	
MGSE9-12.A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. **MGSE9-12.A.CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.	**CRM.PAR.3.7** Using multiple methods, create and solve systems of linear equations and **inequalities**.	**Modification (CRM.PAR.3.7)** ● Students will solve systems of linear equations and **inequalities** using multiple methods.
MGSE9-12.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	**CRM.PAR.3.8** Solve a simple system of equations consisting of a linear and a quadratic equation in two variables. algebraically and graphically.	**Continuation (CRM.PAR.3.8)** ● Maintain teaching this content.

MGSE9-12.A.CED.2 Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		**Subtraction** ● These standards have been removed from College Readiness Mathematics.
MGSE9-12.A.REI.5 Show and explain why the elimination method works to solve a system of two-variable equations. **MGSE9-12.A.REI.11** Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same.		
MGSE9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range.	**CRM.FGR.4** Define, build and interpret functions that arise in various contexts by applying knowledge of the characteristics of the different families of functions, and analyze the effects of parameters.	**Continuation (CRM.FGR.4.1)** ● Maintain teaching this content.
	CRM.FGR.4.1 Define a function through maps, sets, equations and graphs using function notation.	
MGSE9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.IF.4** Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features.	**CRM.FGR.4.2** Identify and sketch by hand the parent graph of functions expressed algebraically and show key **characteristics** of the graph using technology. **CRM.FGR.4.3** Using tables, graphs, and verbal descriptions, interpret the key **characteristics** of a function.	**Modification (CRM.FGR.4.2-3)** ● **Periodicity** has been removed.

MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.		
MGSE9-12.F.IF.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.	**CRM.FGR.4.4** Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from a graph.	**Continuation (CRM.FGR.4.1)** ● Maintain teaching this content.
MGSE9-12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **MGSE9-12.F.LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	**CRM.FGR.4.5** Compare characteristics of two functions each represented in a different way.	
MGSE9-12.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. **MGSE9-12.F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **MGSE9-12.F.BF.2** Write arithmetic and geometric sequences recursively and explicitly, use them to	**CRM.FGR.4.6** Construct linear and exponential functions, given a graph, a description of a relationship, or two input-output pairs. **CRM.FGR.4.7** Construct arithmetic and geometric sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect linear functions to arithmetic sequences and exponential functions to geometric sequences.	

model situations, and translate between the two forms. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.		
MGSE9-12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing **even and odd functions** from their graphs and algebraic expressions for them.	**CRM.FGR.4.8** Identify the effect on the parent graph of replacing f(x) by f(x) + k, kf(x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.	**Modification (CRM.FGR.4.8)** ● Recognizing **even and odd** functions has been removed.
MGSE9-12.G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. **MGSE9-12.G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	**CRM.GSR.5** Reason deductively and inductively about figures and their properties and make sense of geometric situations using measurements in real-world contexts. **CRM.GSR.5.1** Use the distance formula, midpoint formula or slope to verify simple geometric properties. **CRM.GSR.5.2** Use coordinates to compute perimeters of polygons, circumference of circles and areas of triangles, rectangles and circles.	**Continuation (GSR.5.1-2)** ● Maintain teaching this content.
MGSE9-12.G.GMD.1 Give informal arguments for geometric formulas. a. Give informal arguments for the formulas of the circumference of a circle and area of a circle using dissection arguments and informal limit arguments. b. Give informal arguments for the formula of the volume of a	**CRM.GSR.5.3** Informally derive the formulas for the volume and **surface area** of a cylinder, sphere, **prism**, pyramid, and cone.	**Modification (GSR.5.3-4)** ● **Right and oblique prisms** has been added to the list of shapes. **Surface area** of all the shapes has now been included.

cylinder, pyramid, and cone using Cavalieri's principle.		
MGSE9-12.G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**CRM.GSR.5.4** Use formulas for finding the volume and **surface area** of spheres, **right and oblique prisms**, cylinders, pyramids, and cones.	
MGSE9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	**CRM.GSR.5.5** Apply the Pythagorean Theorem and trigonometric ratios to solve problems involving right triangles.	**Continuation (GSR.5.5)** ● Maintain teaching this content with a focus on application.
MGSE9-12.G.MG.2 Apply concepts of density based on area and volume in modeling situations. **MGSE9-12.G.MG.3** Apply geometric methods to solve design problems		**Subtraction** ● These standards have been removed from College Readiness Mathematics.
MGSE9-12.S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).	**CRM.DSR.6:** Make sense of and reason about variation in data using graphs, tables and probability models to solve problems and draw appropriate conclusions from solutions.	**Continuation (DSR.6.1-6)** ● Maintain teaching this content.
	CRM.DSR.6.1 Represent univariate data on the real number line.	
MGSE9-12.S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, mean absolute deviation, standard deviation) of two or more different data sets. **MGSE9-12.S.ID.3** Interpret differences in shape, center, and spread in the context of the data sets,	**CRM.DSR.6.2** Calculate, compare, and interpret shape, center, and spread of two or more univariate data sets, accounting for possible effects of extreme data points.	

accounting for possible effects of extreme data points (outliers).		
MGSE9-12.S.ID.5 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.	**CRM.DSR.6.3** Summarize categorical data for two categories in two-way frequency tables using relative frequencies in the context of the data.	
MGSE9-12.S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	**CRM.DSR.6.4** Represent bivariate data on a scatter plot and describe how the variables are related in terms of strength and direction.	
MGSE9-12.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	**CRM.DSR.6.5** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data	
MGSE9-12.S.ID.8 Compute (using technology) and interpret the correlation coefficient “r” of a linear fit.	**CRM.DSR.6.6** Compute using technology and interpret the correlation coefficient “r” of a linear fit.	
MGSE9-12.S.ID.9 Distinguish between correlation and causation	**CRM.DSR.6.7** Distinguish between correlation and causation, and **interpolation and extrapolation**.	**Modification (DSR.6.7)** ● This learning expectation now includes **interpolation and extrapolation**.
MGSE9-12.S.CP.1 Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events (or, and, not).	**CRM.DSR.6.8** Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events.	**Addition (DSR.6.8-10)** ● These learning expectations have been added from GSE Geometry and remain in Geometry CC.
MGSE9-12.S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use	**CRM.DSR.6.9** Use the two-way frequency table to calculate conditional probabilities.	

the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.		
MGSE9-12.S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in context.	**CRM.DSR.6.10** Calculate the conditional probability of A given B.	
MGSE9-12.S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **MGSE9-12.S.IC.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.		**Subtraction** ● These standards have been removed from College Readiness Mathematics.
SMP 1 Make sense of problems and persevere in solving them.	**CRM.MP** Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback.	**Continuation (CRM.MP.1-8)** ● Maintain teaching this content
	CRM.MP.1 Make sense of problems and persevere in solving them.	
SMP 2 Reason abstractly and quantitatively.	**CRM.MP.2** Reason abstractly and quantitatively.	
SMP 3 Construct viable arguments and critique the reasoning of others. Set and monitor goals.	**CRM.MP.3** Construct viable arguments and critique the reasoning of others. Set and monitor goals.	

SMP 4 Model with mathematics.	**CRM.MP.4** Model with mathematics.	
SMP 5 Use appropriate tools strategically.	**CRM.MP.5** Use appropriate tools strategically.	
SMP 6 Attend to precision.	**CRM.MP.6** Attend to precision.	
SMP 7 Look for and make use of structure.	**CRM.MP.7** Look for and make use of structure.	
SMP 8 Look for and express regularity in repeated reasoning.	**CRM.MP.8** Look for and express regularity in repeated reasoning.	