GEORGIA'S K-12 MATHEMATICS STANDARDS 2021

Governor Kemp and Superintendent Woods are committed to the best set of academic standards for Georgia's students – laying a strong foundation of the fundamentals, ensuring age- and developmentally appropriate concepts and content, providing instructional supports to set our teachers up for success, protecting and affirming local control and flexibility regarding the use of mathematical strategies and methods, and preparing students for life. These Georgia-owned and Georgia-grown standards leverage the insight, expertise, experience, and efforts of thousands of Georgians to deliver the very best educational experience for Georgia's 1.7 million students.

In August 2019, Governor Brian Kemp and State School Superintendent Richard Woods announced the review and revision of Georgia's K-12 mathematics standards. Georgians have been engaged throughout the standards review and revision process through public surveys and working groups. In addition to educator working groups, surveys, and the Academic Review Committee, Governor Kemp announced a new way for Georgians to provide input on the standards: the Citizens Review Committee, a group composed of students, parents, business and community leaders, and concerned citizens from across the state. Together, these efforts were undertaken to ensure Georgians will have buy-in and faith in the process and product.

The Citizens Review Committee provided a charge and recommendations to the working groups of educators who came together to craft the standards, ensuring the result would be usable and friendly for parents and students in addition to educators. More than 14,000 Georgians participated in the state's public survey from July through September 2019, providing additional feedback for educators to review. The process of writing the standards involved more than 200 mathematics educators -- from beginning to veteran teachers, representing rural, suburban, and metro areas of our state.

Grade-level teams of mathematics teachers engaged in deep discussions; analyzed stakeholder feedback; reviewed every single standard, concept, and skill; and provided draft recommendations. To support fellow mathematics teachers, they also developed learning progressions to show when key concepts were introduced and how they progressed across grade levels, provided examples, and defined age/developmentally appropriate expectations.

These teachers reinforced that strategies and methods for solving mathematical problems are classroom decisions -- not state decisions -- and should be made with the best interest of the individual child in mind. These recommended revisions have been shared with the Academic Review Committee, which is composed of postsecondary partners, age/development experts, and business leaders, as well as the Citizens Review Committee, for final input and feedback.

Based on the recommendation of Superintendent Woods, the State Board of Education will vote to post the draft K-12 mathematics standards for public comment. Following public comment, the standards will be recommended for adoption, followed by a year of teacher training and professional learning prior to implementation.

Use of Mathematical Strategies and Methods & Affirming Local Control

These standards preserve and affirm local control and flexibility regarding the use of the "standard algorithm" and other mathematical strategies and methods. Students have the right to use any strategy that produces accurate computations, makes sense, and is appropriate for their level of understanding.

Therefore, the wording of these standards allows for the "standard algorithm" as well as other cognitive strategies deemed developmentally appropriate for each grade level. Revised state tests will not measure the students' use of specific mathematical strategies and methods, only whether students understand the key mathematical skills and concepts in these standards.

Teachers are afforded the flexibility to support the individual needs of their students. It is critical that teachers and parents remain partners to help each child grow to become a mathematically literate citizen.

Georgia's K-12 Mathematics Standards - 2021
Mathematics Big Ideas and Learning Progressions, K-5

Mathematics Big Ideas, K-5

K	1	2	3	4	5
MATHEMATICAL PRACTICES & MODELING					
DATA & STATISTICAL REASONING					
NUMERICAL REASONING (NR)					
PATTERNING & ALGEBRAIC REASONING (PAR)					
GEOMETRIC & SPATIAL REASONING (GSR)					
MEASUREMENT & DATA REASONING (MDR)					

K-5 MATHEMATICS: LEARNING PROGRESSIONS

Key Concepts	K	1	2	3	4	5
NUMERICAL REASONING						
Numbers (whole numbers, fractions, and decimal numbers)	• Whole numbers to 100	• Whole numbers to 120 • Partition shapes into halves and quarters/fourths (fourths) with no shading	• Whole numbers to 1000 • Partition shapes into halves, thirds and quarters (fourths) with no shading	• Whole numbers to 10,000 • Unit fractions with denominators of 2, 3, 4, 6, and 8 • Represent fractions • Equivalence of simple fractions • Introduce shading to identify and compare fractional parts	• Whole numbers to 100,000 • Non-unit fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100 • Fractions with like denominators • Decimal fractions (tenths and hundredths)	• Multi-digit whole numbers • Fractions with unlike denominators • Fractions greater than 1 • Decimal fractions to thousandths
Counting	• Counting forward to 100 • Counting backward from 20 • Counting objects to 20	• Counting forward and backward within 120 • Skip counting by 2s, 5s, and 10s • Counting objects to 120	• Counting forward and backward within 1000 • Skip counting by 2s, 5s, 10s, 25s, and 100s • Counting objects to 1000	• Counting unit fractions	• Counting non-unit fractions	• Counting decimal numbers
Place Value	• Compose and decompose numbers within 20 • Identify and write numerals to 20	• Compose and decompose 2-digit numbers	• Hundreds, tens and ones in 3-digit numbers	• Round numbers to 1000 to nearest 10 or 100 • Read & write multi-digit whole numbers to thousands	• Magnitude of place value • Multi-digit whole numbers to 100,000 • Round multi-digit whole numbers • Fractions with • denominators of 10 or 100	• Magnitude of place value extended to decimal numbers • Powers of 10 to 10^3 • Read & write decimal numbers to thousandths place • Round decimal numbers to hundredths place
Comparisons	• Comparing objects up to 10 • Comparing numbers of objects in a set from 1-10	• Comparing numbers to 100	• Comparing numbers to 1,000	• Comparing numbers to 10,000 • Unit fractions	• Multi-digit numbers • Fractions less than 1 • Decimal fractions to hundredths place	• Decimal fractions to thousandths place • Fractions greater than 1
Computational Fluency	• Fluency with addition and subtraction within 5	• Fluency with addition and subtraction within 10	• Fluency using mental math up to 20 • Fluency with strategies within 100	• Fluency with multiplication and division with single-digit numbers • Fluency with addition and subtraction within 1,000	• Fluency with addition and subtraction with multi-digit whole numbers	• Fluency with multiplication and division with multi-digit whole numbers
Addition & Subtraction	• Single-digit numbers within 10	• Within 20 (using properties of operations) • Within 100 (using base ten understanding)	• Within 1,000 (using tools and strategies)	• Within 10,000	• Within 100,000 • Fractions with like denominators	• Fractions with unlike denominators • Decimal fractions to the hundredths place
Multiplication & Division			• Building arrays	• Within 100 • Multiply by multiples of 10	• Factors and multiples • Prime and composite numbers • Multiply by multi-digit whole numbers • Divide by 1-digit divisors	• Multiply multi-digit whole numbers • Multiply fractions and whole numbers • Divide unit fractions and whole numbers • Reason about multiplying by a fraction >, <, or = 1
Expressions						• Simple numerical expressions involving whole numbers with or without grouping symbols • Express fractions as division problems

K-5 MATHEMATICS: LEARNING PROGRESSIONS

Key Concepts	K	1	2	3	4	5
PATTERNING & ALGEBRAIC REASONING						
Patterns	• Repeating patterns with numbers and shapes • Explain the rationale for the pattern.	• Growing and repeating patterns of 1s, 5s, and 10s • Repeated operations, shapes or numbers	• Numerical patterns involving addition and subtraction	• Numerical patterns related to multiplication • Make predictions based on patterns	• Generate number and shape patterns that follow a rule • Represent and describe patterns	• Generate two numerical patterns using a given rule • Identify relationships using a table
Graphing						• Plot order pairs in first quadrant
GEOMETRIC & SPATIAL REASONING						
Shapes and Properties	• Identify, sort, classify, analyze, and compare 2D & 3D based on attributes using informal language • Positional words	• Identify, sort, and classify 2D & 3D shapes based on specific attributes using formal language and geometric properties • Compose 2D shapes & 3D shapes	• Describe, compare and sort 2-D and 3-D shapes given a set of attributes • Identify lines of symmetry in everyday objects	• Quadrilaterals • Parallel & perpendicular line segments, points, lines, line segments, & right angles and presence or absence of these in quadrilaterals • Lines of symmetry with quadrilaterals	• Points, lines, line segments, rays, angles, and parallel & perpendicular line segments • Classify, compare, & contrast polygons based on presence or absence of parallel or perpendicular line segments, angles of a specified size or side lengths.	• Classify polygons based on geometric properties • Relationships between categories and subcategories of shapes
Geometric Measurement				• Area of rectangles • Perimeter of rectangles	• Area and perimeter of composite rectangles • Angle measurement	• Volume of right rectangular prisms
MEASUREMENT & DATA REASONING						
Measurement & Data	• Measurable attributes of length, height, width and weight • Classify and sort up to 10 objects by attributes • Display and interpret categorical data with up to 10 data points on graphs	• Measure length in non-standard units • Compare, describe and order up to 3 objects using length in non-standard units • Display and interpret categorical data (with up to 3 categories)	• Measure length to nearest whole unit • Use tools such as constructed rulers and standard rulers • Choose units (in, ft, yd) appropriately • Display and interpret categorical data (with up to 4 categories)	• Measure liquid volume, length and mass in customary units • Use rulers to measure lengths in halves and fourths of an inch • Analyze numerical and categorical data with whole number values	• Measure liquid volume, distance, and mass using the metric measurement system • Use rulers to measure lengths to nearest $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ of an inch • Analyze data using dot plots (with values to the nearest 1/8 of a unit)	• Measure length and weight in metric units • Convert between units of measurement • Create and analyze dot plots (line plots) with fraction measurements
Money	• Identify pennies, nickels and dimes and know the value of each coin	• Identify value of pennies, nickels, dimes and quarters	• Combination of coins • Problems involving dollars and all coins	• Using money to solve problems	• Using money as a tool or manipulative to solve problems	• Using money as a tool to solve problems involving decimals
Time		• Tell & write time in hours and half hours • Measure elapsed time to the hour	• Time to the nearest five minutes • Distinguish between a.m. & p.m. • Elapsed time to hour or half hour	• Tell time to the nearest minute • Estimate relative time • Elapsed time to hour, half hour & quarter hour	• Intervals of time • Elapsed time to the nearest minute	• Solving problems involving time

Kindergarten

The nine standards listed below are the key content competencies students will be expected to master in kindergarten. Additional clarity and details are provided through the classroom-level learning objectives and evidence of student learning details for each grade-level standard found on subsequent pages of this document. As teachers are planning instruction and assessing mastery of the content at the grade level, the focus should remain on the key competencies listed in the table below.

KINDERGARTEN STANDARDS
K.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.**
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.2: **Use count sequences within 100 to count forward and backward in sequence.**
K.NR.3: **Use place value understanding to compose and decompose numbers from 11–19.**
K.NR.4: **Identify, write, represent, and compare numbers up to 20.**
K.NR.5: **Explain the concepts of addition, subtraction, and equality and use these concepts to solve real-life problems within 10.**
K.PAR.6: **Explain, extend, and create repeating patterns with a repetition, not exceeding 4 and describe patterns involving the passage of time.**
K.MDR.7: **Observe, describe, and compare the physical and measurable attributes of objects and analyze graphical displays of data to answer relevant questions.**
K.GSR.8: **Identify, describe, and compare basic shapes encountered in the environment, and form two-dimensional shapes and three-dimensional figures.**

Georgia's K-12 Mathematics Standards - 2021

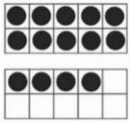
Kindergarten

NUMERICAL REASONING *– counting, money, place value, numbers to 20, addition, subtraction and fluency*

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).

<table>
<tr><th colspan="2">Expectations</th><th colspan="3">Evidence of Student Learning
(not all inclusive; see Grade Level Overview for more details)</th></tr>
<tr><td>K.NR.1.1</td><td>Count up to 20 objects in a variety of structured arrangements and up to 10 objects in a scattered arrangement.</td><td>Fundamentals
This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, CD-MA2.4b: Counts at least 10 objects using one-to-one correspondence.
Students should count objects using one-to-one correspondence saying the number names in the standard order and communicate quantities for authentic purposes. "Authentic purposes" refers to experiences students have in their everyday lives.
The overall goal is for students to be able to count up to 20 objects arranged in a line, a rectangle, or a circle, or up to 10 objects in a scattered arrangement.</td><td>Relevance and Application
Students should be able to count to answer "how many?" questions with up to 20 objects arranged in a variety of ways (a line, a rectangular array, or a circle), or up to 10 objects arranged in a scattered configuration.</td><td>Strategies and Methods
Dot cards, five-frames, ten-frames, rekenreks, dominoes, beads, rocks, counting bears, and playing cards are some tools that can be used for subitizing.</td></tr>
<tr><td>K.NR.1.2</td><td>When counting objects, explain that the last number counted represents the total quantity in a set (cardinality), regardless of the arrangement and order.</td><td colspan="2">Fundamentals
This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, CD-MA1.4e: Quickly recognizes and names how many items are in a set of up to four items. and CD-MA2.4e: With adult guidance and when counting, understands and can respond with the last number counted to represent quantity (cardinality).
Students should know that the last number counted represents the total quantity in a set (cardinality), when counting objects regardless of the arrangement and order.
Students should instantly see how many objects are in a group without counting (subitizing).</td><td>Strategies and Methods
Dot cards, five-frames, ten-frames, and rekenreks can be used for subitizing.</td></tr>
<tr><td>K.NR.1.3</td><td>Given a number from 1-20, identify the number that is one more or one less.</td><td colspan="3">Fundamentals
This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, CD-MA1.4d: Describes sets as having more, less, same as/equal. and CD-MA1.4f: Tells numbers that come before and after a given number up to 10.
Students should be able to understand that each successive number name refers to a quantity that is one larger and the previous number name is one less.</td></tr>
<tr><td>K.NR.1.4</td><td>Identify pennies, nickels, and dimes and know their name and value.</td><td>Fundamentals
Students should be able to identify and represent coins by name and value.</td><td>Strategies and Methods
Students can use different types of coin manipulatives to extend their understanding of counting by ones.
Coins as manipulatives could be used for counting by ones.</td><td>Age/Developmentally Appropriate
Student is able to count five nickels. Students are not expected to find the value.</td></tr>
<tr><td colspan="5"></td></tr>
</table>

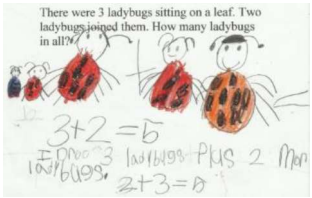
K.NR.2: Use count sequences within 100 to count forward and backward in sequence.				
Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**		
K.NR.2.1	Count forward to 100 by tens and ones and backward from 20 by ones.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA1.4a***: *Recites numbers up to 20 in sequence.* ● Students should count for authentic purposes which connect to their everyday experiences. ● Students should understand that each successive number name refers to a quantity that is one larger. ● When students are rote counting forward, start the count sequence at 1. ● When students are counting backward, start the count sequence beginning at 10 and progress to counting backward beginning at 20.	***Strategies and Methods*** ● When students count backward from 20, they can use visual resources such as a number line, a 99-chart, or a 100-chart.	***Age/Developmentally Appropriate*** ● When students count by tens, they are only expected to master counting by the decade (10, 20, ...). ● This expectation does not require recognition of numerals.
K.NR.2.2	Count forward beginning from any number within 100 and count backward from any number within 20.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA1.4a***: *Recites numbers up to 20 in sequence.* ● Students should count forward and backward from a given number using the known number word sequence for authentic purposes. ● Students should be able to begin and end with any given number.	***Example*** ● Given the number 54, a student will count "54, 55, 56, 57, 58…"	***Age/Developmentally Appropriate*** ● This expectation does not require recognition of numerals.

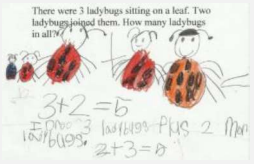
K.NR.3: Use place value understanding to compose and decompose numbers from 11–19.				
Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**		
K.NR.3.1	Describe numbers from 11 to 19 by composing (putting together) and decomposing (breaking apart) the numbers into ten ones and some more ones.	***Fundamentals*** ● Students should be able to put together (compose) and break apart (decompose) numbers into a group of 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. ● Students should use strategic thinking in order to communicate quantities for authentic purposes.	***Strategies and Methods*** ● Use objects or drawings to explain and record each composition or decomposition with a drawing or equation. ● Students should be given the opportunity to use five frames, ten frames, and rekenreks with support to demonstrate each composition or decomposition.	***Example*** ● The teacher can provide students with a variety of tools to make sense of numbers during everyday instruction. One day, a teacher may ask during a Number Talk, "In what ways can you decompose the number 14?". *Possible student response:* "I decomposed 14 in my mind's eye into one full ten frame and four more on another ten frame." The teacher records the student's thoughts as follows: 

K.NR.4: Identify, write, represent, and compare numbers up to 20.

Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
K.NR.4.1	Identify written numerals 0-20 and represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA1.4b***: *Recognizes numerals and uses counting as part of play and as a means for determining quantity.* ● Students should be able to identify and write numerals between 0 and 20 for authentic purposes. ● Students should be able to demonstrate the relationship between written numerals and a number of objects.	
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".	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA2.4a***: *Matches two equal sets using one-to-one correspondence and understands they are the same.* ● Students should compare the number of objects in two groups in authentic situations and identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group. ● Students should be able to explain that equal to is "the same" quantity.	***Age/Developmentally Appropriate*** ● This standard expects mastery of up to 10 objects. ● The words greater than, less than, or the same as (equal to) should be used instead of the symbols.

K.NR.5: Explain the concepts of addition, subtraction, and equality and use these concepts to solve real-life problems within 10.

Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)			
K.NR.5.1	Compose (put together) and decompose (break apart) numbers up to 10 using objects and drawings.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA2.4c***: *Practices combining, separating, and naming quantities.* ● Authentic problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	***Terminology*** ● The terms below are used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective. ○ Compose – put together numbers ○ Decompose – break apart numbers	***Strategies and Methods*** ● Teachers should use dot card images for students to explain how they see different number combinations.	
K.NR.5.2	Represent addition and subtraction within 10 from a given authentic situation using a variety of representations and strategies.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, ***CD-MA2.4c***: *Practices combining, separating, and naming quantities. and* ***CD-MA7.4b***: *Uses simple strategies to solve mathematical*	***Age/Developmentally Appropriate*** ● Exposure to equations is expected but mastery of equations is not required. ● Drawings do not need to show details but should show the	***Strategies and Methods*** – *see special note in appendix* ● Representations may include objects, fingers, mental images, drawings, expressions, or equations.	***Example*** 

		problems and communicates how he/she solved it. ● Students should be able to represent relevant problems involving the addition and subtraction of whole numbers within 10 with objects and drawings. ● Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	mathematics in the problem. ● Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required. However, please note that it is not until First Grade when "Understand the meaning of the equal sign" is an expectation.	● Student drawings and equations should show the mathematics of the solution from the given situation. ● Equations should be derived from visual depiction.	Note: The student work above shows four different representations of the student's thinking. One with pictures (3 ladybugs + 2 ladybugs) and two equations with numerals (3 + 2 and 2 + 3). The student also represented the problem with words and numbers.	
K.NR.5.3	Use a variety of strategies to solve addition and subtraction problems within 10.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, ***CD-MA2.4c***: *Practices combining, separating, and naming quantities. and* ***CD-MA7.4b***: *Uses simple strategies to solve mathematical problems and communicates how he/she solved it.*	***Strategies and Methods*** – *see special note in appendix* ● Students should be able to solve authentic, mathematical problems involving the addition and subtraction of single-digit whole numbers, using a variety of strategies such as: ○ counting on ○ counting backward ○ making 10 ● Authentic, mathematical problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and	***Terminology*** ● Students should be provided with a variety of problem types including Join: Result Unknown, Separate: Result Unknown, Part-Part-Whole: Whole Unknown, and Part-Part-Whole: Both Parts Unknown; however, students are not required to know or use this terminology. ● Join: Result Unknown ○ Example: 3 birds were sitting in a tree and 2 more birds flew onto the tree. How many birds were in the tree then? ● Separate: Result Unknown ○ Example: Toni had 8 guppies. She gave 3 guppies to Roger.	***Age/Developmentally Appropriate*** ● Exposure to equations is expected but mastery of equations is not required in Kindergarten.	***Example***  Note: The student work above shows four different representations that helped the student solve the problem: One with pictures (3 ladybugs + 2 ladybugs), two with numerals (3 + 2 = 5 and 2 + 3 = 5), and written form. The student also used the commutative property of addition to solve the problem.

			interesting for the learners to pique their natural, intellectual curiosity.	How many guppies does Toni have now? ● Part-Part-Whole: Whole Unknown ○ Example: 6 girls and 4 boys were playing soccer. How many children were playing soccer? ● Part-Part-Whole: Both Parts Unknown ○ Example: Ann has 15 cap erasers. Some are pink and some are blue. How many could be pink and how many could be blue?		
K.NR.5.4	Fluently add and subtract within 5 using a variety of strategies to solve practical, mathematical problems.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA7.4b***: *Uses simple strategies to solve mathematical problems and communicates how he/she solved it.*	***Strategies and Methods*** – *see special note in appendix* ● Students should be able to solve problems involving the addition and subtraction of numbers within five related to everyday life. ● Problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.	***Terminology*** ● The terms below are used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective. ○ Fluently/Fluency -- To achieve fluency, students should be able to choose flexibly among methods and strategies to solve mathematical problems accurately and efficiently.	***Age/Developmentally Appropriate*** ● Fluency does not lend itself to timed tests or speed. ● Exposure to equations is expected but mastery of equations is not required.	***Example*** ● When making toothpick designs to represent the various combinations of the number "5", the student writes the numerals for the various parts (such as "4" and "1") or selects a number sentence that represents that particular situation (such as 5 = 4 + 1).

PATTERNING & ALGEBRAIC REASONING *– repeating patterns and time*					
K.PAR.6: Explain, extend, and create repeating patterns with a repetition, not exceeding 4 and describe patterns involving the passage of time.					
Expectations		**Evidence of Student Learning** (not all inclusive; see Grade Level Overview for more details)			
K.PAR.6.1	Create, extend, and describe repeating patterns with numbers and shapes, and explain the rationale for the pattern.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, ***CD-MA4.4c***: *Creates and extends simple, repeating patterns.* and ***CD-MA7.4b***: *Uses simple strategies to solve mathematical problems and communicates how he/she solved it.*	***Strategies and Methods*** ● Patterns should include spatial, color, location, shape, and symbols (letter/ number).	***Age/Developmentally Appropriate*** ● This standard should be taught throughout the year. ● The repetition (iteration) of pattern should not exceed 4.	***Examples*** ● Students are able to use shapes to create and extend patterns such as the following: In the pattern of 1 blue, 1 green,1 blue, 2 greens, students would explain that 1 blue would be next in the sequence and that the pattern increases by one for the green.
K.PAR.6.2	Describe patterns involving the passage of time using words and phrases related to actual events.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA3.4d*** *Associates and describes the passage of time with actual events.*	***Strategies and Methods*** ● Patterns should include yesterday, today and tomorrow, as well as morning and afternoon. ● Students should be able to use terms such as now, earlier, later, before, after, yesterday, today, tomorrow, morning, afternoon, evening, day of the week, week, month, year.	***Age/Developmentally Appropriate*** ● This standard should be taught throughout the year.	***Examples*** ● A student may explain: ○ "Tomorrow is Tom's birthday. Next week will be my birthday." ○ "It is sunny outside now. This morning it was rainy." ○ "I got dressed this morning. This afternoon I will ride the bus home. I will go to my ball game this evening." ○ "Today is Friday. We do not go to school on Saturday and Sunday. It is the weekend."

MEASUREMENT & DATA REASONING *– attributes of objects, classifying objects*				
K.MDR.7: Observe, describe, and compare the physical and measurable attributes of objects and analyze graphical displays of data.				
Expectations		**Evidence of Student Learning** (not all inclusive; see Grade Level Overview for more details)		
K.MDR.7.1	Directly compare, describe, and order common objects, using measurable attributes (length, height, width, or weight) and describe the difference.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, ***CD-MA3.4a***: *Uses mathematical terms to describe experiences involving measurement.;* ***CD-MA3.4b***: *Compares objects using two or more attributes, such as length, weight and size.;* ***CD-MA3.4c***: *Uses a variety of techniques and standard and non-standard tools to measure and compare length, volume (capacity) and weight.; and* ***CD-MA4.4a****:*	***Terminology*** ● The terms below are used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective.	***Examples*** ● Directly compare the heights of two objects and describe one object as taller/shorter. ● A student may describe a shoe as, "The red shoe is

<table>
<tr><td></td><td></td><td colspan="2">Independently orders objects using one characteristic and describes the criteria used.
● In Kindergarten, students should use language such as heavier, lighter, longer, taller, shorter, wider, larger, smaller.
● In Kindergarten, students may use a variety of techniques and tools to compare, describe, and order objects. Students may use a referent object being compared as a tool to describe the other object(s).</td><td colspan="2">○ Attributes – characteristics (i.e., length, height, width, or weight)
○ Referent object – an object used as the standard of comparison</td><td>heavier than the blue shoe (the blue shoe is the referent in this case)! The red shoe is also longer!”</td></tr>
<tr><td>K.MDR.7.2</td><td>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.</td><td>Fundamentals
● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, CD-MA4.4b: Sorts and classifies objects using one or more attributes or relationships.
● Kindergarten students should be able to sort objects by characteristics such as heavier, lighter, longer, and shorter (compare to benchmark item).</td><td>Terminology
● The terminology below is used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective.
○ Attributes – characteristics (i.e., length, height, width, or weight)</td><td>Age/Developmentally Appropriate
● Categories should have no more than 10 objects.</td><td>Example
● When given a collection of buttons, the student separates the buttons into different piles based on color. Then, the student counts the number of buttons in each pile. Finally, the student organizes the groups by the quantity in each group: orange buttons (3), green buttons next (4), purple buttons with the green buttons because purple also had (4), blue buttons last (5).</td></tr>
<tr><td>K.MDR.7.3</td><td>Ask questions and answer them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.</td><td colspan="2">Strategies and Methods
● Questions should be student generated.</td><td colspan="2">Fundamentals
● Relevant problems can include word problems that are meaningful to a student’s real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.</td></tr>
<tr><td colspan="6"></td></tr>
</table>

GEOMETRIC & SPATIAL REASONING *– 2D and 3D shapes, relative locations, attributes*						
K.GSR.8: Identify, describe, and compare basic shapes encountered in the environment, and form two-dimensional shapes and three-dimensional figures.						
Expectations		**Evidence of Student Learning** (not all inclusive; see Grade Level Overview for more details)				
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.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA6.4a***: *Recognizes and names common two-dimensional and three-dimensional shapes, their parts and attributes.*	***Age/Developmentally Appropriate*** ● Students should be able to identify basic shapes, including squares, circles, triangles, rectangles, hexagons, octagons, cubes, cones, cylinders, and spheres. ● Students begin to understand how three-dimensional figures are composed of two-dimensional shapes.	***Terminology*** ● The terms below are used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective. ○ Attributes – characteristics (i.e., two-dimensional shapes (lying in a plane, "flat") and three-dimensional figures ("solid"), including geometric properties.). An example of an attribute is having sides of equal length. ○ Vertices – corners of a geometric figure	***Example*** ● The base and top of a cylinder is a circle.
K.GSR.8.2	Describe the relative location of an object using positional words.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standard, ***CD-MA5.4a***: *Uses appropriate directional language to indicate where things are in their environment - positions, distances, order.* ● Kindergarten students should be able to explain the location of an object in relation to another object using positional language, such as "above," "below," "beside," "in front of," "behind," or "next to."		***Age and Developmentally Appropriate*** ● Kindergarten students should be able to use various objects they come in contact with in their everyday life.	***Examples*** ● "The cup is beside the pencil." ● "The boy is behind the girl in line." ● In a sequence of pictures, the student would describe the position of a particular object.
K.GSR.8.3	Use basic shapes to represent specific shapes found in the environment by creating models and drawings.	***Age and Developmentally Appropriate*** ● Basic shapes used in kindergarten should include squares, circles, triangles, rectangles, hexagons, octagons, cubes, cones, cylinders, and spheres.	***Strategies and Methods*** ● A variety of materials can be used to create models of shapes that exist in everyday life.		***Examples*** ● *Models* – sticks with clay balls, toothpicks with marshmallows, popsicle sticks, technology, etc.
K.GSR.8.4	Use two or more basic shapes to form larger shapes.	***Age/Developmentally Appropriate*** ● Basic shapes used in kindergarten should include squares, circles, triangles, rectangles, hexagons, octagons, cubes, cones, cylinders, and spheres.	***Fundamentals*** ● This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, ***CD-MA5.4b***: *Uses deliberate manipulation and describes process for fitting objects together.* and ***CD-MA6.4b***: *Combines simple shapes to form new shapes.*	***Strategies and Methods*** ● Students should be able to form (compose) larger shapes by putting together smaller shapes through exploration and play.	***Examples*** ● "Use the 7 tangram pieces to make a fox."

ESSENTIAL INSTRUCTIONAL GUIDANCE

MATHEMATICAL PRACTICES

The Mathematical Practices describe the reasoning behaviors students should develop as they build an understanding of mathematics – the "habits of mind" that help students become mathematical thinkers. There are eight standards, which apply to all grade levels and conceptual categories.

These mathematical practices describe how students should engage with the mathematics content for their grade level. Developing these habits of mind builds students' capacity to become mathematical thinkers. These practices can be applied individually or together in mathematics lessons, and no particular order is required. In well-designed lessons, there are often two or more Mathematical Practices present.

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

MATHEMATICAL MODELING

Teaching students to model with mathematics is engaging, builds confidence and competence, and gives students the opportunity to collaborate and make sense of the world around them, the main reason for doing mathematics. For these reasons, mathematical modeling should be incorporated at every level of a student's education. This is important not only to develop a deep understanding of mathematics itself, but more importantly to give students the tools they need to make sense of the world around them. Students who engage in mathematical modeling will not only be prepared for their chosen career but will also learn to make informed daily life decisions based on data and the models they create.

The diagram below is a mathematical modeling framework depicting a cycle of how students can engage in mathematical modeling when solving a realistic problem or task.

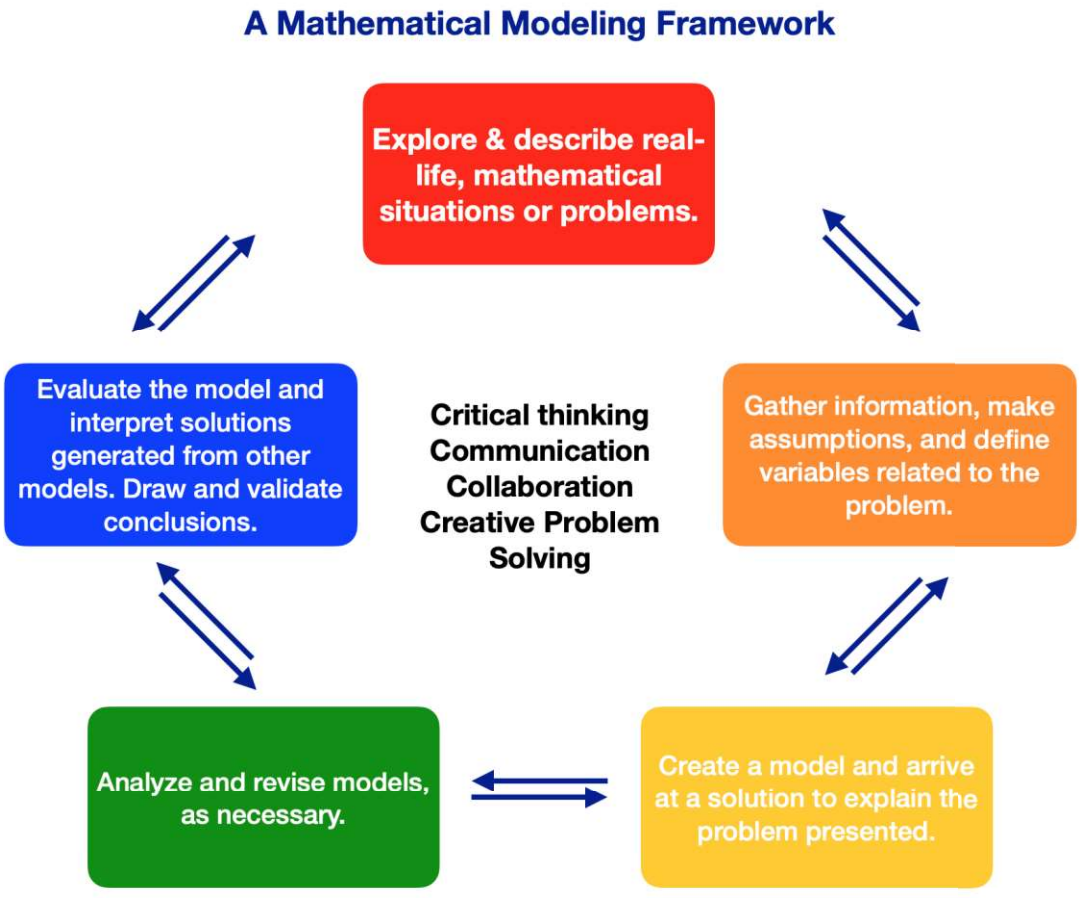


Image adapted from: Suh, Matson, Seshaiyer, 2017

FRAMEWORK FOR STATISTICAL REASONING

Statistical reasoning is important for learners to engage as citizens and professionals in a world that continues to change and evolve. Humans are naturally curious beings and statistics is a language that can be used to better answer questions about personal choices and/or make sense of naturally occurring phenomena. Statistics is a way to ask questions, explore, and make sense of the world around us.

The Framework for Statistical Reasoning should be used in all grade levels and courses to guide learners through the sense-making process, ultimately leading to the goal of statistical literacy in all grade levels and courses. Reasoning with statistics provides a context that necessitates the learning and application of a variety of mathematical concepts.

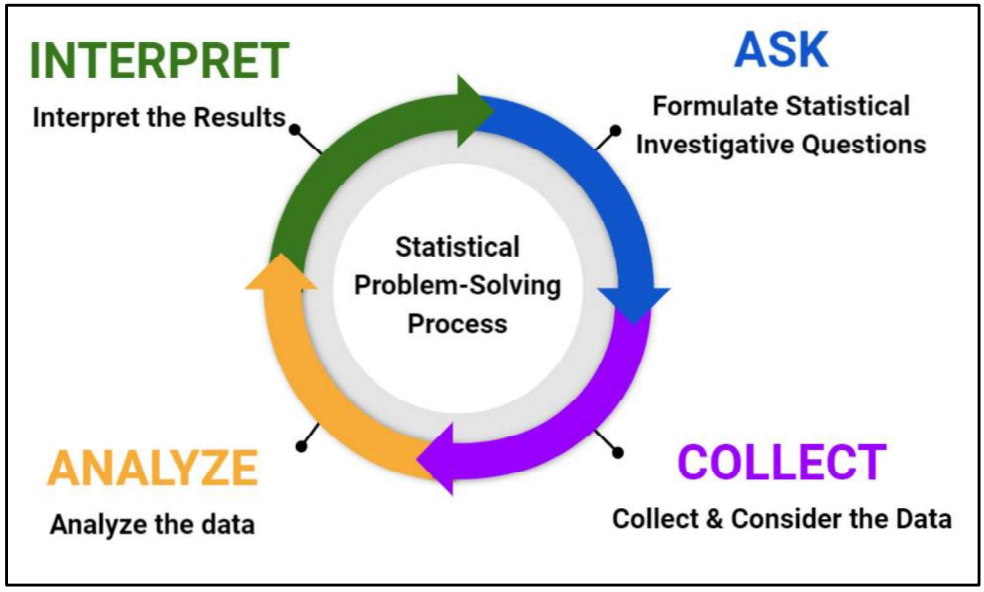


FIGURE 1: GEORGIA FRAMEWORK FOR STATISTICAL REASONING

The following four-step statistical problem-solving process can be used throughout each grade level and course to help learners develop a solid foundation in statistical reasoning and literacy:

I. Formulate Statistical Investigative Questions
Ask questions that anticipate variability.

II. Collect & Consider the Data
Ensure that data collection designs acknowledge variability.

III. Analyze the Data
Make sense of data and communicate what the data mean using pictures (graphs) and words. Give an accounting of variability, as appropriate.

IV. Interpret the Results
Answer statistical investigative questions based on the collected data.

Kindergarten: Create statistical investigative questions that can be answered by collecting, analyzing, and interpreting data with **up to 10 data points.**

Ask	Collect	Analyze	Interpret
Generate and ask questions to investigate situations within the classroom.	**Collect data to answer a statistical investigative question.**	**Represent the findings from generated questions using objects and pictures.**	**Explain the findings based on the data collected and represented on graphs.**

Instructional Supports

- Expectations in this grade level should be taught throughout the year and applied contextually to the current expectation and everyday events.
- Relevant problems can include word problems that are meaningful to a student's real environment. It is important for the problems presented to be relevant and interesting for the learners to pique their natural, intellectual curiosity.
- Limit category counts to be less than or equal to ten.
- At this grade level, more support is needed with formulating statistical questions. Students should be given guidance when developing statistical investigative questions. Students should be provided with support strategies for collecting and organizing their data.
- Students will display their data using objects and pictures. In later grades, students will represent data in pictographs and bar graphs.
- In Kindergarten, students should be able to use friendly language to explain their data and answer the overall question.
- The terminology below is used to clarify expectations for the teaching professional. Students are not required to use this terminology when engaging with the learning objective.
- A statistical investigative question is one that requires data that will vary. Examples: "How did you get to school today?"; "What is your favorite ____?"

1st Grade: Create a statistical investigative question that can be answered using data involving numerical values **within 20**. Collect, analyze, and interpret **categorical data** presented as **picture graphs** and **bar graphs** (with single-unit scales) with **up to three categories** from actual situations to answer the question posed.

Ask	Collect	Analyze	Interpret
Create a statistical investigative question that can be answered by gathering, representing, and interpreting data.	**Determine strategies for collecting and organizing data within 20 to answer a statistical investigative question.**	**Create a picture graph and a bar graph (with single-unit scale) to represent a data set with up to three categories. Analyze the information by asking and answering questions about the data.**	**Interpret categorical data to answer the statistical investigative question created, including total number of data points, how many in each category, and how many more or less are in one category than another.**

Instructional Supports

- Expectations in this grade level should be taught throughout the year and applied contextually to the current expectation and actual events.
- Students should formulate a statistical investigative question to explore a realistic situation in their classroom. Ex. "How many pets do you have?" is a statistical investigative question because it anticipates variability in students' responses.
- Students should be able to organize the data collected, represent the data on a table, and ask questions about the data generated. This expectation is limited to data with up to three categories presented in tables and charts. Students should be using tally marks and numerical values to organize and represent data.
- Students should use tally marks and numerical values within 20 to organize and represent the data. Students should be able to summarize the number of tally marks in each category.
- Students should be able to analyze and interpret categorical data on a provided pictograph or bar graph to answer the formulated statistical investigative question. On a picture graph, one symbol stands for a value of 1 at this grade level.
- Developing strategies for collecting data include students collaborating to determine ways to collect data. Data can be gathered from a variety of sources to answer the statistical investigative question posed.