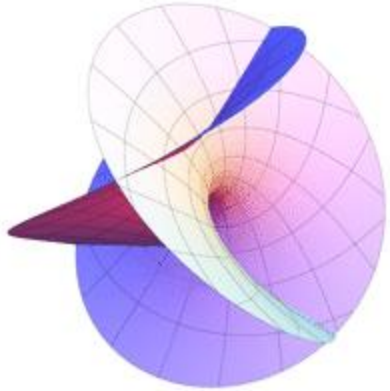
Understanding Georgia's K-12 Mathematics Standards



Georgia Department of Education
Mathematics Team

January 2023

GaDOE Mathematics Team Members

- Lya Snell, Ph.D.
  Mathematics & Computer Science Program Manager
  lsnell@doe.k12.ga.us

- Karla Cwetna, Ph.D.
  Secondary Mathematics Program Specialist
  kcwetna@doe.k12.ga.us

- Kenneth Golden
  Secondary Mathematics Program Specialist
  Kenneth.golden@doe.k12.ga.us

- Michael Wiernicki
  Elementary Mathematics Program Specialist
  mwiernicki@doe.k12.ga.us

- Jenise Sexton
  Mathematics Content Integration Specialist
  jsexton@doe.k12.ga.us

YOUR GADOE MATHEMATICS TEAM IS HERE TO SERVE YOU!

Follow us:
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Important Websites

Georgia Mathematics Program Updates:
www.gadoe.org/mathematics

Professional Learning Communities:
https://community.gadoe.org

Curriculum Resources:
www.georgiastandards.org

Professional Learning Conferences:
www.gadoe.org/mathcon

New Interdisciplinary Content Support Specialists on GaDOE Mathematics Team

Denise Castleberry

Interdisciplinary Content Support Specialist for Mathematics

Experience:

- Elementary Mathematics Coach
- District Instructional Specialist, 6-8
- High School Mathematics Teacher

Dr. Jacqueline Hennings

Interdisciplinary Content Support Specialist for Mathematics

Experience:

- K-12 Mathematics Coordinator
- K-12 RESA School Improvement Specialist
- High School Mathematics Teacher

Learning Outcomes

- Overview of Georgia's K-12 Mathematics Standards
- Implementation Plan for 2023-2024

Important Details

As you engage with the new standards:

- Use the progressions, age appropriateness guardrails, decomposition of the standards through learning objectives or expectations, and evidence of student learning in all grade levels.
- Explore the embedded ways to help students master the fundamentals in numeracy development in K-5.
- Build relevant pathways through the big ideas to engage students based on a foundation of part-whole reasoning and flexible thinking.

Important Details

As you engage with students:

- Communicate flexibility in strategy selection or approach to solving mathematical problems.
- Promote the use of mathematical reasoning and sense-making through research-based, effective mathematics teaching practices in all grade levels and courses.
- Make mathematics learning fun and engaging while helping learners see the connection between mathematics and real-life phenomena.

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

<table>
<tr><th>K</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>HS Algebra: Concepts & Connections</th><th>HS Geometry: Concepts & Connections</th><th>HS Advanced Algebra: Concepts & Connections</th></tr>
<tr><td colspan="12">Mathematical Modeling (MM)</td></tr>
<tr><td colspan="12">Mathematical Practices (MP)</td></tr>
<tr><td colspan="12">Data & Statistical Reasoning (DSR)</td></tr>
<tr><td colspan="12">Numerical Reasoning (NR)</td></tr>
<tr><td colspan="12">Patterning & Algebraic Reasoning (PAR)</td></tr>
<tr><td colspan="12">Geometric & Spatial Reasoning (GSR)</td></tr>
<tr><td colspan="6">Measurement & Data Reasoning (MDR)</td><td colspan="6"></td></tr>
<tr><td colspan="8"></td><td colspan="4">Functional & Graphical Reasoning (FGR)</td></tr>
<tr><td colspan="7"></td><td colspan="2">Probability Reasoning (PR)</td><td colspan="2"></td><td colspan="2">Probabilistic Reasoning (PR)</td></tr>
</table>

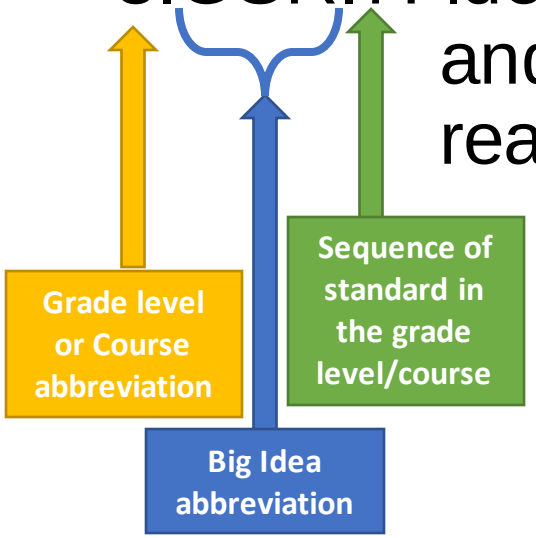
*The Big Ideas extend to High School 4th course options beyond Advanced Algebra: Concepts and Connections. These Big Ideas can be found within each course standards document.

Georgia's K-12 Mathematics Standards

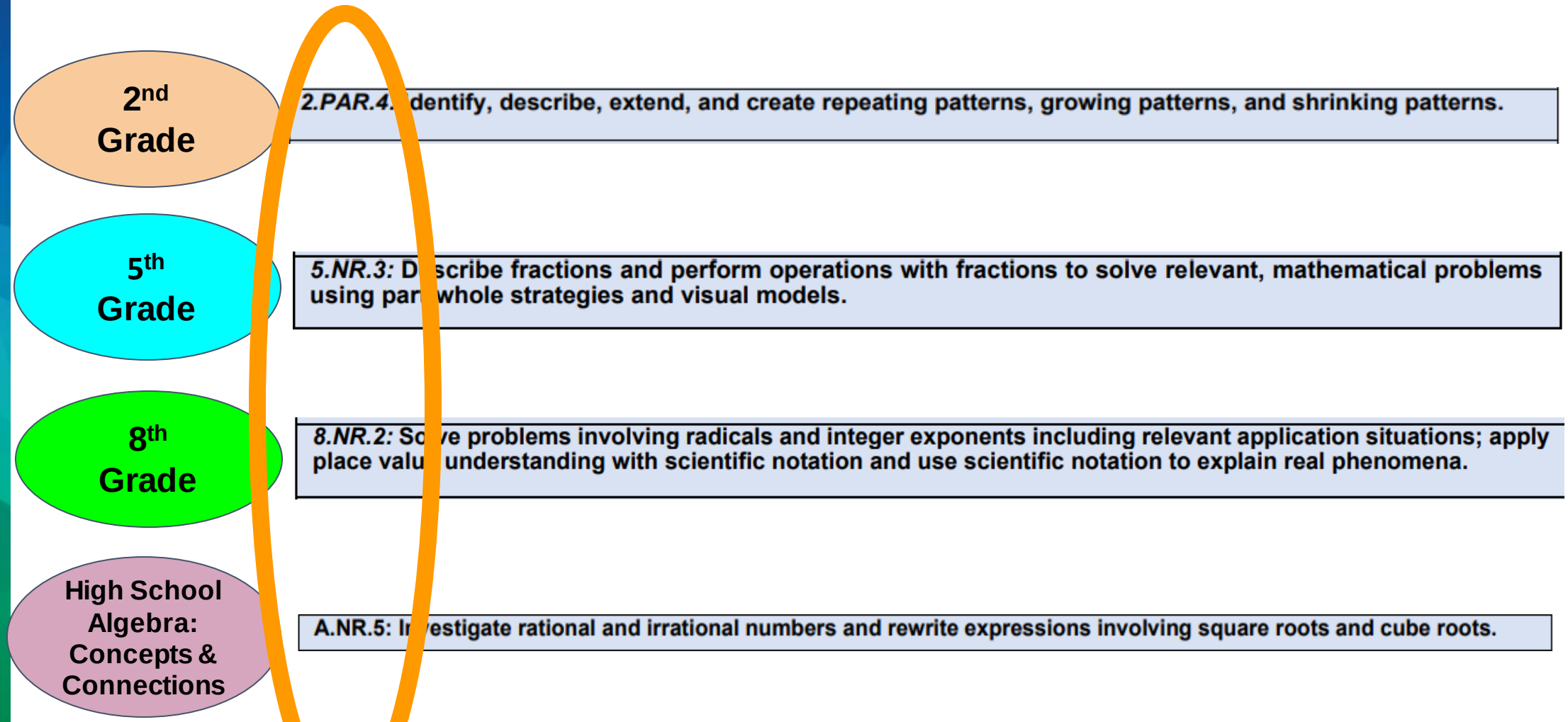
THIRD GRADE STANDARDS
3.MP: **Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.**
3.NR.1: **Use place value reasoning to represent, read, write, and compare numerical values up to 10,000 and round whole numbers up to 1,000.**
3.PAR.2: **Use part-whole strategies to represent and solve real-life problems involving addition and subtraction with whole numbers up to 10,000.**
3.PAR.3: **Use part-whole strategies to solve real-life, mathematical problems involving multiplication and division with whole numbers within 100.**
3.NR.4: **Represent fractions with denominators of 2, 3, 4, 6 and 8 in multiple ways within a framework using visual models.**
3.MDR.5: **Solve real-life, mathematical problems involving length, liquid volume, mass, and time and analyze graphical displays of data to answer relevant questions.**
3.GSR.6: **Identify the attributes of polygons, including parallel segments, perpendicular segments, right angles, and symmetry.**
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.8: **Determine the perimeter of a polygon presented in real-life, mathematical problems.**

Coding/ Naming Convention

3.GSR.7: Identify area as a measurable attribute of rectangles and determine the area of a rectangle presented in real-life, mathematical problems.



Understanding the Standards Coding



NUMERICAL REASONING *– place value, rounding, comparisons with multi-digit numbers, addition and subtraction, multiplicative comparisons, multiplication, and division involving whole numbers*

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.

	Expectations	Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
4.NR.1.1	Read and write multi-digit whole numbers to the hundred-thousands place using base-ten numerals and expanded form.	***Age/Developmentally Appropriate*** • Students are not expected to write numbers in word form.	
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.	***Fundamentals*** • Students should be able to use numerical reasoning to represent and explain using concrete materials, the relationship among the numbers 1, 10, 100, and 1,000. Students should be able to extend the pattern to the hundred-thousands place. • Students should be able to recognize the relationship of same digits located in different places in a whole number.	***Example*** • The population of Atlanta is about 500,000 people and the population of Valdosta is about 50,000 people. How many times greater is the population of Atlanta than Valdosta?
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.	***Fundamentals*** • Students should be able to order up to 5 whole numbers less than 1,000,000 through the hundred-thousands place.	***Age/Developmentally Appropriate*** • Students are not expected to use more than two inequality symbols when recording comparisons (< or >).
4.NR.1.4	Use place value understanding to round multi-digit whole numbers.	***Age/Developmentally Appropriate*** • Grade 4 students should explore rounding within multiple authentic situations. • Students should be able to round whole numbers to the 1,000s, 10,000s and 100,000s.	***Strategies and Methods*** • Students should locate numbers on a number line to determine the nearest multiple of 1,000s, 10,000s or 100,000s.

Competency-Based/Clustering Instructional Approach

GRADE 2

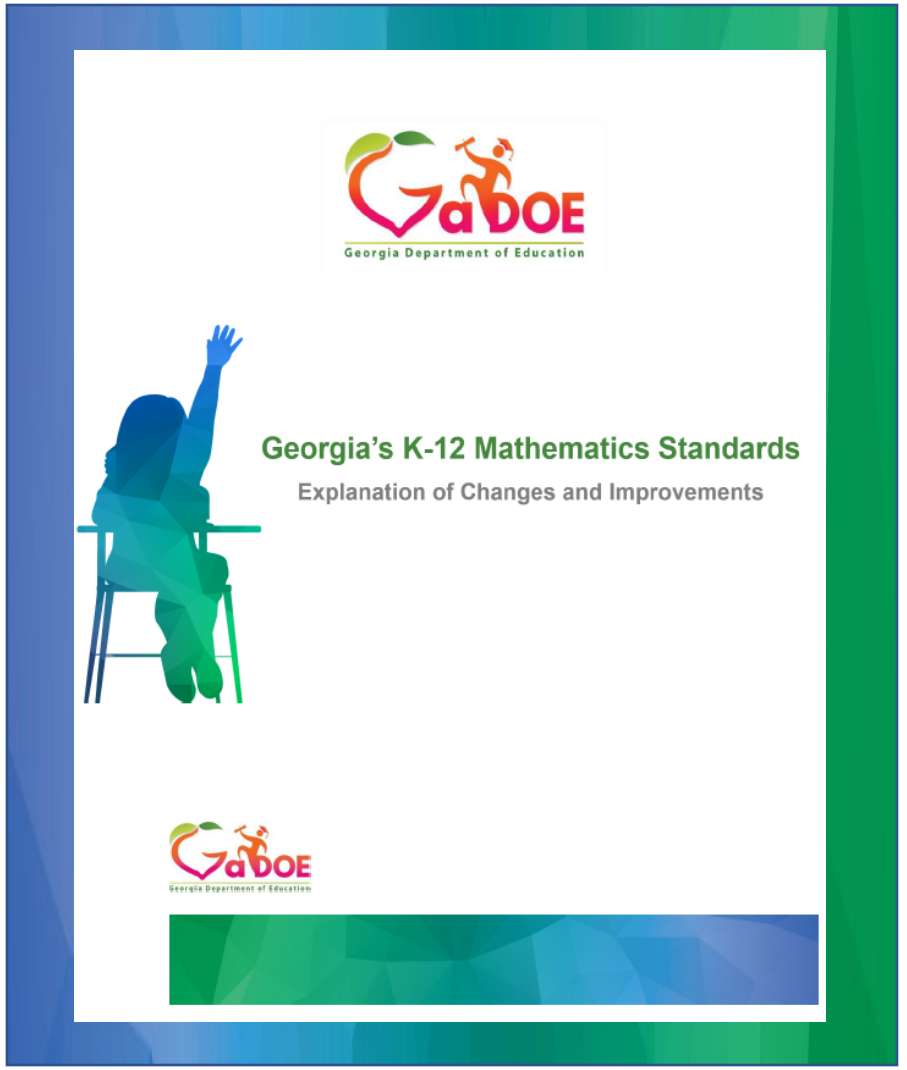
Unit 2: Building Fluency with Addition and Subtraction (4 - 5 weeks)
Big Ideas: Numerical Reasoning, Patterning & Algebraic Reasoning, Measurement & Data Reasoning
Standards Addressed in this Unit:
2.NR.2: Apply multiple part-whole strategies, properties of operations and place value understanding to solve real-life, mathematical problems involving addition and subtraction within 1,000. (within 100 for this unit).
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.
2.PAR.4: Identify, describe, extend, and create repeating patterns, growing patterns, and shrinking patterns.
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.
Suggested Clusters of Concepts (Learning Objectives)
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.
2.NR.2.3 Solve problems involving the addition and subtraction of two-digit numbers using part-whole strategies
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.
2.NR.1.1 Explain the value of a three-digit number using hundreds, tens, and ones in a variety of ways.
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
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.
2.PAR.4.1 Identify, describe, and create a numerical pattern resulting from repeating an operation such as addition and subtraction.

Mathematical Practices (2.MP.1- 8) should be evidenced at some point throughout each unit depending on the tasks that are explored. It is important to note that MPs 1, 3 and 6 should support the learning in every lesson.

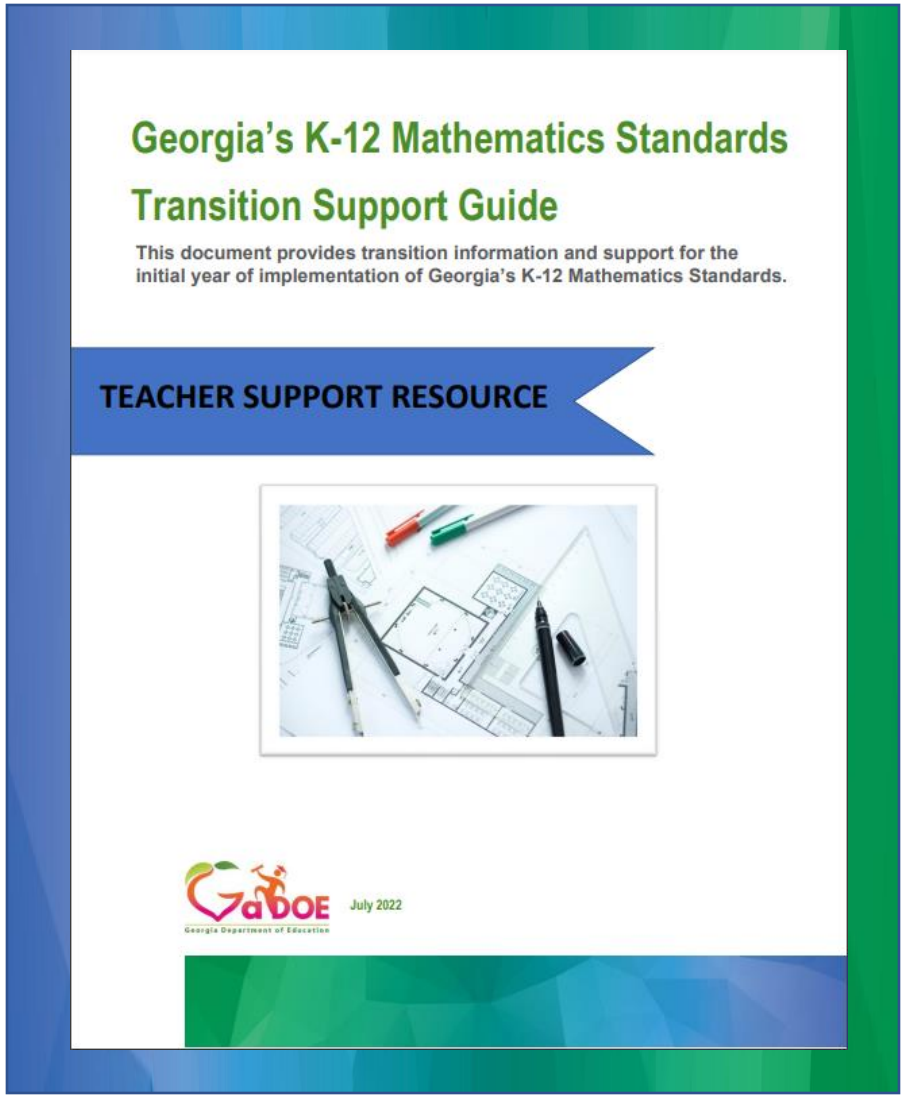
- For instructional purposes, the learning objectives are not intended to be taught as an isolated checklist, but rather as a cluster within the standard.
- Ultimately, students must show mastery of the overall standard/key competency for the grade level.

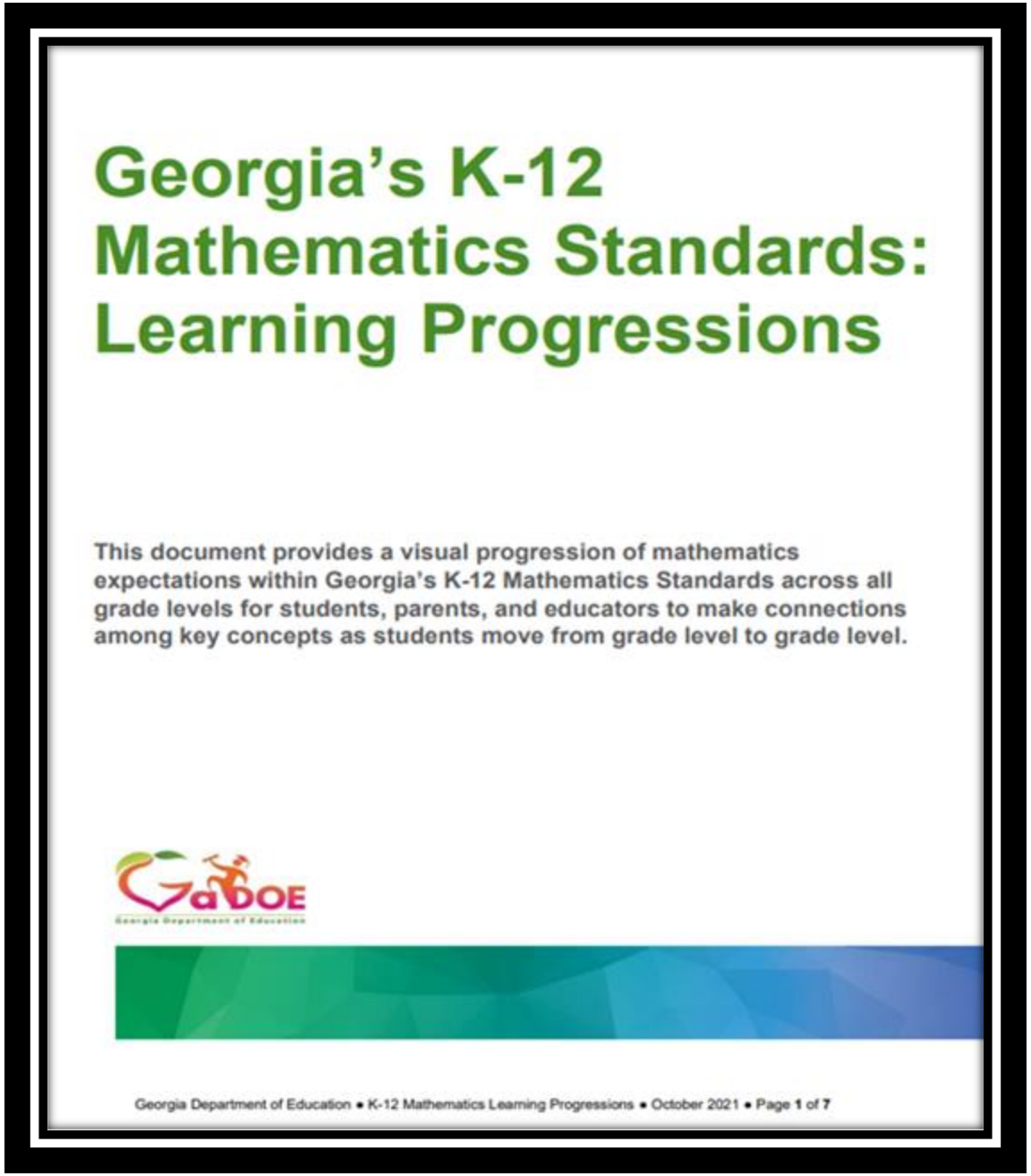
Instructional Resources and Supports for Georgia's K-12 Mathematics Standards

Explanation of Changes



Transition Document

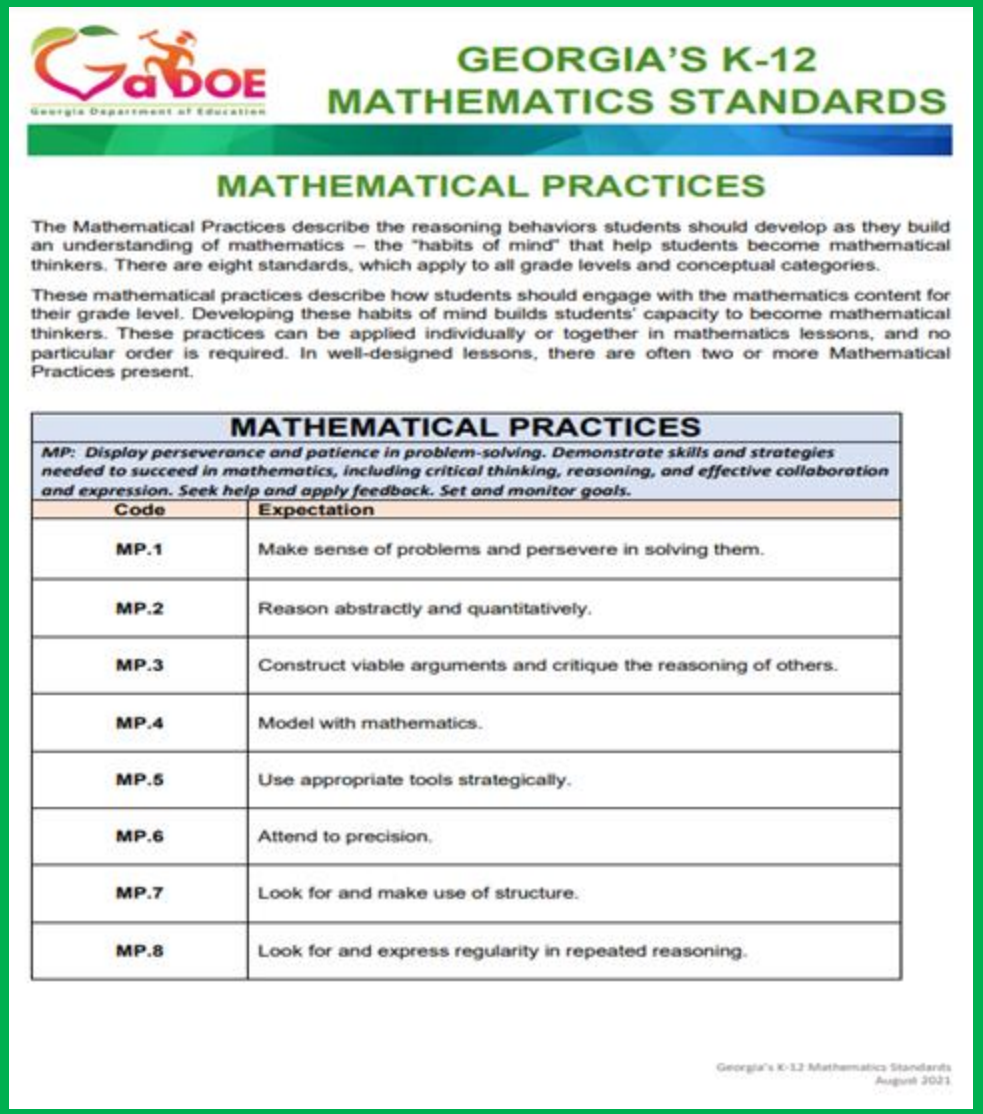



Georgia's K-12 Mathematics Standards: Learning Progressions
This document provides a visual progression of mathematics expectations within Georgia's K-12 Mathematics Standards across all grade levels for students, parents, and educators to make connections among key concepts as students move from grade level to grade level.
Georgia Department of Education • K-12 Mathematics Learning Progressions • October 2021 • Page 1 of 7

New Course Numbers (available in SuitCASE)

ESSENTIAL INSTRUCTIONAL GUIDANCE

- Mathematical Practices
- Mathematical Modeling
- Framework for Statistical Reasoning
- Computational Strategies for Whole Numbers



GEORGIA'S K-12 MATHEMATICS STANDARDS

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.

Georgia's K-12 Mathematics Standards
August 2021

8 Mathematical Practices (K-12 Habits of Mind for Mathematics)

COMPUTATIONAL STRATEGIES FOR WHOLE NUMBERS

Mathematics Place-Value Strategies and US Traditional Algorithms

Specific mathematics strategies for teaching and learning are not mandated by the Georgia Department of Education or assessed on state or federally mandated tests. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and-makes sense to them. It is critical that teachers and parents remain partners to help each child grow to become a mathematically literate citizen. These standards preserve and affirm local control and flexibility.

In mathematics, the emphasis is on the reasoning and thinking about the quantities within mathematical contexts. Algorithms, tape diagrams (bar models), and number line representations are a few examples of ways that students communicate their strategic thinking in a written form.

Addition Example: 1573 + 796

US Traditional Algorithm:

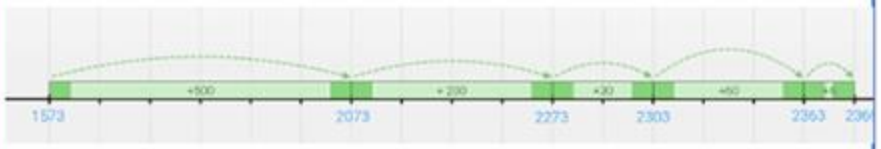
$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ \ } \\ 1\ 5\ 7\ 3 \\ +\ \ 7\ 9\ 6 \\ \hline 2\ 3\ 6\ 9 \end{array}$$

Description:
As students make sense of and use addition strategies and algorithms, it is important for them to be given the flexibility to use a part-whole strategy such as place value partitioning, adding on in parts, estimation and compensation, and friendly numbers to communicate their thinking using a written recording of that strategy that is most comfortable for and makes sense to them. Students should be able to demonstrate a deep understanding of the relationship between the quantities presented in the mathematics number sentence and to attend to precision in their explanations. Flexibility in thinking is key!

Place Value Algorithm:

$$\begin{array}{r} 1\ 5\ 7\ 3 \\ +\ \ 7\ 9\ 6 \\ \hline \ \ \ \ \ \ 9 \\ +\ \ \ 1\ 6\ 0 \\ +\ 1\ 2\ 0\ 0 \\ +\ 1\ 0\ 0\ 0 \\ \hline 2\ 3\ 6\ 9 \end{array}$$

Number Line Representation:



It is important to note that the examples of strategies provided in the tables are not all inclusive. Students may solve problems in different ways and have the flexibility to choose a mathematical strategy that allows them to make sense of and strategically solve problems using efficient methods that are most comfortable for and makes sense to them.

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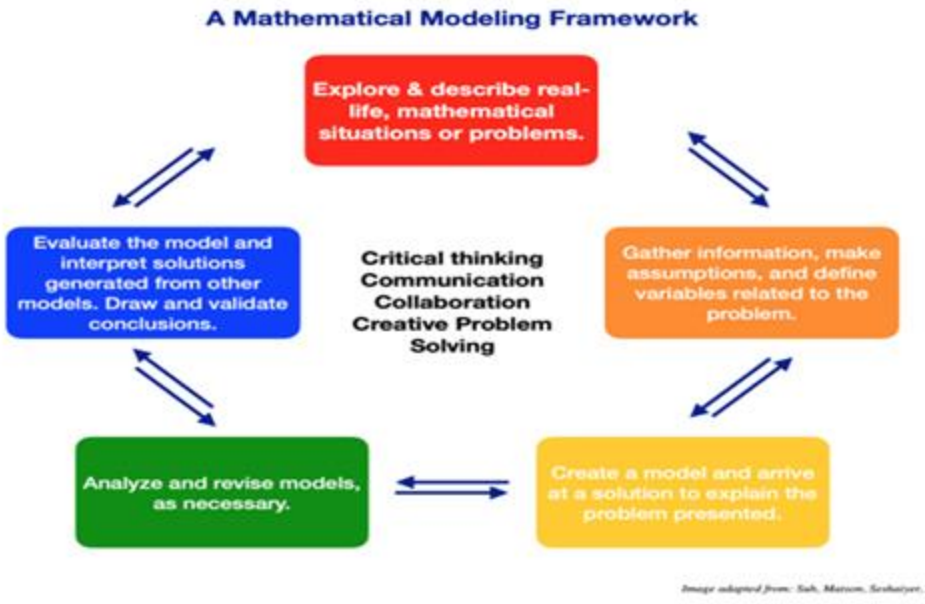
Mathematical Modeling Framework (K-12)

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.



Framework for Statistical Reasoning (K-12)

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.

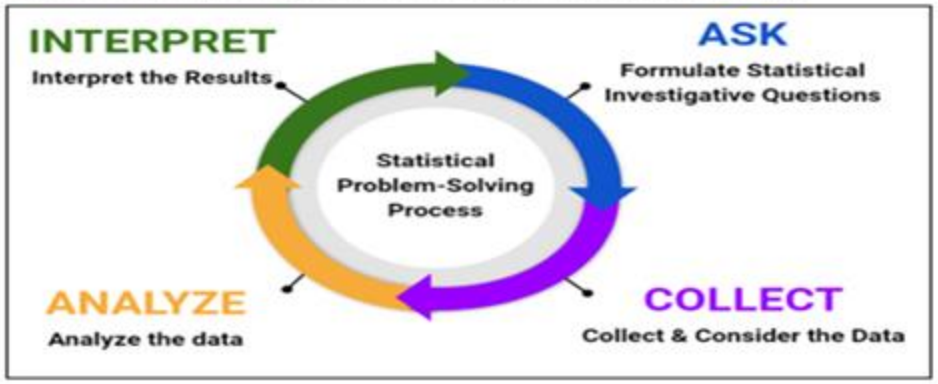


Figure 1: Georgia Framework for Statistical Reasoning

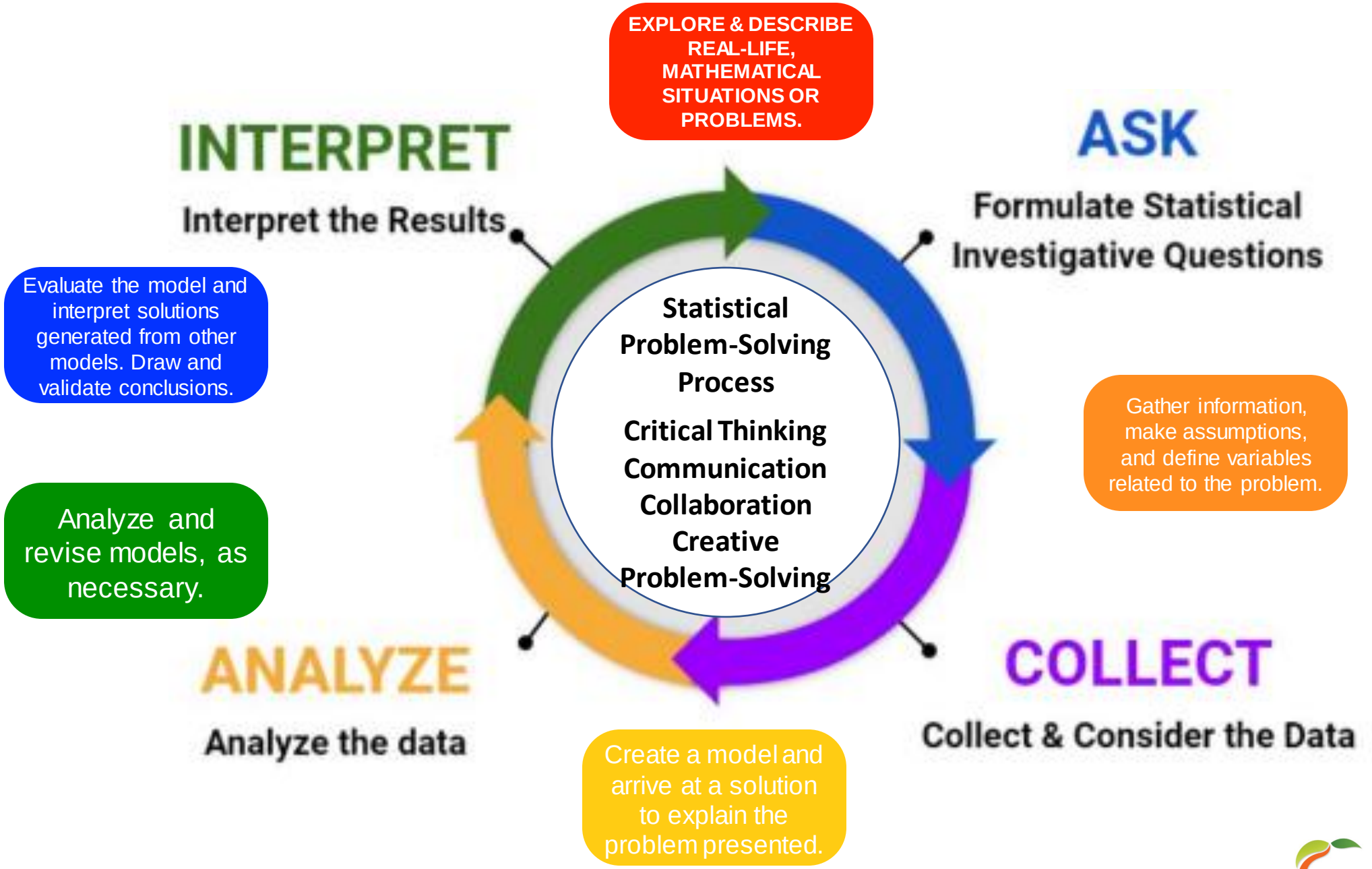
The following four-step statistical problem-solving process can be used throughout each grade level and course to help learners develop a solid foundation in statistical reasoning and literacy:

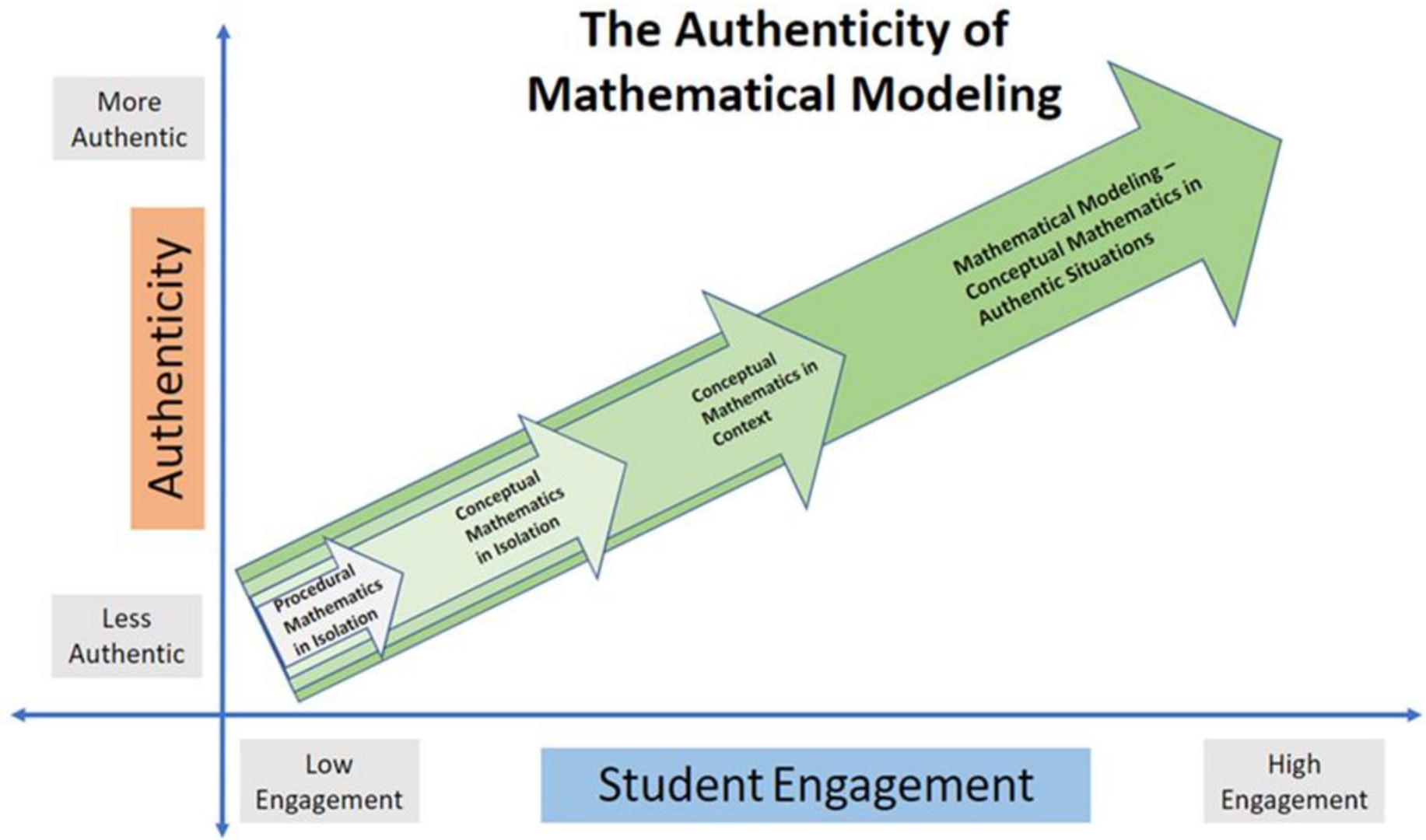
I. **Formulate Statistical Investigative Questions**
Ask questions that anticipate variability.

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.


EXPLORE & DESCRIBE REAL-LIFE, MATHEMATICAL SITUATIONS OR PROBLEMS.
ASK
Formulate Statistical Investigative Questions
Gather information, make assumptions, and define variables related to the problem.
COLLECT
Collect & Consider the Data
Create a model and arrive at a solution to explain the problem presented.
ANALYZE
Analyze the data
Analyze and revise models, as necessary.
INTERPRET
Interpret the Results
Evaluate the model and interpret solutions generated from other models. Draw and validate conclusions.
Statistical Problem-Solving Process
Critical Thinking
Communication
Collaboration
Creative Problem-Solving


The Authenticity of Mathematical Modeling
More Authentic
Authenticity
Less Authentic
Procedural Mathematics in Isolation
Conceptual Mathematics in Isolation
Conceptual Mathematics in Context
Mathematical Modeling – Conceptual Mathematics in Authentic Situations
Low Engagement
Student Engagement
High Engagement

New K-12 Mathematics Glossary

Current Glossary

Fraction. A number expressible in the form *a*/*b* where *a* is a whole number and *b* is a positive whole number. (The word *fraction* in these standards always refers to a non-negative number.) *See also: rational number*.

Hierarchy. An arrangement or classification of things according to relative importance or inclusiveness. *For further information on hierarchy of quadrilaterals, see:* http://bit.ly/1Fvrbc3

Identity property of 0. *See Table 3 in this Glossary*.

Independently combined probability models. Two probability models are said to be combined independently if the probability of each ordered pair in the combined model equals the product of the original probabilities of the two individual outcomes in the ordered pair.

Integer. A number expressible in the form *a* or –*a* for some whole number *a*.

Interpreting multiplication expressions. When interpreting multiplication expressions, the factors may be read as a groups of b, or b groups of a. For example, 3x6 means how many are in 3 groups of 6 things each: three sixes, or 3 x6 means how many are 3 things taken 6 times (6 groups of 3 things each): six threes. The context of the expression will determine which interpretation is required. *For further explanation, see:* http://bit.ly/1Kr1wkI

Interquartile Range. A measure of variation in a set of numerical data, the interquartile range is the distance between the first and third quartiles of the data set. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the interquartile range is 15 – 6 = 9. *See also*: first quartile, third quartile.

Interval. For $a \leq b$, the closed interval [a,b] is the set of elements x satisfying $a \leq x \leq b$ (i.e. $a \leq x$ and $x \leq b$). It contains at least the elements a and b. Using the corresponding strict relation "<", the open interval (a,b) is the set of elements x satisfying $a < x < b$ (i.e. $a < x$ and $x < b$). http://en.wikipedia.org/wiki/Interval_%28mathematics%29

Line plot. A method of visually displaying a distribution of data values where each data value is shown as a dot or mark above a number line. Also known as a dot plot.[3]

Georgia's K-12 Mathematics Standards

K-12 Mathematics Glossary

How to Use this Glossary

Get Started

Richard Woods, Georgia's School Superintendent | Georgia Department of Education | *Educating Georgia's Future*

Click a letter to explore mathematical terms associated with that letter.

Georgia Department of Education

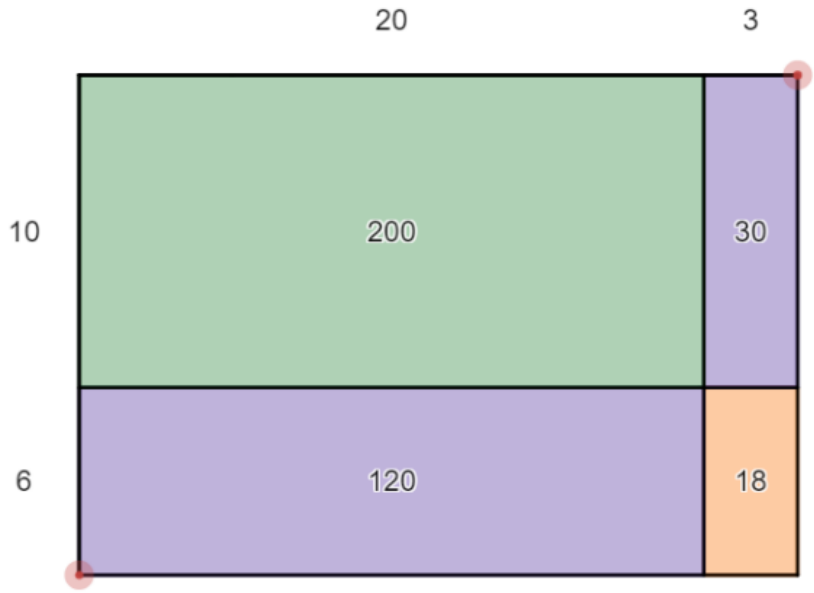
Submit a Term to Add to the Glossary

A

Area Model. A model for multiplication and/or division problems, in which the length and width of a rectangle represents the factors, and the partial areas represent partial products. Area models can be used for division as well as multiplication.

Example: 23×16

Click the image to try an interactive area model for multiplication using the Desmos Graphing Calculator.



For further examples, see: Undoing Concrete Models, by Graham Fletcher

Back to Start

Georgia's New K-12 Mathematics Standards Curriculum Maps

IMPLEMENTATION 2023-2024 SCHOOL YEAR

Georgia Department of Education

Georgia's New K-12 Mathematics Standards Grade Level and Course Overviews

IMPLEMENTATION 2023-2024 SCHOOL YEAR

- K-12 Mathematical Practices
- K-12 Mathematical Modeling Framework
- K-12 Statistical Reasoning Framework
- Whole Child Supports for Learner Variability

ELEMENTARY (K-5)

- KINDERGARTEN
- FIRST GRADE
- SECOND GRADE
- THIRD GRADE
- FOURTH GRADE
- FIFTH GRADE

MIDDLE (6-8)

- SIXTH GRADE
- SEVENTH GRADE
- EIGHTH GRADE
- ENHANCED ALGEBRA: CONCEPTS & CONNECTIONS

HIGH (9-12)

- ALGEBRA: CONCEPTS & CONNECTIONS
- GEOMETRY: CONCEPTS & CONNECTIONS
- ADVANCED ALGEBRA: CONCEPTS & CONNECTIONS
- ENHANCED ADVANCED ALGEBRA & PRECALCULUS: CONCEPTS & CONNECTIONS
- HIGH SCHOOL FOURTH COURSE OPTIONS

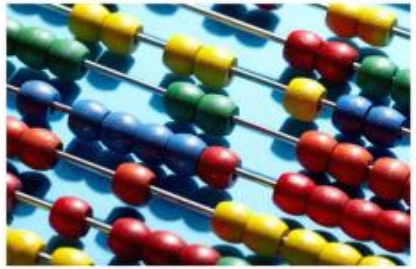
New Instructional Units

Kindergarten

Unit 1:

Wondering About My World and Investigating to Find Answers

Students will explore how numbers up to 10 are used to explain the quantity of objects in their world.

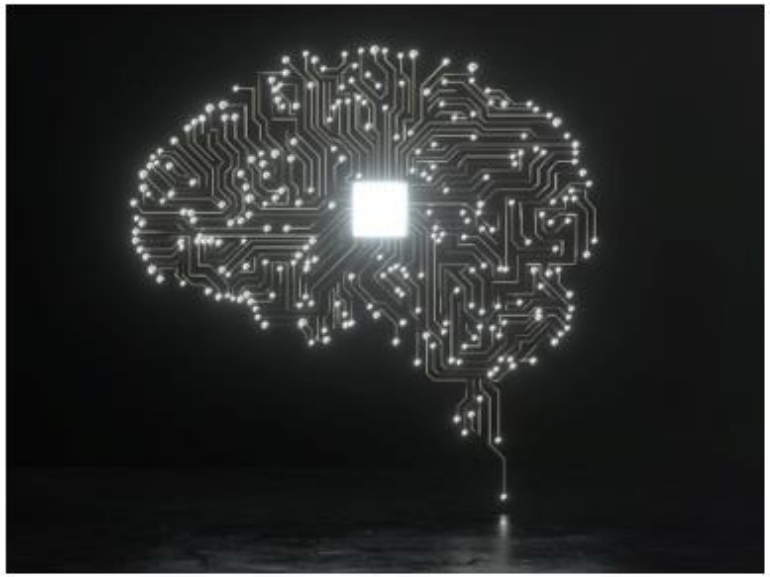


MATHEMATICS

Model Interdisciplinary PBL

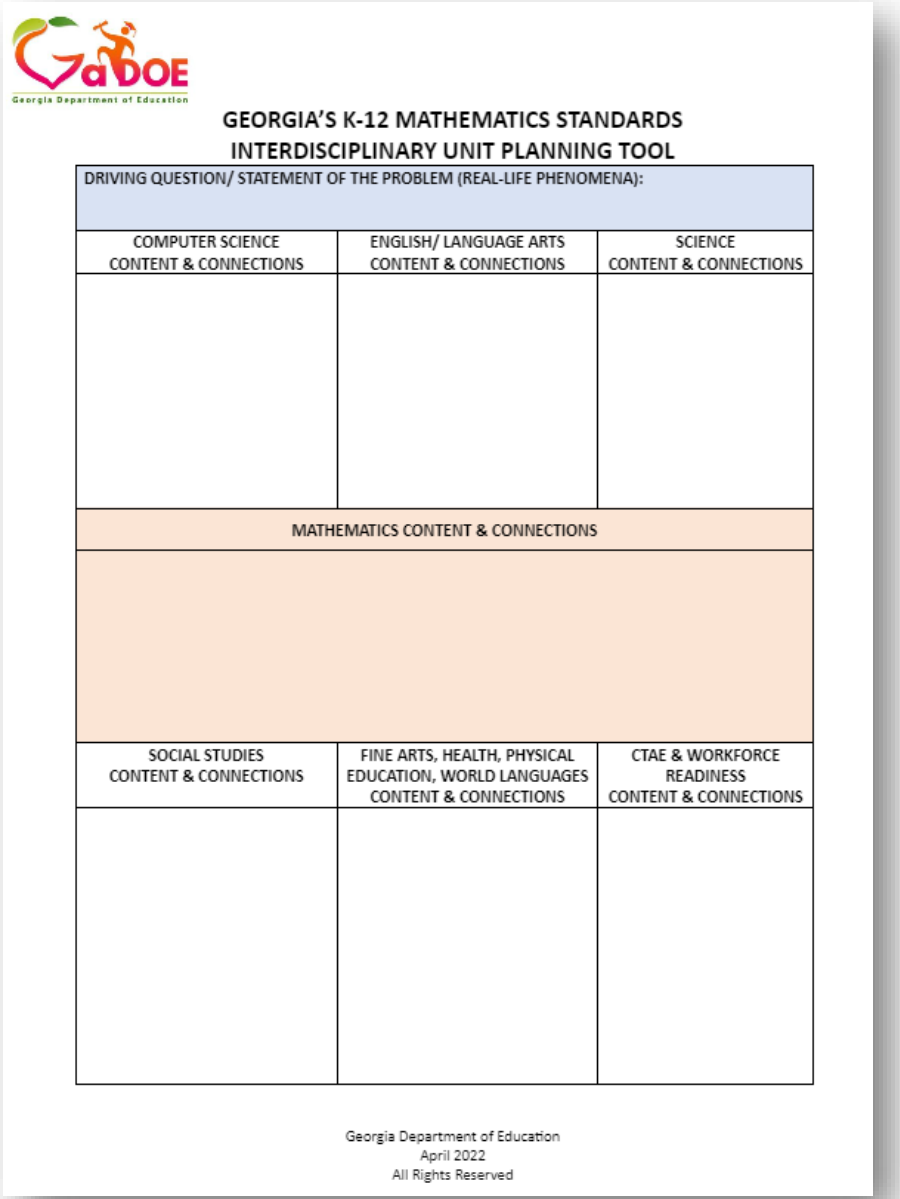
Unit 5: Probability on the Farm

In this unit, students will explore probability and selective breeding. Students will develop probability models that allow them to predict the possible outcomes of crosses in a selective breeding program.



Customized for School Community and Needs

All content areas connected to the mathematics standards to provide inspiration for teachers to implement interdisciplinary instruction.



GEORGIA'S K-12 MATHEMATICS STANDARDS
INTERDISCIPLINARY UNIT PLANNING TOOL

DRIVING QUESTION/ STATEMENT OF THE PROBLEM (REAL-LIFE PHENOMENA):		
COMPUTER SCIENCE CONTENT & CONNECTIONS	ENGLISH/ LANGUAGE ARTS CONTENT & CONNECTIONS	SCIENCE CONTENT & CONNECTIONS
MATHEMATICS CONTENT & CONNECTIONS		
SOCIAL STUDIES CONTENT & CONNECTIONS	FINE ARTS, HEALTH, PHYSICAL EDUCATION, WORLD LANGUAGES CONTENT & CONNECTIONS	CTAE & WORKFORCE READINESS CONTENT & CONNECTIONS

Interdisciplinary approaches to teaching and learning

Strong connections with mathematical modeling

Instructional Design

Engage

Real World Hook/ Introduction

How will you engage the students?

What is the real world "hook" that will intrigue their interest?

Explore

Student Engagement through Process Based Thinking

What will students be asked to do in each step of process-based thinking? What will students write and/or draw in journals for each step?

How will students connect new information to what they already know?

In what ways will the student engagement allow for open-ended exploration and inquiry?

Apply

Student Presentation

How will students share their findings?

What form of presentation will they use?

Which community partners might provide feedback?

Reflect

Student Reflection

How will students summarize their efforts in this unit and pose questions that will lead to the next one?

Instructional Design

- **Engage**

(Includes an evidence-based instructional strategy and learning task that can be used as an introduction that mentally engages students to capture their interest, provides an opportunity to communicate what they know, and allows them to connect what they know to new ideas)

  - **Includes suggestions for Synchronous, Asynchronous, Unplugged/ Offline learning.**

- **Explore**

(Includes an evidence-based instructional strategy and learning task that allows students to engage in hands-on activities to explore the new concept/big idea at a deep level)

  - **Includes suggestions for Synchronous, Asynchronous, Unplugged/ Offline learning.**

- **Apply**

(Includes an evidence-based instructional strategy and learning task that allows students to apply what they have learned in a new situation to develop a deeper understanding of the big idea)

  - **Includes suggestions for Synchronous, Asynchronous, Unplugged/ Offline learning.**

- **Reflect**

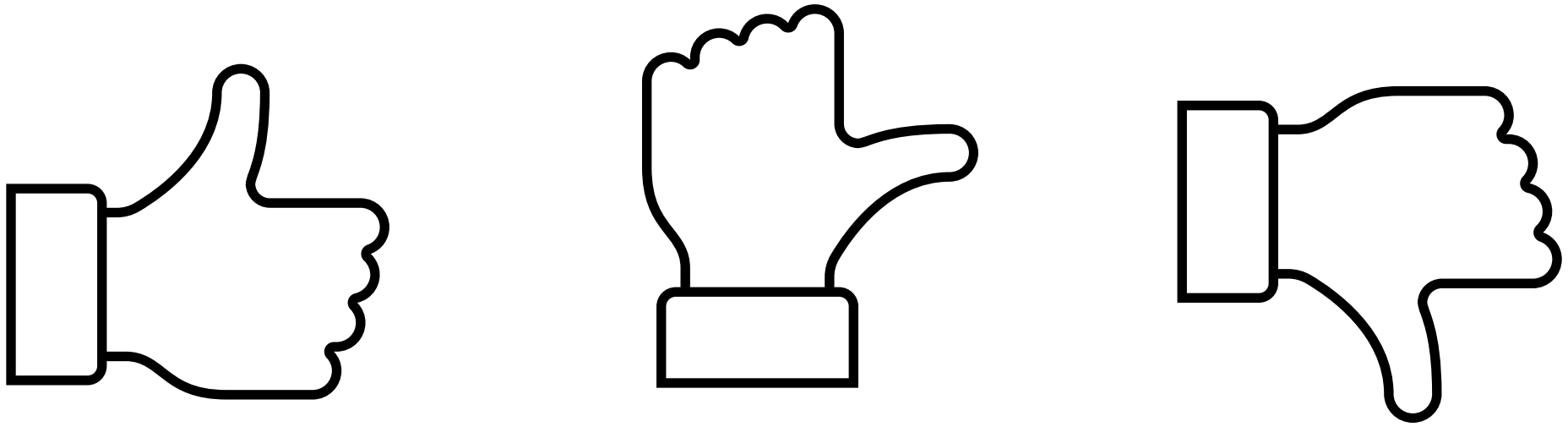
(Includes an evidence-based instructional strategy and learning task that allows students the opportunity to review and reflect on their own learning and new understandings)

  - **Includes suggestions for Synchronous, Asynchronous, Unplugged/ Offline learning.**

Student Learning Supports

Addressing Learning Variability

Always, Sometimes, Never



Always, Sometimes, Never

All students have needs that are academic and non-academic.

All students are general education students.

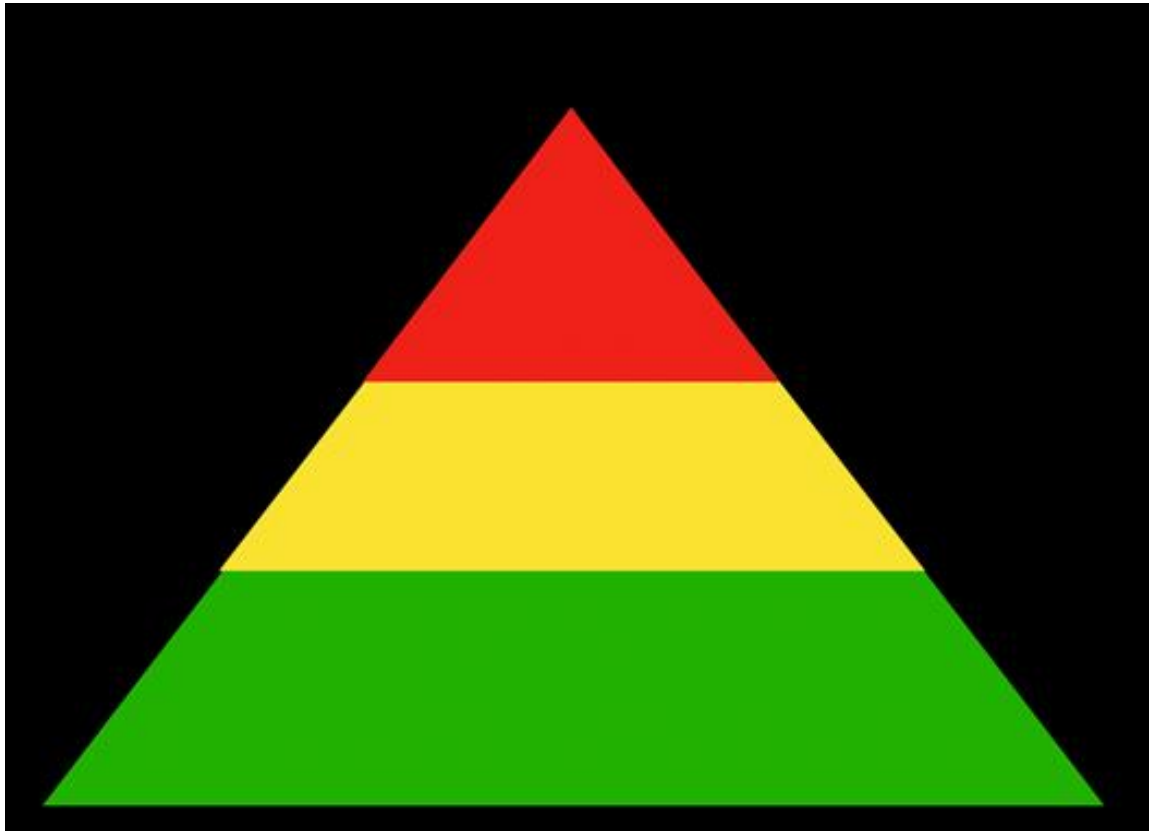
At some point during their K-12 career, all students will need some supports.

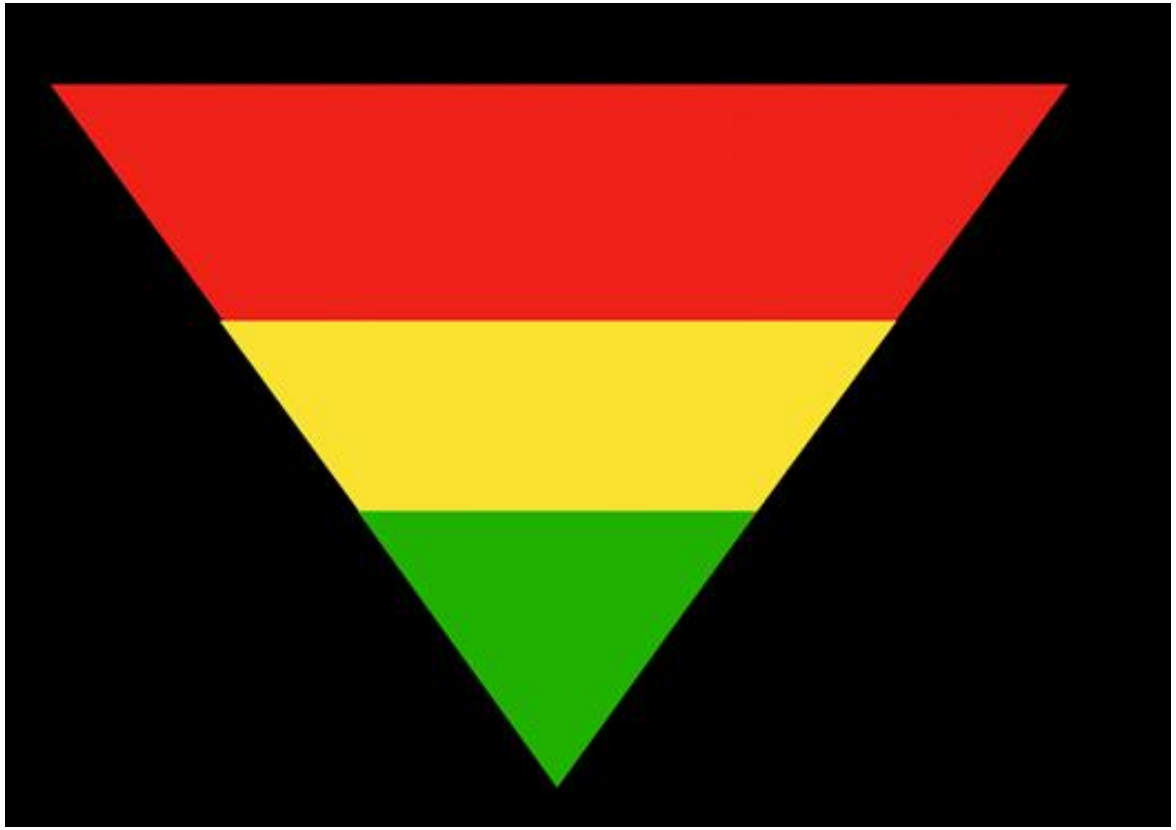
What We Know About Learners

- ✓All students have needs that are academic and non-academic.
- ✓All students are general education students FIRST.
  - ✓Yes…students with disabilities are general education students.
  - ✓Yes…students identified as gifted or advanced are general education students.
  - ✓Yes…multi-lingual learners are general education students.

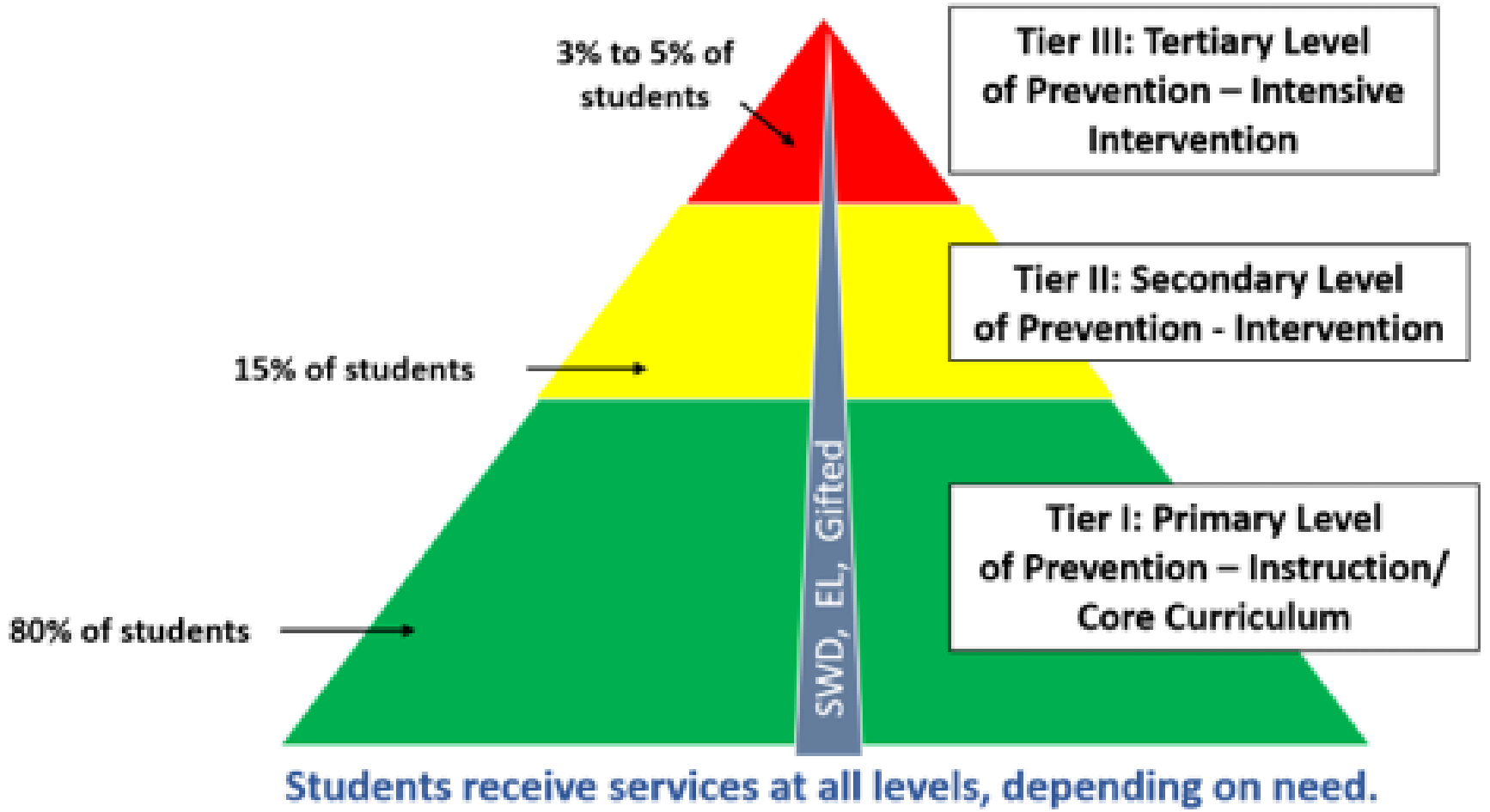
Georgia's System of Continuous Improvement

What do you notice?
What do you wonder?





Services Provided to Students




GROUP
A

ESSENTIAL INSTRUCTIONAL GUIDANCE

- Mathematical Practices
- Mathematical Modeling
- Framework for Statistical Reasoning
- Computational Strategies for Whole Numbers

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 Standards for Mathematical Practice 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.

GEORGIA'S K-12 MATHEMATICS STANDARDS

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.

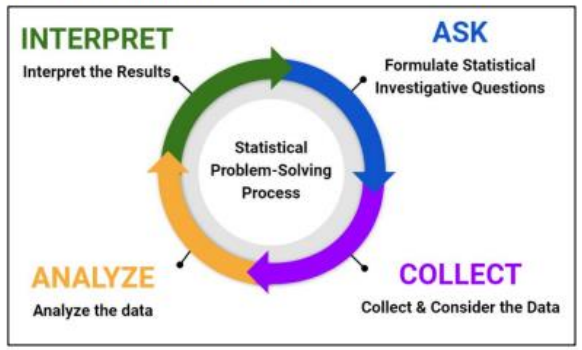


FIGURE 1: GEORGIA FRAMEWORK FOR STATISTICAL REASONING

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.

A Mathematical Modeling Framework

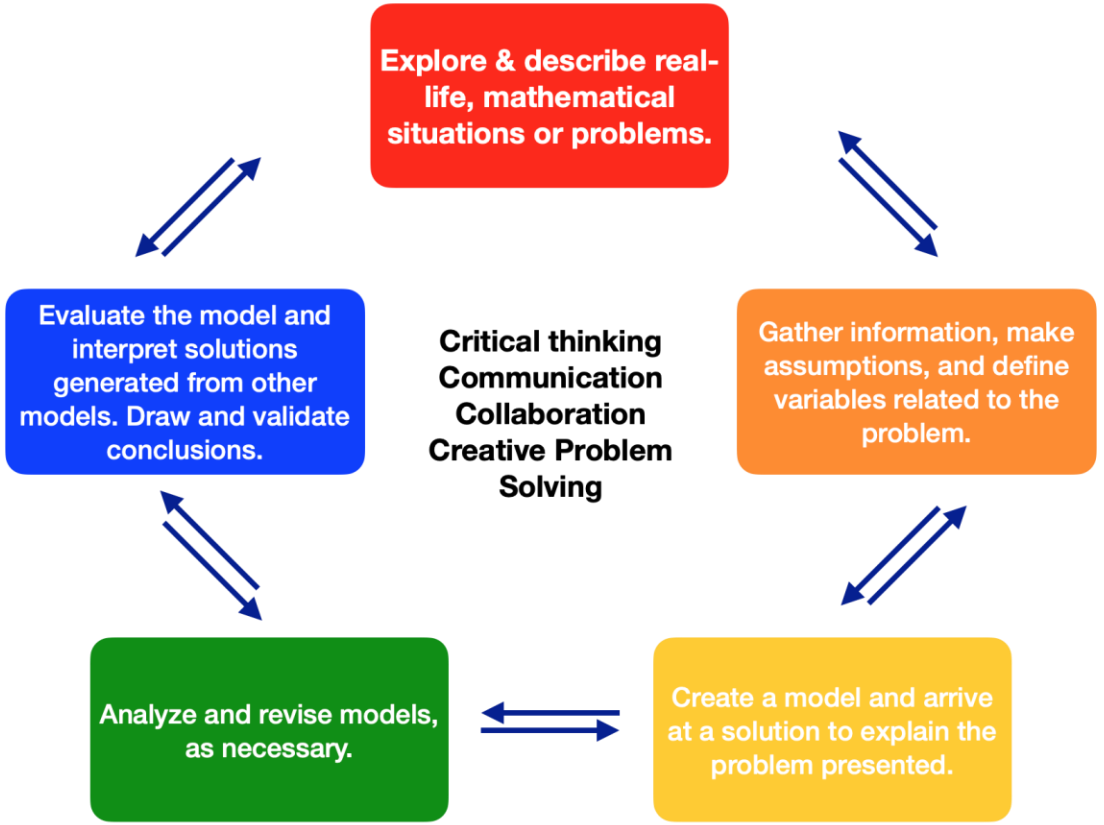
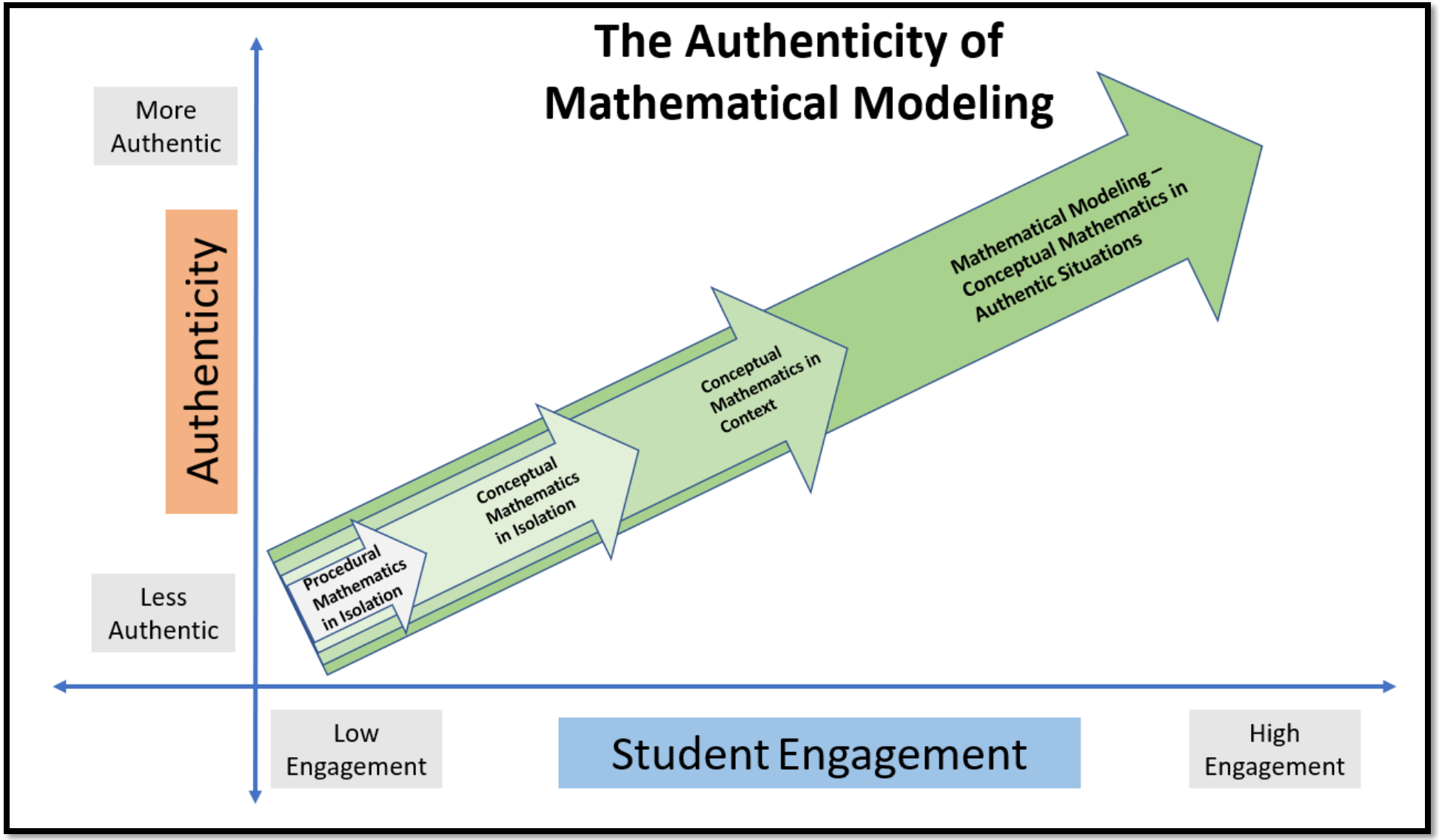


Image adapted from: Suh, Matson, Seshaiyer, 2017


The Authenticity of Mathematical Modeling
More Authentic
Authenticity
Less Authentic
Procedural Mathematics in Isolation
Conceptual Mathematics in Isolation
Conceptual Mathematics in Context
Mathematical Modeling – Conceptual Mathematics in Authentic Situations
Low Engagement
Student Engagement
High Engagement

Addressing Learner Variability

Supports for Learner Variability

Supporting the Learning

- intervention activities specific to the learning experiences
- teacher actions from the Georgia Mathematics Strategy Toolkits tailored to the learning experiences

Extending the Learning

- extension activities specific to the learning experiences
- instructional strategies that support students who are labeled gifted or demonstrated a solid understanding of the mathematical concepts within the learning experiences

Language Supports

- teacher actions from the English Language Proficiency for English (as a 2nd language) Learners section of the Mathematics Strategy Toolkit tailored to the learning experiences
- strategies and resources included in the Mathematics Resources to Support English Learners provide specific evidence-based practices that indicate the benefits of hands-on, relevant learning experiences in the mathematics classroom

Collective Teacher Efficacy

Belief you can make a difference

X

Evidence you are making a difference

=

Effect size of 1.57*

John Hattie, Visible Learning https://visible-learning.org/2018/03/collective-teacher-efficacy-hattie/

Georgia Mathematics Strategy Toolkits to Address Learner Variability

Georgia Numeracy Project
Numeracy Intervention Resource

Enter Here

Parallel Resources

Georgia Early Numeracy Project

K - 7 Resource

8 - HS Resource

Georgia Secondary Numeracy Project

GEORGIA NUMERACY PROJECT

Numeracy Assessments

Fall, Winter, Spring

Data Interpretation

What do the data say?

Data Analysis

What do the data mean?

Planning

What will I do with this information?

Small Group Instruction

How will I support individual student needs through small group instruction?

Numeracy Project Tasks/Activities

Whole Group Instruction

What will I do with all students?

Number Talks

Numeracy Project Group/Partner Games, Activities, and Tasks

STOP: The NEXT steps are for students who need additional, more intense support.

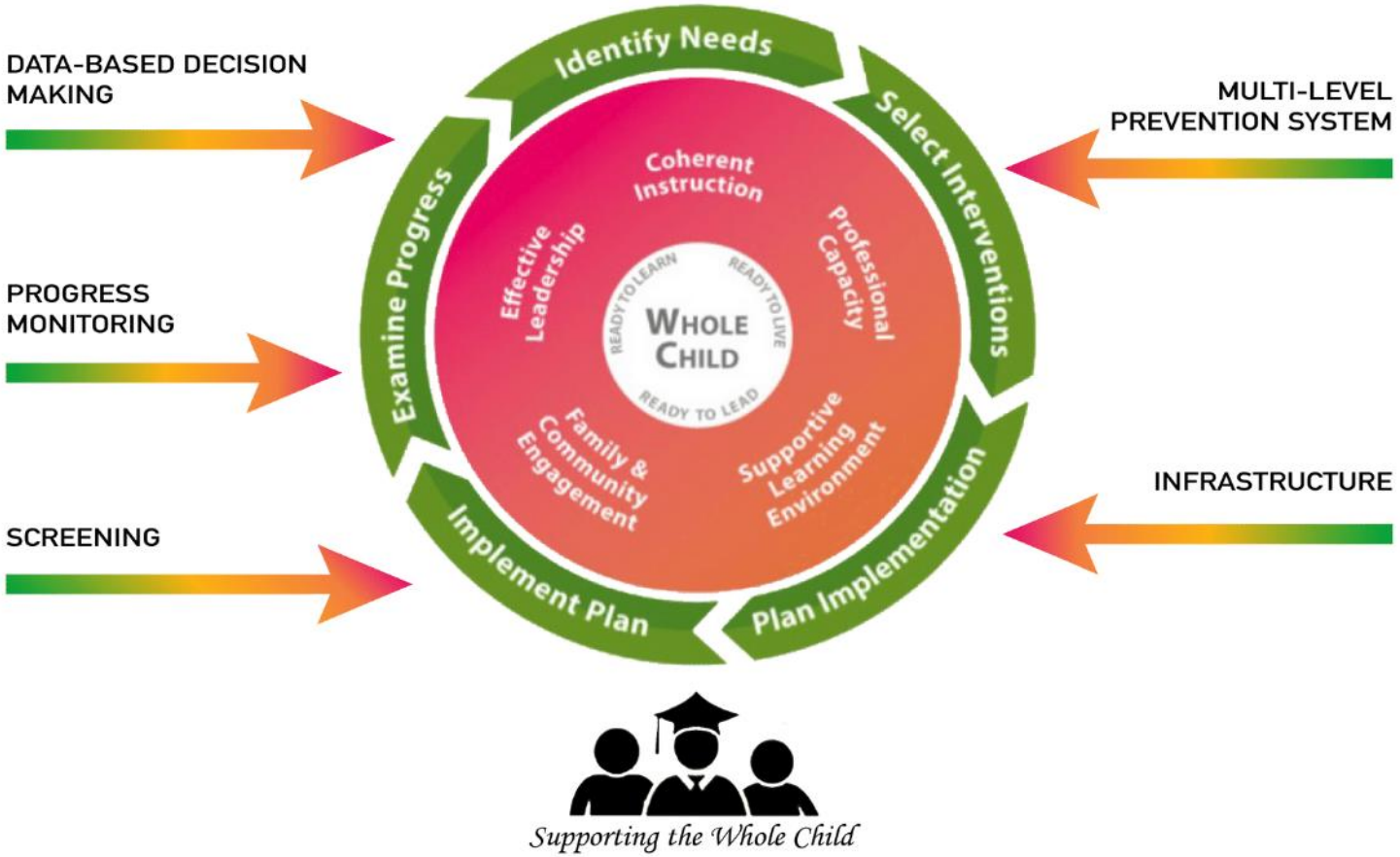
Numeracy Intervention Instrument

What will I do with students who need more?

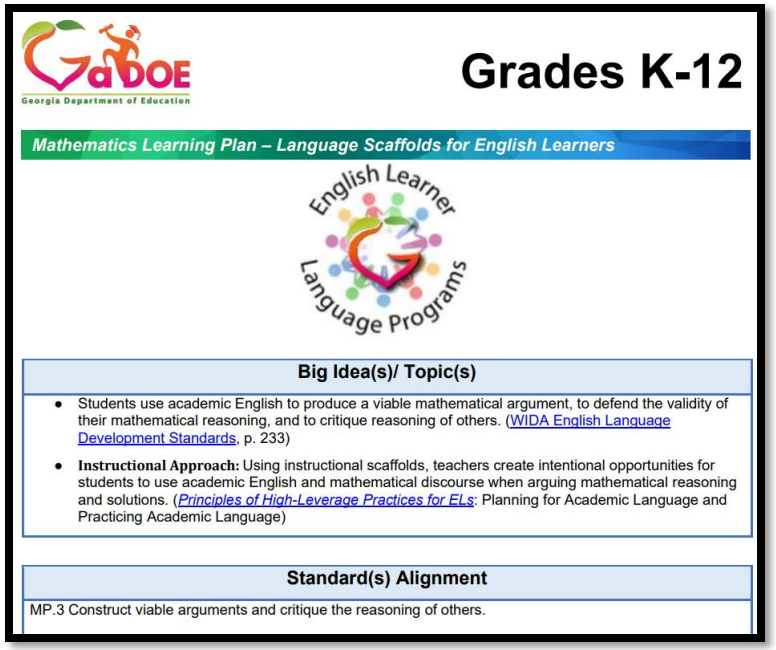
Intense Intervention with Numeracy Activities

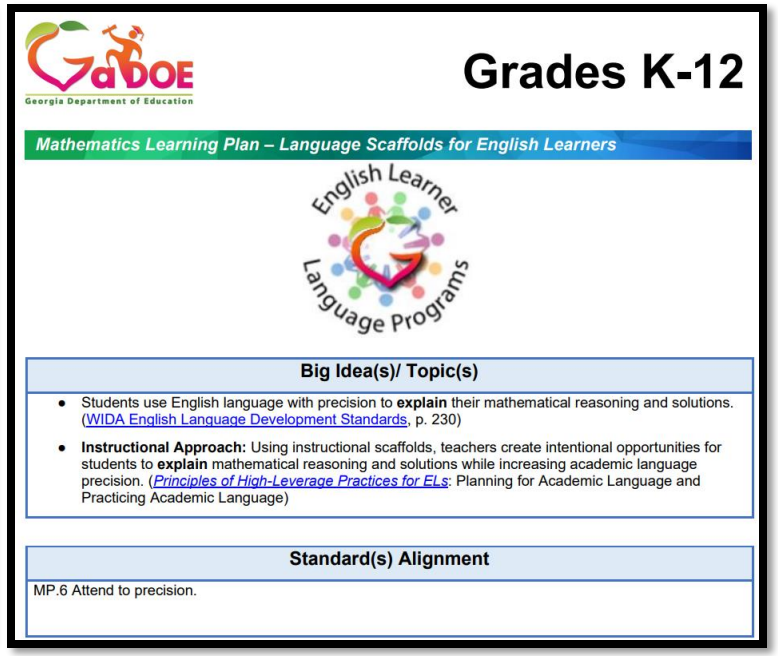
(based on specific skill needs identified on NII)

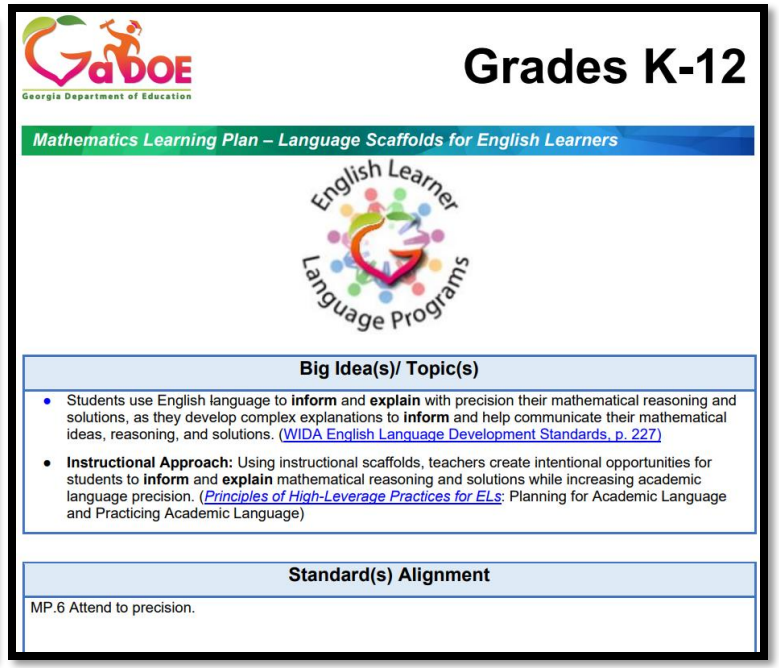
Alignment to Essential Components of Georgia's Tiered System of Supports for Students



Supporting Multilingual Learners





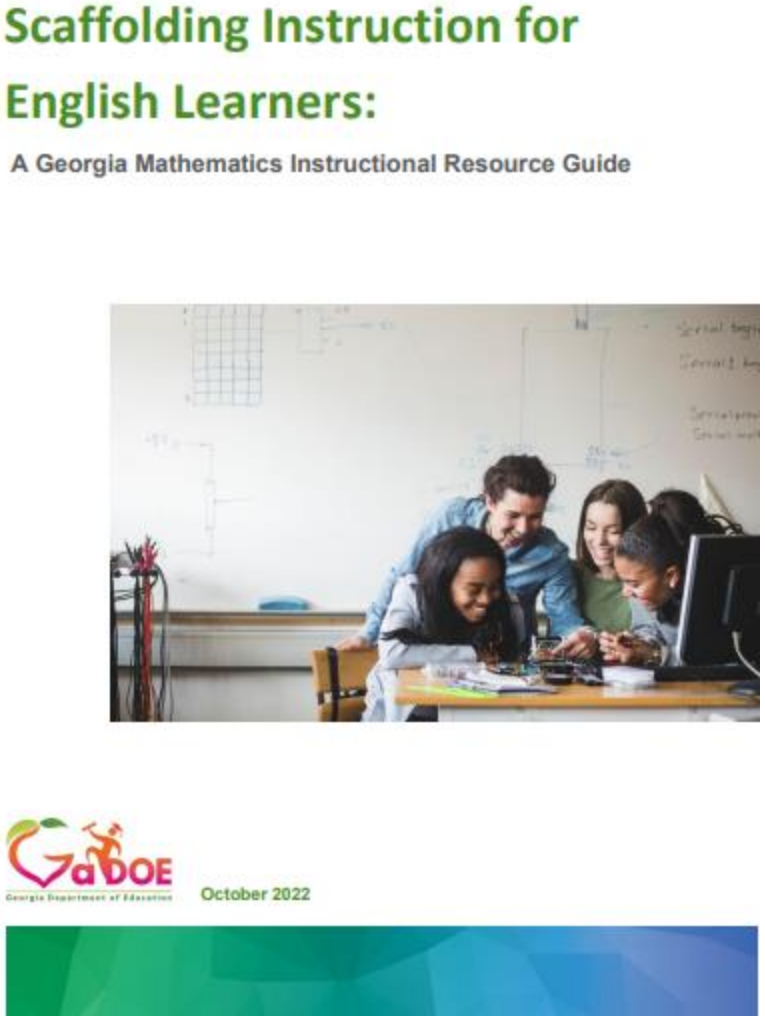


K-12 Digital Learning Plans

www.gpb.org/education/learn/k-12-learning-plans/math

NEW

Support for Multilingual Learners



Supporting Students with Disabilities

Specially Designed Instruction

- Specially designed instruction is implemented by general education or special education teacher
- **Based on needs** arising from the student's identified disability
- It's "special".

Georgia Mathematics Strategy Toolkits to Address Learner Variability

Introduction

"If the goal in mathematics teaching and learning is to support student success with mathematical proficiency, then we must be explicit about using instructional routines that focus on student engagement in activities that support reasoning and sense making, communication with and about mathematical ideas, making meaningful connections, building procedural fluency from conceptual understanding…"

- Thinking about Instructional Routines in Mathematics Teaching and Learning

Within this toolkit, educators will find observations of student behavior for each of the 14 identified areas for addressing learner variability. Aligned to each observation of student behavior, are evidence-based, research-based strategies intended to strengthen students' ability in mathematics. Support resources are provided to assist educators with implementing the strategies.

- Behavior
- Cognitive Processing
  - Attention
  - Conceptual
  - Memory
  - Reasoning
- Executive Functioning
- Instructional Climate and Student Mindsets
- Language Processing
- Language Proficiency
- Mathematics Calculation
- Other Exceptionalities
- Problem-Solving
- Visual-Spatial Processing

Looking for more evidence-based, researched based practices for mathematics? Please visit gadoe.org/mathematics.

Cognitive Processing: Memory

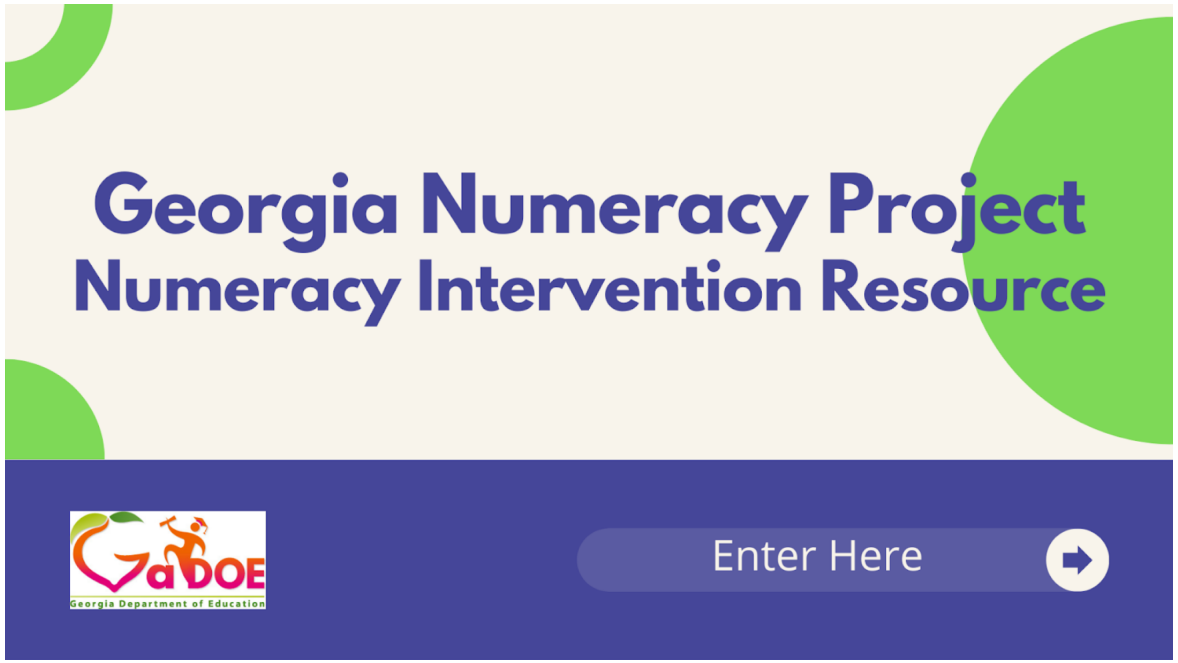
Mathematics Connection: Using rote memory to recall facts or remember the steps of an algorithm does not yield long-term learning. Students should have opportunities to use conceptual learning strategies that will lead to committing the basic computational facts to memory.

Student Learning Expectations: Students should have opportunities to use knowledge from their memories to perform calculations and procedures, identify geometric figures, and demonstrate basic graphing skills by using visual-spatial and numerical representations to make sense of real-life, mathematical problems to help with sustaining long-term memory.

Memory			
Observations	**Teacher Actions**	**Student Actions**	**Support Resources**
Observations reveal difficulty recalling key vocabulary terms consistently, such as: number names, the difference between area and perimeter, etc.	The teacher will facilitate meaningful discourse that allows students to repeat accurate math vocabulary while engaging in rich tasks. (EMTP 4)	The student will demonstrate precise communication of mathematical ideas using clear academic-language and accurate vocabulary. (MP.6)	Counting Cup Lesson This video shows how teachers explicitly use and reinforce vocabulary terms with manipulatives. GA Frameworks Task on Perimeter and Area This GA frameworks task allows students to demonstrate their knowledge and distinguish between concepts.
Observations reveal difficulty recalling prior mathematics skills or concepts previously taught.	The teacher will pose purposeful questions to assess student prior knowledge and elicit student thinking to address concepts needing review. (EMTP 5)	The student will use math models to build conceptual understanding of the previous skills and apply them to current content. (MP.4)	GA Frameworks Video: MGSEK.CC.4 This video is part of the GA Frameworks video series. Here, the teacher demonstrates questioning skills that connect previous learning to new knowledge. Addition and Subtraction Progression Video This video provides the teacher with knowledge of the sequencing of skills.

Developing Meaningful IEP Goals

- ✓Follow the appropriate administration protocol
- ✓Expose the strengths and the needs
- ✓Identify skills using the Numeracy Intervention Instrument and use the skills to formulate Individual Education Program goals
- ✓Implement the numeracy tasks and activities to address identified goal



Embedded Supports

Sample Unit - Structures

INTERVENTION TABLE OF TASKS/ACTIVITIES

The Intervention Table below provides links to intervention tasks/activities specific to this unit. The interventions support students and teachers in filling foundational gaps revealed as students work through the unit. All listed interventions are from the Georgia Early Numeracy Project.

Standard(s)	Learning Objective(s)	Name of Intervention Task/Activity	Skill(s) Addressed
K.NR.1	K.NR.1.1 K.NR.1.2	Birthday Cake	Count, identify and form groups of items to 10.
		Flower Petals	Count, form and identify all the numbers of a set of objects in the range 0-10.
		Feed the Elephants	Count, identify and form a set of objects in the range 1-10.
		How Many Cubes?	Count a set of objects in the range 1-10.
		Match It Up	Count, form and identify all the numbers of a set of objects in the range 0-10.
K.NR.1	K.NR.1.2	Ten Frames Matching Game	Know groupings of five, within ten, and with ten.
K.NR.2	K.NR.2.1	Number Line Flips	Order and say the forwards and backwards number word sequences in the range 0-10, 0-20.
		Clapping	Say the forwards and backwards number word sequence in the range 0-10, 0-20, 0-100.
K.NR.4	K.NR.4.1	Counting as We Go	Form a set of objects and identify all the numbers in the range 0-10.
		Caterpillar Legs	Identify numbers 0-20. Count, order and form groups of items to 10.

Standard(s) Alignment

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.

2.MDR.5 - Estimate and measure the lengths of objects and distance to solve problems found in real-life using stand units of measurement, including inches, feet, and yards.

- 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.

Diagnostic Assessment

Diagnostic Assessment: Classroom Favorites

Students will be able to show their understanding of creating and analyzing picture graphs.

Use the data in the table to create a picture graph. Make sure to include a title and appropriate labels. (Desmos Activity) If using this electronically, students may drag the images to create a picture graph. If this will be done with paper and markers or crayons, use the Diagnostic Hard Copy.

Favorite Color	
Blue	
Red	
Black	
Pink	

Answer the following questions:

How many students' favorite color is red?

What is the most common favorite color?

What is the least popular favorite color?

How many more students have a favorite color of blue instead of a favorite color of pink?

Student Learning Supports

This section provides suggested strategies to support learners before, during and/or after the learning experiences outlined within the instructional design. Teachers should use frequent formative assessment information to determine which students need additional support. For more information on supporting the learning, extending the learning and language supports, please review the information under Instructional Support Strategies within the Comprehensive Grade Level Overview.

Establish mathematics goals to focus learning.

- **Supporting the Learning:** Make explicit connections between current and prior lessons or units.

Implement tasks that promote reasoning and problem solving.

- **Extending the Learning:** Students can create their own graph on another topic. Students can either use a data set provided by the teacher or collect their own data with a spinner or using a survey.
- **Supporting the Learning:** Students can pull colored chips/discs from a bag to record tally marks and turn it into a graph.

Use and connect mathematical representations.

- **Supporting the Learning:** Provide copies of notes, graph paper to align numbers, and utilize color coding to organize information to connect mathematical representations.
- **Extending the Learning:** Students can create a graph based on the same or different data set.

Facilitate meaningful mathematical discourse.

- **Language Supports:** Explicitly model and teach good "discussion board" etiquette.
- **Language Supports:** Provide multiple opportunities for structured peer interactions or conversations (pairs or triads) to negotiate meaning by allowing students to use sentence starters when sharing the graphs they created.

Instructional Resources

Available Now!

The following resources are available for all grade levels and courses aligned to Georgia's K-12 Mathematics Standards:

- Explanation of Changes and Improvements
- K-12 Progressions
- Curriculum Maps
- Guidance for Acceleration and Support
- Transitions Resource
- Machine Readable Standards in SuitCASE
- Comprehensive Grade-Level or Course Overviews
- K-12 Interactive Instructional Frameworks Units
- Digital Learning Plans
- K-12 Mathematics Glossary
- Supports for Numeracy Development
- K-12 Mathematical Practices
- Mathematical Modeling Framework
- Framework for Statistical Reasoning
- Mathematical Modeling Continuum
- Supports for Learner Variability
- Instructional Support Guide for Multi-lingual Learners

Instructional Resources

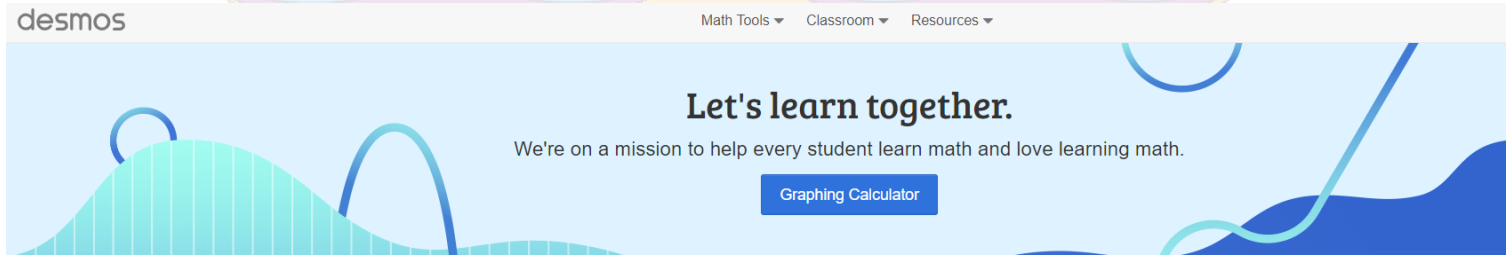
The following resources will be available soon for all grade levels and courses aligned to Georgia's K-12 Mathematics Standards:

- Professional Learning Videos *(each standard and other key topics)*
- Newly Aligned State Assessments and Resources
- K-12 Parent Letters, in Multiple Languages
- Whole Child Mathematics Supports Resource Toolkit
- K-12 Interactive Instructional Frameworks Units

Additional Information

- New State Assessment Information
- Personalized Mathematics Pathways

New State Assessment Calculator Policy Georgia



New for Spring 2023 & beyond

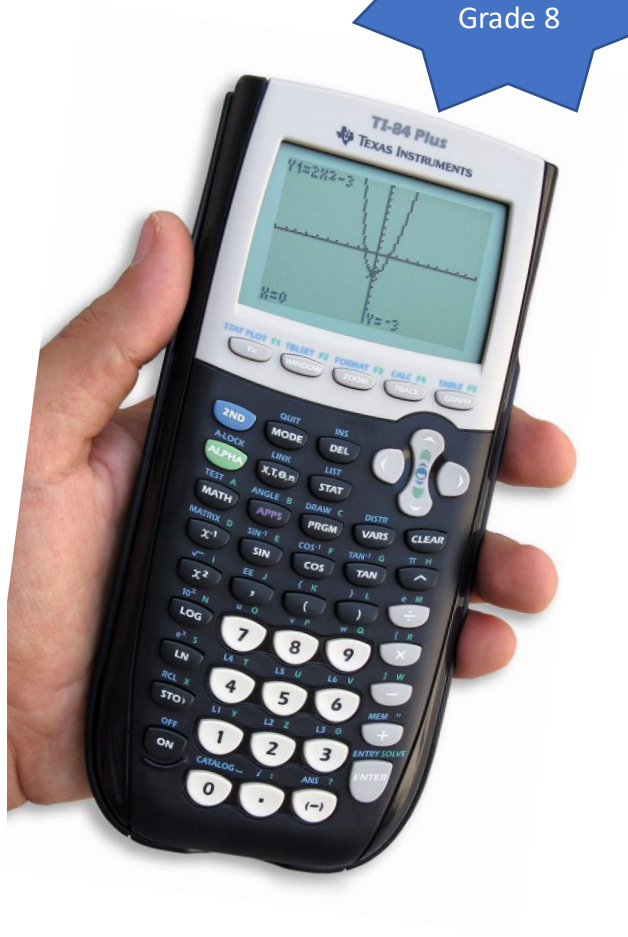
Scientific new for Grade 6

NEW CALCULATOR POLICY

- Allowable Calculators – End of Grade
  - Grades 3-5 – No Calculators Allowed
  - Grades 6-7 – Scientific or basic four-function calculator with square root and percentage functions allowed
  - Grade 8 – Graphing calculator or Scientific
  - HS Physical Science (Grade 8 only) – Scientific or basic calculator with square root and percentage functions allowed
- Allowable Calculators – End of Course
  - Coordinate Algebra – Graphing calculator or Scientific
  - Algebra I – Graphing calculator or Scientific

All grades 6 – high school test takers should receive training in the use of the online Desmos Calculator embedded in the practice tests or at https://www.desmos.com/testing/Georgia.

Graphing new for Grade 8



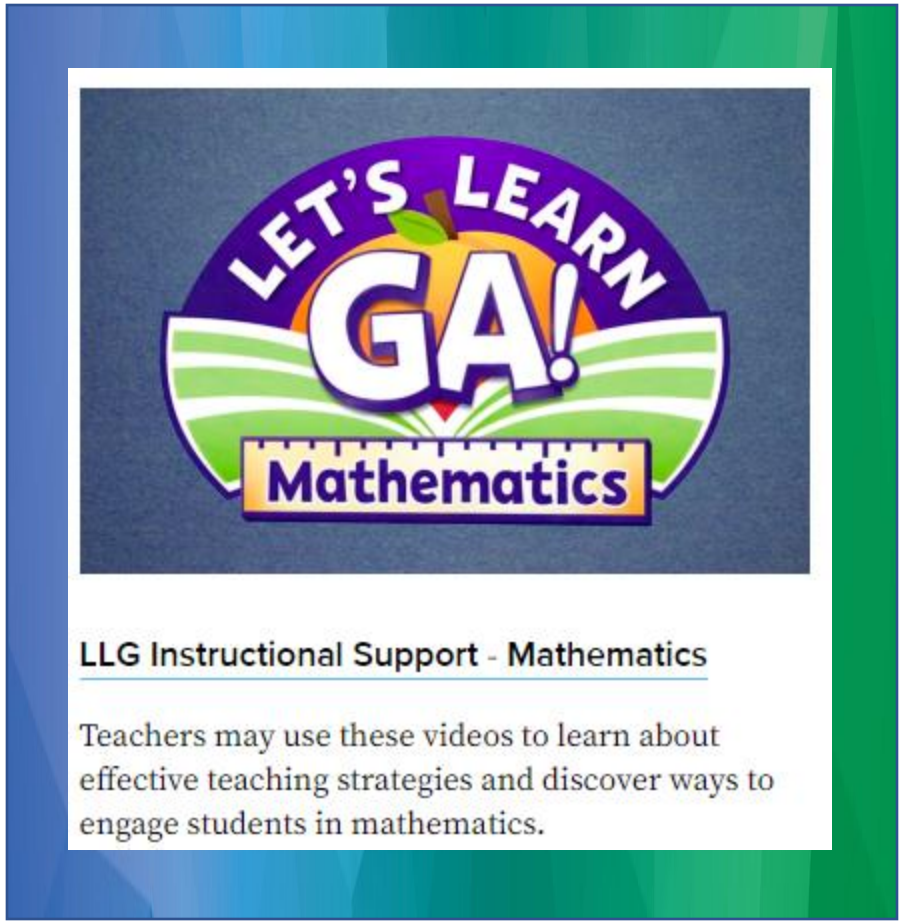
Acceleration in Mathematics using Gifted Services Model

- Acceleration at every grade level, K-12, with the gifted services model
- Alignment with the gifted model and definition of acceleration
- Alignment with the federal expectations of assessment and accountability
- New enhanced mathematics courses that are open-access for students interested in pursuing higher levels of mathematics

Additional Resources

Georgia Home Classroom

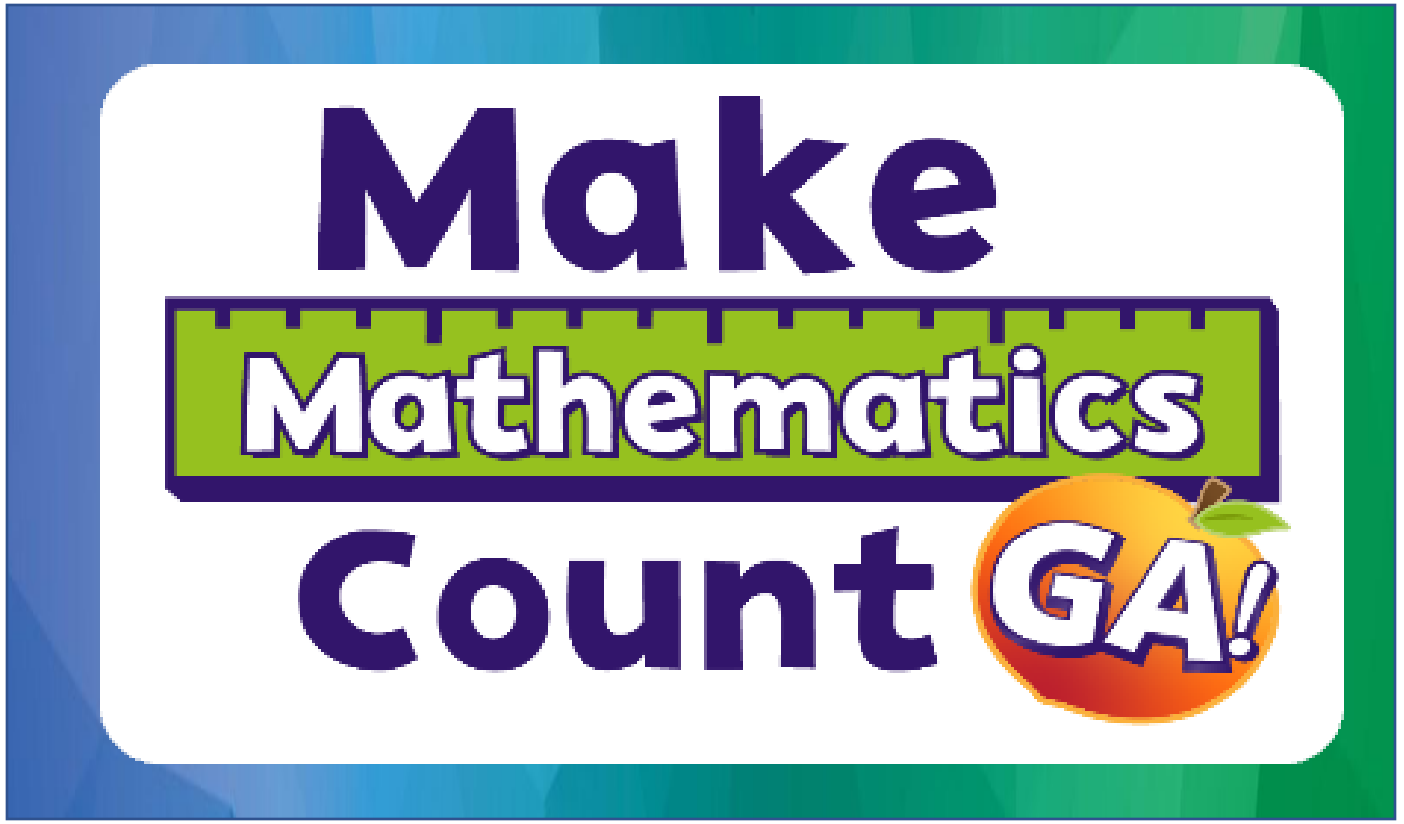
Let's Learn GA!



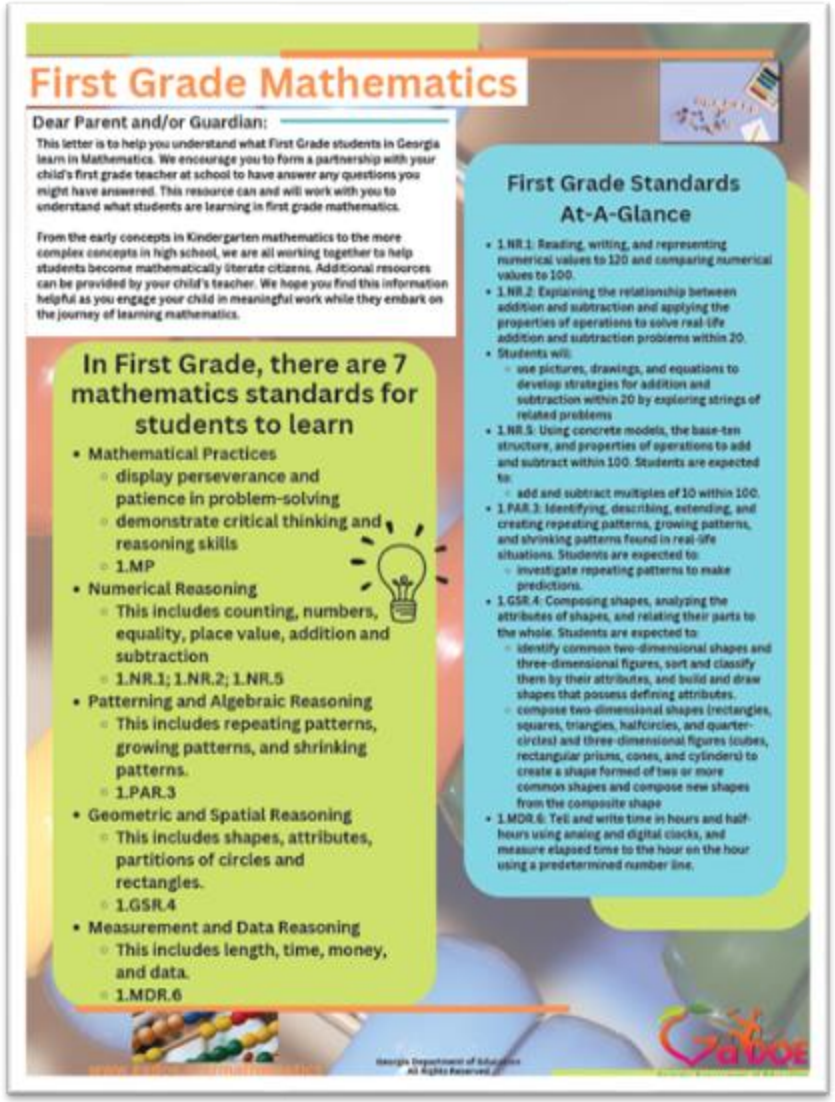
https://www.gpb.org/education/learn/lets-learn-ga/instructional-support/mathematics

Resources for Parents

- Make Mathematics Count, GA! Parent Videos and Resources



Resources for Parents



First Grade Mathematics

Dear Parent and/or Guardian:

This letter is to help you understand what First Grade students in Georgia learn in Mathematics. We encourage you to form a partnership with your child's first grade teacher at school to have answer any questions you might have answered. This resource can and will work with you to understand what students are learning in first grade mathematics.

From the early concepts in Kindergarten mathematics to the more complex concepts in high school, we are all working together to help students become mathematically literate citizens. Additional resources can be provided by your child's teacher. We hope you find this information helpful as you engage your child in meaningful work while they embark on the journey of learning mathematics.

In First Grade, there are 7 mathematics standards for students to learn

- Mathematical Practices
  - display perseverance and patience in problem-solving
  - demonstrate critical thinking and reasoning skills
  - 1.MP
- Numerical Reasoning
  - This includes counting, numbers, equality, place value, addition and subtraction
  - 1.NR.1; 1.NR.2; 1.NR.5
- Patterning and Algebraic Reasoning
  - This includes repeating patterns, growing patterns, and shrinking patterns.
  - 1.PAR.3
- Geometric and Spatial Reasoning
  - This includes shapes, attributes, partitions of circles and rectangles.
  - 1.GSR.4
- Measurement and Data Reasoning
  - This includes length, time, money, and data.
  - 1.MDR.6

First Grade Standards At-A-Glance

- 1.NR.1: Reading, writing, and representing numerical values to 120 and comparing numerical values to 100.
- 1.NR.2: Explaining the relationship between addition and subtraction and applying the properties of operations to solve real-life addition and subtraction problems within 20.
- Students will:
  - use pictures, drawings, and equations to develop strategies for addition and subtraction within 20 by exploring strings of related problems
- 1.NR.5: Using concrete models, the base-ten structure, and properties of operations to add and subtract within 100. Students are expected to:
  - add and subtract multiples of 10 within 100.
- 1.PAR.3: Identifying, describing, extending, and creating repeating patterns, growing patterns, and shrinking patterns found in real-life situations. Students are expected to:
  - investigate repeating patterns to make predictions.
- 1.GSR.4: Composing shapes, analyzing the attributes of shapes, and relating their parts to the whole. Students are expected to:
  - 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.
  - compose two-dimensional shapes (rectangles, squares, triangles, halfcircles, 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
- 1.MDR.6: 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.


Mathematizing a Student's Journey
Getting Ready Guides
You're on your way! Move ahead ONE Space!
BATTLESHIP
Myths of Early Math
HIDATO
10
Make Mathematics Count GA
SCHOOL
Elementary School
Middle School
The MATH LEARNING CENTER
Math Learning Center Apps
youcubed
Play Now!
1300+ Resources for Students to Have Fun with Mathematics!
Transition to High School!
OPEN MIDDLE
GEORGIA MATHEMATICS
High School
GEORGIA VIRTUAL
High School Mathematics Graduation Guidance
Post-Secondary Opportunities
WEB SUDOKU
GICA
CollegeBoard
ib
Dual Enrollment
GAfutures
Explore. Plan. Succeed.
Make Mathematics Count GA
100
73
STEAM
STEAM

Mathematics Professional Learning

Professional Learning Opportunities Resources for Teachers and Leaders

www.gadoe.org/mathematics

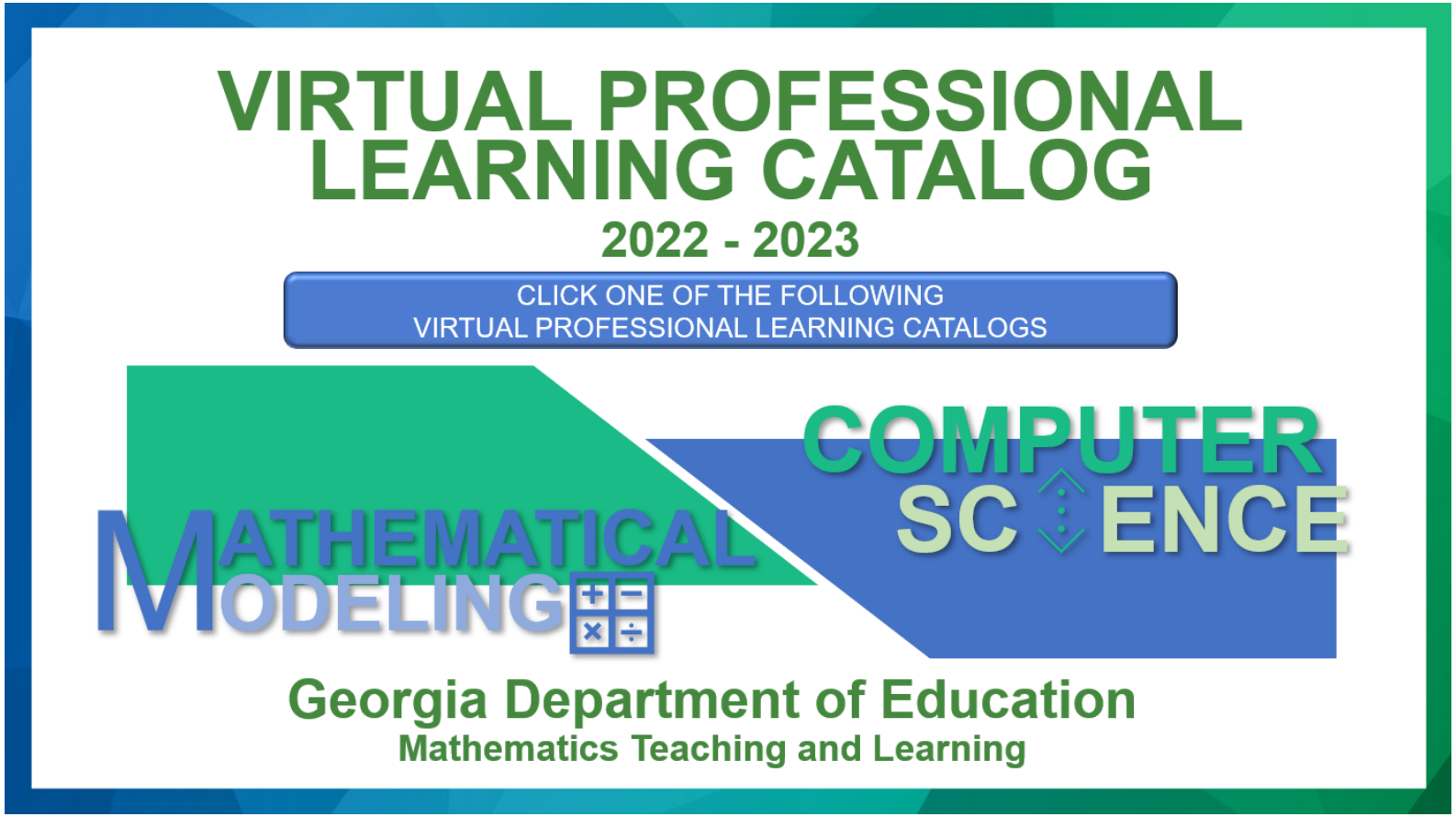
Mathematics PL Series
(on the Road to RESAs)

Mathematics Professional Learning Series with RESA

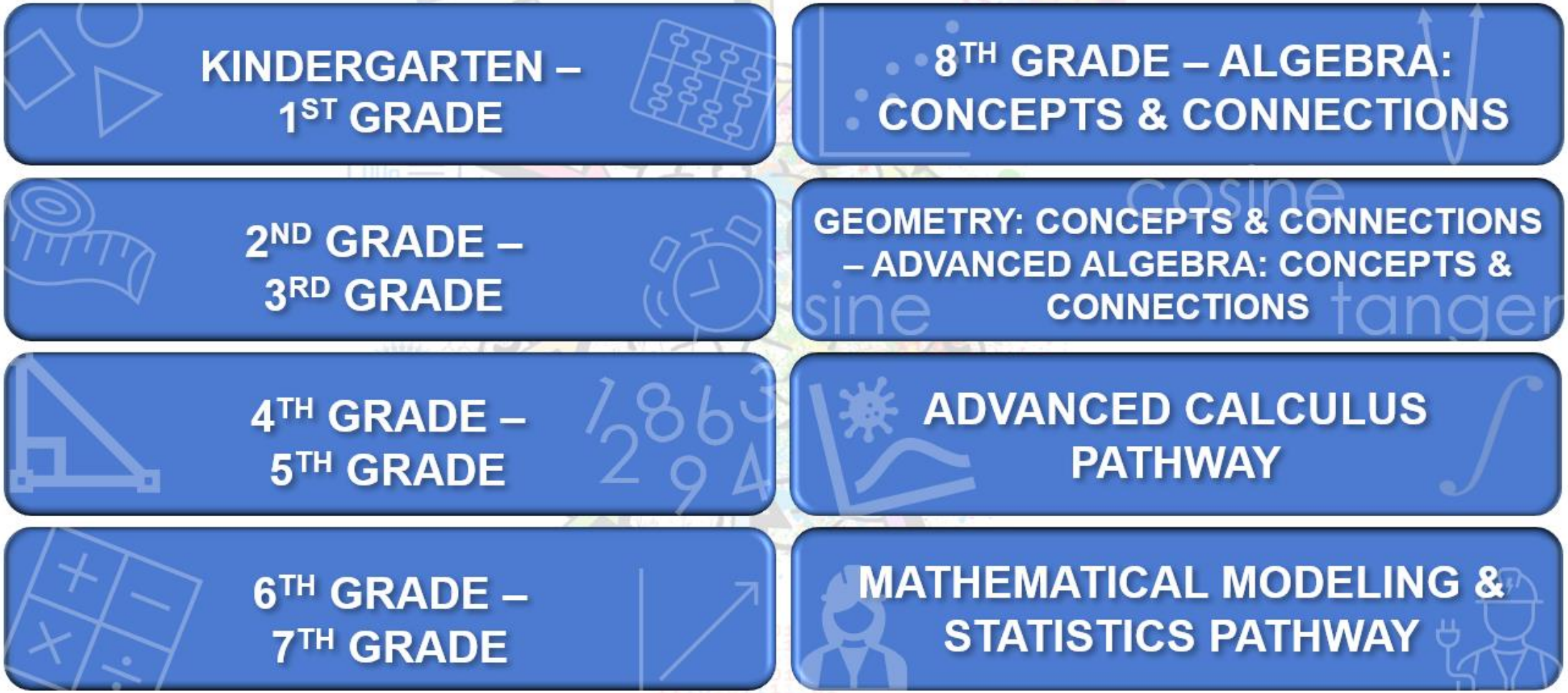
(Register on each individual RESA website.)

Mathematics Virtual Specialists PL

Saturday morning sessions at 9:00 AM on select dates
(First Date Recordings Available from October 22, 2022)



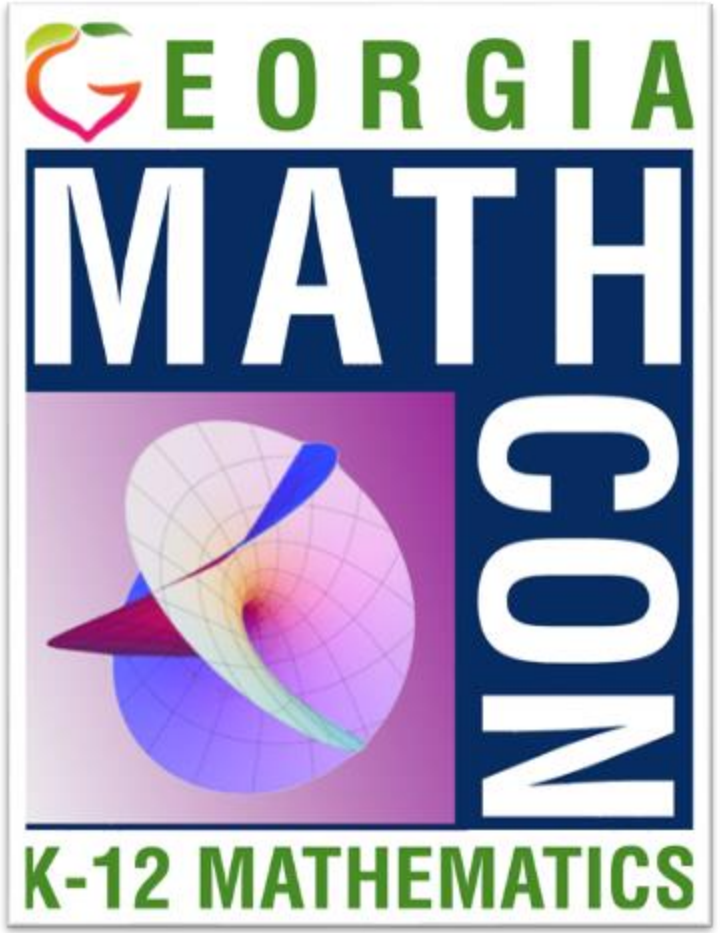
Grade Bands/ Course Pathways



GA MathCON

SAVE THE DATE

July 11 – 13, 2023



Professional Learning Videos

COMING SOON!

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