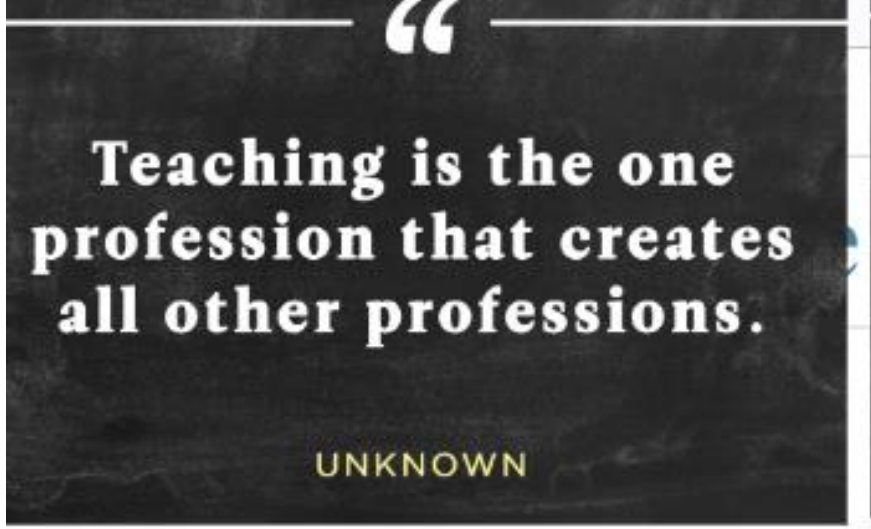
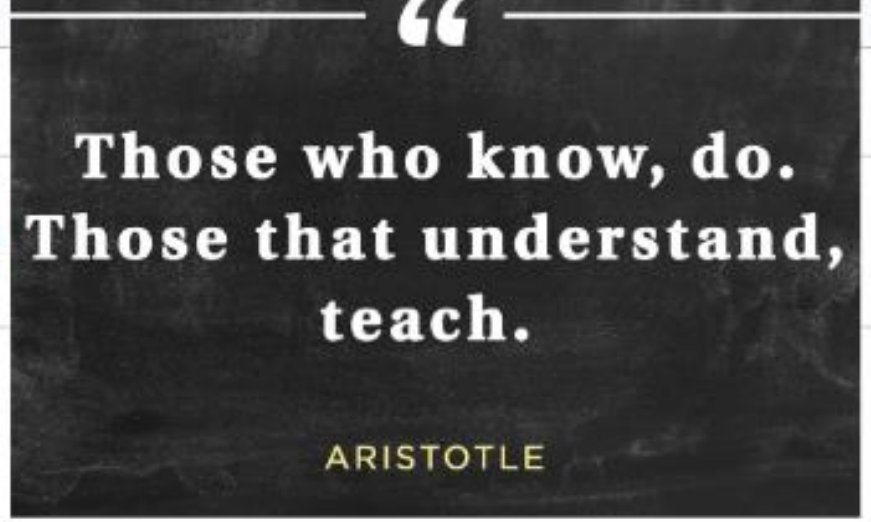


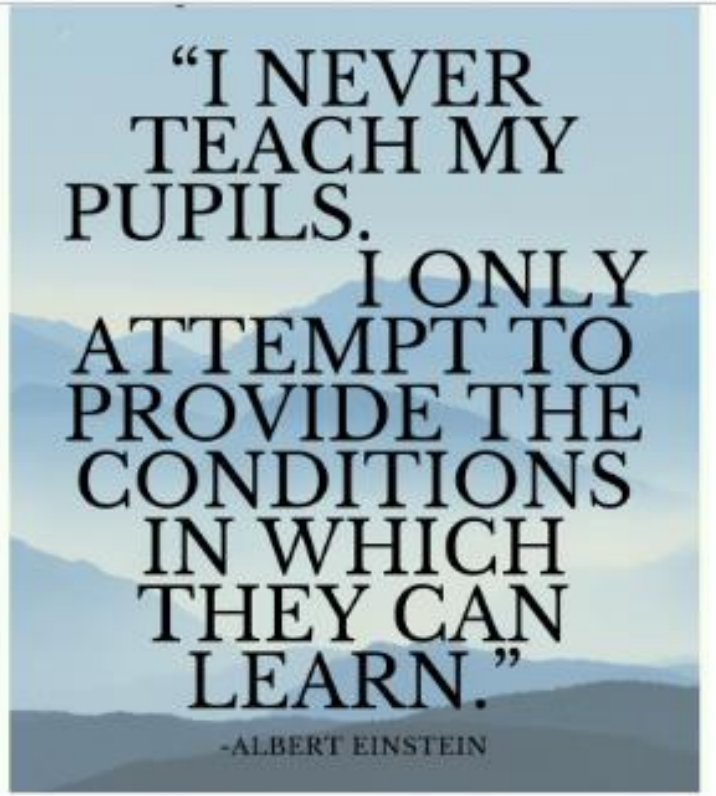
Georgia's K-12 Mathematics Standards

Resource-Rich Mathematics Instruction: Focusing on Tier 1 Success

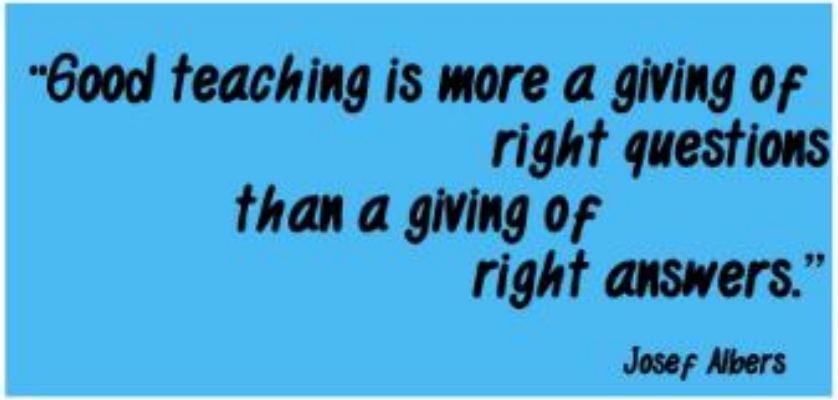
GaDOE Mathematics Team

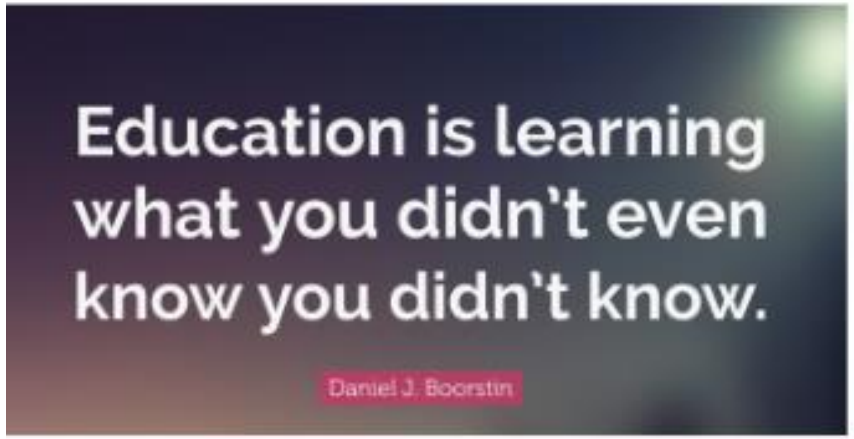

Teaching is the one profession that creates all other professions.
UNKNOWN

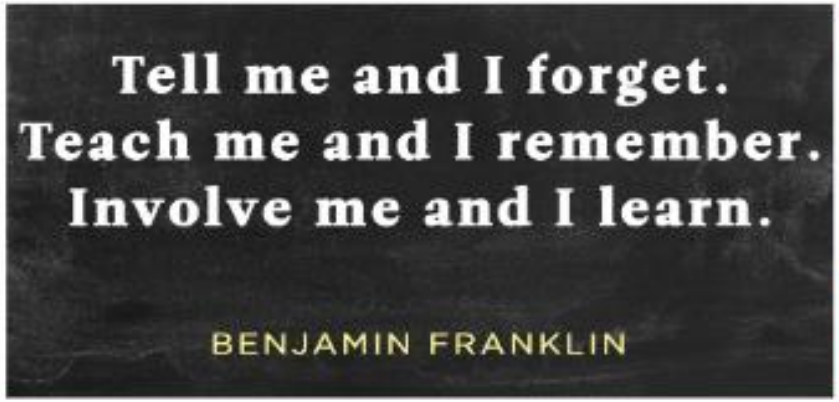

Those who know, do. Those that understand, teach.
ARISTOTLE

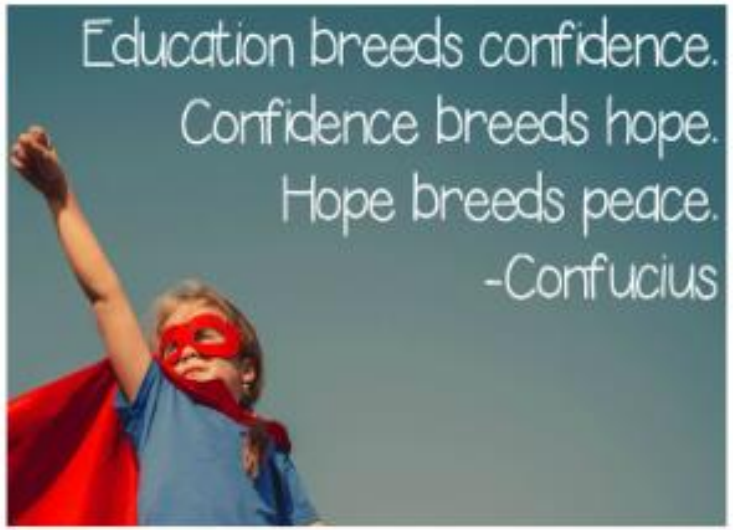

"I NEVER TEACH MY PUPILS. I ONLY ATTEMPT TO PROVIDE THE CONDITIONS IN WHICH THEY CAN LEARN."
-ALBERT EINSTEIN


Teaching is a great way to keep learning.
Matthea Harvey


"Good teaching is more a giving of right questions than a giving of right answers."
Josef Albers


Education is learning what you didn't even know you didn't know.
Daniel J. Boorstin


Tell me and I forget. Teach me and I remember. Involve me and I learn.
BENJAMIN FRANKLIN


Education breeds confidence.
Confidence breeds hope.
Hope breeds peace.
-Confucius

Session Outline

- Learning in a World with Emerging Technologies
- Overview of Georgia's K-12 Mathematics Standards
- Exploration of the Mathematics Instructional Resources



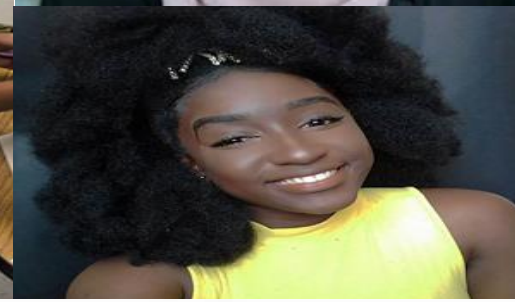


















2024
HAPPY NEW YEAR

CHAT GPT

photomath
smart camera calculator

Bard

MathGPTPro

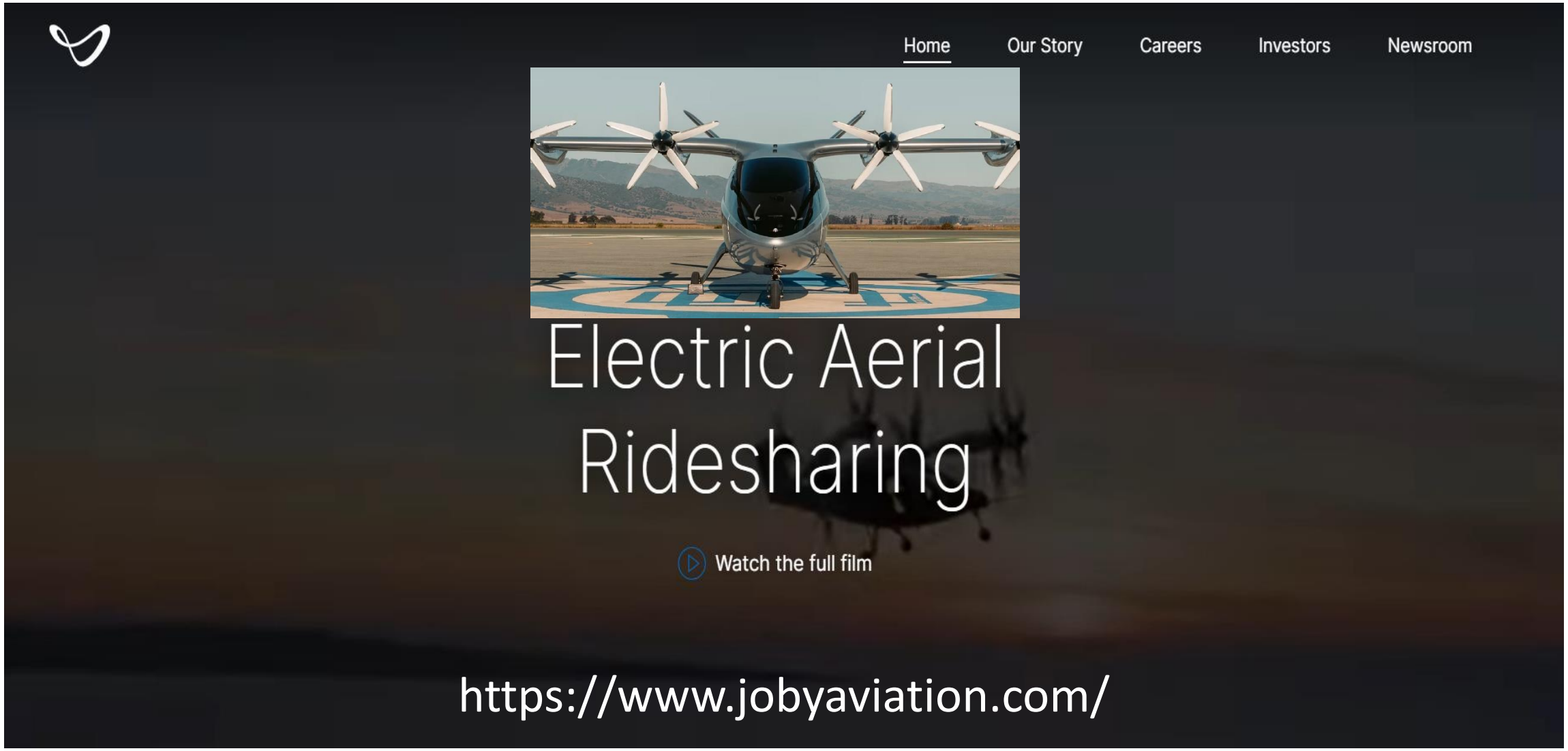
MathGPT

WAYMO



Archer Aviation, Inc. & Joby Aviation




Home
Our Story
Careers
Investors
Newsroom
Electric Aerial Ridesharing
Watch the full film
https://www.jobyaviation.com/


ALQUIST
ICON
Bio 3D
Image: Andrew McCoy

Emerging Technologies



Technology is increasing at such a rapid rate!






ICON's House Zero
Pushing the Boundaries
ICON


2036
HAPPY NEW YEAR

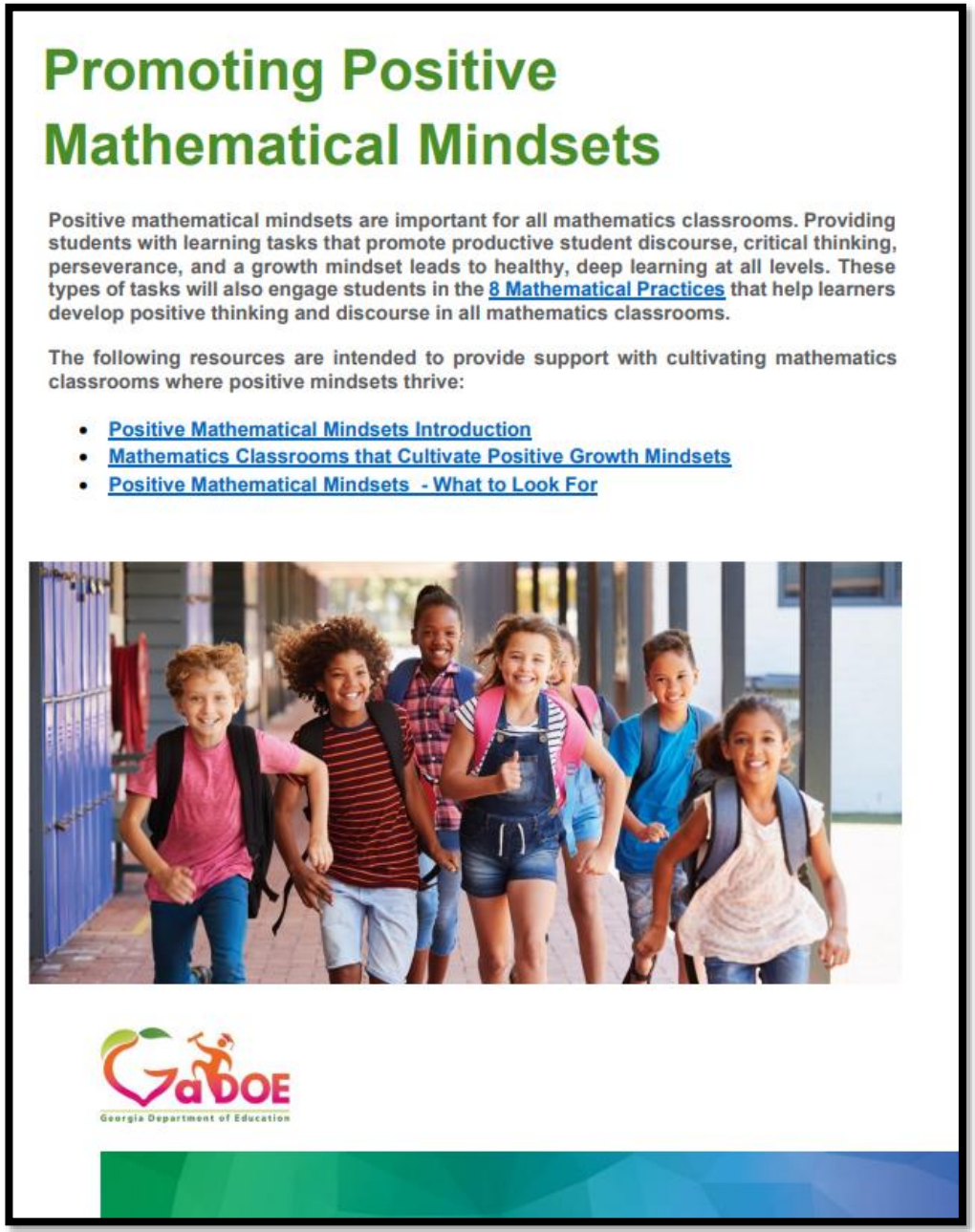

Technology is advancing at such a rapid rate. How can we prepare students for the future based on what we know about technology advancements?

Jobs of the future will require an advanced level of mathematical reasoning and application, as well as data analysis and statistical reasoning and comprehension.



Georgia's K-12 Mathematics Standards

Full Implementation 2023 - 2024



Key Highlights

- A student's belief that they can be successful (self-efficacy) has a positive effect on student achievement.
- The collective belief of teachers in their ability to positively affect students (collective teacher efficacy) is strongly correlated with student achievement.

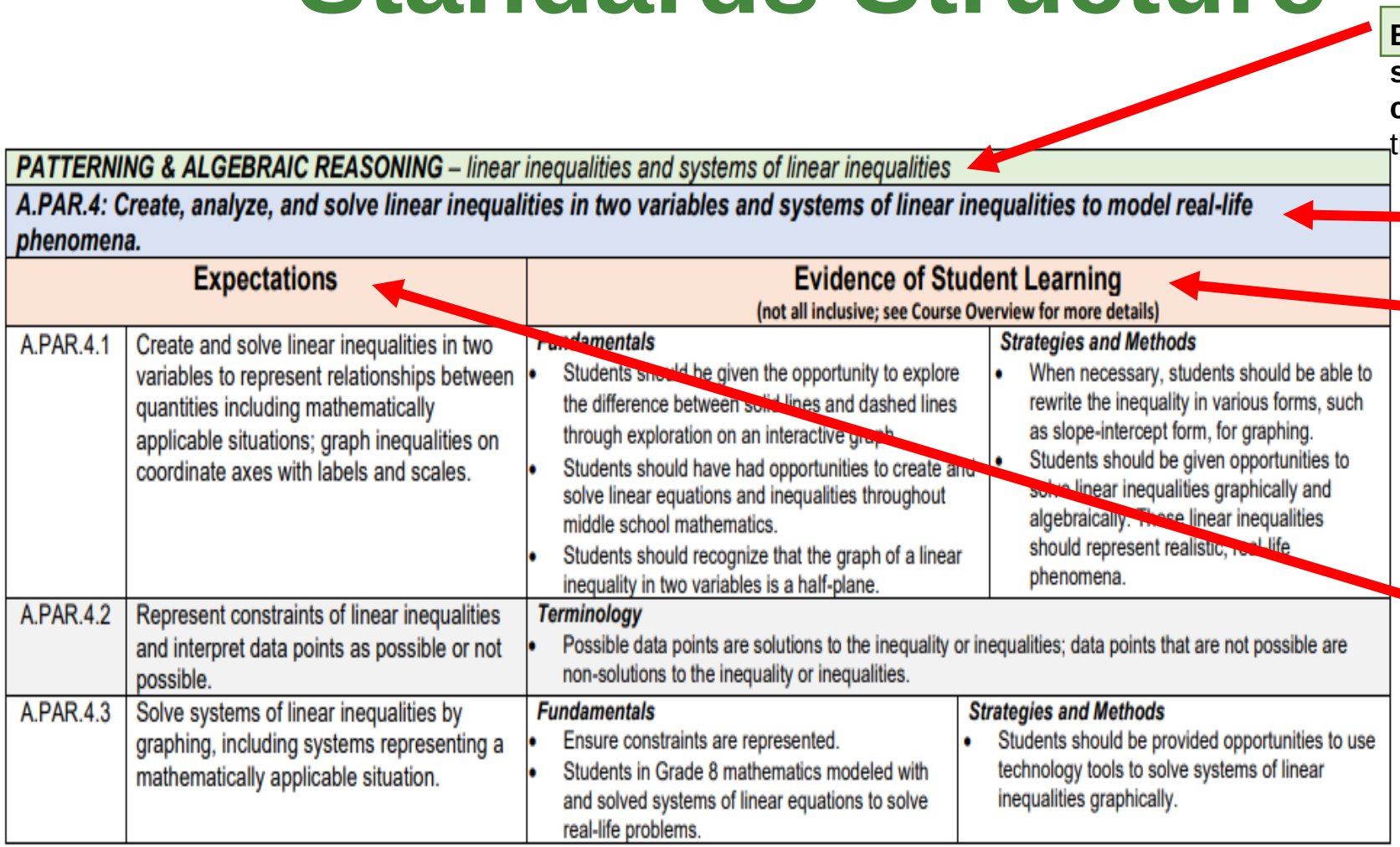
"Whether you think you can, or you think you can't – you're right."

- Reasoning over answer-getting in Isolation
- Create a culture of risk-taking
- Implement tasks effectively
- Support efforts of learning
- Cultivate student success

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="1"></td><td colspan="2">Probabilistic Reasoning (PR)</td></tr>
</table>

Standards Structure



***PATTERNING & ALGEBRAIC REASONING** – linear inequalities and systems of linear inequalities*

A.PAR.4: Create, analyze, and solve linear inequalities in two variables and systems of linear inequalities to model real-life phenomena.

Expectations		Evidence of Student Learning (not all inclusive; see Course Overview for more details)	
A.PAR.4.1	Create and solve linear inequalities in two variables to represent relationships between quantities including mathematically applicable situations; graph inequalities on coordinate axes with labels and scales.	***Fundamentals*** • Students should be given the opportunity to explore the difference between solid lines and dashed lines through exploration on an interactive graph. • Students should have had opportunities to create and solve linear equations and inequalities throughout middle school mathematics. • Students should recognize that the graph of a linear inequality in two variables is a half-plane.	***Strategies and Methods*** • When necessary, students should be able to rewrite the inequality in various forms, such as slope-intercept form, for graphing. • Students should be given opportunities to solve linear inequalities graphically and algebraically. These linear inequalities should represent realistic, real-life phenomena.
A.PAR.4.2	Represent constraints of linear inequalities and interpret data points as possible or not possible.	***Terminology*** • Possible data points are solutions to the inequality or inequalities; data points that are not possible are non-solutions to the inequality or inequalities.	
A.PAR.4.3	Solve systems of linear inequalities by graphing, including systems representing a mathematically applicable situation.	***Fundamentals*** • Ensure constraints are represented. • Students in Grade 8 mathematics modeled with and solved systems of linear equations to solve real-life problems.	***Strategies and Methods*** • Students should be provided opportunities to use technology tools to solve systems of linear inequalities graphically.

Big Idea and **summary of concepts** in this section

Standard

Evidence of Student Learning – instructional supports

Expectations 'breaks down' the standard in an instructional progression

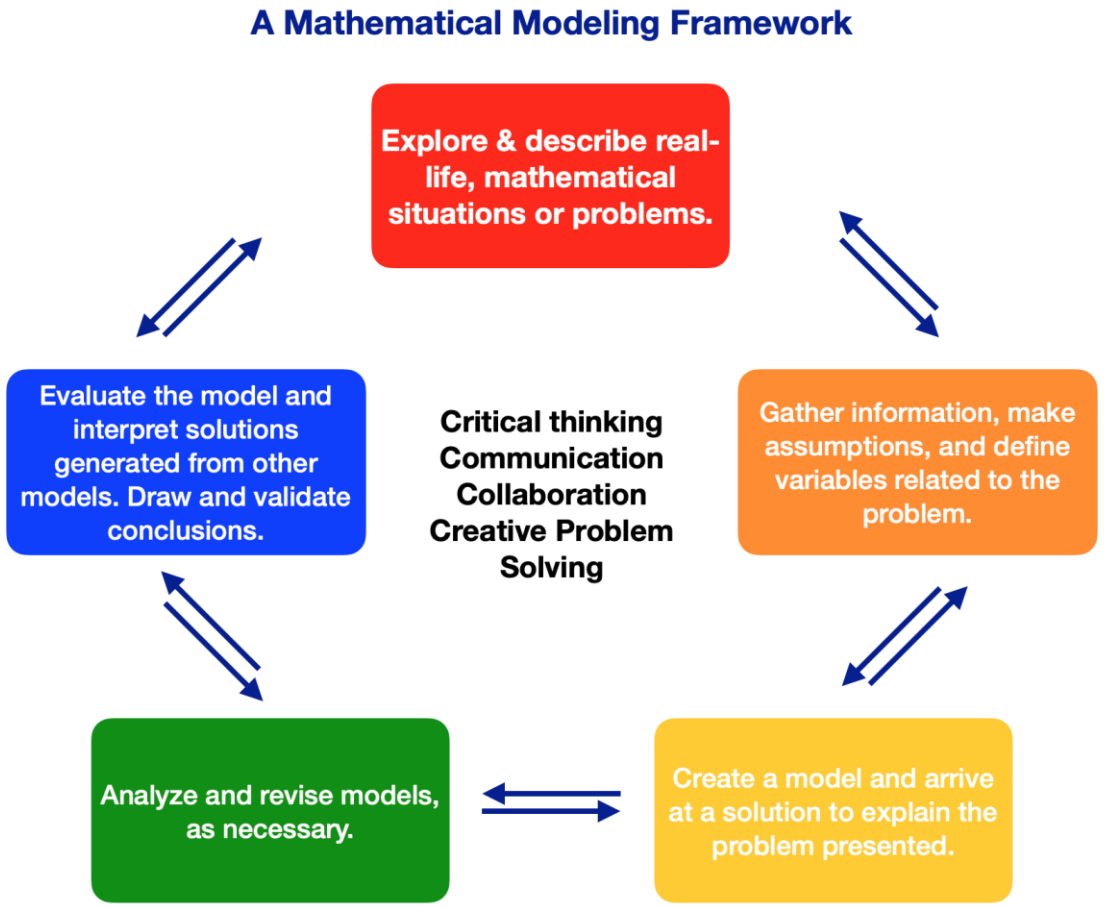
ESSENTIAL INSTRUCTIONAL GUIDANCE

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

Overarching Mathematical Practice Standard (all grade levels and courses)

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.

Mathematical Modeling



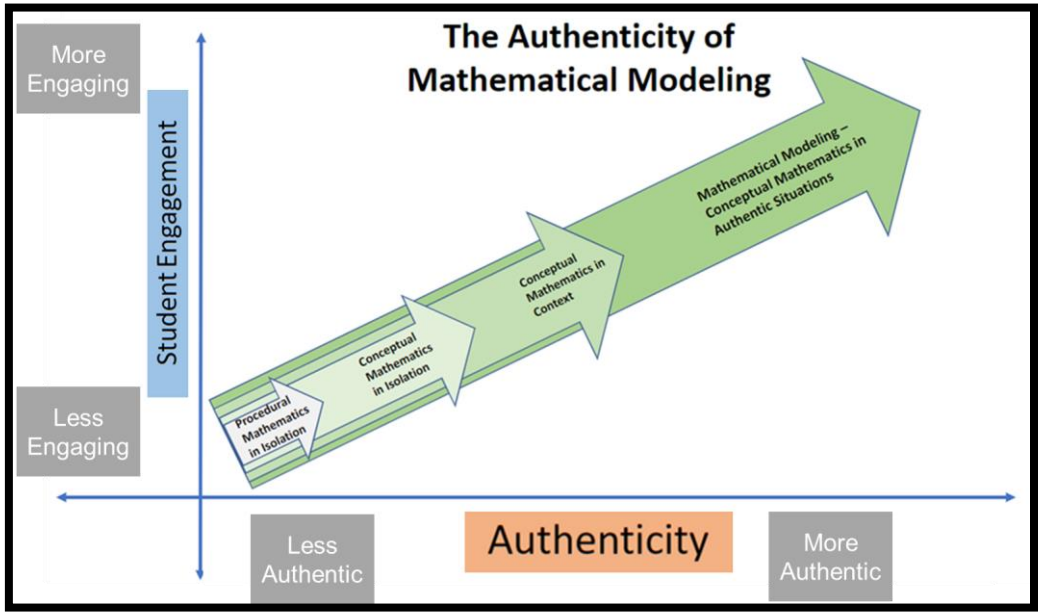
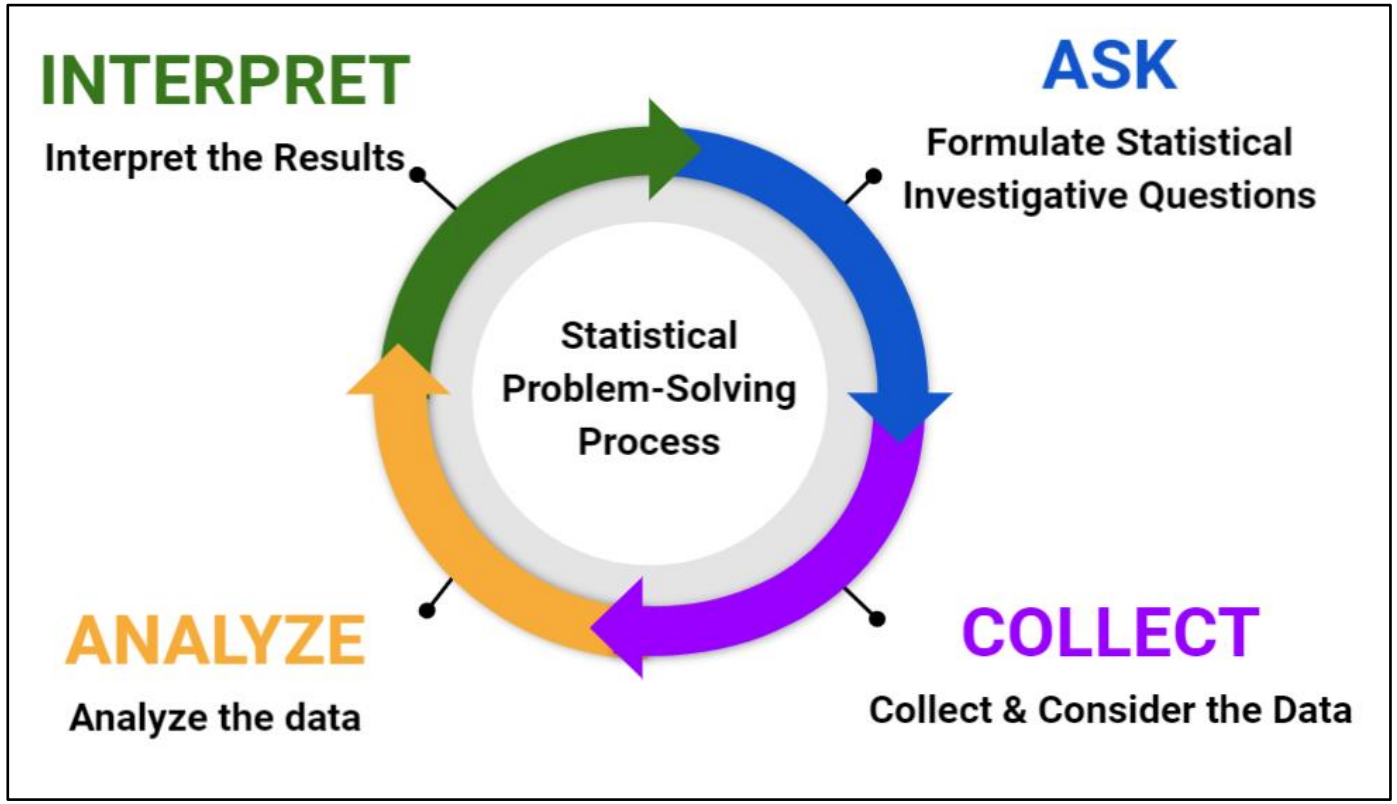


Image adapted from: Suh, Matson, Seshaiyer, 2017

Framework for Statistical Reasoning



"Ask [developmentally appropriate] questions and answer them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life."

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
around us.

The Framework for Statistical Reasc
learners through the sense-making p
grade levels and courses. Reasoning
and application of a variety of mathen



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.

2nd Grade: Create statistical investigative questions that can be answered using data. Collect, analyze, and interpret categorical data presented as picture graphs and bar graphs (with single-unit scales) with **up to four categories** from real situations to answer questions.

Ask	Collect	Analyze	Interpret
Create a statistical	**Determine strategies**	**Create a picture graph and a**	**Interpret categorical data to answer the statistical investigative question created.**
			e current expectation and real events. ir classroom. lly marks can be used to organize data. four categories. phs, bar graphs, and tally charts.
			ered using data. Collect, **number values** obtained
			Interpret
	answer a statistical investigative question.	**graphical display.**	**Interpret categorical and numerical data to answer the statistical investigative question created.**

Instructional Supports

- Expectations in this grade level should be taught throughout the year and applied contextually to the current expectation and actual life events.
- In previous grade levels, students analyzed categorical data. In third grade, this is extended to include numerical data analysis.
- Students should formulate a statistical investigative question to explore a real situation in their classroom.
- Students should be provided with learning experiences to collect and analyze both numerical data and categorical data.
- Some problems should include reading bar graphs, pictographs, and dot plots, as well as customary measurements. Dot plots and line plots can be used interchangeably. Dot plots should be used for numerical data representation on a number line.
- 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. Data sets for categorical data may include several categories.
- The scales of the pictographs, bar graphs, and dot plots should depend on the data collected. On a pictograph, one symbol may stand for a value greater than 1 to allow students to apply their understanding of single digit multiplication and division facts.
- Students should use a ruler that is marked at halves and fourths only to create an evenly spaced number line for the dot plot.
- *Numerical data* - data that can be expressed in numbers rather than natural language. An example of numerical data that could be collected is the number of people who attended the movie theater over the course of a month.
- *Categorical data* - a type of data used to group information with similar characteristics. Examples of categorical data that could be collected might be marital status, favorite sport, or favorite type of movie.

Ask questions and answer them based on gathered information, observations, and appropriate graphical displays to solve problems relevant to everyday life.

Georgia Milestones

Georgia Milestones Assessment System

Algebra: Concepts & Connections

ASSESSMENT BLUEPRINT

Claims, Targets, and Content Standards

Claims and Targets	Content Standards Assessed	Approximate # of Points
Geometric & Spatial Reasoning		**6**
Solve problems involving distance, midpoint, slope, area, and perimeter to model and explain real-life phenomena.	A.GSR.3+	6
Numerical Reasoning		**6**
Investigate rational and irrational numbers and rewrite expressions involving square roots and cube roots.	A.NR.5+	6
Patterning & Algebraic Reasoning		**19**
Create, analyze, and solve linear inequalities in two variables and systems of linear inequalities to model real-life phenomena.	A.PAR.4+	7
Build quadratic expressions and equations to represent and model real-life phenomena; solve quadratic equations in mathematically applicable situations.	A.PAR.6+	6
Create and analyze exponential expressions and equations to represent and model real-life phenomena; solve exponential equations in mathematically applicable situations.	A.PAR.8+	6
Functional & Graphical Reasoning		**21**
Construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena. Use formal notation to represent linear functions and the key characteristics of graphs of linear functions, and informally compare linear and non-linear functions using parent graphs.	A.FGR.2+	7
Construct and interpret quadratic functions from data points to model and explain real-life phenomena; describe key characteristics of the graph of a quadratic function to explain a mathematically applicable situation for which the graph serves as a model.	A.FGR.7+	7
Construct and analyze the graph of an exponential function to explain a mathematically applicable situation for which the graph serves as a model; compare exponential with linear and quadratic functions.	A.FGR.9+	7
Data & Statistical Reasoning		**6**
Collect, analyze, and interpret univariate quantitative data to answer statistical investigative questions that compare groups to solve real-life problems; Represent bivariate data on a scatter plot and fit a function to the data to answer statistical questions and solve real-life problems.	A.DSR.10+	6
	Total	**58**

+ Standard **A.MM.1** will be assessed in collaboration with all other content standards. **A.MM.1**: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

EOC Scores & Assessments

Mathematics Assessment Waiver for 2023-2024

The State Board of Education approved a waiver of promotion requirements for grades 5 and 8 and EOC course grade requirements for mathematics for the 2023-2024 school year. With the implementation of new math standards and assessments, we will have to hold standard setting meetings next summer. This means score reporting for mathematics will be delayed to late summer/early fall 2024 and will not be available in time for promotion decisions and course grades. Additional information about the waiver is available here.



Aiming for Excellence in Georgia

We believe ALL students can learn at high levels.

We believe every student has a goal for success in life, and we must match their passion, potential and pursuits by providing a high-quality mathematics instruction experience to help them be successful.

We believe a high-quality mathematics experience starts with positive mathematical mindsets coupled with high-quality, student-centered instructional materials.

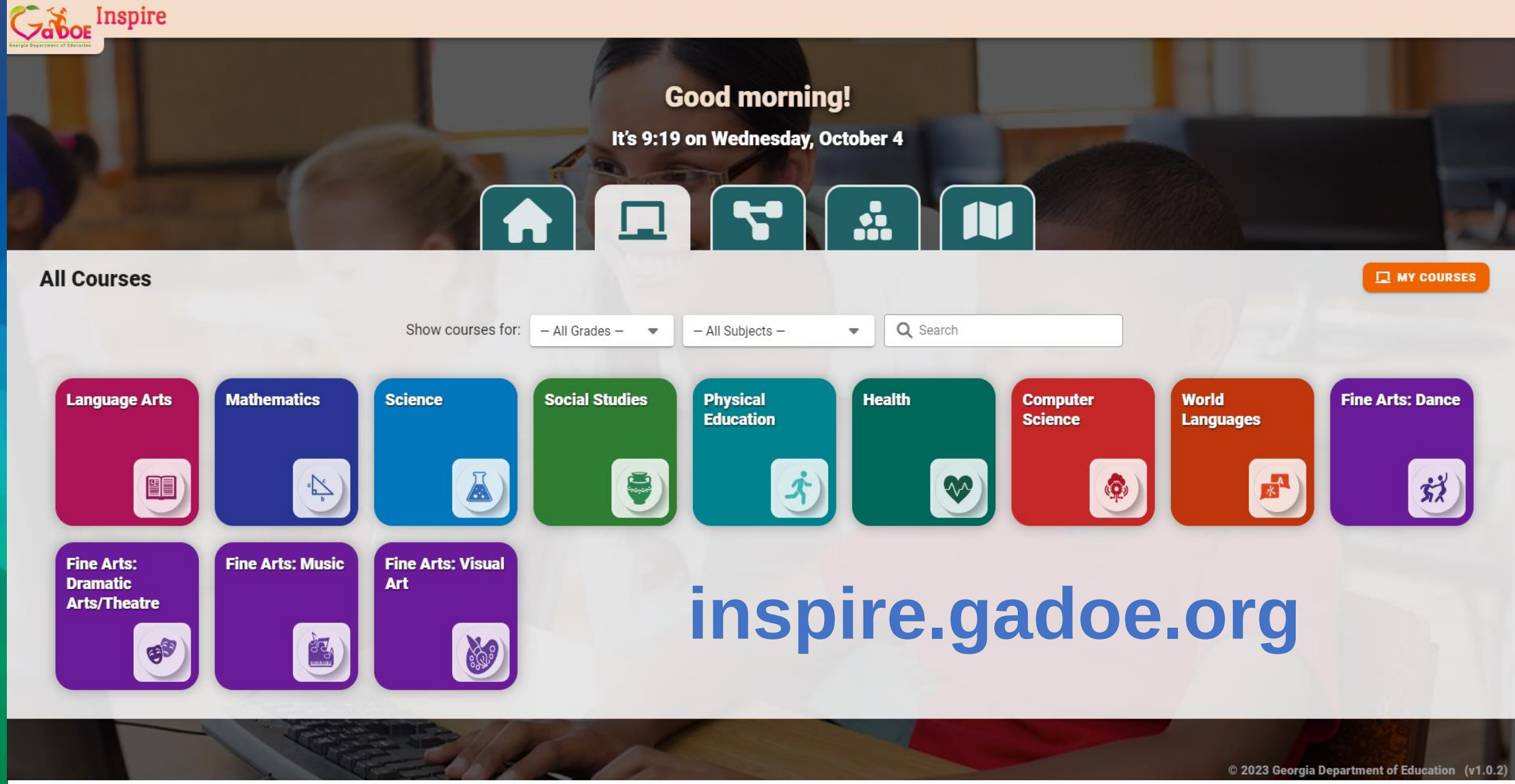
Georgia Standards

inspire.gadoe.org

GeorgiaStandards.org

[Georgia's K-12 Mathematics Standards (georgiastandards.org)]




Inspire
Good morning!
It's 9:19 on Wednesday, October 4
All Courses
MY COURSES
Show courses for:
– All Grades –
– All Subjects –
Search
Language Arts
Mathematics
Science
Social Studies
Physical Education
Health
Computer Science
World Languages
Fine Arts: Dance
Fine Arts: Dramatic Arts/Theatre
Fine Arts: Music
Fine Arts: Visual Art
inspire.gadoe.org
© 2023 Georgia Department of Education (v1.0.2)

Georgia Inspire

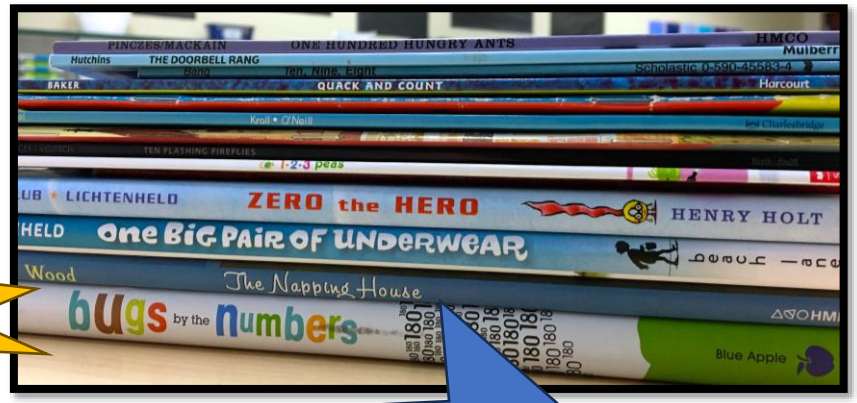


inspire.gadoe.org

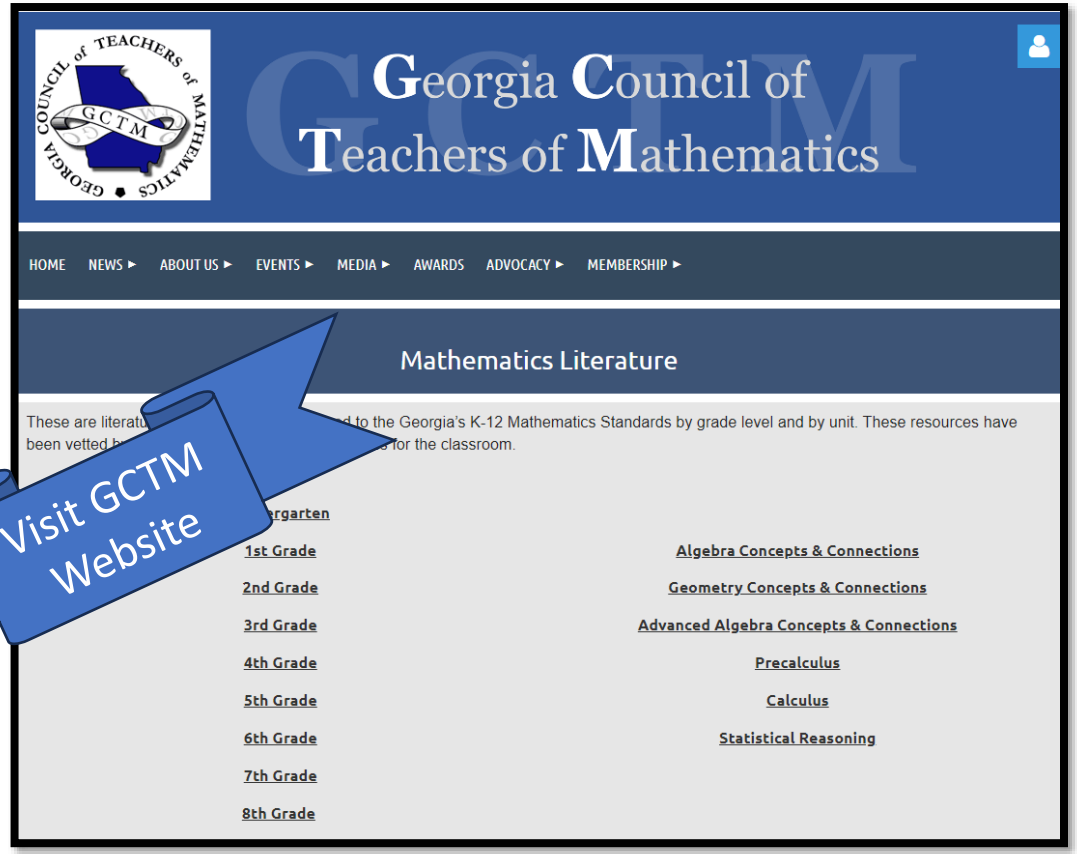
Literature Embedded in Mathematics

https://www.gctm.org/Mathematics-Literature

NEW



Example 5th Grade



Visit GCTM Website

FIFTH GRADE MATHEMATICS LITERATURE CONNECTI

aligned with Georgia's K-12 Mathematics Standards

Unit 1: Investigating Volume and Solid Figures	
Shape Up	David A.
The Greedy Triangle	Marilyn Bu
Unit 2: Building Conceptal Understanding of Place Value Using Measurement and Data Reasoning	**Auth**
If You Made a Million	David M. Schwartz
Millions of Cats	Wanda Ga'g
How Much is a Million	David M. Schwartz
Math Curse	Jon Scieszka and Lane Smith
Unit 3: Building Conceptual Understanding of Multiplication and Division with Whole Numbers	**Author**
Anno's Mysterious Multiplying Jar	Mitsumasa & Masaichiro Anno
The Multiplying Menace Divides	Pam Calvert
Unit 4: Building Fraction Understanding	**Author**
Sir Cumference and the Fraction Faire	Cindy Neuschwander
Unit 5: Making Sense of Fraction Multiplication and Division	**Author**
Multiplying Menace The Revenge of Rumplestilskin	Pam Calvert
Unit 6: Extending Place Value and Working with Decimals to Solve Problems	**Author**
Sir Cumference Gets Decima's Point	Cindy Neuschwander
Fractions, Decimals, and Percents	David A. Adler
Unit 7:Exploring Geometry and the Coordinate Plane	**Author**
The Fly on the Ceiling	Dr. Julie Glass

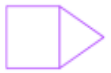
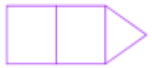
Art Designs

Ahmad and Chris are working on their pattern designs for art class, and they began comparing each other's designs at different stages of the process.

Ahmad's Design

Stage 1	Stage 2	Stage 3
		

Chris' Design

Stage 1	Stage 2	Stage 3
		

1. Look at how each of the designs changes from stage to stage.

   a. How does Ahmad's design change from stage to stage?

   b. How does Chris' design change from stage to stage?

2. If they continue with their design, determine the total number of shapes for:

   a. Ahmad's design at stage 17.

   b. Chris' design at stage 17.

3. How did you determine the number of shapes at stage 17 for both Ahmad and Chris?

Kuta Software - Infinite Algebra 1 Name_____

Multi-Step Equations

Date_____ Period____

Solve each equation.

1) $-20 = -4x - 6x$

2) $6 = 1 - 2n + 5$

3) $8x - 2 = -9 + 7x$

4) $a + 5 = -5a + 5$

5) $4m - 4 = 4m$

6) $p - 1 = 5p + 3p - 8$

7) $5p - 14 = 8p + 4$

8) $p - 4 = -9 + p$

9) $-8 = -(x + 4)$

10) $12 = -4(-6x - 3)$

11) $14 = -(p - 8)$

12) $-(7 - 4x) = 9$

13) $-18 - 6k = 6(1 + 3k)$

14) $5n + 34 = -2(1 - 7n)$

15) $2(4x - 3) - 8 = 4 + 2x$

16) $3n - 5 = -8(6 + 5n)$

17) $-(1 + 7x) - 6(-7 - x) = 36$

18) $-3(4x + 3) + 4(6x + 1) = 43$

19) $24a - 22 = -4(1 - 6a)$

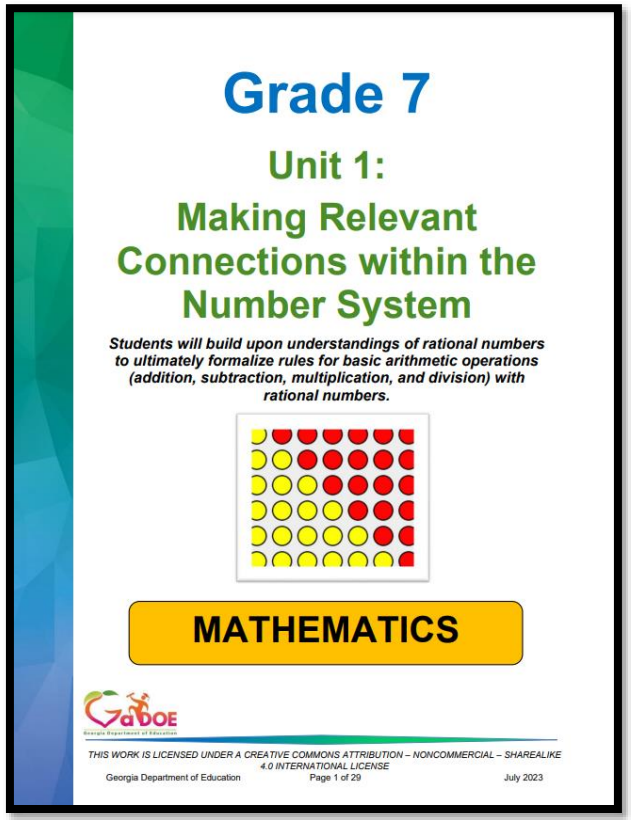
20) $-5(1 - 5x) + 5(-8x - 2) = -4x - 8x$

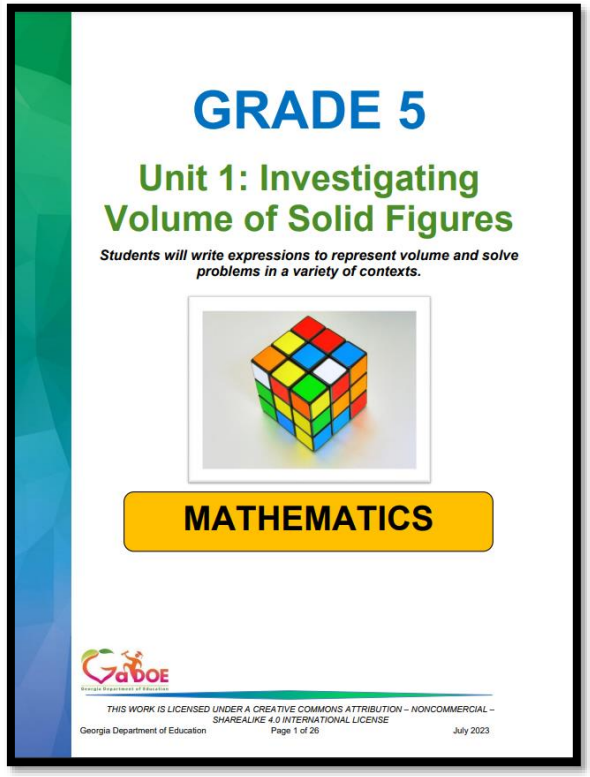
Effective Instructional Practices Resource for Leaders

Georgia's K-12 Mathematics Standards



MATHEMATICS





New Instructional Units

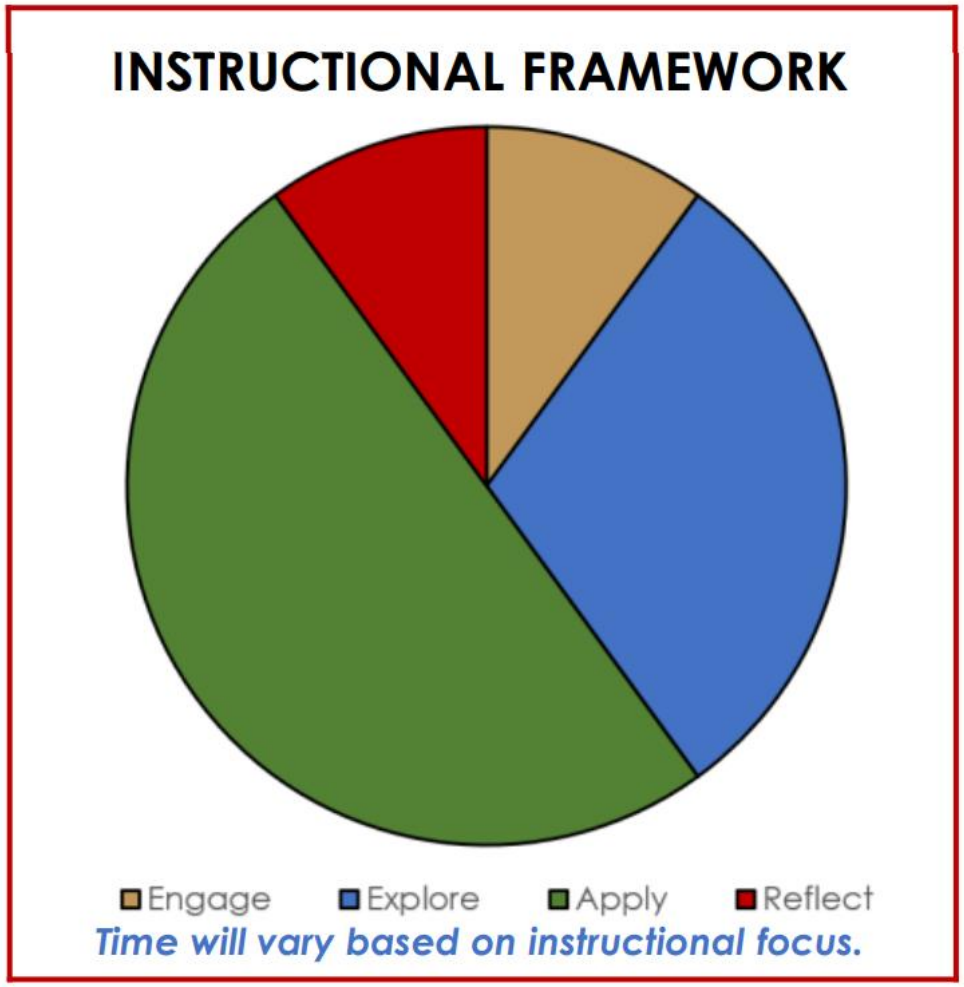
AVAILABLE NOW in INSPIRE At NO COST to GA Educators



Components of All Mathematics Instructional Learning Plans

- ✓ Standard(s) and Learning Objectives
- ✓ Background Information
- ✓ Common Misconceptions
- ✓ Learning Targets
- ✓ Materials & Student Handouts Needed
- ✓ Diagnostic Assessment
- ✓ 4-Part Instructional Design

  Engage, Explore, Apply, Reflect
- ✓ Evidence of Student Success
- ✓ Student Learning Supports
- ✓ Engaging Families



MATHEMATICS STANDARDS-BASED CLASSROOM INSTRUCTIONAL FRAMEWORK

GaDOE Georgia Department of Education

DIVISION OF SCHOOL & DISTRICT EFFECTIVENESS

INSTRUCTIONAL FRAMEWORK



Time will vary based on instructional focus.

Mathematical Practices

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.

Students are expected to:

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

Engage

Teacher:
- Facilitate an interesting and captivating introduction to the lesson.
- Present the relevant learning objectives within an engaging activity.
- Encourage students' curiosity and wonder about the topics being explored.

Student:
- Notice patterns or connections from previously explored topics.
- Ask questions and express wonder about the concepts being presented.

Explore

Teacher:
- Facilitate and guide student-centered instruction.
- Engage students in exploration of new concepts.
- Provide opportunities for open-ended exploration and inquiry.
- Offer support and assistance as needed during the exploration process.
- Use a variety of data to inform instruction and provide feedback.

Student:
- Think critically, exercise flexibility in thinking, and engage in strategic reasoning.
- Collaborate with peers and ask questions when needed.
- Make connections and explore patterns using various tools and representations.

Apply

Teacher:
- Create opportunities for students to demonstrate and communicate their thinking process.
- Provide clear instructions and expectations for the application tasks.
- Offer guidance, support, or enhancement, as needed.
- Use a variety of data to inform instruction and provide feedback.
- Facilitate collaborative groups to support productive student discourse.

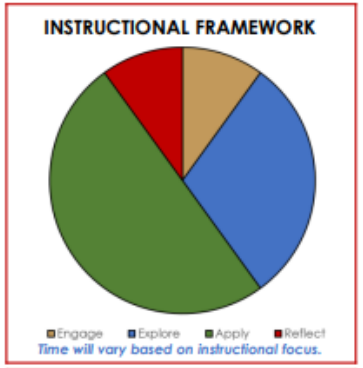
Student:
- Apply the learned concepts to real-world situations, independently or collaboratively.
- Demonstrate and communicate reasoning through various tasks aimed at applying knowledge gained from the exploration.
- Take responsibility for completing the application tasks as assigned.
- Connect and generalize patterns to a broader situation.

Reflect

Teacher:
- Facilitate a summary of the lesson and its objectives.
- Encourage students to reflect on their efforts and learning experience.
- Use purposeful questioning to prompt students to pose questions for future exploration or learning.

Student:
- Communicate efforts by summarizing the learning.
- Engage in self-reflection about their learning process, achievements, and new knowledge obtained.
- Contribute to group discussions or individual reflections and pose questions to solidify understanding for future exploration or learning.

Georgia Department of Education
August 2023 • Page 1 of 1



Mathematical Practices

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.

Students are expected to:

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

Reflect

Teacher:

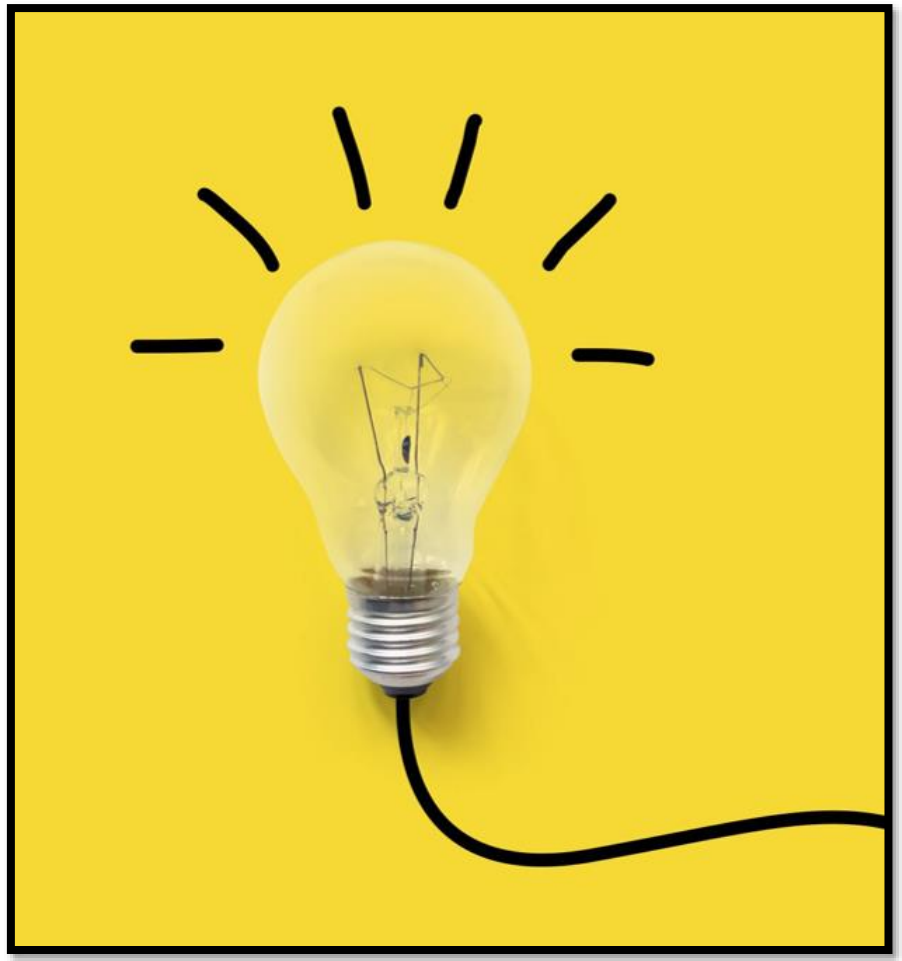
- Facilitate a summary of the lesson and its objectives.
- Encourage students to reflect on their efforts and learning experience.
- Use purposeful questioning to prompt students to pose questions for future exploration or learning.

Student:

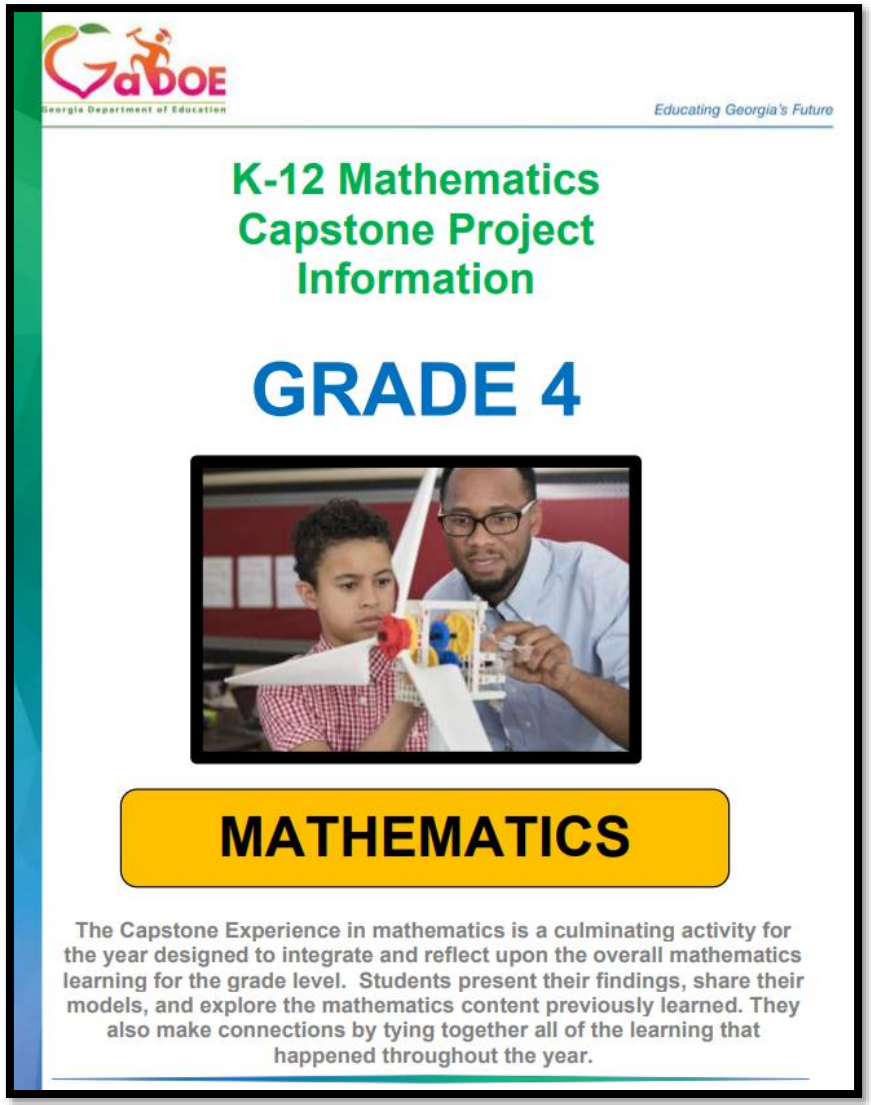
- Communicate efforts by summarizing the learning.
- Engage in self-reflection about their learning process, achievements, and new knowledge obtained.
- Contribute to group discussions or individual reflections and pose questions to solidify understanding for future exploration or learning.

Uncovering Key Points

- Teachers should know that mathematical modeling opportunities can be found within the learning plans.
- An entire class period of teacher-centered instruction is in direct conflict with best practices for a student-centered environment.
- I Do, We Do, You Do is in direct conflict with the new instructional design.



Culminating Capstone Unit:



Georgia's K-12 Mathematics Curriculum

Goal:
100% Implementation as base curriculum for instructional planning



Thinking Through a Learning Plan Protocol

Thinking Through a Learning Plan



Standards and Learning Objectives
What mathematics standards and learning objectives will be addressed?

What other content standards will be addressed?

Intended Outcomes and Learning Goals

What are the expected outcomes of the lesson?

What understandings will students take away from this lesson?

Diagnostic Assessment
What do the data say about student thinking?

Plan for Support
What student learning support strategies can be implemented to address anticipated student thinking during the instructional design?

How will I support students who need:

Extension support-

Language support-

Scaffolded support-

Instructional Design
Engage: What is the main activity that students will be working on in this task?

Explore: What is the main activity that students will be working on in this task?

Apply: What is the main activity that students will be working on in this task?

Reflect: What is the main activity that students will be working on in this task?

Tools, Resources, Materials
What tools or resources will be available to give students entry to—and help them reason through—the activities?

Prior Knowledge
What prior knowledge and experience will students draw on in their work on this learning plan?

Anticipated Mathematical Models, Strategies, and Pathways to Solutions
What are the various ways that students might approach the tasks in the learning plans? Be sure to include ideas of mathematical models and possible pathways to solutions.

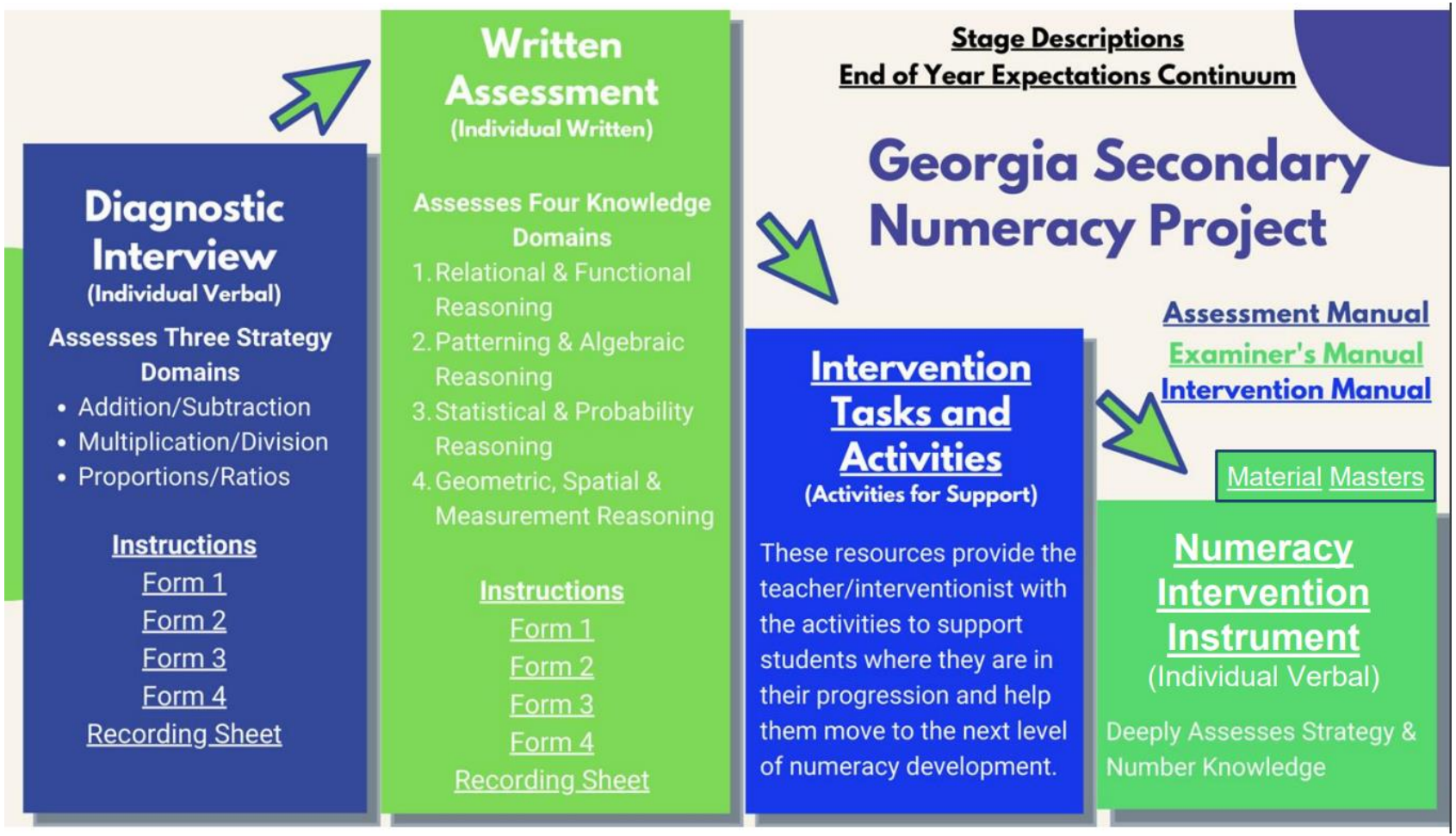
What questions might you ask students that will support their exploration of the tasks and bridge between what they did and what you want them to learn? These questions should assess what a student currently knows and advance her or him toward the goals of the lesson. Be sure to consider questions that you will ask students who cannot begin as well as students who finish quickly.

Possible Errors or Misconceptions

Possible Solutions
(include correct, incorrect and complete)


Georgia Numeracy Project
Numeracy Intervention Resource
Enter Here
Georgia Early Numeracy Project
K - 7 Resource
8 - HS Resource
Georgia Secondary Numeracy Project

Secondary Numeracy Project Overview



Interdisciplinary Connections for All Units in all grade levels and courses

- Aligned to workforce needs (based on industry input)
- Incorporates employability skills and workforce readiness indicators at all grade levels
- Provides innovative inspiration for interdisciplinary teaching and learning with multiple content areas and disciplines

Customized for School Community and Needs

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

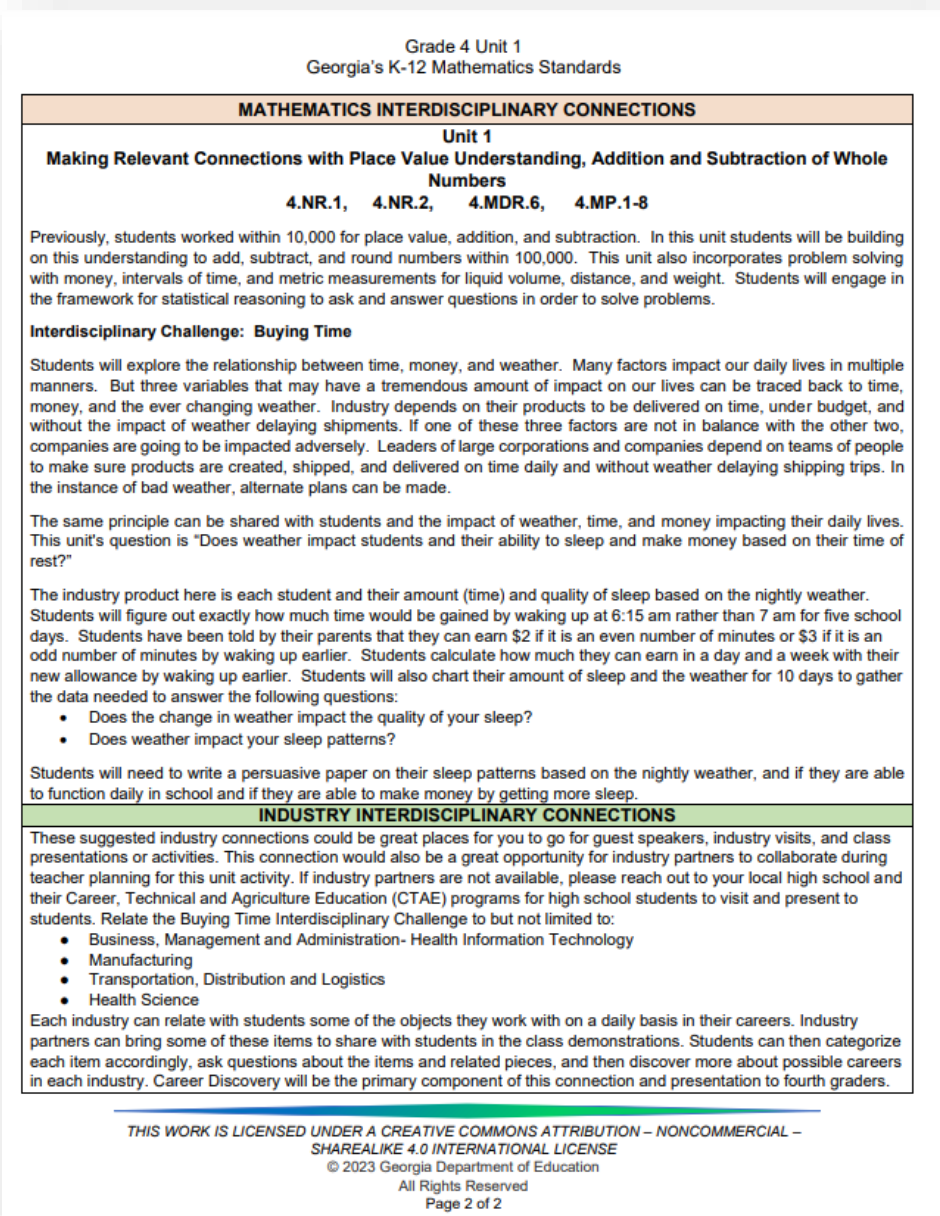
GEORGIA'S K-12 MATHEMATICS STANDARDS INTERDISCIPLINARY CONNECTIONS PLANNING TOOL EIGHTH GRADE

DRIVING QUESTION/ STATEMENT OF THE PROBLEM (REAL-LIFE PHENOMENA): How can we explore Real-Life Phenomena Through Systems of Linear Equations?		
COMPUTER SCIENCE CONTENT & CONNECTIONS	**ENGLISH/ LANGUAGE ARTS CONTENT & CONNECTIONS**	**SCIENCE CONTENT & CONNECTIONS**
Possible connections: • Develop through application, logical observations relative to computational thinking procedures to analyze and solve problems current to everyday life. • Understand and use the basic steps in algorithmic problem solving in computing and other authentic applications.	Possible connections: • Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. • Have students research and answer the following question: What is the impact of bringing walking, speed walking, jogging, or running into an individual exercise program on a regular basis in relation to their overall health?	Possible connections: • Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects. • Analyze and interpret data to identify patterns in the relationships between speed and distance, and velocity and acceleration.
MATHEMATICS CONTENT & CONNECTIONS **Unit 4** **Real-Life Phenomena Explored Through Systems of Linear Equations** **8.FGR.7 8.MP.1-8** In this unit, students will extend their understanding of solving equations and functional and graphical reasoning to solving systems of equations, including those created by parallel and/or perpendicular lines. Solving systems should include estimating solutions graphically, solving using substitution, and solving using elimination.		
SOCIAL STUDIES CONTENT & CONNECTIONS	**PHYSICAL EDUCATION CONTENT & CONNECTIONS**	**CTAE & WORKFORCE READINESS CONTENT & CONNECTIONS**
Possible connections: • Interpret timelines, charts, and tables. • Identify and use primary and secondary sources.	Possible connections: • The physically educated student applies the knowledge of concepts, principles, strategies, and tactics related to movement and performance. • The physically educated student demonstrates competency in a variety of motor skills and movement patterns.	Possible connections: • Use appropriate technology to collect, record, manipulate, analyze, and report data. • Demonstrate the ability to recognize cause and effect when faced with projects or issues. • Healthcare Science • Human Services- Nutritionist The interdisciplinary workforce goal is for students to explore and start to make connections to the world of work through career exploration.

Interdisciplinary approaches to teaching and learning

Strong connections with mathematical modeling

Interdisciplinary Challenges



Grade 4 Unit 1
Georgia's K-12 Mathematics Standards

MATHEMATICS INTERDISCIPLINARY CONNECTIONS

Unit 1

Making Relevant Connections with Place Value Understanding, Addition and Subtraction of Whole Numbers

4.NR.1, 4.NR.2, 4.MDR.6, 4.MP.1-8

Previously, students worked within 10,000 for place value, addition, and subtraction. In this unit students will be building on this understanding to add, subtract, and round numbers within 100,000. This unit also incorporates problem solving with money, intervals of time, and metric measurements for liquid volume, distance, and weight. Students will engage in the framework for statistical reasoning to ask and answer questions in order to solve problems.

Interdisciplinary Challenge: Buying Time

Students will explore the relationship between time, money, and weather. Many factors impact our daily lives in multiple manners. But three variables that may have a tremendous amount of impact on our lives can be traced back to time, money, and the ever changing weather. Industry depends on their products to be delivered on time, under budget, and without the impact of weather delaying shipments. If one of these three factors are not in balance with the other two, companies are going to be impacted adversely. Leaders of large corporations and companies depend on teams of people to make sure products are created, shipped, and delivered on time daily and without weather delaying shipping trips. In the instance of bad weather, alternate plans can be made.

The same principle can be shared with students and the impact of weather, time, and money impacting their daily lives. This unit's question is "Does weather impact students and their ability to sleep and make money based on their time of rest?"

The industry product here is each student and their amount (time) and quality of sleep based on the nightly weather. Students will figure out exactly how much time would be gained by waking up at 6:15 am rather than 7 am for five school days. Students have been told by their parents that they can earn $2 if it is an even number of minutes or $3 if it is an odd number of minutes by waking up earlier. Students calculate how much they can earn in a day and a week with their new allowance by waking up earlier. Students will also chart their amount of sleep and the weather for 10 days to gather the data needed to answer the following questions:

- Does the change in weather impact the quality of your sleep?
- Does weather impact your sleep patterns?

Students will need to write a persuasive paper on their sleep patterns based on the nightly weather, and if they are able to function daily in school and if they are able to make money by getting more sleep.

INDUSTRY INTERDISCIPLINARY CONNECTIONS

These suggested industry connections could be great places for you to go for guest speakers, industry visits, and class presentations or activities. This connection would also be a great opportunity for industry partners to collaborate during teacher planning for this unit activity. If industry partners are not available, please reach out to your local high school and their Career, Technical and Agriculture Education (CTAE) programs for high school students to visit and present to students. Relate the Buying Time Interdisciplinary Challenge to but not limited to:

- Business, Management and Administration- Health Information Technology
- Manufacturing
- Transportation, Distribution and Logistics
- Health Science

Each industry can relate with students some of the objects they work with on a daily basis in their careers. Industry partners can bring some of these items to share with students in the class demonstrations. Students can then categorize each item accordingly, ask questions about the items and related pieces, and then discover more about possible careers in each industry. Career Discovery will be the primary component of this connection and presentation to fourth graders.

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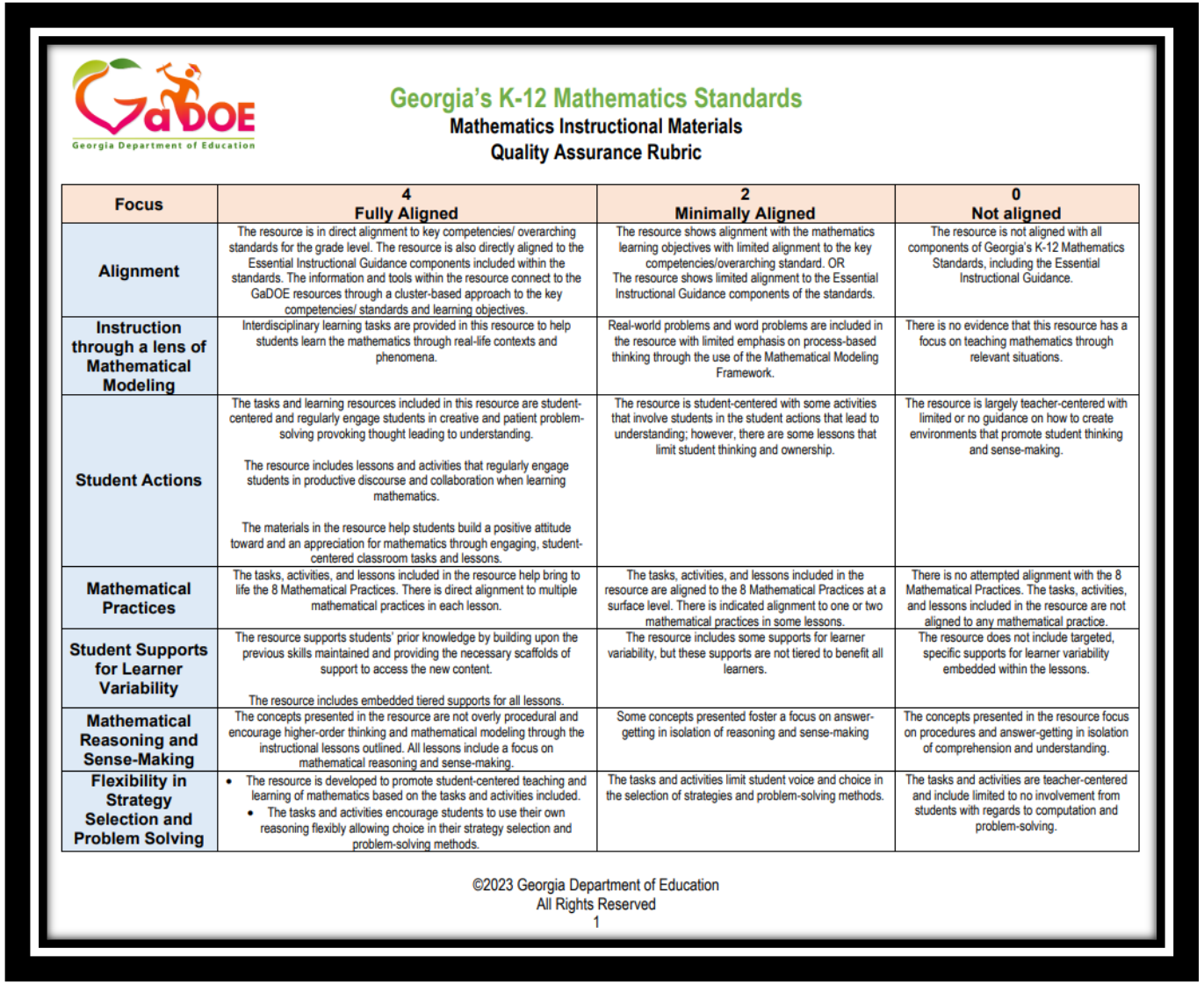
Georgia Department of Education

Model PBL



NEW

Quality Assurance Instructional Resources Rubric



Georgia's K-12 Mathematics Standards

Mathematics Instructional Materials
Quality Assurance Rubric

Focus	4 Fully Aligned	2 Minimally Aligned	0 Not aligned
Alignment	The resource is in direct alignment to key competencies/ overarching standards for the grade level. The resource is also directly aligned to the Essential Instructional Guidance components included within the standards. The information and tools within the resource connect to the GaDOE resources through a cluster-based approach to the key competencies/ standards and learning objectives.	The resource shows alignment with the mathematics learning objectives with limited alignment to the key competencies/overarching standard. OR The resource shows limited alignment to the Essential Instructional Guidance components of the standards.	The resource is not aligned with all components of Georgia's K-12 Mathematics Standards, including the Essential Instructional Guidance.
Instruction through a lens of Mathematical Modeling	Interdisciplinary learning tasks are provided in this resource to help students learn the mathematics through real-life contexts and phenomena.	Real-world problems and word problems are included in the resource with limited emphasis on process-based thinking through the use of the Mathematical Modeling Framework.	There is no evidence that this resource has a focus on teaching mathematics through relevant situations.
Student Actions	The tasks and learning resources included in this resource are student-centered and regularly engage students in creative and patient problem-solving provoking thought leading to understanding. The resource includes lessons and activities that regularly engage students in productive discourse and collaboration when learning mathematics. The materials in the resource help students build a positive attitude toward and an appreciation for mathematics through engaging, student-centered classroom tasks and lessons.	The resource is student-centered with some activities that involve students in the student actions that lead to understanding; however, there are some lessons that limit student thinking and ownership.	The resource is largely teacher-centered with limited or no guidance on how to create environments that promote student thinking and sense-making.
Mathematical Practices	The tasks, activities, and lessons included in the resource help bring to life the 8 Mathematical Practices. There is direct alignment to multiple mathematical practices in each lesson.	The tasks, activities, and lessons included in the resource are aligned to the 8 Mathematical Practices at a surface level. There is indicated alignment to one or two mathematical practices in some lessons.	There is no attempted alignment with the 8 Mathematical Practices. The tasks, activities, and lessons included in the resource are not aligned to any mathematical practice.
Student Supports for Learner Variability	The resource supports students' prior knowledge by building upon the previous skills maintained and providing the necessary scaffolds of support to access the new content. The resource includes embedded tiered supports for all lessons.	The resource includes some supports for learner variability, but these supports are not tiered to benefit all learners.	The resource does not include targeted, specific supports for learner variability embedded within the lessons.
Mathematical Reasoning and Sense-Making	The concepts presented in the resource are not overly procedural and encourage higher-order thinking and mathematical modeling through the instructional lessons outlined. All lessons include a focus on mathematical reasoning and sense-making.	Some concepts presented foster a focus on answer-getting in isolation of reasoning and sense-making	The concepts presented in the resource focus on procedures and answer-getting in isolation of comprehension and understanding.
Flexibility in Strategy Selection and Problem Solving	• The resource is developed to promote student-centered teaching and learning of mathematics based on the tasks and activities included. • The tasks and activities encourage students to use their own reasoning flexibly allowing choice in their strategy selection and problem-solving methods.	The tasks and activities limit student voice and choice in the selection of strategies and problem-solving methods.	The tasks and activities are teacher-centered and include limited to no involvement from students with regards to computation and problem-solving.

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1



High School Updates

Personalized Mathematics Pathways: Opportunities for ALL Georgia Students

- Open access for all pathways for all students
- Prepares students for any path they choose aligned with their unique college and career goals
- Includes secondary courses for support and enhancement
- Multiple on-ramps and off-ramps for learners participating in the accelerated pathway

Mathematics Graduation Requirements for High School

First Three Required Courses

Algebra: Concepts & Connections *(or the equivalent)*

OR

Enhanced Algebra: Concepts & Connections*

**This course is an equivalent course to high school Algebra: Concepts and Connections for eligible Grade 8 students.*

Geometry: Concepts & Connections *(or the equivalent)*

Advanced Algebra: Concepts & Connections *(or the equivalent)*

OR

Enhanced Advanced Algebra and AP Precalculus: Concepts & Connections

4th Core Mathematics Course

4th Mathematics Course Options

- AP Statistics
- Statistical Reasoning
- Computer Science Courses*
- Precalculus
  - Linear Algebra with Computer Science Applications
  - Calculus
    - History of Mathematics (elective credit ONLY)
    - Multivariable Calculus
  - AP Calculus AB
  - AP Calculus BC
    - Differential Equations
    - Engineering Calculus
- Advanced Finite Mathematics
- Advanced Mathematical Decision Making
- Mathematics of Industry and Government
- Mathematics Capstone Course
- Advanced Financial Algebra
- Approved Dual Enrollment Courses

Fourth mathematics course options may be taken simultaneously once the prerequisite for each course is satisfied.

- **Multiple choices for 4th core mathematics courses**
- **Co-Requisite Support courses offered, as needed.**

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Course Options for Mathematics Graduation Requirements for Traditional High School Diploma

Required Course Options for Three Credits in Mathematics

Graduation Requirement	*Course Number*	*Course Name*	*Federally Required Assessment(s)*
1 Required Unit of Core Credit in Mathematics *(two options)*	27.08110	Algebra: Concepts and Connections	Algebra: Concepts & Connections End of Course (EOC)* **SBOE Rule 160-5-1-.15 allows students to demonstrate subject area competency and "test out" of this course.*
	OR		
	27.09110	Enhanced Algebra: Concepts and Connections (taken in Grade 8)	8th Grade End of Grade (EOG) *and* Algebra: Concepts & Connections EOC* **SBOE Rule 160-5-1-.15 allows students to demonstrate subject area competency and "test out" of this course.*

AND

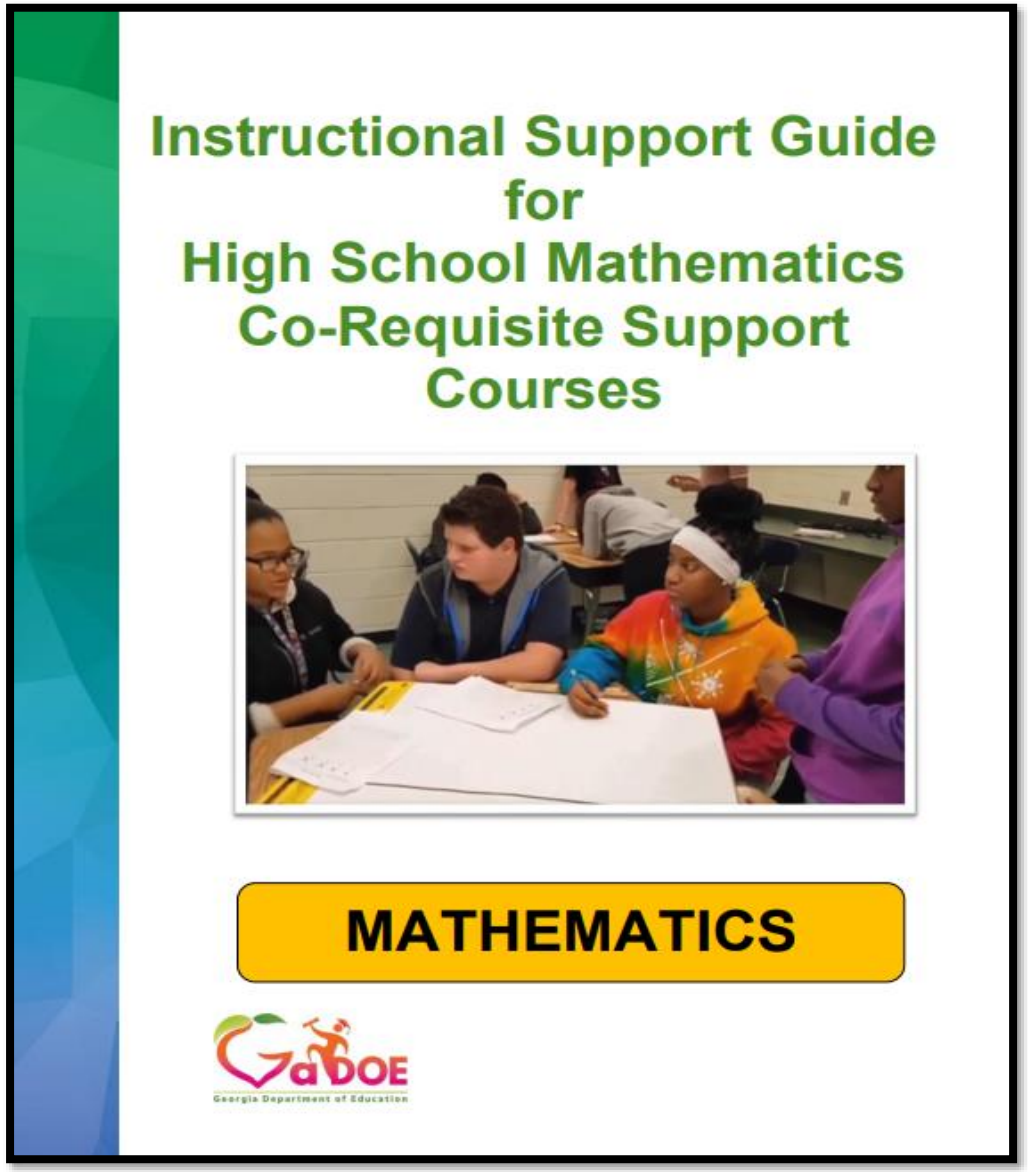
Graduation Requirement	*Course Number*	*Course Name*	*Federally Required Assessment(s)*
1 Required Unit of Core Credit in Mathematics	27.08210	Geometry: Concepts and Connections	None

AND

Graduation Requirement	*Course Number*	*Course Name*	*Federally Required Assessment(s)*
1 Required Unit of Core Credit in Mathematics *(two options)*	27.08310	Advanced Algebra: Concepts and Connections	None
	OR		
	27.09310	Enhanced Advanced Algebra and AP Precalculus: Concepts and Connections	None

Note: The chart above depicts the course sequence conducive to the success of the majority of students. Districts have flexibility to offer courses in the sequence they see fit to increase student outcomes and opportunities. For additional options, see *Mathematics Pathways to Postsecondary* on page 7. Georgia's three (3) required mathematics courses meet eligibility requirements for NCAA.

These courses are designed to fit the Georgia MTSS model to provide real-time intervention support for students aligned to the high school standards.



Important Note:

This follows the TCSG and USG model for Co-Requisite Support offered in real time.

[High-School-Mathematics-Co-Requisite-Support-Courses (gadoe.org)]

Additional Pathways for Students interested in Advanced Calculus Options in High School

Open Access for **ANY** intereste d student

NOTE:
Local Districts have the flexibility to create additional pathways that support student success based on the needs in their individual districts.

Personalized, Student-Centered Decision Points

Middle and High School Course-Taking Sequences and Pathways for All Students

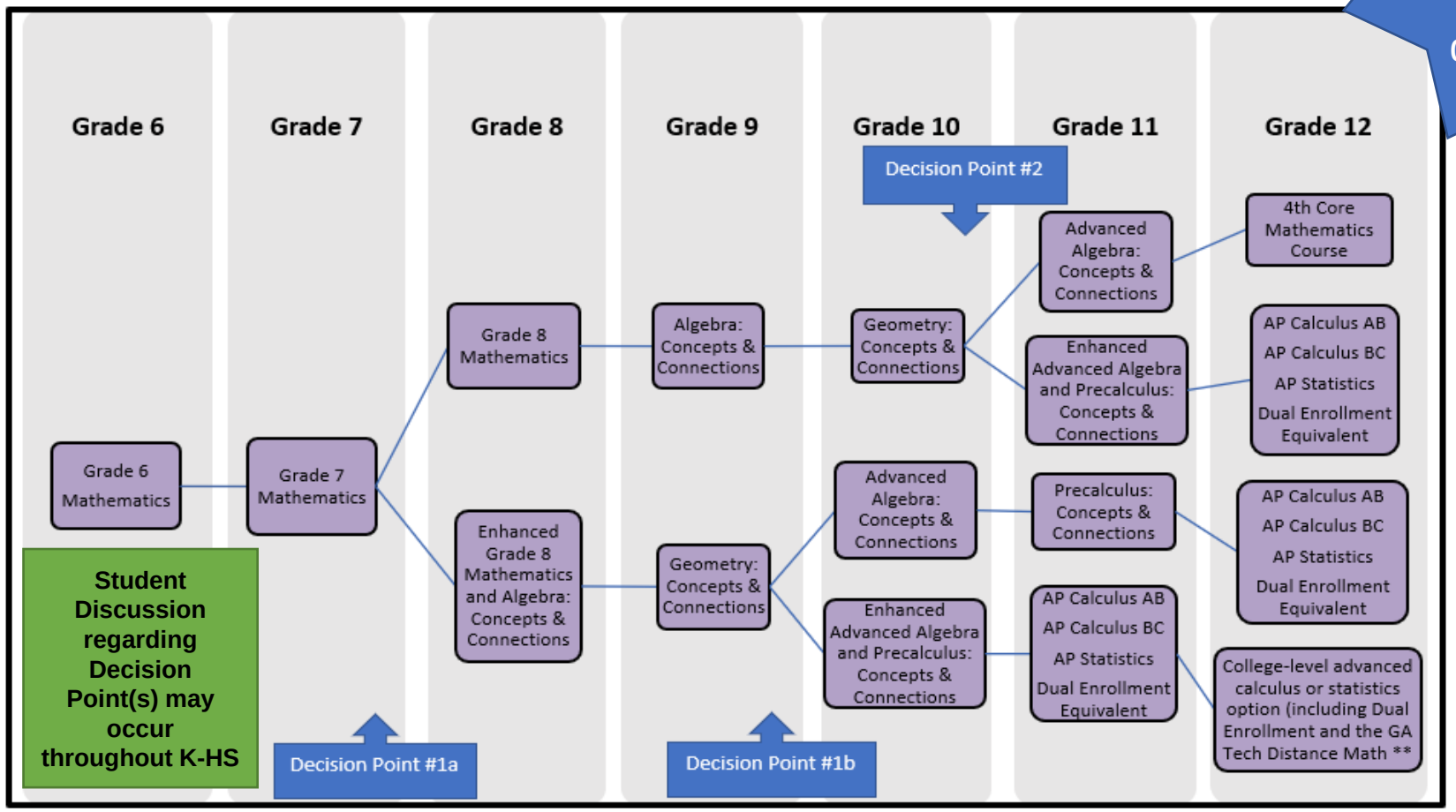
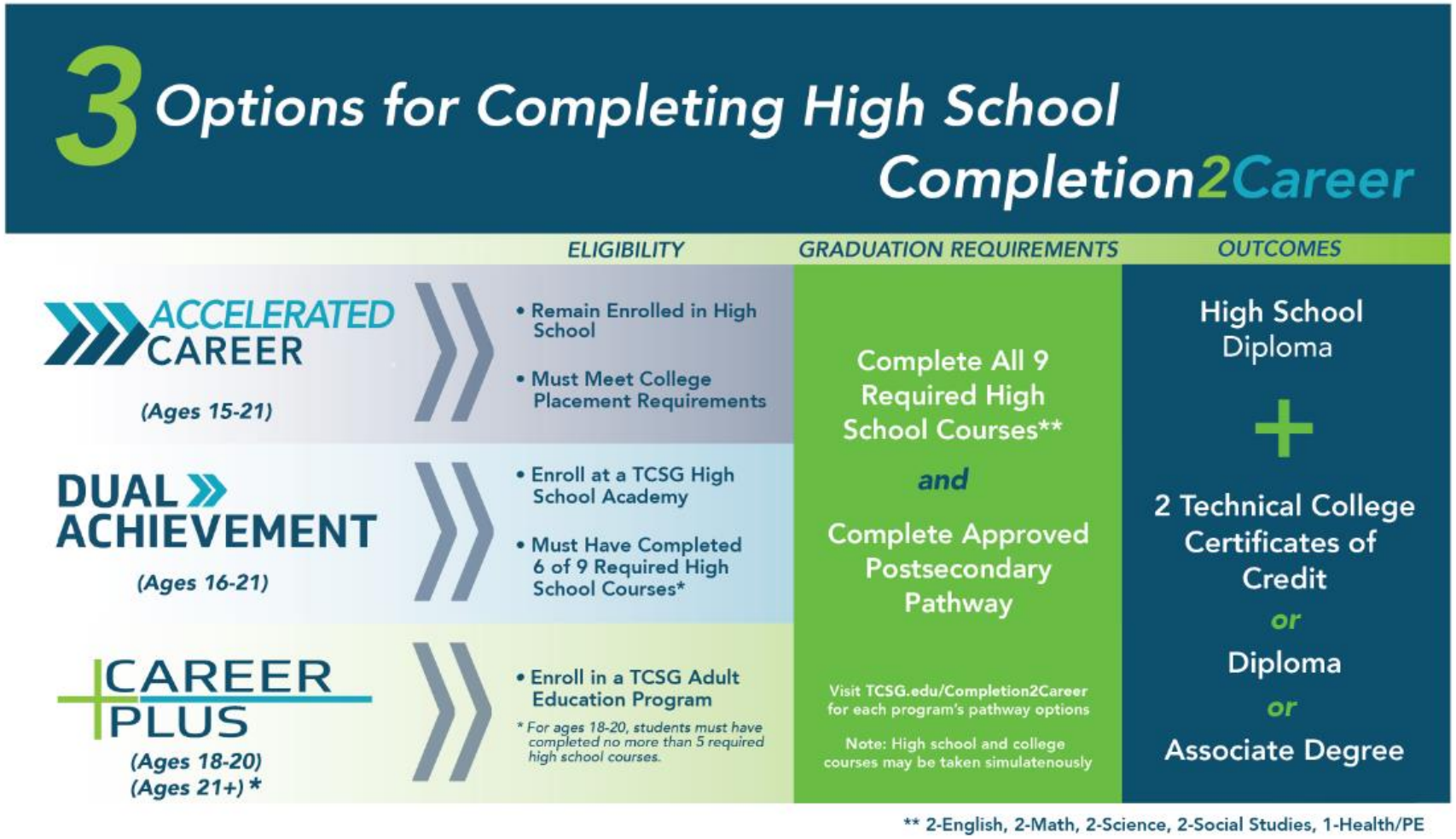


Figure 3. Mathematics Pathways to Graduation

***AP Calculus BC is required for the Georgia Tech Distance Mathematics Program*

Completion2Career TCSG Accelerated Career Opportunities

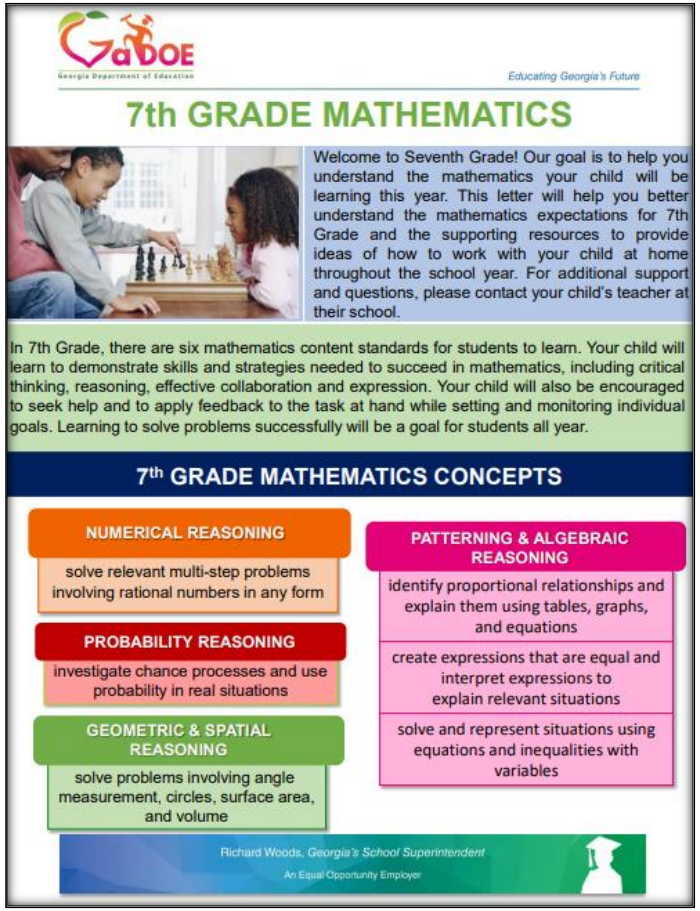


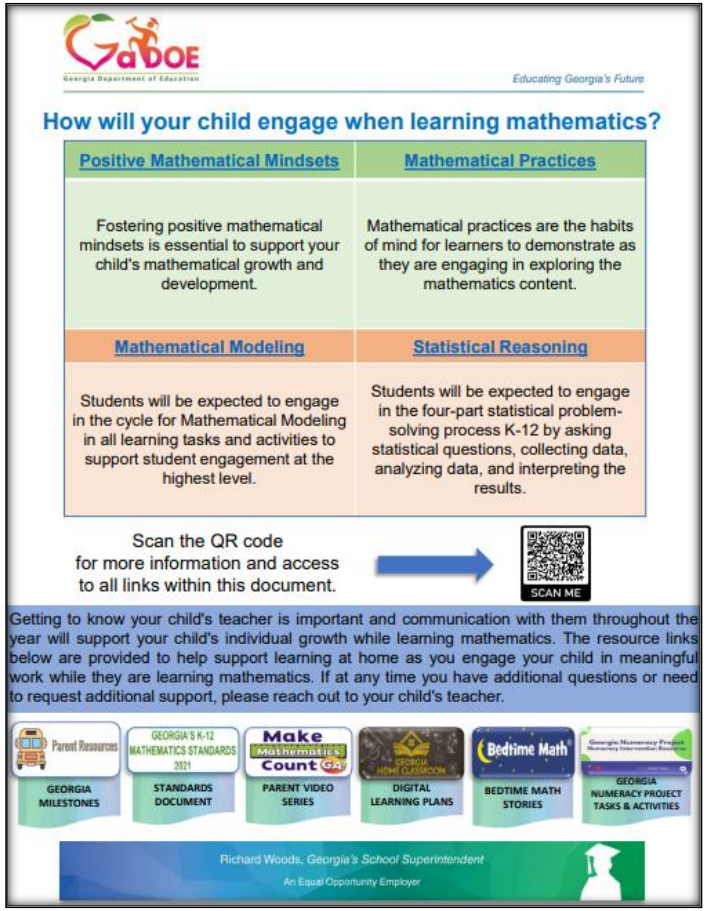
NEW

K-12 Mathematics Parent Letters



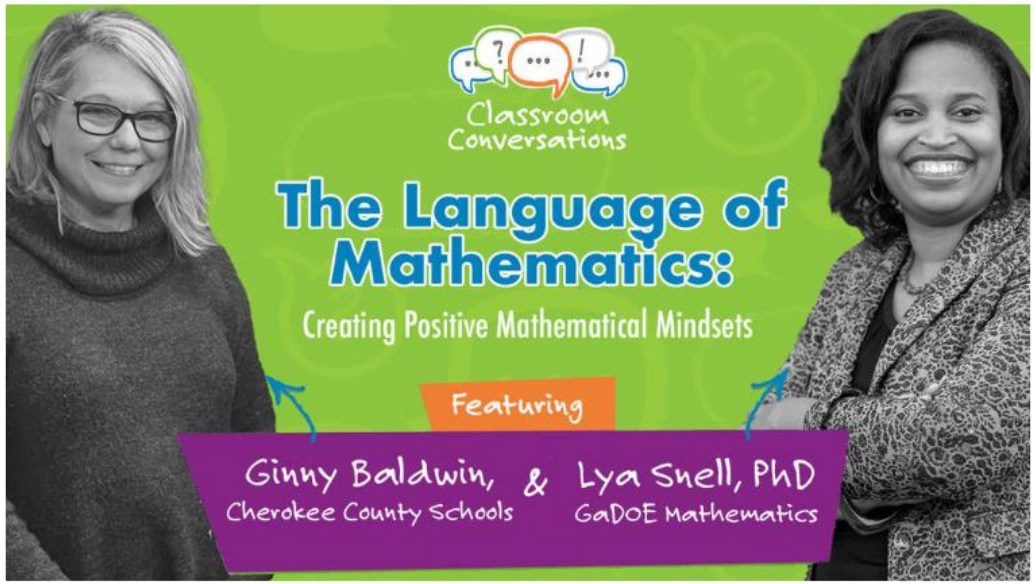
Make Mathematics Count GA!



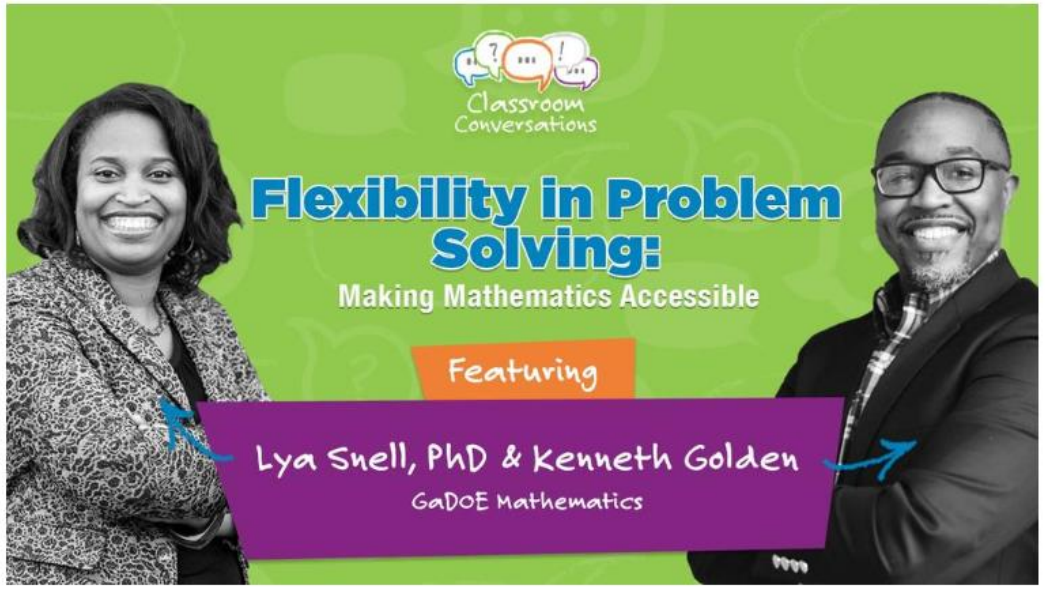


Classroom Conversations

NEW PODCASTS



https://www.gpb.org/blogs/classroom-conversations/2023/07/10/episode-317-the-language-of-mathematics-creating-positive



https://www.gpb.org/blogs/classroom-conversations/2023/07/10/episode-318-flexibility-in-problem-solving-making

MathCONnect

Mathematics Virtual Specialist Program 2023 – 2024

GEORGIA'S K-12 MATHEMATICS STANDARDS



November 15, 2023
Live, Synchronous Session
Click Here to Register!

\+ 3 Supporting Asynchronous Experiences



February 7, 2024
Live, Synchronous Session
Click Here to Register!

\+ 3 Supporting Asynchronous Experiences



March 27, 2024
Live, Synchronous Session
Click Here to Register!

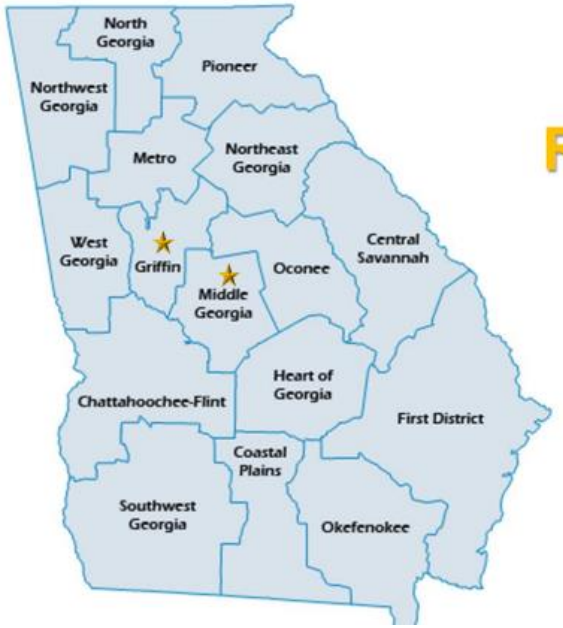
\+ 3 Supporting Asynchronous Experiences

MathCONnect

Virtual Specialist 2023 – 2024



Heather Cloud



K-12 Regional Support

Middle Georgia RESA
Griffin RESA

Grade K – 2

Synchronous Sessions & GaDOE Community

Back to Table of Contents

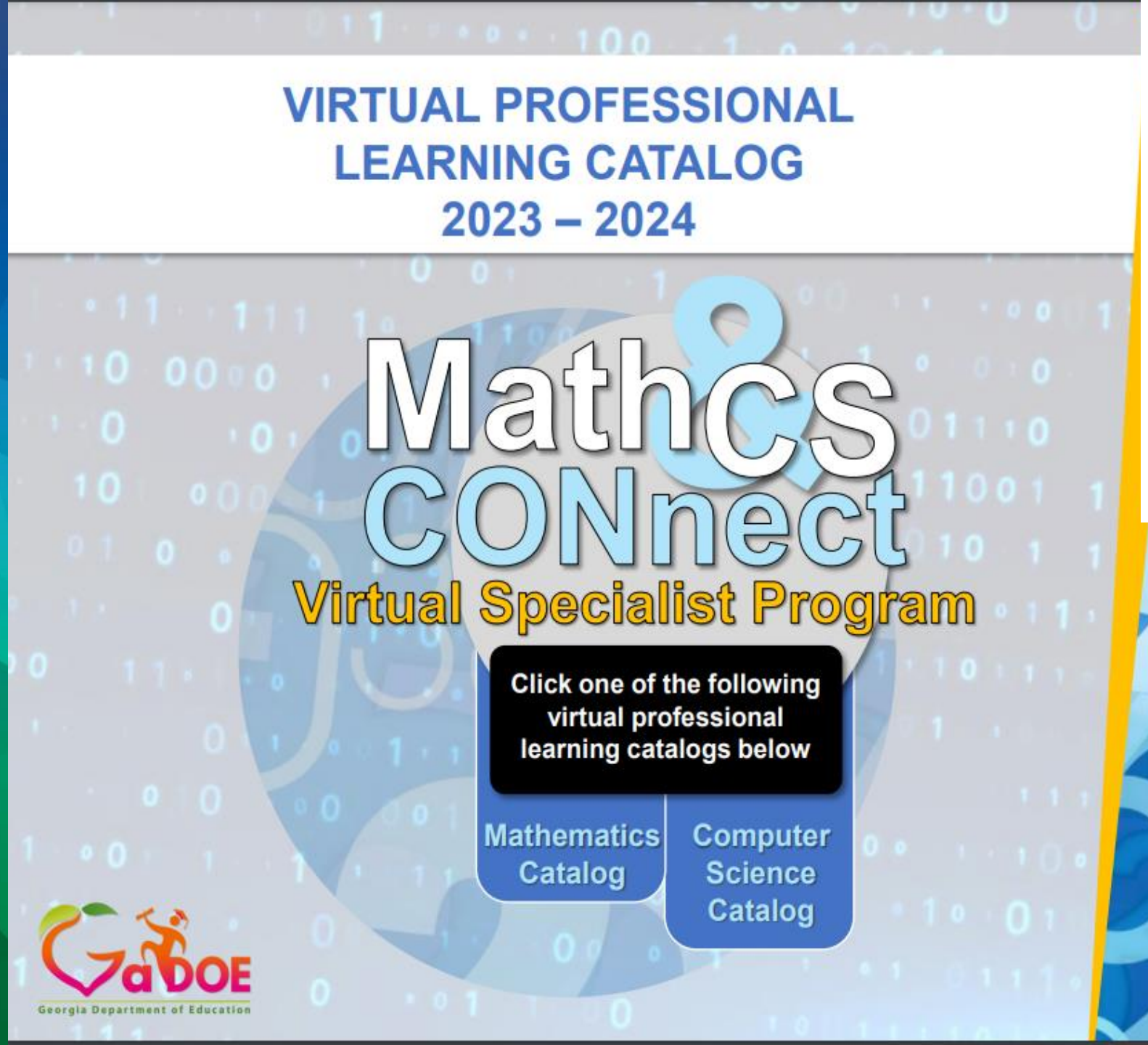


CLICK HERE TO SIGN UP!

GEORGIA'S K-12 MATHEMATICS STANDARDS

CONTACT INFORMATION

hcloud42@gmail.com



THANK YOU!

We would like to send a huge thank you to all of our virtual specialists who have committed to providing engaging learning experiences for teachers throughout Georgia!

SCAN ME

GaDOE Community

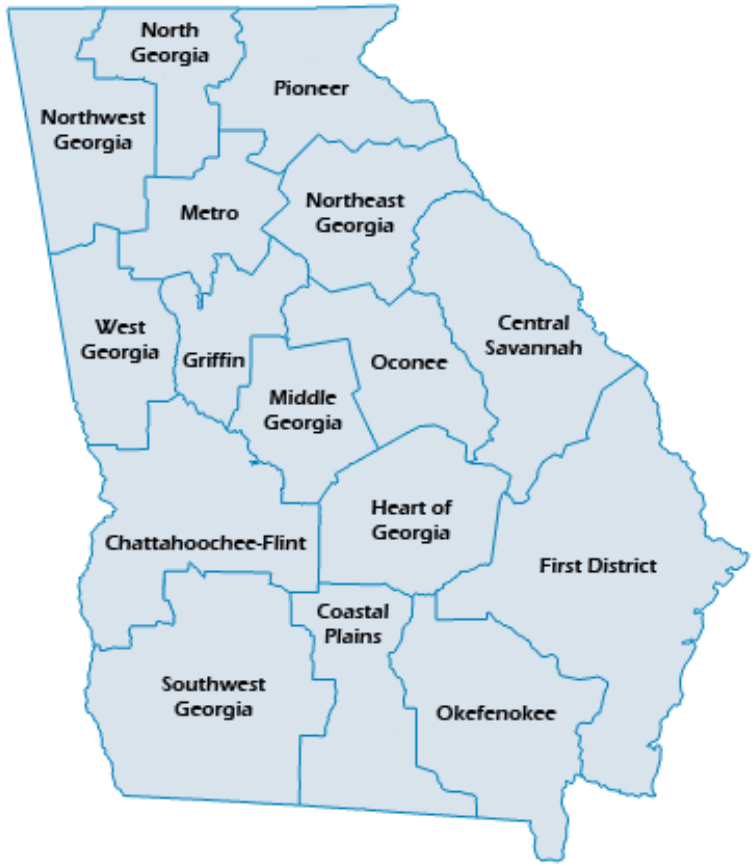


For more information visit
GaDOE Community Website

GaDOE Community provides:

- **GaDOE Professional Learning Catalog** – recorded and on-demand options; both virtual and in person
- GaDOE hosted collaborative groups – **Virtual Specialists**

Mathematics Mentor Program

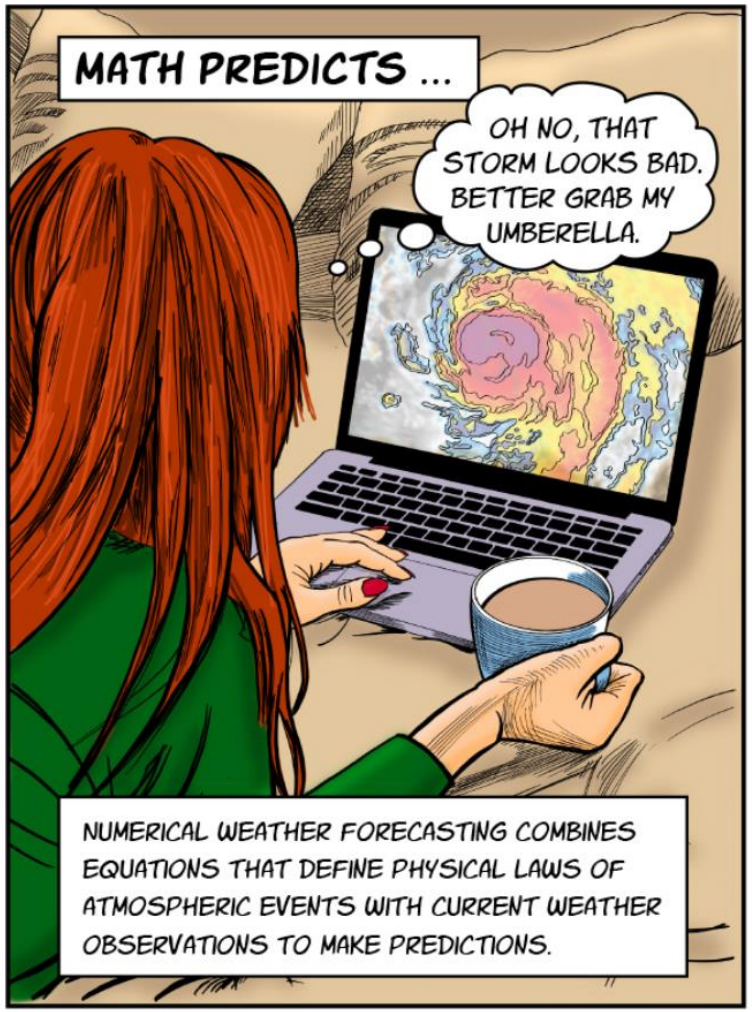


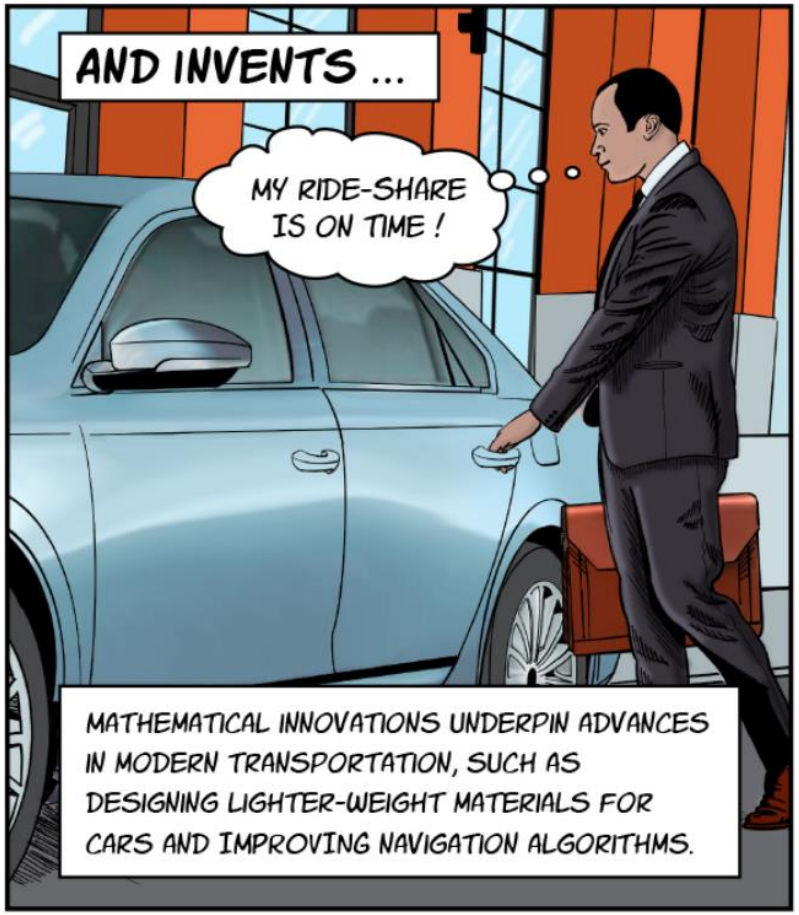
Learn more at www.gadoe.org/mathematics

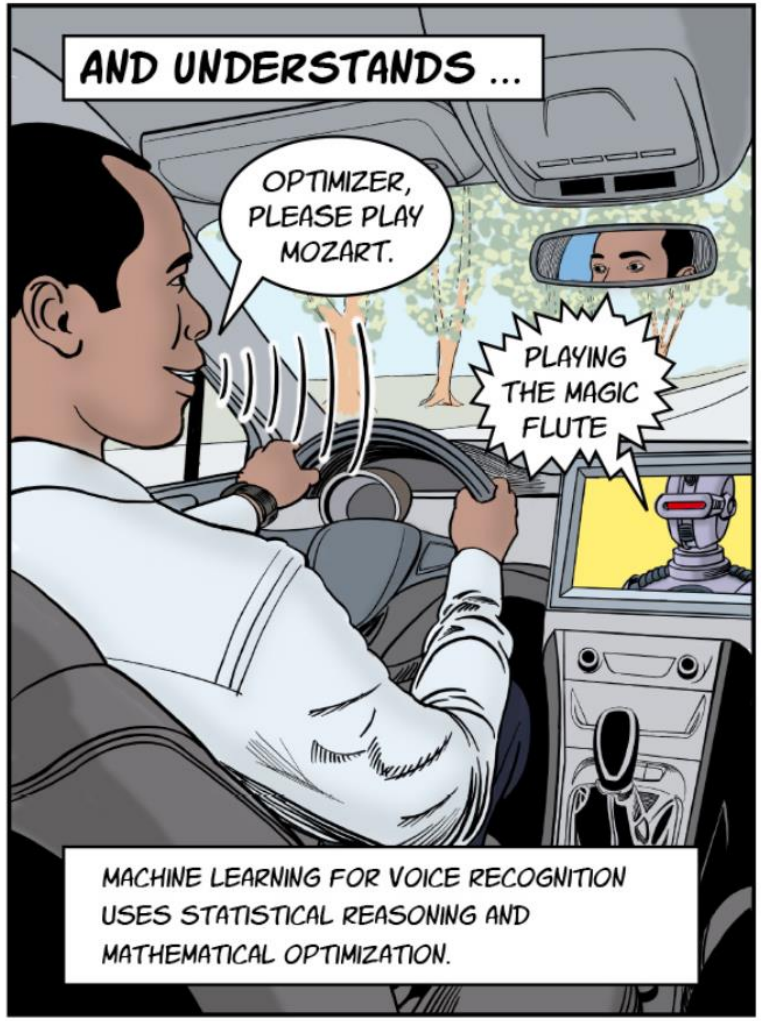
At EACH RESA, there is at least one mathematics content specialist dedicated to support the implementation of Georgia's K-12 Mathematics Standards.

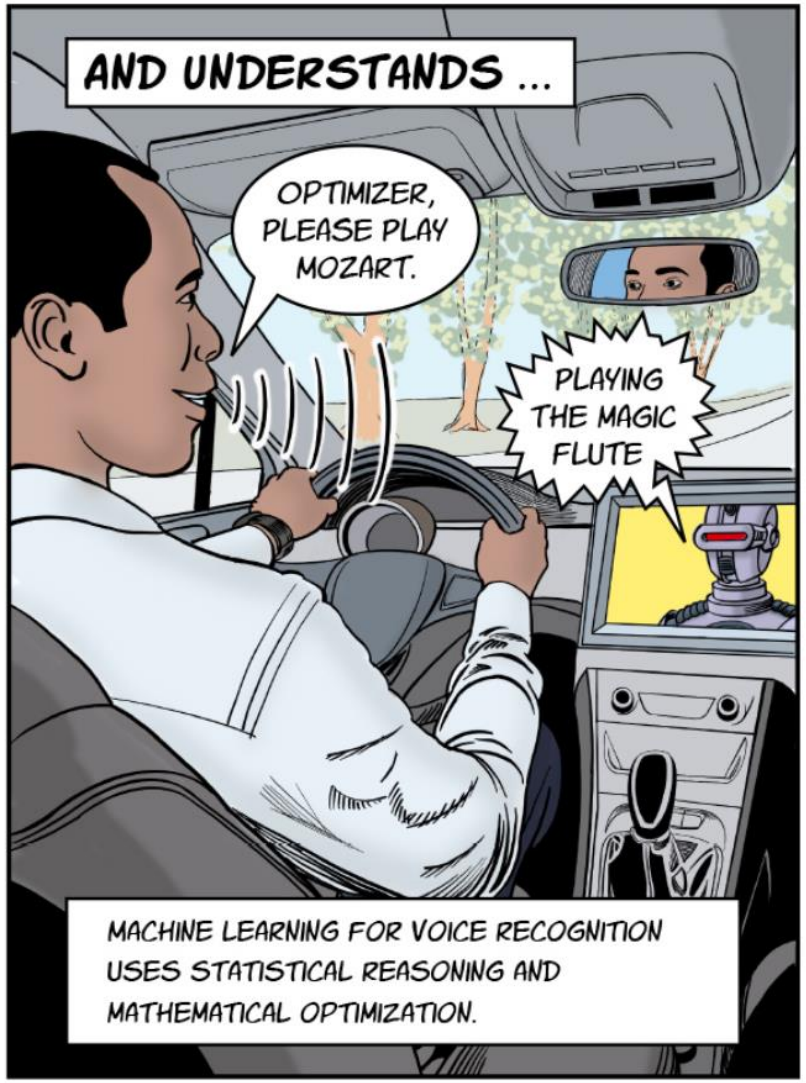
MATH IS THE HERO

NATIONAL ACADEMIES
Sciences
Engineering
Medicine

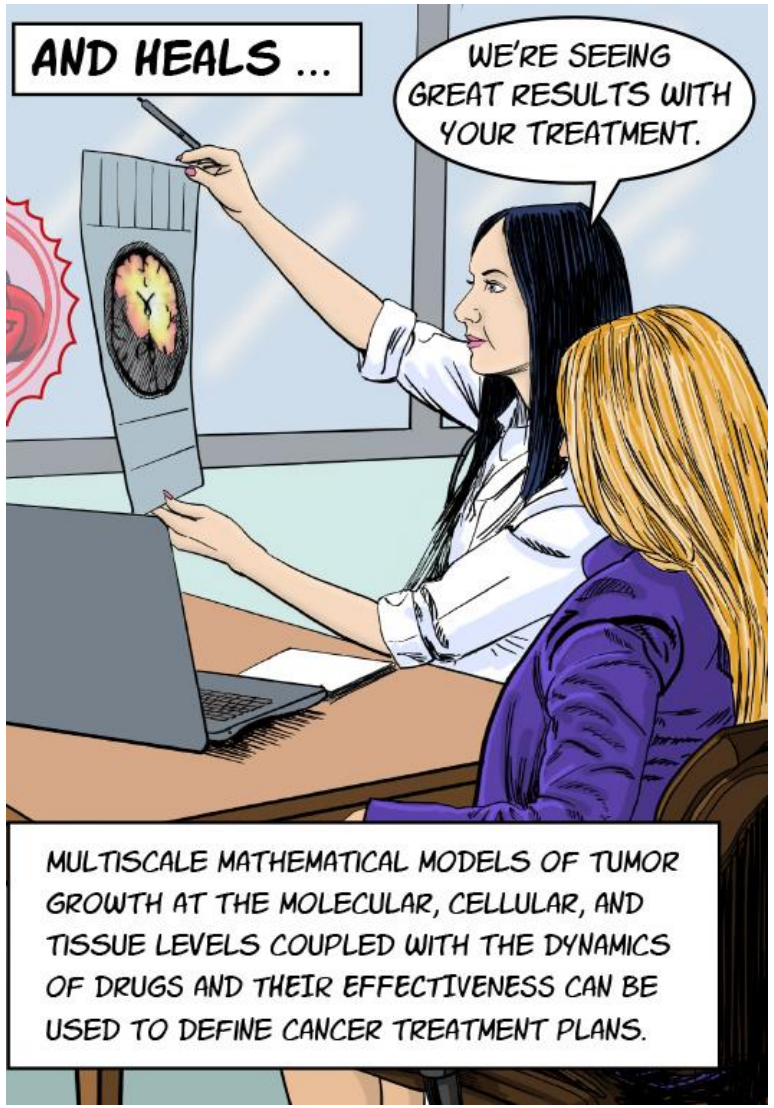

MATH PREDICTS ...
OH NO, THAT STORM LOOKS BAD. BETTER GRAB MY UMBERELLA.
NUMERICAL WEATHER FORECASTING COMBINES EQUATIONS THAT DEFINE PHYSICAL LAWS OF ATMOSPHERIC EVENTS WITH CURRENT WEATHER OBSERVATIONS TO MAKE PREDICTIONS.

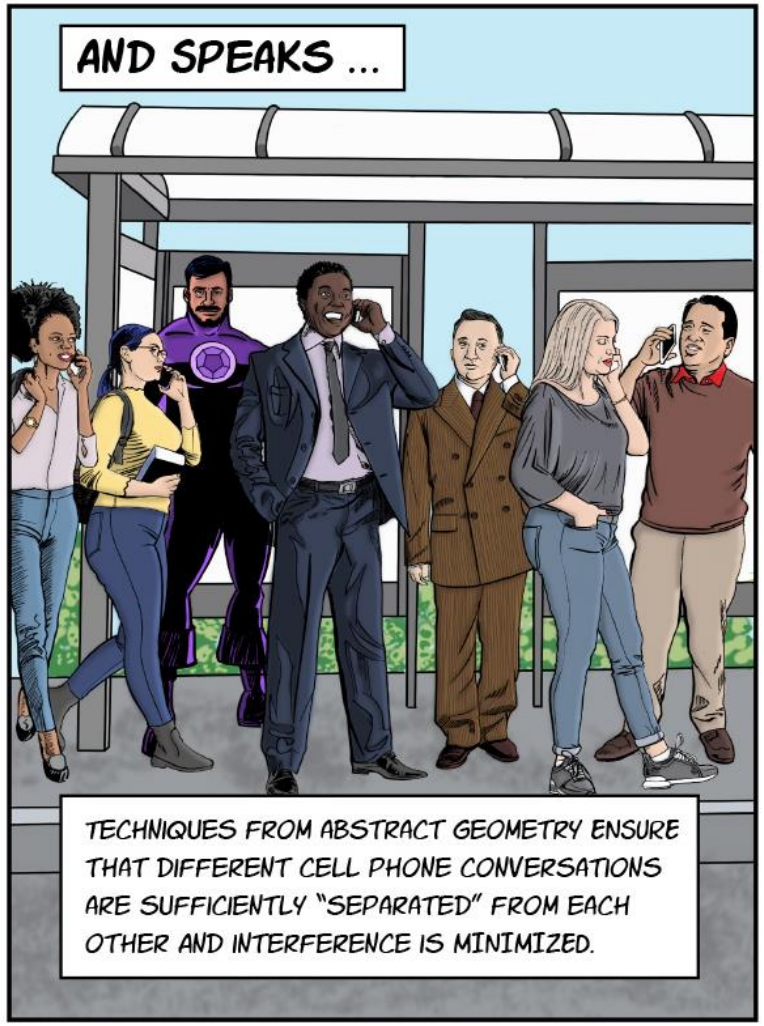

AND INVENTS ...
MY RIDE-SHARE IS ON TIME !
MATHEMATICAL INNOVATIONS UNDERPIN ADVANCES IN MODERN TRANSPORTATION, SUCH AS DESIGNING LIGHTER-WEIGHT MATERIALS FOR CARS AND IMPROVING NAVIGATION ALGORITHMS.


AND UNDERSTANDS ...
OPTIMIZER, PLEASE PLAY MOZART.
PLAYING THE MAGIC FLUTE
MACHINE LEARNING FOR VOICE RECOGNITION USES STATISTICAL REASONING AND MATHEMATICAL OPTIMIZATION.


AND UNDERSTANDS ...
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PLAYING THE MAGIC FLUTE
MACHINE LEARNING FOR VOICE RECOGNITION USES STATISTICAL REASONING AND MATHEMATICAL OPTIMIZATION.

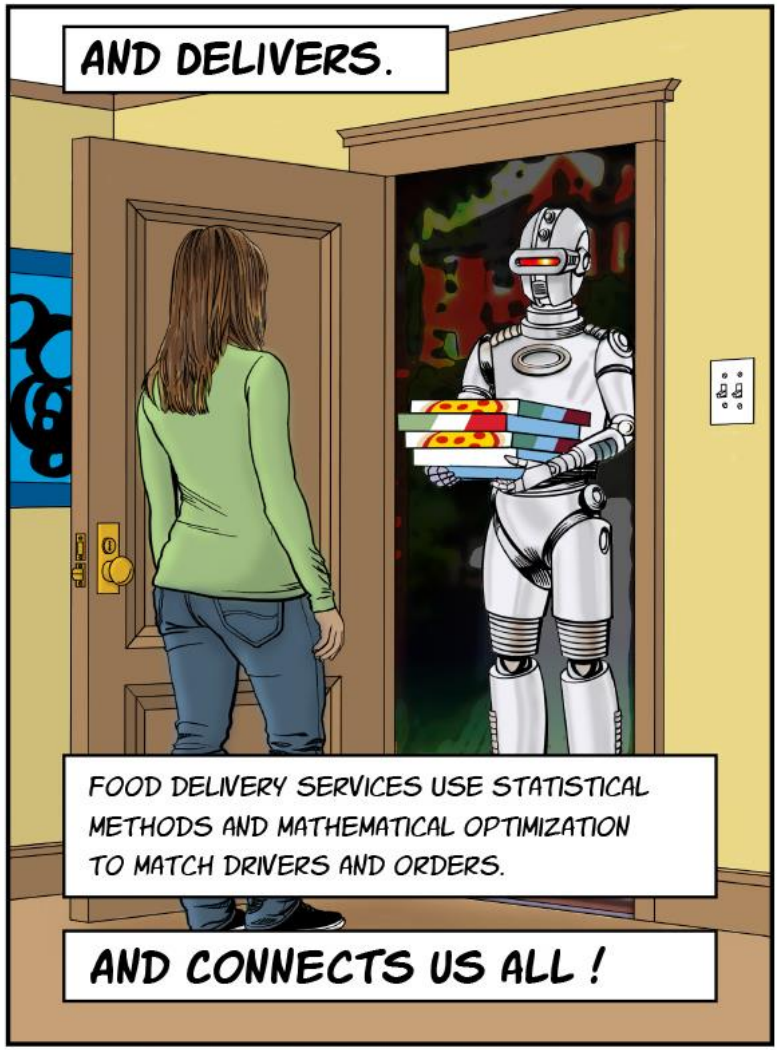

AND DIAGNOSES ...
THIS SCAN WILL HELP US UNDERSTAND WHAT IS GOING ON INSIDE YOUR BODY.
THE RADON TRANSFORM AND THE FILTERED BACK PROJECTION PIECE TOGETHER X-RAYS TAKEN FROM MANY ANGLES TO CREATE A COHERENT IMAGE OF THE BODY PART SCANNED.


AND HEALS ...
WE'RE SEEING GREAT RESULTS WITH YOUR TREATMENT.
MULTISCALE MATHEMATICAL MODELS OF TUMOR GROWTH AT THE MOLECULAR, CELLULAR, AND TISSUE LEVELS COUPLED WITH THE DYNAMICS OF DRUGS AND THEIR EFFECTIVENESS CAN BE USED TO DEFINE CANCER TREATMENT PLANS.


AND SPEAKS ...
TECHNIQUES FROM ABSTRACT GEOMETRY ENSURE THAT DIFFERENT CELL PHONE CONVERSATIONS ARE SUFFICIENTLY "SEPARATED" FROM EACH OTHER AND INTERFERENCE IS MINIMIZED.


GEOMETRO
DOCTOR WAVELET
ENCRYPTO
THE OPTIMIZER


AND PROTECTS ...
FOUR PIZZAS SHOULD BE ENOUGH FOR EVERYONE.
PIZZA DELIVERY
16"
12"
CHEESE
VEGGIE
MEAT
SIDES
DRINKS
PUBLIC KEY CRYPTOGRAPHY IS A MATHEMATICAL WAY TO SECURE ONLINE TRANSACTIONS.


AND DELIVERS.
FOOD DELIVERY SERVICES USE STATISTICAL METHODS AND MATHEMATICAL OPTIMIZATION TO MATCH DRIVERS AND ORDERS.
AND CONNECTS US ALL !

Let's Make Mathematics Learning Relevant and Fun for Students!!





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YOUR GADOE MATHEMATICS TEAM IS HERE TO SERVE YOU!

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Important Websites

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

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

Curriculum Resources:
www.georgiastandards.org

Professional Learning Conferences:
www.gadoe.org/mathcon



Thank You for Your Commitment to Georgia's Learners!

