Alexandria City Public Schools

Mathematical Progression and Services in ACPS

TAGAC Meeting
February 13, 2023

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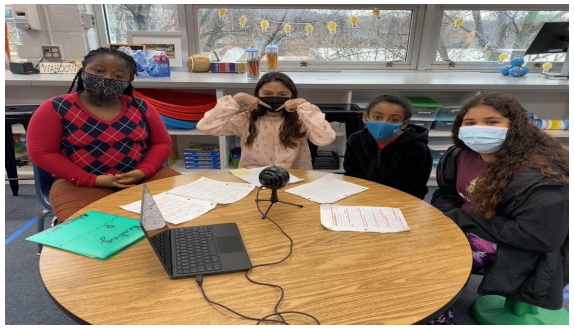
Agenda

1. Number sense routine
2. Virginia Department of Education (VDOE) updates
3. National and VDOE recommendations in math education
4. Teaching for deeper learning
5. Triangle lesson example (acceleration vs. deeper learning)
6. Current ACPS practices and data



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Number Talk

12 x 22

Think about the problem, solve on your own and be ready to share your strategy.

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VDOE Timeline to Update Standards

2022–2023 School Year	• A draft of the proposed 2023 Mathematics Standards of Learning (SOL) is presented for review and public comment.
September 2023	• The Superintendent of Public Instruction presents the proposed 2023 Mathematics SOL to the Board of Education for final review and adoption. • The Department of Education posts the final approved documents on its website.
2024–2025 School Year	• Crosswalk year: The 2016 and 2023 Mathematics SOL are included in the written and taught curriculum. • SOL assessments measure the 2016 SOL and include field- test items measuring the 2023 SOL.
2025–2026 School Year	• Full-implementation year: The written and taught curriculum reflect the 2023 Mathematics SOL. • SOL assessments measure the 2023 Mathematics SOL.

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Catalyzing Change in School Mathematics Key Recommendations

Broaden the purposes of learning mathematics.

Each and every student should develop **deep mathematical understanding**; **comprehend** and **critique** the world through mathematics; and **experience** the **wonder, joy, and beauty** of mathematics, which all contribute to a **positive mathematical identity**.

Create equitable structures in mathematics.

Middle school mathematics should **dismantle inequitable structures,** including tracking teachers, as well as the practice of ability grouping and tracking students into qualitatively different courses.

Implement equitable mathematics instruction.

Mathematics instruction should be **consistent** with **research-informed** and **equitable teaching** practices that **foster** students' **positive mathematical identities**.

Develop deep mathematical understanding.

Middle schools should offer a **common, shared pathway** grounded in the use of mathematical practices and processes to coherently **develop deep mathematical understanding,** ensuring the **highest-quality mathematics education** for each and every student.

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Virginia's 5 C's

The "Five C's" are foundational principles developed by the Virginia Department of Education that help students meet the demands and expectations of modern society. These principles inform the Profile of a Virginia Graduate and set new expectations for student instruction.

- Citizenship
- Creative Thinking
- Communication
- Collaboration
- Critical Thinking

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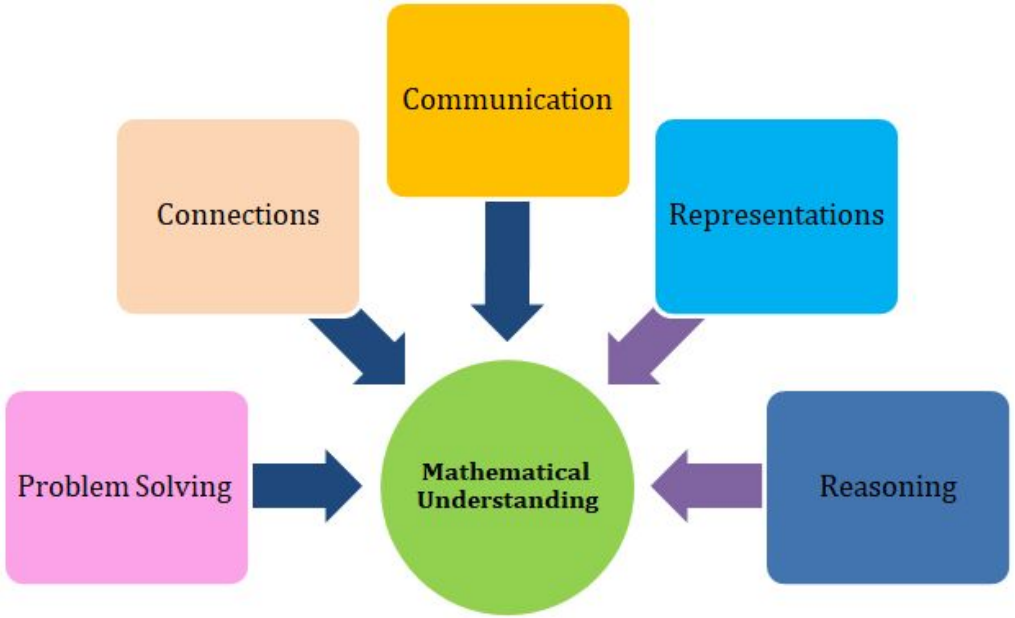
Mathematics Process Goals for Students

"The content of the mathematics standards is intended to support the five process goals for students."

- 2019 and 2016 Mathematics Standards of Learning



Grade 6 Mathematics **Strand: Patterns, Functions, and Algebra**

6.12 The student will

a) represent a proportional relationship between two quantities, including those arising from practical situations;
b) determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table;
c) determine whether a proportional relationship exists between two quantities; and
d) make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.

Understanding the Standard

- A ratio is a comparison of any two quantities. A ratio is used to represent relationships within a quantity and between quantities.
- Equivalent ratios arise by multiplying each value in a ratio by the same constant value. For example, the ratio of 4:2 would be equivalent to the ratio 8:4, since each value in the first ratio could be multiplied by 2 to obtain the second ratio.
- A proportional relationship consists of two quantities where there exists a constant number (constant of proportionality) such that each measure in the first quantity multiplied by this constant gives the corresponding measure in the second quantity.
- Proportional thinking requires students to thinking multiplicatively, versus additively. The relationship between two quantities could be additive (i.e., one quantity is a result of adding a value to the other quantity) or multiplicative (i.e.., one quantity is the result of multiplying the other quantity by a value). Therefore, it is important to use practical situations to model proportional relationships, because context can help students to see the relationship. Students will explore algebraic representations of additive relationships in grade seven.
  - Example:

Additive relationship:

x	y
2 $\xrightarrow{+8}$	10
3 $\xrightarrow{+8}$	11
4 $\xrightarrow{+8}$	12
5 $\xrightarrow{+8}$	13

Multiplicative relationship:

x	y
2 $\xrightarrow{\cdot 5}$	10
3 $\xrightarrow{\cdot 5}$	15
4 $\xrightarrow{\cdot 5}$	20
5 $\xrightarrow{\cdot 5}$	25

Essential Knowledge and Skills

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Make a table of equivalent ratios to represent a proportional relationship between two quantities, when given a ratio. (a)
- Make a table of equivalent ratios to represent a proportional relationship between two quantities, when given a practical situation. (a)
- Identify the unit rate of a proportional relationship represented by a table of values or a verbal description, including those represented in a practical situation. Unit rates are limited to positive values. (b)
- Determine a missing value in a ratio table that represents a proportional relationship between two quantities using a unit rate. Unit rates are limited to positive values. (b)
- Determine whether a proportional relationship exists between two quantities, when given a table of values or a verbal description, including those represented in a practical situation. Unit rates are limited to positive values. (c)
- Determine whether a proportional relationship exists between two quantities given a graph of ordered pairs. Unit rates are limited to positive values. (c)

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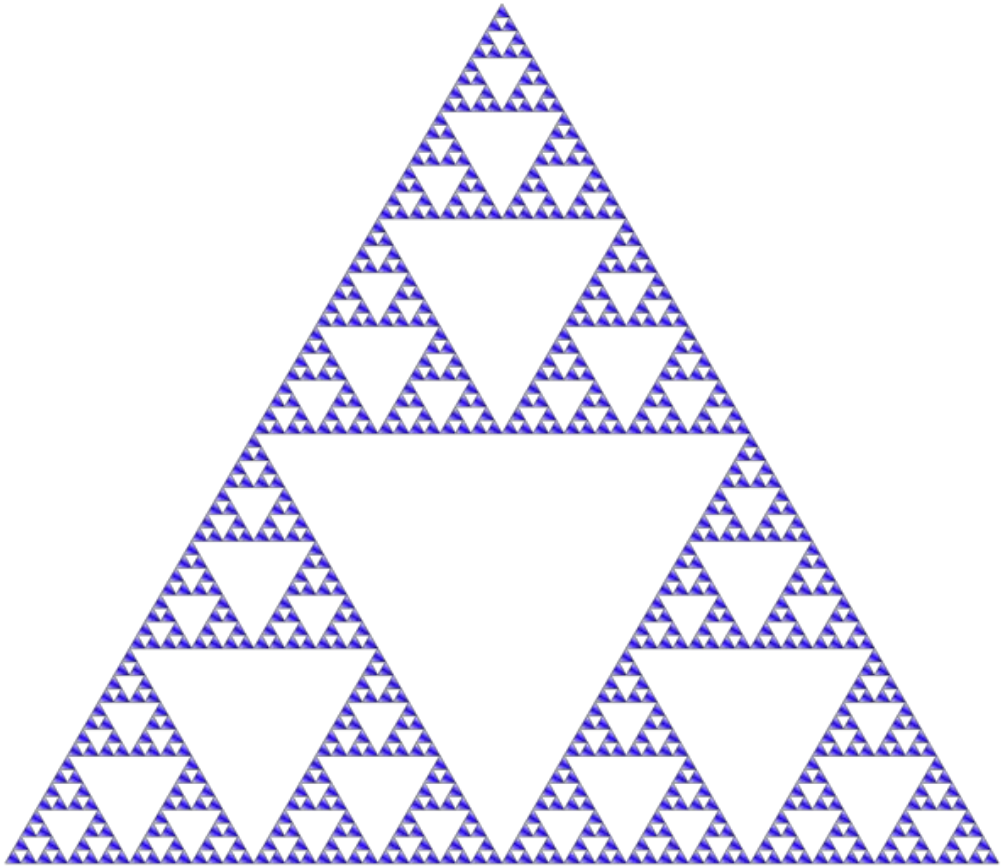
Triangle Lesson



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Can any three side lengths be used to form a triangle?

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Investigation Directions

Time: 5 minutes

Structure: Partners

Use the Exploragons to find side lengths that will make a triangle and side lengths that will not make a triangle. Record your results on the chart paper.

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Investigation

With your partner make a conjecture about what three lengths will form a triangle.

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Traditional Instruction

Triangle Inequality Theorem: The sum of any two sides of a triangle must be greater than the measure of the third side.

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Traditional Instruction

What is the range of the third side of a triangle when given two sides?

Rule: The length of the third side of a triangle must always be **between (but not equal to) the sum and the difference of the other two sides**. For instance, take the example of 2, 6, and 7. and . Therefore, the third side length must be greater than 4 and less than 8.

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Traditional Instruction

Determine whether the following lengths will form a triangle.

a. 5 in., 2 in., 8 in.

b. 6 cm, 18 cm, 15 cm

c. 5 ft., 6 ft., 9 ft.

d. 7 in., 7 in., 8 in.

e. 1.2 mi., 4.0 mi., 1.8 mi.

f. 10 mm, 10 mm, 0.001 mm

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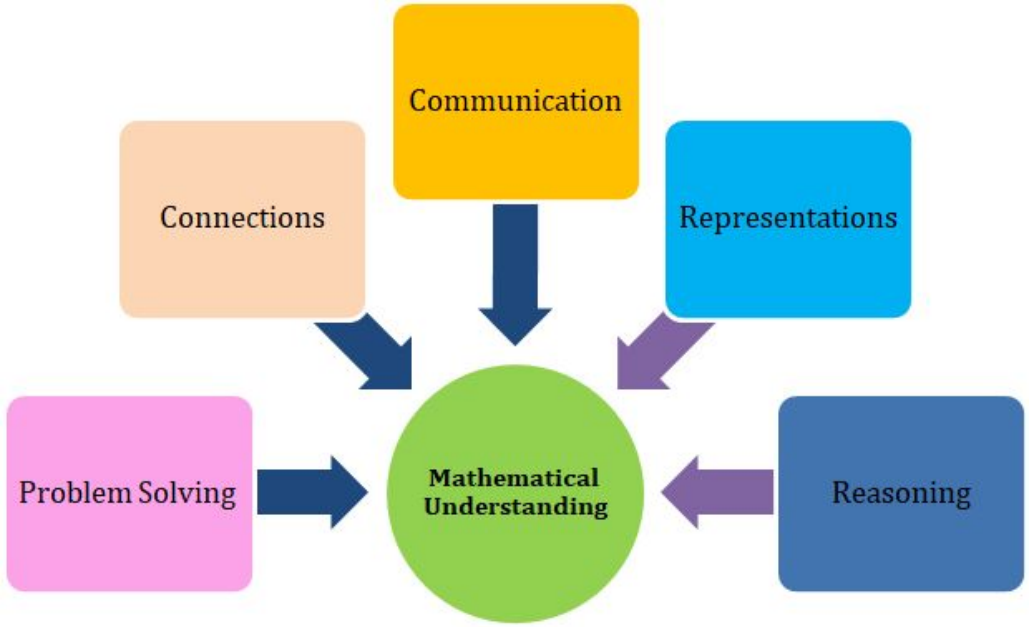
Triangle Lesson Reflection



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Barriers to teaching for deeper understanding

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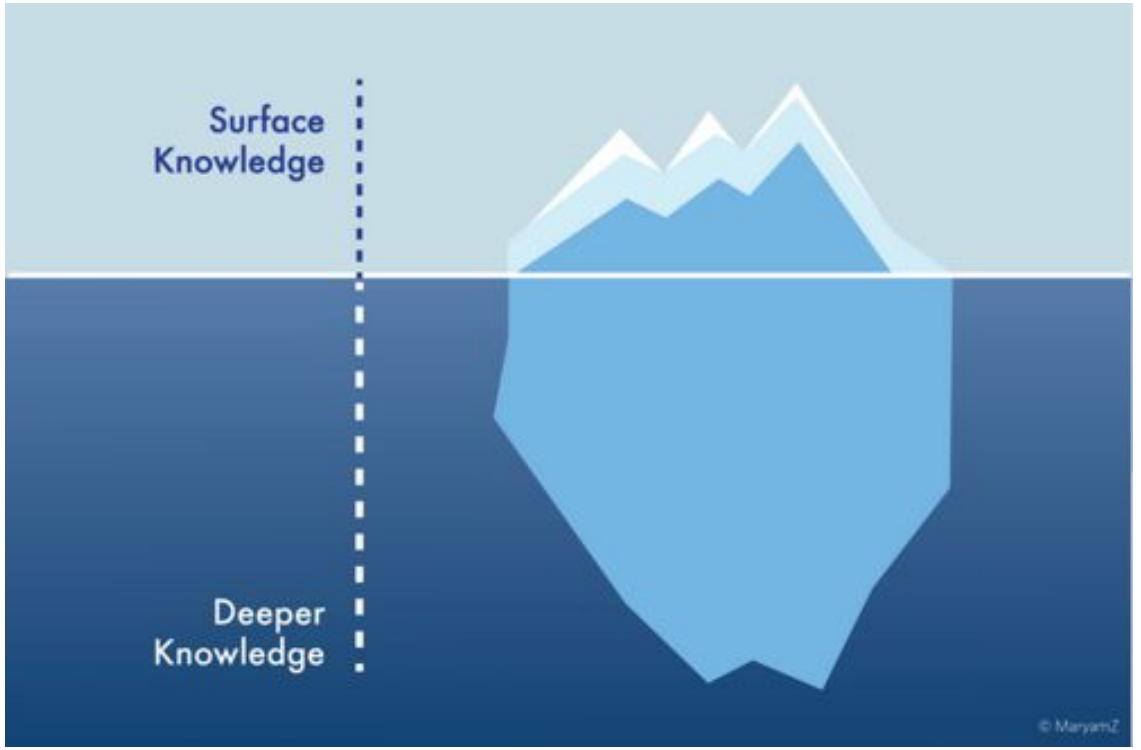
4th Grade TAG Math Curriculum

- Compacted Course includes all of grade 4 and grade 5 math in one year
- Covers 71 Discrete Standards of Learning



Current Practices and Data

What does data say about our current practices?

Grade	Typical ACPS Math Progression	Progression of Math Compared to Other VA Districts	ACPS TAG Math Course Progression	Acceleration Level Compared VA Districts	Algebra 1 in 6th Grade Progression	Acceleration Level
4th Grade	4th Grade Math	On-Grade Level	4th/5th Compacted Math	1 Year	4th/5th Compacted Math	1 Year
5th Grade	5th Grade Math	On-Grade Level	Math 6 Honors	1 Year	Math 6 Honors	1 Year
6th Grade	6th Grade Math	On-Grade Level	Math 7 Honors	1 Year	Algebra I	3 Years
7th Grade	7th Grade Math	On-Grade Level	Algebra I	2 Years	Geometry	3 Years
8th Grade	Algebra I	1 Year	Geometry	2 Years	***Algebra II (online)	3 Years
9th Grade	Geometry	1 Year	***Algebra II	2 Years		
10th Grade	Algebra II or AFDA	1 Year				

NWEA MAP Data - 8th Grade TAG

NWEA MAP Math Assessment Data for current 8th grade TAG identified students

Percentile Range	0-49	50-59	60-69	70-79	80-89	90-94	95-99
Fall 21-22	8%	10%	13%	24%	31%	8%	6%
Winter 21-22	8%	9%	15%	32%	24%	10%	3%
Spring 21-22	8%	8%	16%	34%	23%	5%	5%
Fall 22-23	18%	17%	15%	17%	24%	6%	4%
Winter 22-23	17%	6%	16%	19%	22%	13%	7%

2021-22 Math SOL Data for Students

	Advanced	Proficient	Passed	Failed
Grade 3	7%	43%	50%	50%
Grade 4	2%	43%	45%	55%
Grade 5	5%	43%	47%	53%
Grade 6	7%	37%	44%	56%
Grade 7	5%	42%	46%	54%
Algebra I	3%	46%	49%	51%
Geometry	4%	49%	54%	46%

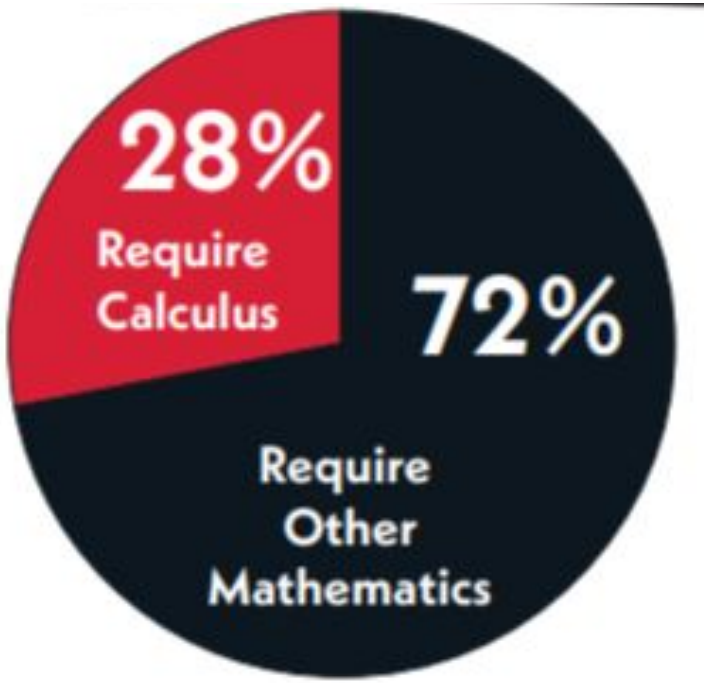
Course Enrollment

DE Calc III & Differential Equations

Year	Enrollment
2022-23	<10
2021-22	<10
2020-21	<10

Why the Race to Calculus?

NOT ALL COLLEGE MAJORS NEED CALCULUS!



Burdman, P. (2015). Degrees of Freedom: Diversifying math requirements for college readiness and graduation. Oakland, CA: Learning Works and Policy Analysis for California Education

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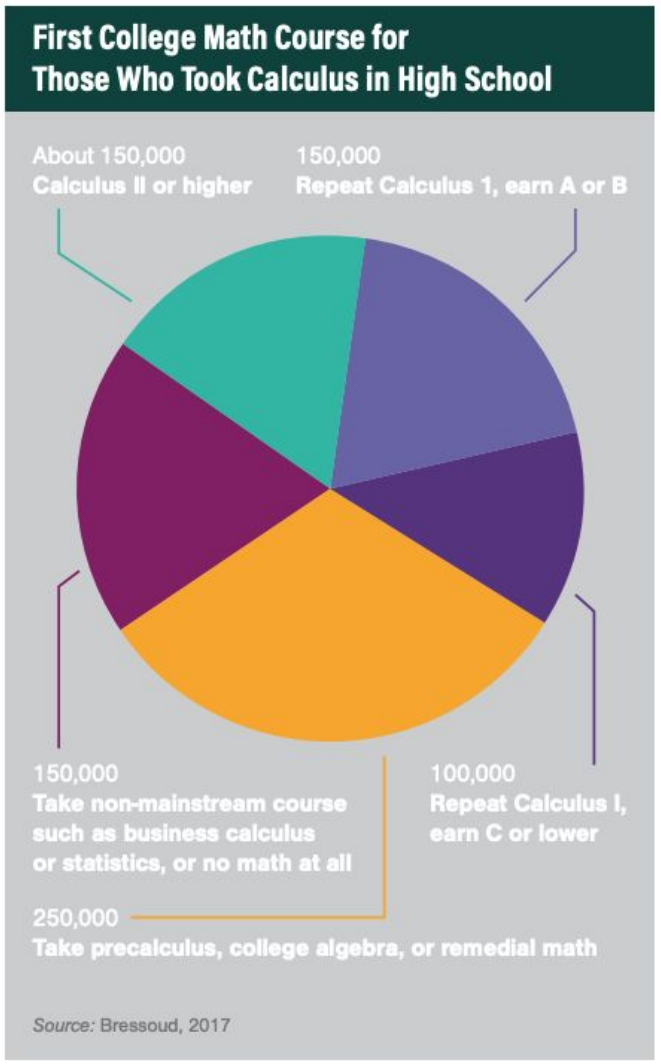
VIRGINIA DEPARTMENT OF EDUCATION

Who is Taking Calculus in College?



First College Math Course for Those Who Took Calculus in High School

- **18.75%** - Take Calculus II or Higher

- **18.75%** - Retake Calculus I and earn A or B
- **12.5%** - Retake Calculus I and earn C or lower
- **31.25%** - Take Precalculus, College Algebra, or Remedial Mathematics
- **18.75%** - Take a Non-Calculus Mainstream Course (e.g., Business Calculus or Statistics)

Bressoud, *The Role of Calculus in the Transition from High School to College Mathematics*, MAA and NCTM, 2017.

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Reflection and Commitment

From a parent's perspective, what programmatic shifts should ACPS make to strengthen the gifted mathematical services to ensure high quality instruction and engagement for our children/students?

Alexandria City Public Schools

Questions?

Suzanne Futrell, Secondary Mathematics Instructional Specialist

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Dr. Gregory C. Hutchings, Jr.

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