



CCSSM: From Theory to Practice

Julie McNamara

Florida Association of Mathematics Supervisors

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Orlando, Florida





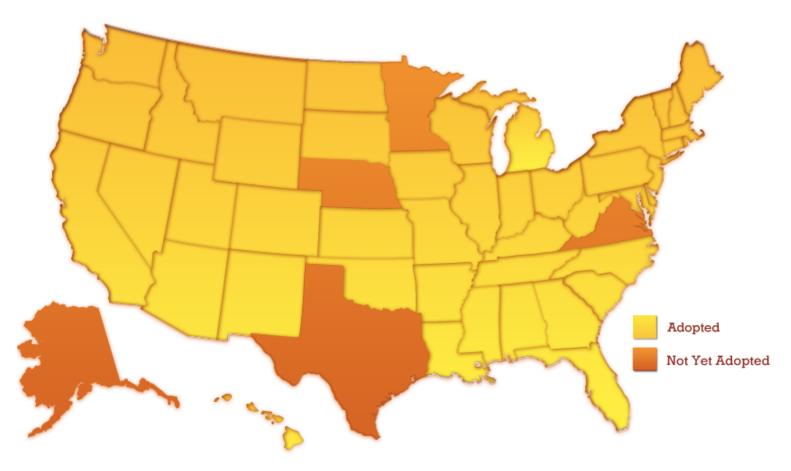


CCSS History/Overview

- State-led effort coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO).
- Three main authors Phil Daro, Bill McCallum (mathematician), and Jason Zimba (physicist), plus commission of 75 others
- As of April, 45 states have officially adopted
- Adoption required for Race to the Top funds



State Adoption









The Standards

- Are aligned with college and work expectations;
- Are clear, understandable and consistent;
- Include rigorous content and application of knowledge through high-order skills;
- Build upon strengths and lessons of current state standards;
- Are informed by other top performing countries, so that all students are prepared to succeed in our global economy and society; and
- Are evidence-based.







Goals of the Common Core

- Provide a clear, consistent framework to prepare students for college and the workforce
- Clearly communicate student expectations at every grade level
- Provide rigorous standards that are consistent across states and provide teachers, parents, and students with a set of clear expectations that everyone can work toward together





What the CCSS Do Not Do

- Dictate curriculum or teaching methods
- Define intervention methods or materials to support students who are well below or well above grade level expectations
- Define the full range of supports appropriate for English language learners and for students with special needs





Intent of the CCSS

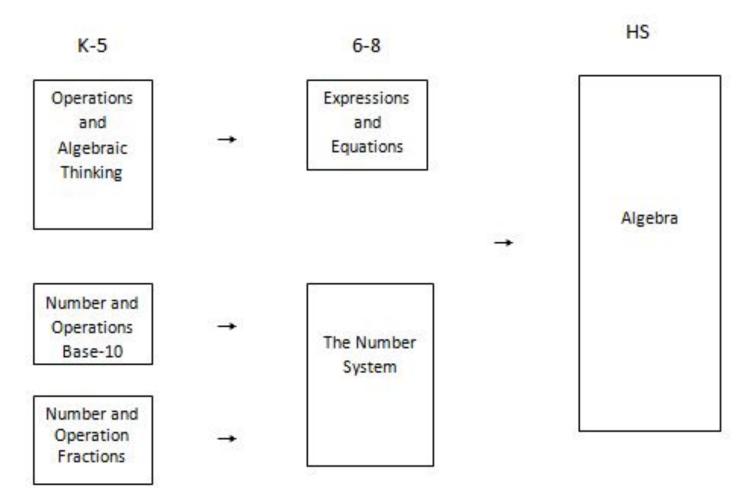
College and Career Readiness

- Focus
- Coherence
- Rigor





Example of Coherence









(Standards for Mathematical Content (CCSS) Kindergarten: Geometry

Analyze, compare, create, and compose shapes.

K.G6: Compose simple shapes to form larger shapes.







Standards for Mathematical Content (CCSS) Grade 1: Geometry

Reason with shapes and their attributes.

1.G3: Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of.
Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.







Standards for Mathematical Content (CCSS) Grade 2: Geometry

Reason with shapes and their attributes.

2.G3: Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.







Standards for Mathematical Content (CCSS)

Grade 3: Number and Operations – Fractions

Develop understanding of fractions as numbers.







©Standards for Mathematical Content (CCSS) Grade 4: Number and Operations – Fractions

Extend understanding of fraction equivalence and ordering.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Understand decimal notation for fractions, and compare decimal fractions.







Standards for Mathematical Content (CCSS)

Grade 5: Number and Operations – Fractions

Use equivalent fractions as a strategy to add and subtract fractions.

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.







©Standards for Mathematical Content (CCSS) Grade 6: The Number System

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Apply and extend previous understandings of numbers to the system of rational numbers.







Standards for Mathematical Content (CCSS) Grade 7: The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.





(Standards for Mathematical Content (CCSS) Grade 8: The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.





New Comprehensive Assessment Systems

- Two assessment consortia
 - Partnership for the Assessment of Readiness for College and Careers (PARCC)
 - SMARTER Balanced Assessment Consortium
- Designed to replace individual state tests in ELA and mathematics.
- Usher in a new and different approach to assessment design.







Four Basic Principles

- Assessments are common across states and aligned to the CCSS
- Students take "performance-based" assessments for accountability
- The assessment systems are "computer-based" for more sophisticated design and quick, reliable scoring.
- Transparent reporting systems drive effective decision-making.





CCSS Standards

- Standards for Mathematical Content
 - What is taught at each grade level
- Standards for Mathematical Practice
 - How content is taught at all grade levels

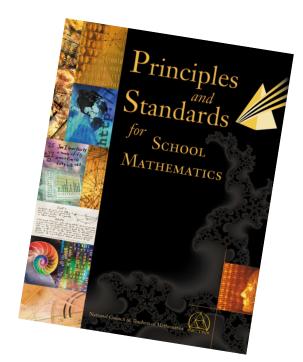




Principles and Standards for School Mathematics

Process Standards

- Problem Solving
- Reasoning
- Communication
- Connections
- Representation



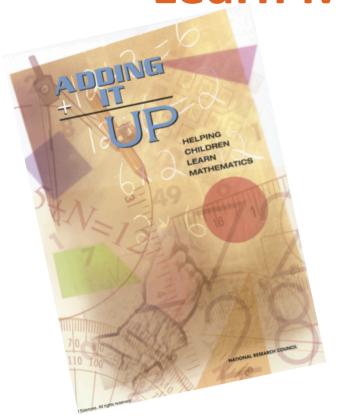
Principles and Standards for School Mathematics, ©2000 by the National Council of Teachers of Mathematics. All rights reserved.

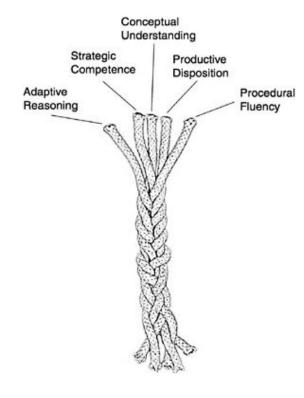






Adding It Up: Helping Children Learn Mathematics





Adding It Up: Helping Children Learn Mathematics,
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Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 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.
- Look for and express regularity in repeated reasoning.





(*) Standards for Mathematical Practice

Student Practices



Teacher Practices





The Mathematical Practices in Action

A Peek into Classrooms







When watching the clips....

Assume positive intent

 Focus on how the teacher creates opportunities for students to engage in the Mathematical Practices





Standards for Mathematical Practice

Mathematical Practice #1:

Make sense of problems and persevere in solving them.





Kindergarten Example: How many students are wearing shoelaces?

- What mathematics are the kindergarteners making sense of?
- How does the teacher help Maimouna clarify and share her thoughts?
- How does the teacher help the class orient to the thinking of Maimouna?





View clip 1.1a, "A First Look at Productive Math Discourse," from *Classroom Discussions: Seeing Math Discourse in Action*.





Turn and Talk







Kindergarten Example: How many students are wearing shoelaces?

- What mathematics are the kindergarteners making sense of?
- How does the teacher help Maimouna clarify and share her thoughts?
- How does the teacher help the class orient to the thinking of Maimouna?





Standards for Mathematical Practice

Mathematical Practice #3:

Construct viable arguments and critique the reasoning of others.





Grade 3 Example Subtraction: 70 - 34

 What strategies (arguments) would you anticipate?

What challenges would you anticipate?

 How does Ms. Montgomery enable students to engage in MP3?







View clip 3.4 "Subtraction: 70 – 34," from Number Talks: Helping Children Build Mental Math and Computation Strategies."





Grade 3 Example Subtraction: 70 - 34

 How does Ms. Montgomery enable students to engage in MP3?





Standards for Mathematical Practice

Mathematical Practice #4:

Model with mathematics.







Grade 5 Example: Volume of a rectangular prism

 How does Mrs. Foley help students understand how the mathematics (the formula) describes the volume?





View clip 6.2, "Developing Methods for Volume of Rectangular Prisms," from *Classroom Discussions:*Seeing Math Discourse in Action.





Grade 5 Example: Volume of a rectangular prism

 How does Mrs. Foley help students understand how the mathematics (the formula) describes the volume?





Standards for Mathematical Practice

Mathematical Practice #7:

Look for and make use of structure.





Middle/High School Example: Arrays

Using all one color, build a 4 x 4 array.

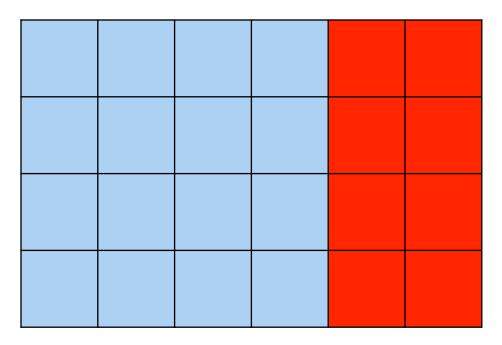
4 x 4







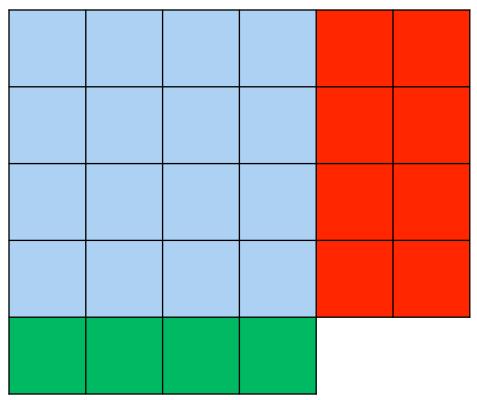
Using a different color, add two columns on the right.







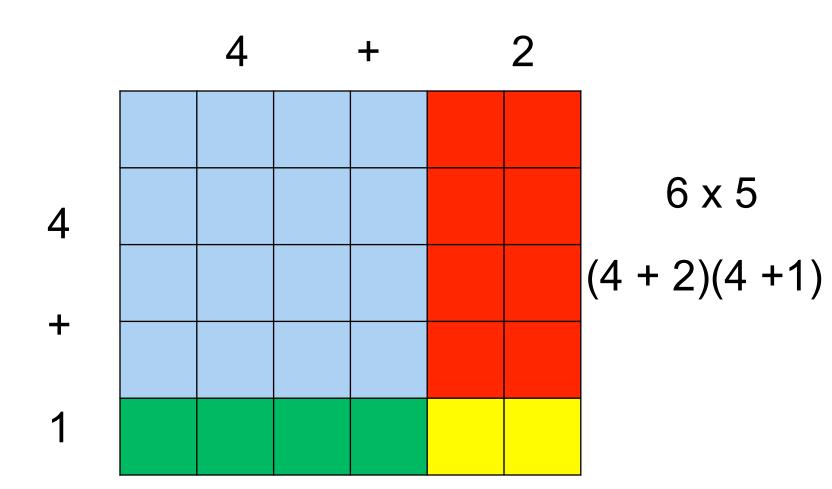
Using a third color, add one row along the bottom of the original square only.





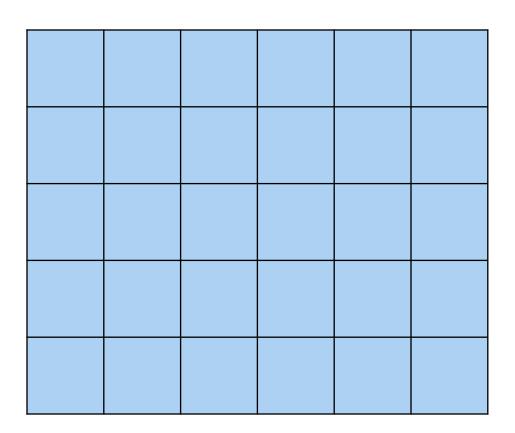


Finally, using the fourth color, complete the rectangle.





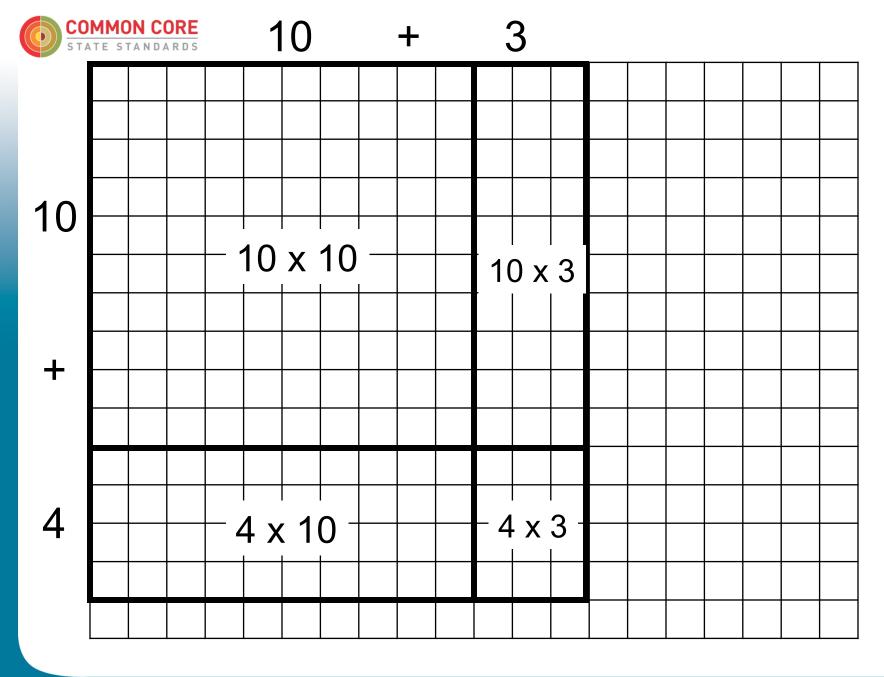
Repartition your large rectangle another way.

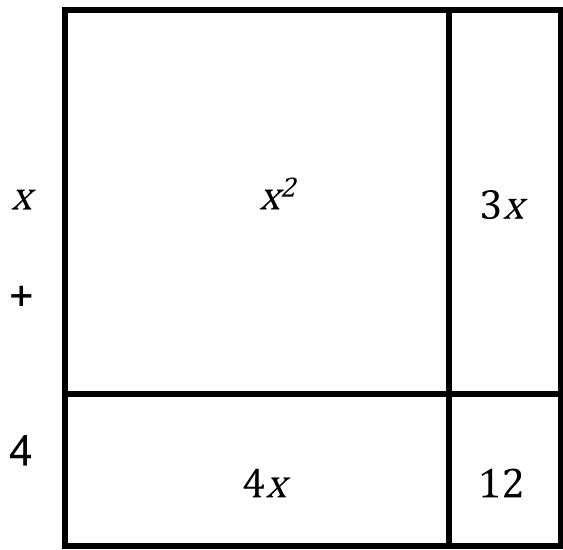














$$(x + 3)(x + 4) = x^2 + 3x + 4x + 12 = x^2 + 7x + 12$$

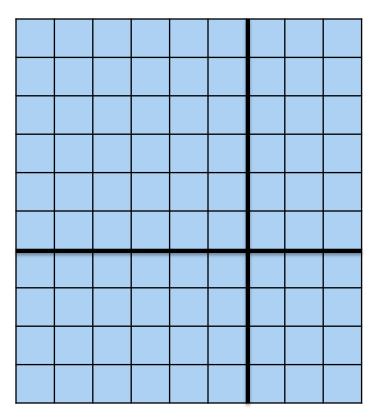
 $x + 3$

<i>X</i>	x ²	3 <i>x</i>
4	4 <i>x</i>	12





Mathematical Practice #7: Look for and make use of structure.



$$= x^2 + 7x + 12$$





Mathematical Properties

- Properties of Operations
- Properties of Equality
- Properties of Inequality





Comparing Standards

NY Grade 3

Use a variety of strategies to add and subtract 3-digit numbers (with and without regrouping).

CCSS Grade 3

Use **place value understanding** and **properties of operations** to perform multi-digit arithmetic.

- Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- Explain why addition and subtraction strategies work, using place value and the properties of operations.







Distributive Property in Action

View clip 3.5 "Multiplication String: 7 x 7," from Number Talks: Helping Children Build Mental Math and Computation Strategies."







Reflecting on the Video

- How were students using the distributive property to find the answer to 7 x 7?
- How did the teacher's intentional use of the problem string encourage this?





Continuing to Focus on the Properties

- Review the multiplication chart in your folder.
- Identify patterns that appear in the chart.
- Identify properties that make these patterns possible or that these patterns illustrate.





X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9

The numbers in the two rows are identical and increase by 1 moving from left to right.

This is because each number in the top row is multiplied by 1 and written in the row below.

The Multiplicative Identity Property of 1 states that

$$a \times 1 = 1 \times a = a$$
.







Think, Pair, Share

- Investigate the multiplication chart on your own.
- Discuss with a partner.
- Share the patterns and properties with your table groups.





Identifying Patterns

4	6	8	10	12	14
6	တ	12	15	18	21
8	12	16	20	24	28
10	15	20	25	30	35
12	18	24	30	36	42
14	21	28	35	42	49



 $16 \cdot 25 = 20 \cdot 20$

$$(4 \bullet 4)(5 \bullet 5) = (4 \bullet 5)(4 \bullet 5)$$





Identifying Patterns

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54



The Distributive Property

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18

$$1 \bullet 2 + 3 \bullet 2 = 4 \bullet 2$$

$$2(1+3) = 2+6=8$$



Identifying Patterns

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54



Problem Types

- Addition/Subtraction
- Multiplication/Division

Carpenter et al. (1999) *Children's Mathematics: Cognitively Guided Instruction.*Portsmouth, NH: Heinemann.







Writing Word Problems

 Write one addition and one subtraction problem that would be relevant/ appropriate to your students.

Share your problems with others at your table.





Problem Types

Addition and Subtraction

Result Unknown
Change Unknown
Start Unknown

Add To

Take From

Put Together/Take

Apart

Compare

What kind of problems did you write?







School Bus Problem

There are 295 students in the school.

School buses hold 25 students.

How many school buses are needed to fit all the students?





View clip "Marisa School Bus Problem," from the MRI website:

https://mathreasoninginventory.com/Home/ AssessmentsOverview







Problem Types

Multiplication and Division

Product Unknown
Number of Groups
Unknown
Group Size Unknown

Equal Groups
Arrays/Area
Compare





How can focusing on different problem types help students engage in the Standards for Mathematical Practice?





Engaging in Constructive Struggle

"All students need to constructively struggle—to get to the good stuff."

—Cathy Seeley, Faster Isn't Smarter







Typical Flow of a Math Class

Demonstrate a procedure.

Assign similar problems for students to practice.

Assign homework.





Upside-Down Teaching

Start with a rich problem.

Engage students in dealing with the problem.

Discuss, compare, interact.

Help students connect and notice what they have learned.

Assign exercises and homework.





Conclusion

The promise of standards

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep.

p. 5 Common Core State Standards for Mathematics







For more information about Math Solutions and the MRI go to:

www.mathsolutions.com

www.mathreasoninginventory.com







For the full text of the CCSS go to:

http://www.corestandards.org







mathsolutions.com 800.868.9092 info@mathsolutions.com



