



Math Solutions.
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Helping Teachers Transition to the Common Core: What They Need to Know **NOW**

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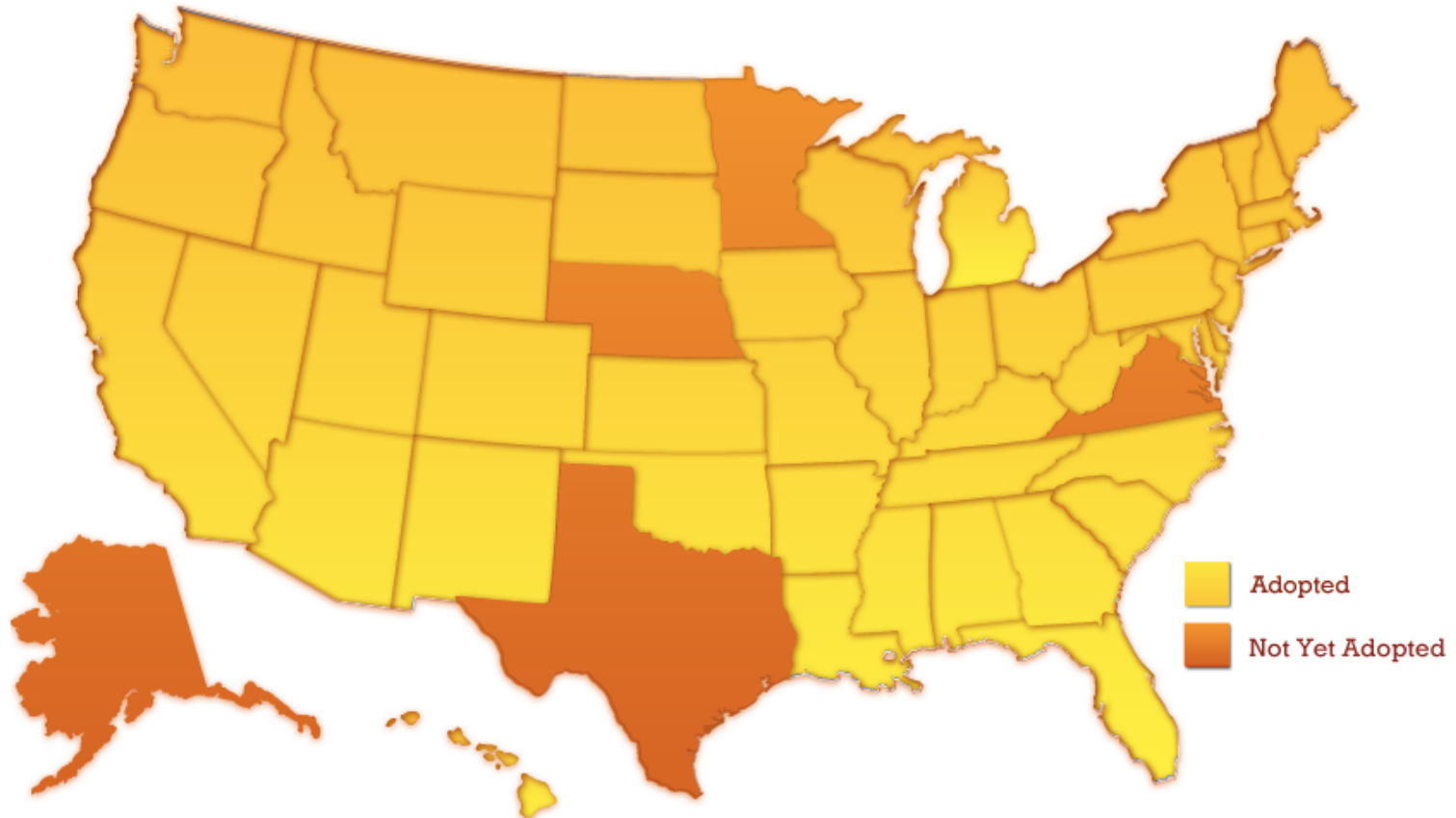
NCSM 2012



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
- Coherence
- Focus
- Clarity and Specificity

Example of Coherence

K-5

Operations
and
Algebraic
Thinking

Number and
Operations
Base-10

Number and
Operation
Fractions

Standards for Mathematical Content (CCSS)

Kindergarten: Geometry

Analyze, compare, create, and compose shapes.

6. Compose simple shapes to form larger shapes.

Standards for Mathematical Content (CCSS)

Grade 1: Geometry

Reason with shapes and their attributes.

3. 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.

3. 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.

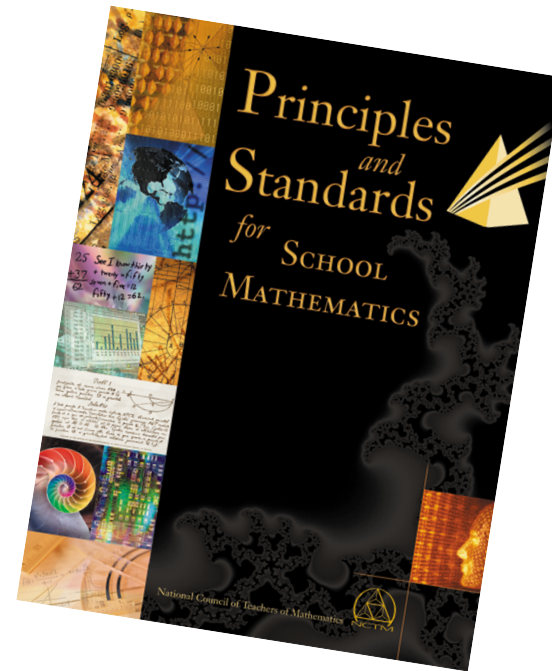
What to Focus on Now

- Standards for Mathematical Practice
- Mathematical Properties
- Problem Types
 - Addition/Subtraction
 - Multiplication/Division

Principles and Standards for School Mathematics

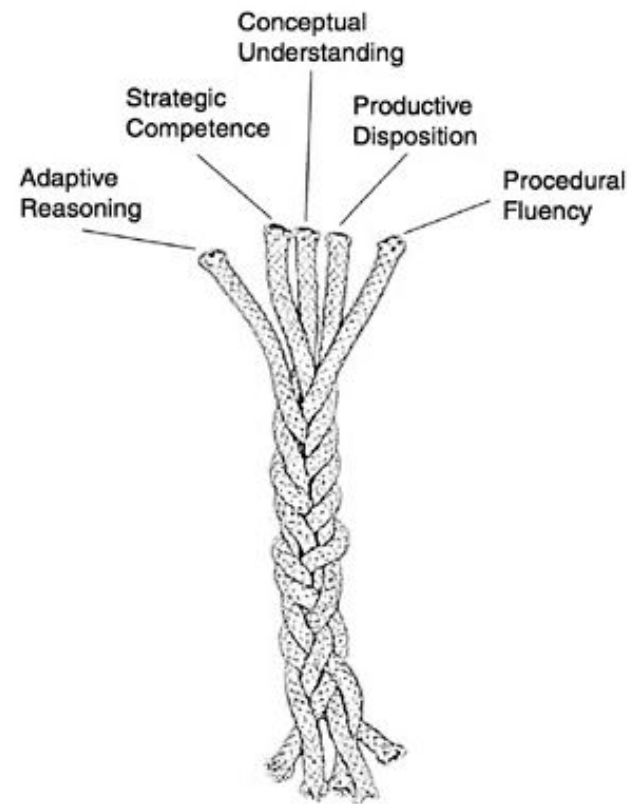
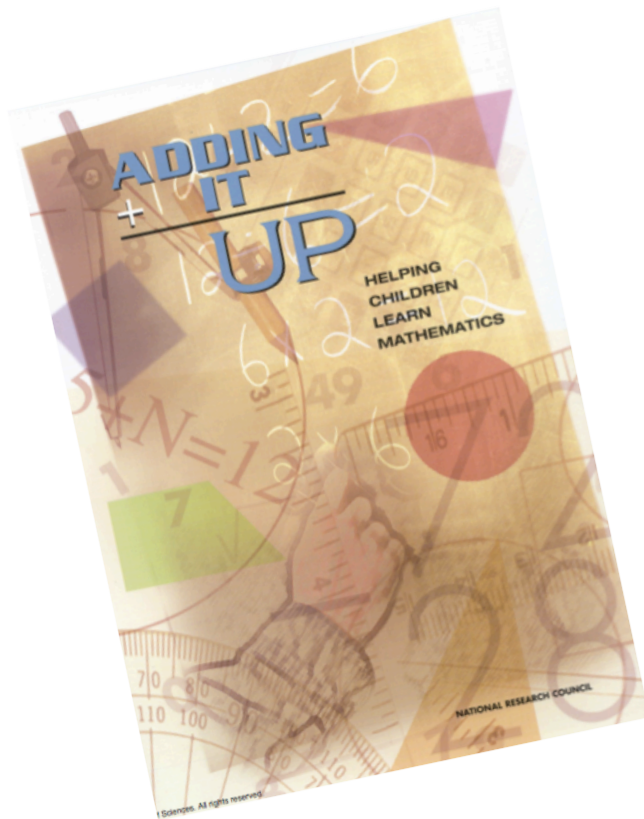
Process Standards

- Problem Solving
- Reasoning
- Communication
- Connections
- Representation



NCTM, 2000

Adding It Up: Helping Children Learn Mathematics



NRC, 2001

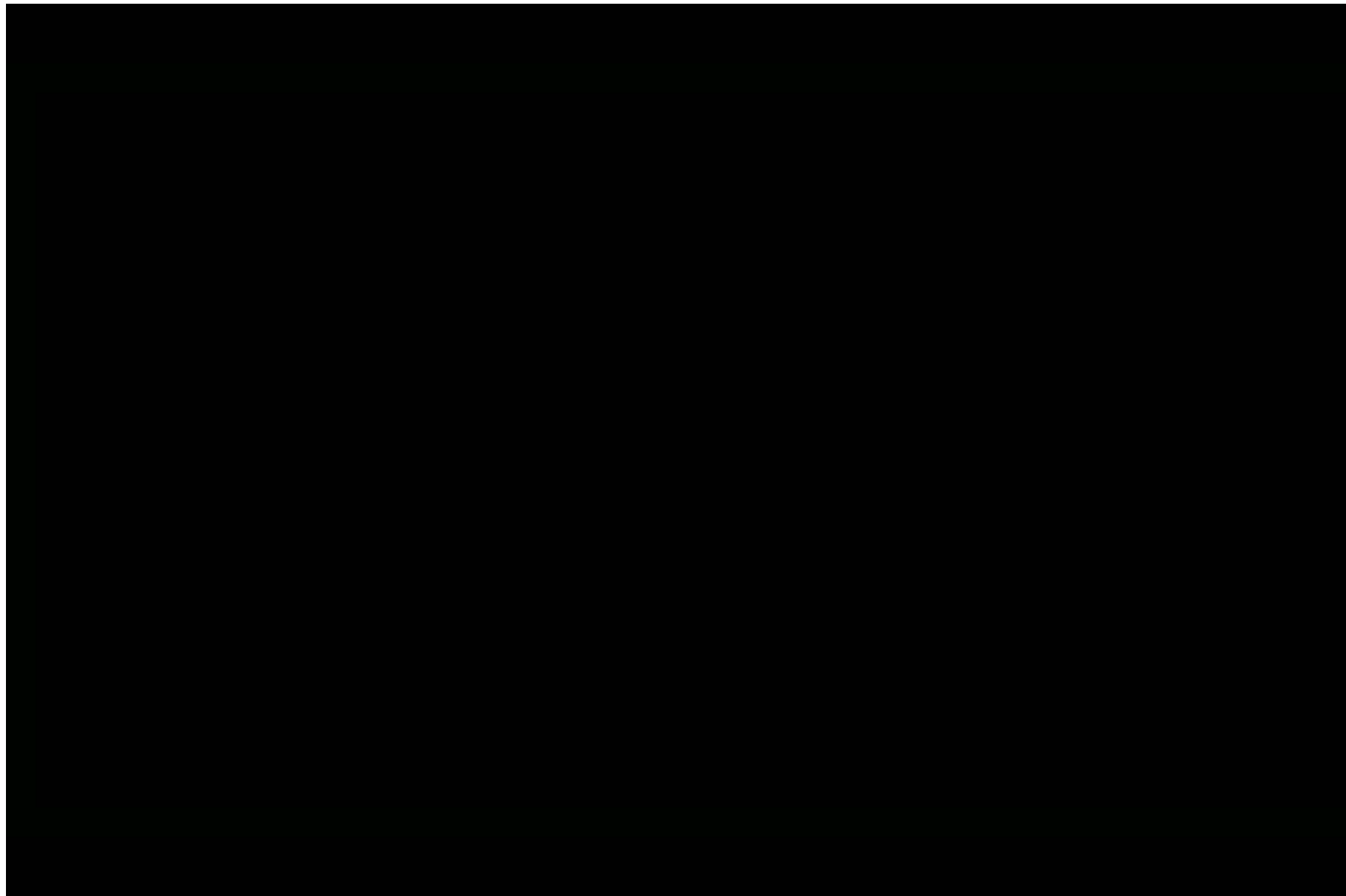
Standards for Mathematical Practice

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

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 talking about?
- How does the teacher help Maimouna clarify and share her thoughts?
- How does the teacher help the class orient to the thinking of Maimouna?



Mathematical Practice #3: Construct viable arguments and critique the reasoning of others.

Grade 3 Example

Subtraction: $70 - 34$

- What strategies would you anticipate?
- What challenges would you anticipate?
- How does Ms. Montgomery enable students to engage in MP3?

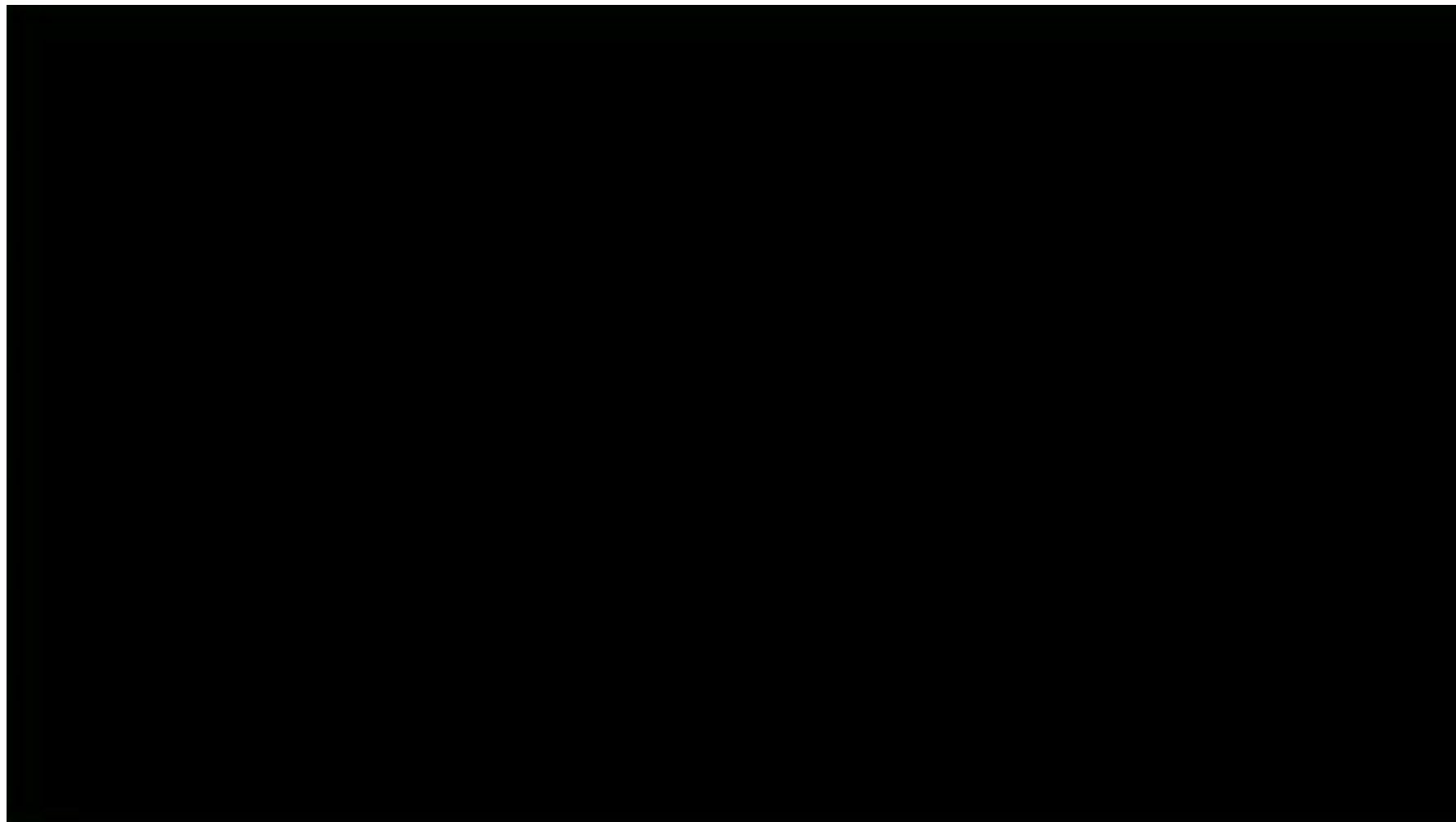


Mathematical Practice #4: Model with mathematics.

Grade 5 Example:

Volume of a rectangular prism

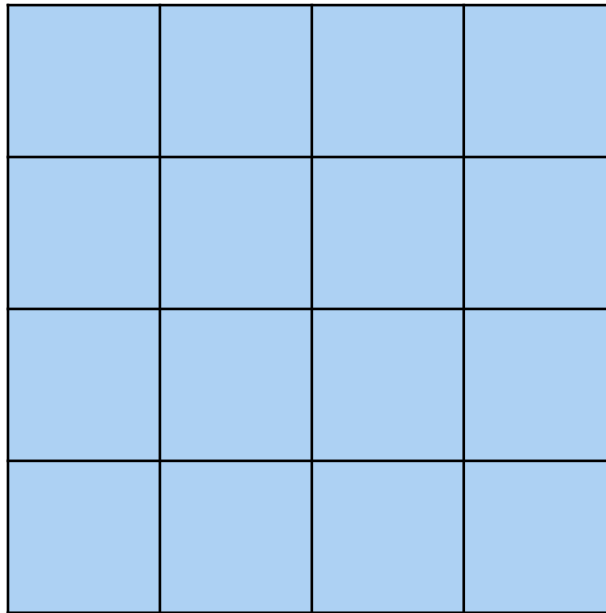
- How does Mrs. Foley help students understand how the mathematics (the formula) describes the volume?



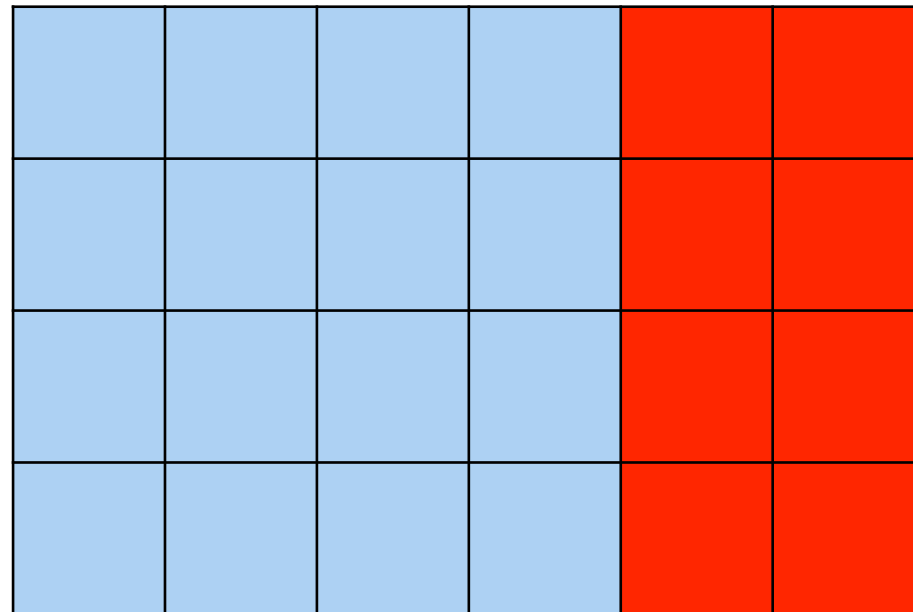
Mathematical Practice #7: Look for and make use of structure.

Middle/High School Example: Arrays

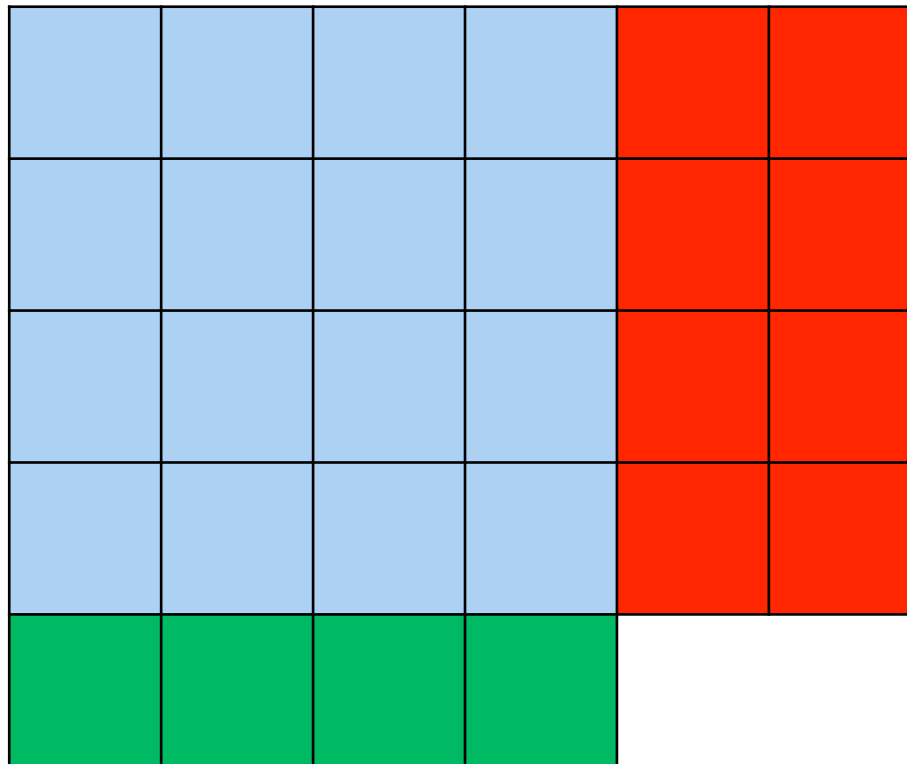
Using all one color, build a 4 x 4 array .



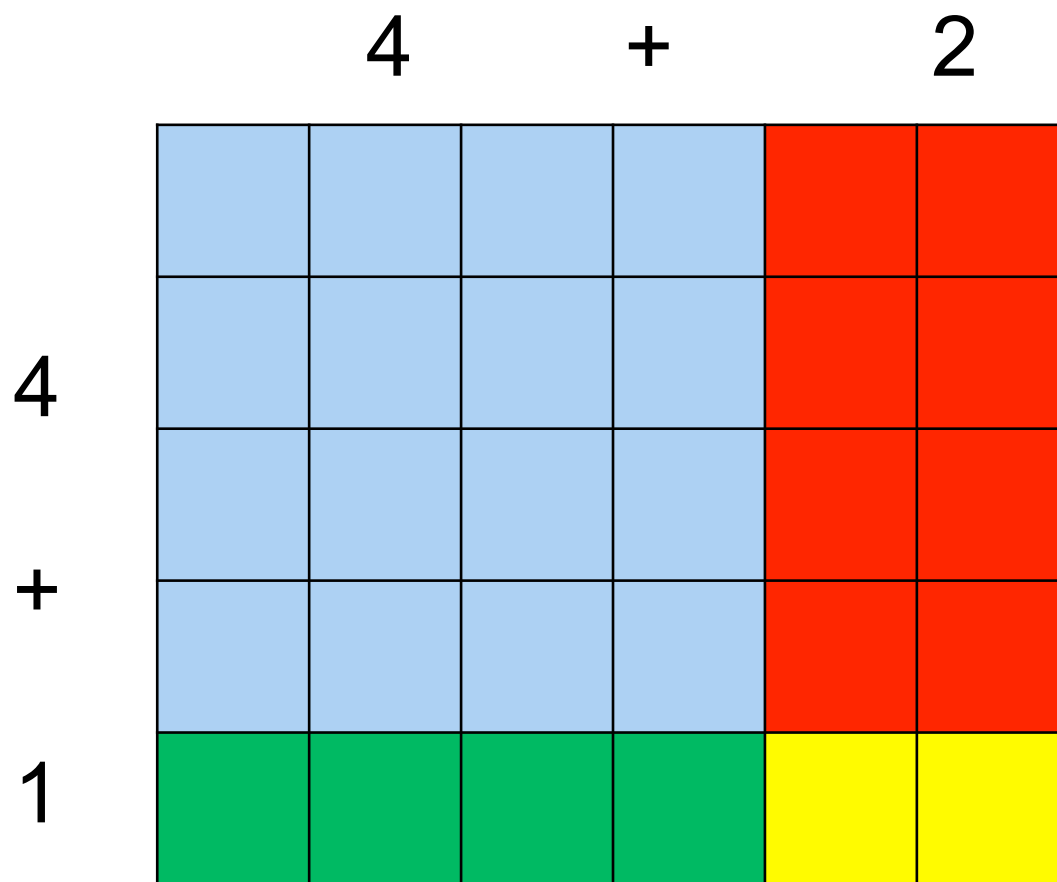
Using a different color, add two columns on the right.



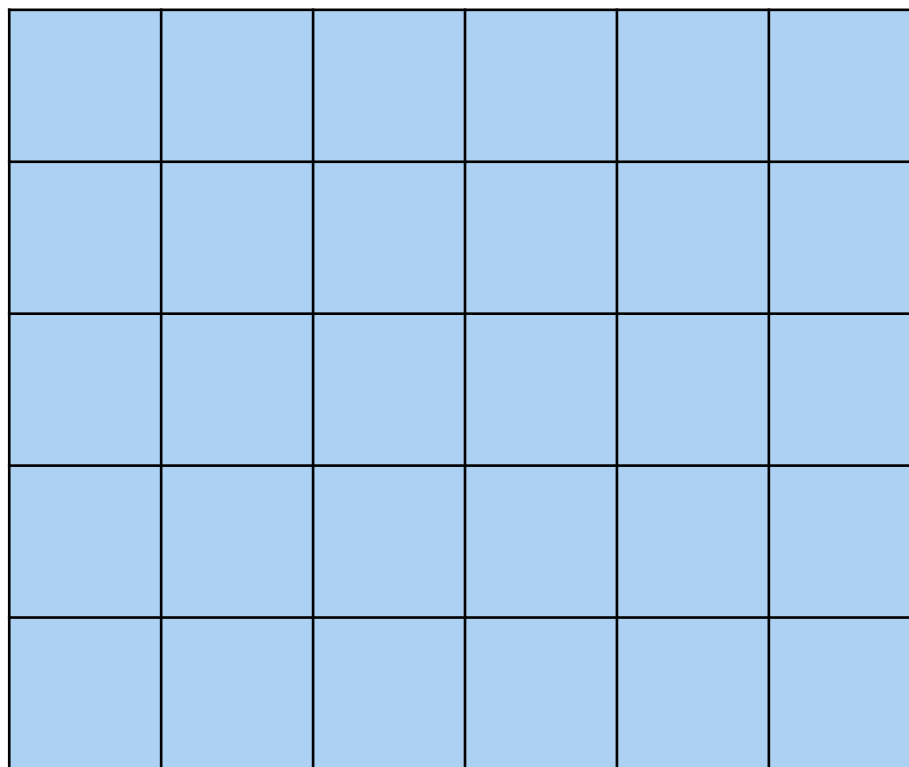
Using a third color, add one row along the bottom
of the original square only.

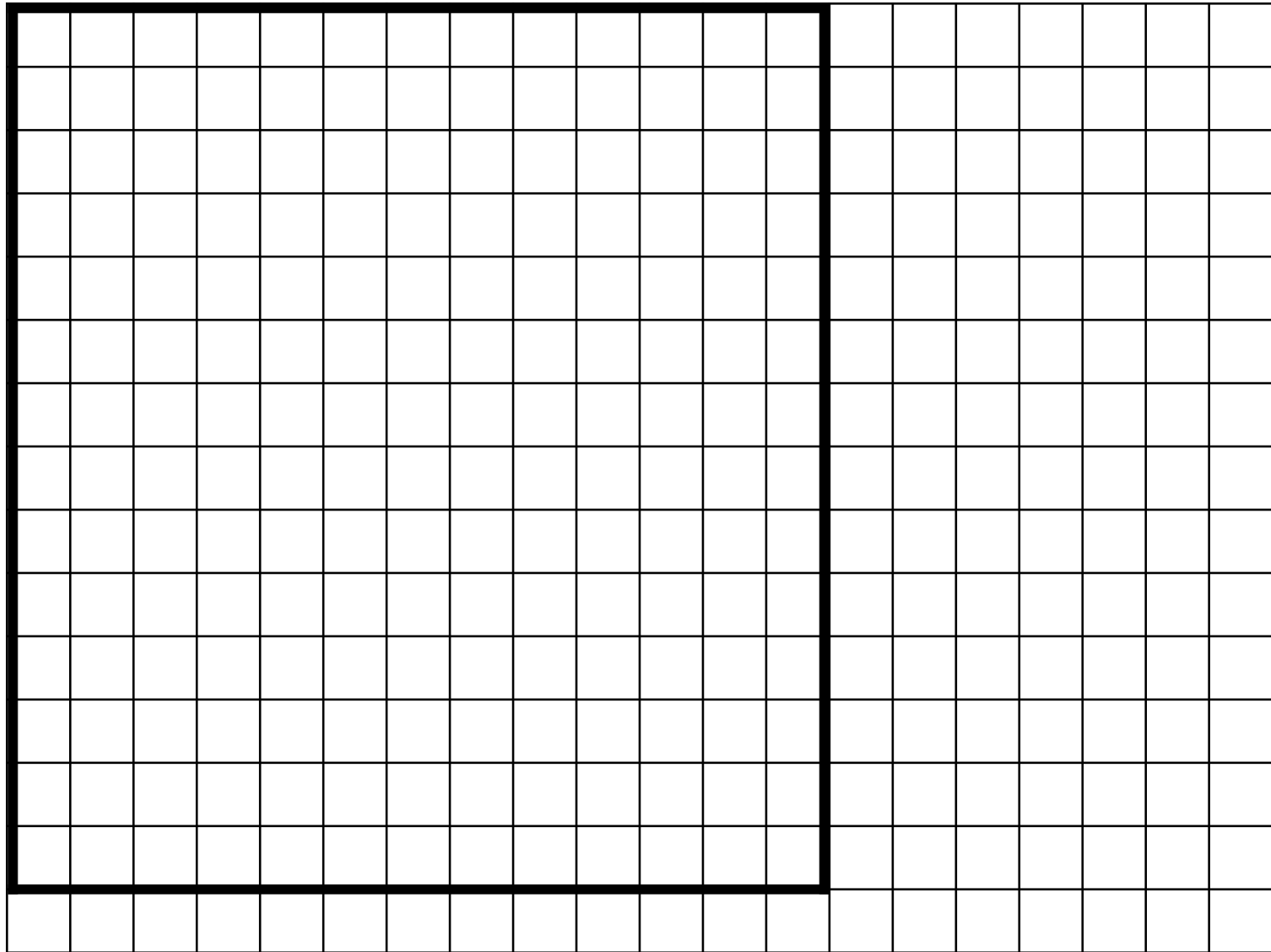


Finally, using the fourth color, complete the rectangle.

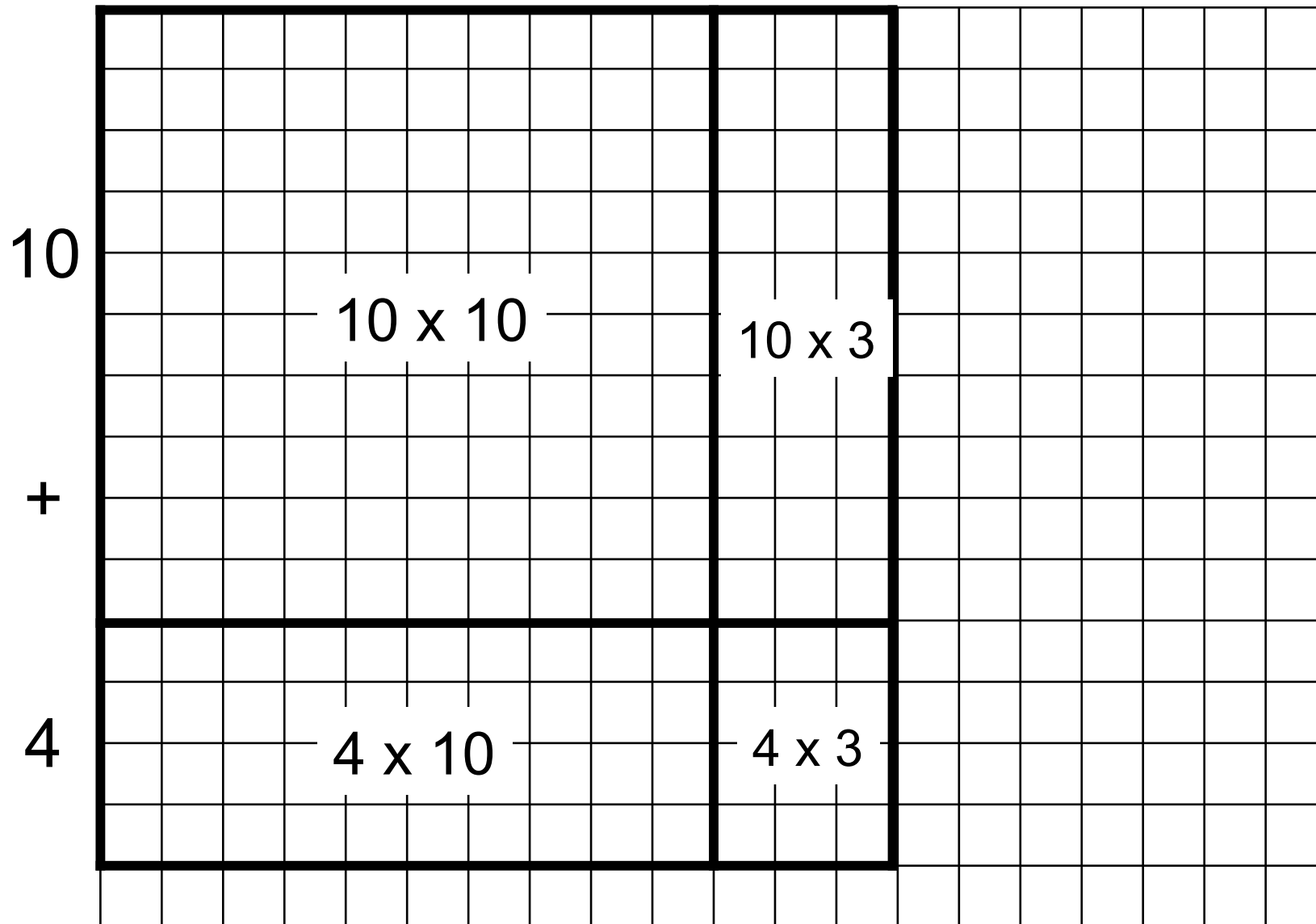


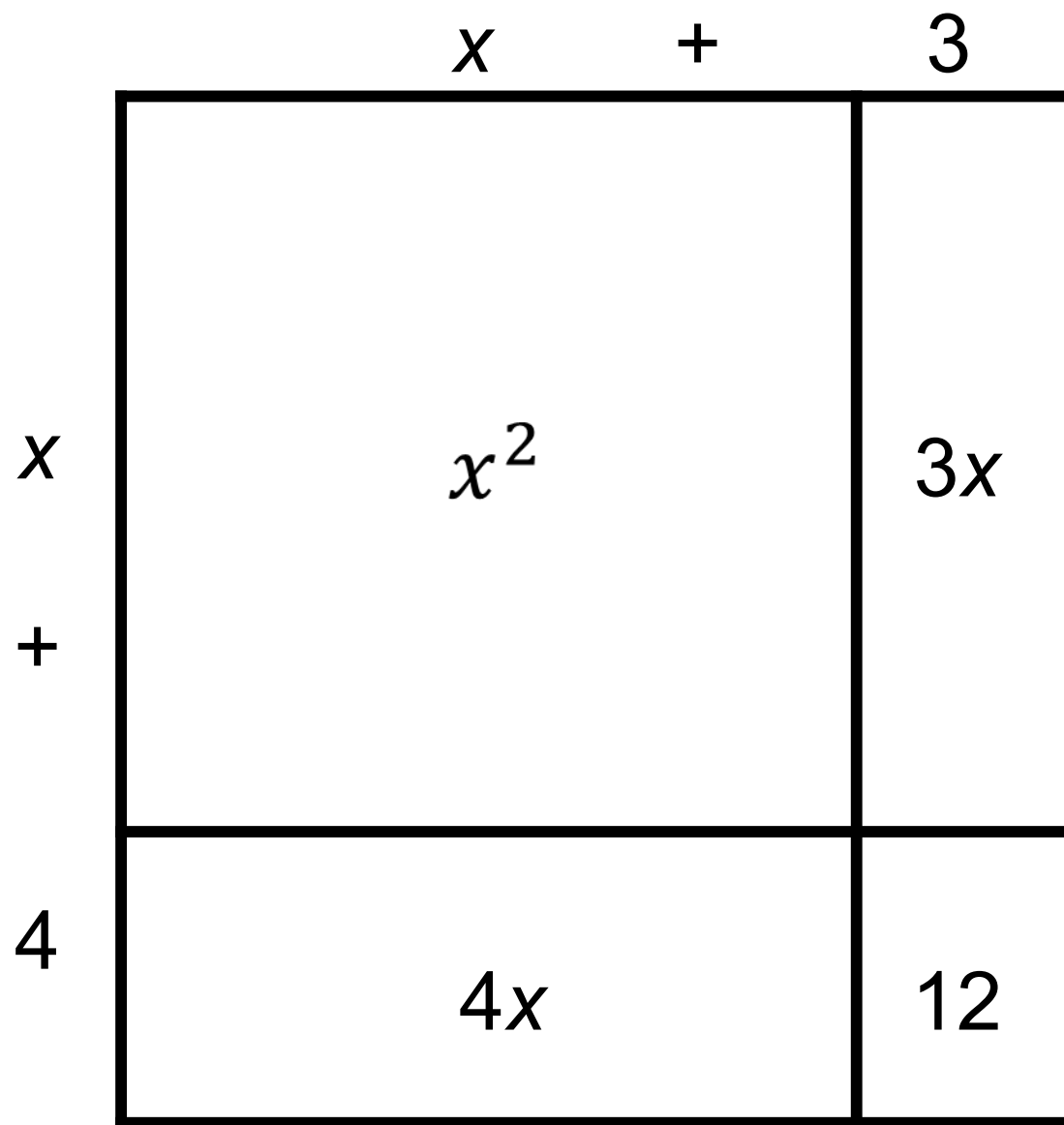
Repartition your large rectangle another way.





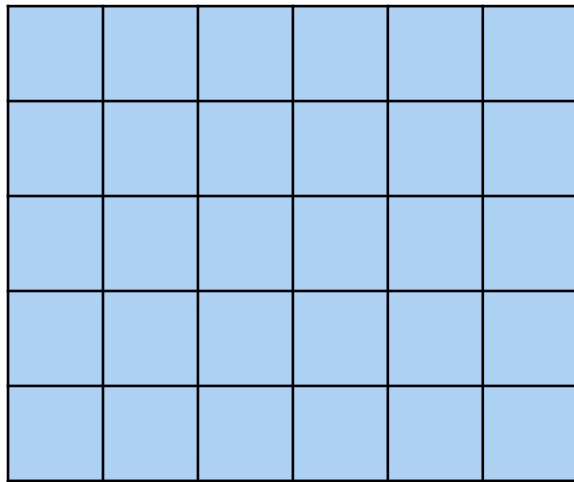
$$10 + 3$$





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

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



Reflecting on the Video

- How were students using the distributive property to find the answer to 7×7 ?
- 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	9	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

$$16 \times 25 = 20 \times 20$$

$$(4 \times 4) \times (5 \times 5) = (4 \times 5) \times (4 \times 5)$$

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

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

$$(1 + 3) \times 2 = 4 \times 2$$

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

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?

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?

What to Focus on Now

- Standards for Mathematical Practice
- Mathematical Properties
- Problem Types
 - Addition/Subtraction
 - Multiplication/Division

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 the full text of the CCSS go to:

<http://www.corestandards.org>



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