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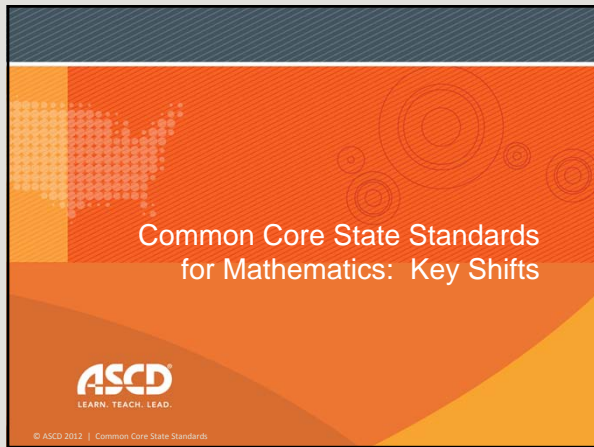
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**Setting the Background**

- Aligned to requirements for College and Career Readiness
- Based on evidence
- Honest about time



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### Principles of the Standards

- Fewer
- Clearer
- Higher

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### **SHIFT ONE: FOCUS** **FOCUS STRONGLY WHERE THE STANDARDS FOCUS**

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### **FOCUS**

- Significantly narrow the scope of content and deepen how time and energy is spent in the math classroom
- Focus deeply only on what is emphasized in the standards, so that students gain strong foundations

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### FOCUS

- Move away from **'mile wide, inch deep'** curricula identify in TIMSS
- International comparisons
- Teach less, learn more
- Less topic coverage can be associated with higher scores on those topics covered because students have more time to master the content that is taught."

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— Ginsburg et al., 2005

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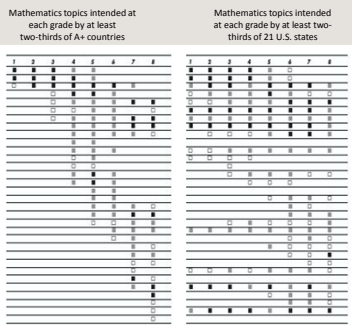
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### The shape of math in A+ countries



<sup>1</sup>Schmidt, Houang, & Cogan, "A Coherent Curriculum: The Case of Mathematics." (2002).

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### Traditional U.S. Approach



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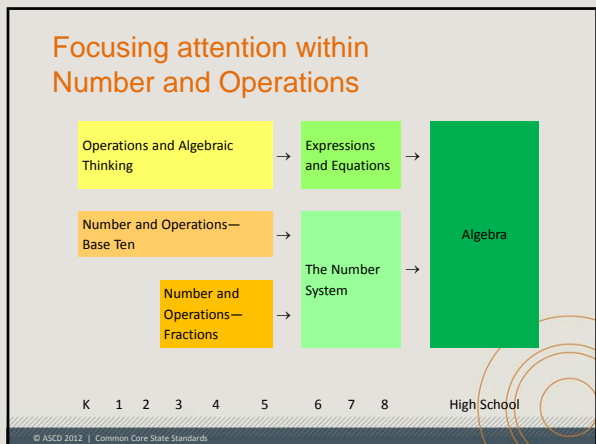
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### SHIFT TWO: COHERENCE

THINK ACROSS GRADES, AND LINK TO MAJOR TOPICS WITHIN GRADES

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### COHERENCE

- Carefully connect the learning within and across grades so that students can build new understanding onto foundations built in previous years.
- Begin to count on solid conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

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### Coherence example: Progression across grades

“The coherence and sequential nature of mathematics dictate the foundational skills that are necessary for the learning of algebra. The most important foundational skill not presently developed appears to be proficiency with fractions (including decimals, percents, and negative fractions). **The teaching of fractions must be acknowledged as critically important and improved before an increase in student achievement in algebra can be expected.**”

Final Report of the National Mathematics Advisory Panel (2008, p. 18)

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Gr. 4	Gr. 5	Gr. 6
<p><b>Addition and subtraction</b></p> <ul style="list-style-type: none"> <li>Add and subtract like fractions</li> <li>Add and subtract related fractions (denominators of given fractions should not exceed 12)</li> </ul> <p><b>Multiplication of a proper or improper fraction and a whole number</b></p>	<p><b>Addition and subtraction of fractions with unlike denominators</b></p> <ul style="list-style-type: none"> <li>Add and subtract fractions with unlike denominators</li> </ul> <p><b>Multiplication and division of</b></p> <ul style="list-style-type: none"> <li>Multiply proper fractions, improper fractions, mixed numbers and whole numbers by proper fractions, improper fractions, and mixed numbers</li> <li>Divide fractions by whole numbers and whole numbers by fractions</li> </ul>	<p><b>Division of fractions</b></p> <ul style="list-style-type: none"> <li>Divide proper fractions by proper fractions</li> </ul> <p><b>Know how to solve word problems involving division of whole numbers leading to whole numbers and remainders</b></p>

**CCSS**

**Grade 4**

4.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

**Grade 5**

5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

**Grade 6**

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

6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

*Informing Grades 1-6 Mathematics Standards Development: What Can Be Learned from High-Performing Hong Kong, Singapore, and Korea? American Institutes for Research (2009, p. 13)*

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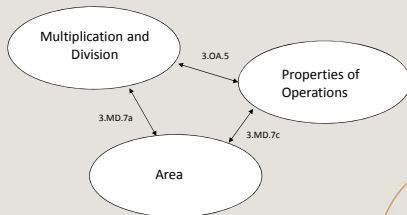
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### Coherence example: Grade 3

The standards make explicit connections at a single grade



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**SHIFT THREE: RIGOR**

**IN MAJOR TOPICS, PURSUE:**

- **Conceptual understanding**
- **Procedural skill and fluency, and**
- **Applications**

**WITH EQUAL INTENSITY**

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**RIGOR**

- The CCSSM require a balance of:
  - Solid conceptual understanding
  - Procedural skill and fluency
  - Application of skills in problem solving situations
- This requires equal intensity in time, activities, and resources in pursuit of all three

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**(a) Solid Conceptual Understanding**

- Teach more than “how to get the answer” and instead support students’ ability to access concepts from a number of perspectives
- Students are able to see math as more than a set of mnemonics or discrete procedures
- Conceptual understanding supports the other aspects of rigor (fluency and application)

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(b) Fluency

- The standards require speed and accuracy in calculation.
- Teachers structure class time and/or homework time for students to practice core functions such as single-digit multiplication so that they are more able to understand and manipulate more complex concepts

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Name: Aring

**7.7**  
STRETCH YOUR THINKING

**Finger Fun for Facts with 9**  
Work Together • Visual Thinking

You can use your fingers to calculate any fact that has 9 as a factor.


**Step 1** Hold your hands up with palms facing you.  
**Step 2** Mentally number your fingers 1–10 as shown. These numbers will stand for the factor that is not 9.


**Step 3** To find  $6 \times 9$ , bend the “6” finger (your right pinky) down.

**Step 4** The fingers to the left of the pinky are tens. The fingers to the right of the pinky are ones.

There are 5 tens and 4 ones.  
So,  $6 \times 9 = 54$ .

Write the fact that is shown by the fingers.

  $9 \times 8 = 72$

  $9 \times 2 = 18$

Sit beside a partner. One person chooses any fact below and shows it with fingers. The other person finds that fact and writes the product. Take turns until you complete all the facts.

$1 \times 9 \times 3 = 27$      $4 \times 9 \times 9 = 36$      $7 \times 9 \times 9 = 63$   
 $2 \times 9 \times 9 = 81$      $5 \times 9 \times 2 = 18$      $8 \times 9 \times 9 = 72$   
 $3 \times 9 \times 5 = 45$      $6 \times 9 \times 8 = 72$      $9 \times 9 \times 1 = 81$

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Required Fluencies in K-6

Grade	Standard	Required Fluency
K	K.OA.5	Add/subtract within 5
1	1.OA.6	Add/subtract within 10
2	2.OA.2	Add/subtract within 20 (know single-digit sums from memory)
	2.NBT.5	Add/subtract within 100
3	3.OA.7	Multiply/divide within 100 (know single-digit products from memory)
	3.NBT.2	Add/subtract within 1000
4	4.NBT.4	Add/subtract within 1,000,000
5	5.NBT.5	Multi-digit multiplication
6	6.NS.2,3	Multi-digit division Multi-digit decimal operations

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## Fluency in high school

### Fluency Recommendations

- A/G** Algebra I students become fluent in solving characteristic problems involving the analytic geometry of lines, such as writing down the equation of a line given a point and a slope. Such fluency can support them in solving less routine mathematical problems involving linearity, as well as in modeling linear phenomena (including modeling using systems of linear inequalities in two variables).
- A-APR.1** Fluency in adding, subtracting and multiplying polynomials supports students throughout their work in algebra, as well as in their symbolic work with functions. Manipulation can be more mindful when it is fluent.
- A-SSE.1b** Fluency in transforming expressions and chunking (seeing parts of an expression as a single object) is essential in factoring, completing the square and other mindful algebraic calculations.

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PARCC Model Content Frameworks for Mathematics  
October 2011

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## (c) Application

- Students can use appropriate concepts and procedures for application even when not prompted to do so
- Provide opportunities at all grade levels for students to apply math concepts in "real world" situations, recognizing this means different things in K-5, 6-8, and HS
- Teachers in content areas outside of math, particularly science, ensure that students are using grade-level-appropriate math to make meaning of and access science content

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## It starts with Focus

- The current U.S. curriculum is 'a mile wide and an inch deep.'
- Focus is necessary in order to achieve the rigor set forth in the standards
- Remember Hong Kong example: more in-depth mastery of a smaller set of things pays off

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### Content Emphases by Cluster: Grade Four

Key: ■ Major Clusters; ■ Additional Clusters; ○ Supporting Clusters

#### Operations and Algebraic Thinking

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

#### Number and Operations in Base Ten

- Generalize place value understanding for multi-digit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

#### 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.

#### Measurement and Data

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data
- Geometric measurement: understand concepts of angle and measure angles.

#### Geometry

- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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Steal these tools  
You've got to read this  
By teachers for teachers

[www.achievethecore.org](http://www.achievethecore.org)

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### The Coming CCSS Assessments Will Focus Strongly on the Major Work of Each Grade



A quality assessment should strive to reinforce focus and coherence at each grade level by testing for proficiency with central and pivotal mathematics rather than covering too many ideas superficially – a key point of the Common Core Standards.

#### PARCC Releases ITN To Develop Assessments

Submitted by parcc on Fri, 2013-02-01 09:16  
Major addition: end-of-the-year administration in 2014-2015.

**Design for focus and coherence.** Consistent with the design of the CCSSM, the previous iteration of the assessment design adopted by the Leadership Team, and the extended discussion of emphases in the standards in the PARCC Model Content Frameworks, the Mathematics Assessment System as a whole and in each component will focus heavily on the major content<sup>102</sup> of each grade.

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**Cautions:**

- ✓ Not about “gap analysis”
- ✓ Not about buying a text series
- ✓ Not a march through the standards
- ✓ Not about breaking apart each standard

**Resources**

- [www.achievethecore.org](http://www.achievethecore.org)
- [www.illustrativemathematics.org](http://www.illustrativemathematics.org)
- [www.pta.org/4446.htm](http://www.pta.org/4446.htm)
- <http://parcconline.org/parcc-content-frameworks>

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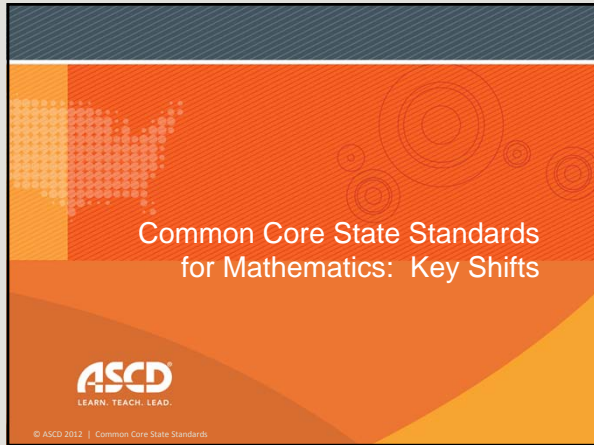
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