

Common Core State Standards for Mathematics: *Rigor*

Grade 5

Essential Questions

- How and why were the Common Core State Standards developed and by whom?
- What are the 3 shifts in math instruction in the CCSS?
- Why the need for Focus?
- How is Focus reflected in the classroom?
- What are the next steps in implementing Focus?

Overview of the Common Core State Standards

COMMON CORE
STATE STANDARDS FOR

Mathematics



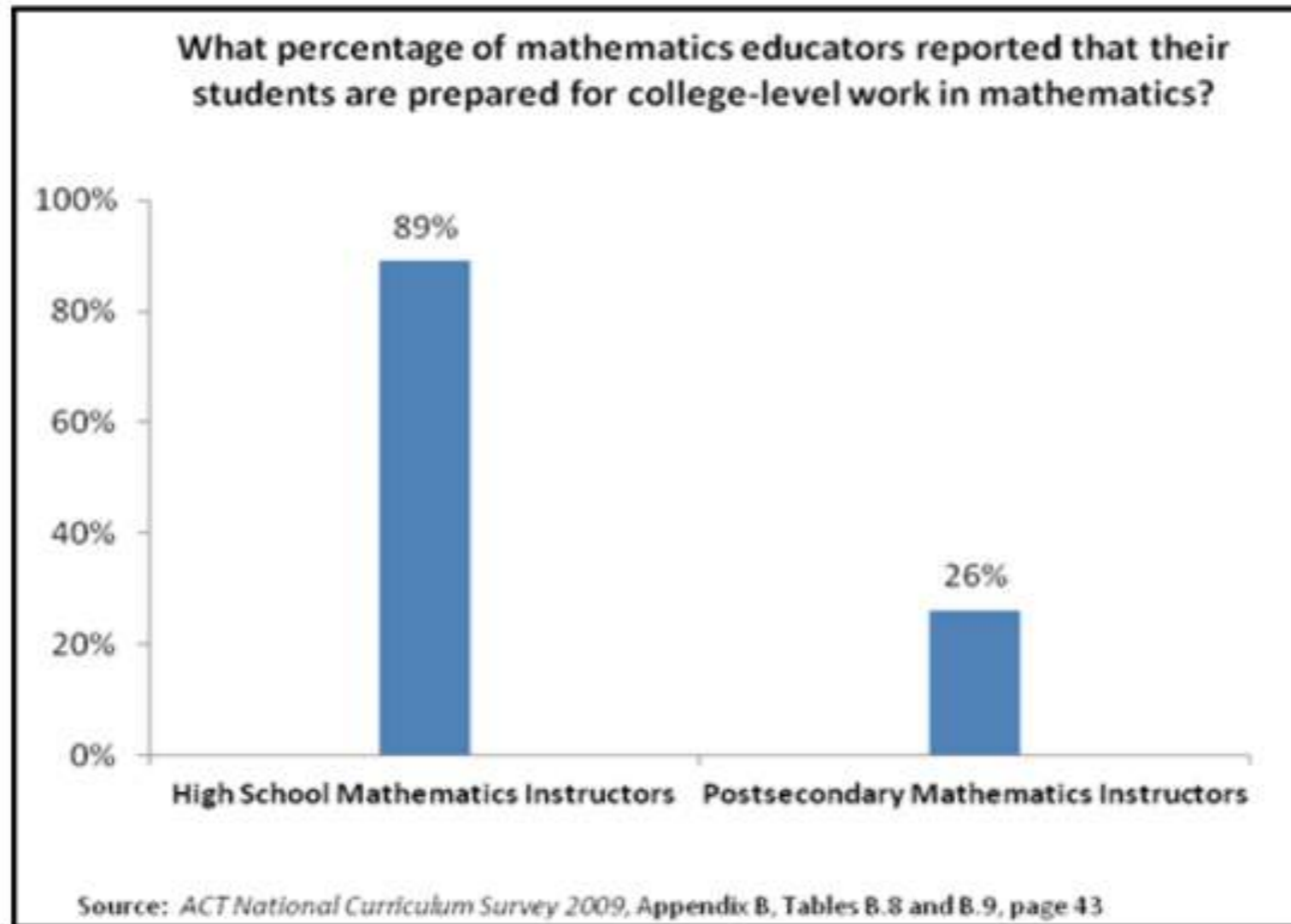
Rationale for CCSS

- Declining US competitiveness with other developed countries
- NAEP performance that is largely flat over the past 40 years in 8th grade
- Slight improvement on NAEP performance at the 4th grade level
- Slight decline on NAEP performance at the high school level
- High rates of college remediation

Background of CCSS

- Initiated by the National Governor's Association (NGA) and Council of Chief State School Officers (CCSSO) with the following design principles:
 - Result in College and Career Readiness
 - Based on solid research and practice evidence
 - Fewer, higher (greater DOK), and clearer standards

College Math Professors Feel HS students Today are Not Prepared for College Math



What The Disconnect Means for Students

- Nationwide, many students in two-year and four-year colleges need remediation in math.
- Remedial classes lower the odds of finishing the degree or program.
- Need to set the agenda in high school math to prepare more students for postsecondary education and training.

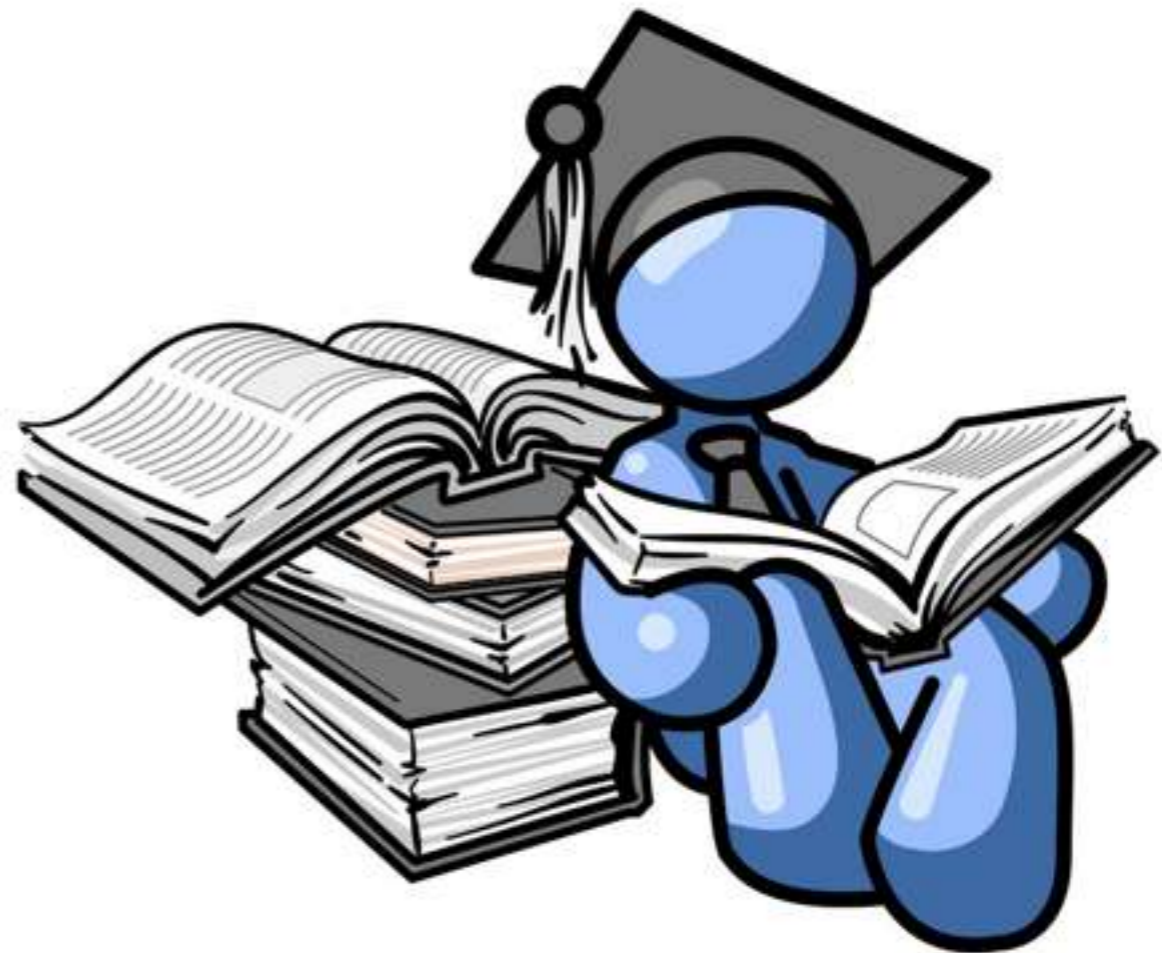
The Common Core State Standards

Require Three Instructional Shifts in Mathematics

- **Focus:** Focus strongly where the standards focus.
- **Coherence:** Think across grades and link to major topics.
- **Rigor:** In major topics, pursue conceptual understanding, procedural skill and fluency, and application.

Shift 3: Rigor

To help students meet the Standards, educators will need to pursue, with equal intensity, three aspects of ***Rigor*** in the major work of each grade: conceptual understanding, procedural skill and fluency, and applications.



Shift 3: Rigor

- **Conceptual Understanding:** Students need a conceptual understanding of key concepts, such as place value and ratios. Teachers support students' ability to access concepts from a number of perspectives so that students are able to see math as more than just a set of mnemonics or discrete procedures.
- **Procedural Skill and Fluency:** Students need to have speed and accuracy when performing calculations. Teachers should structure class/homework time for students to practice core functions such as single-digit multiplication so students have access to more complex concepts and procedures.
- **Application:** Students need to be able to use math flexibly for applications. Teachers should provide opportunities for students to apply math in context. Teachers in content areas outside of math, particularly science, ensure that students are using math to make meaning of and access content.

Jason Zimba on Rigor



Rigor

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)

Place Value **WITHOUT** evidence of
conceptual understanding.

Directions: Complete each equation below to make it true.

1) 5 thousands + 3 hundreds + 8 tens + 1 one = _____

2) 9 thousands + 6 hundreds + 3 tens + 3 ones = _____

3) 7 thousands + 4 hundreds + 2 tens + 2 ones = _____

4) 6 thousands + 6 hundreds + 3 tens + 8 ones = _____

5) 5 thousands + 3 hundreds + 6 tens + 5 ones = _____

Place Value **WITH**
evidence of
conceptual
understanding.

1) 53 hundreds + 8 tens + 1 one = _____

2) 33 ones + 9 thousands + 6 hundreds = _____

3) 2 hundreds + 22 tens + 2 ones + 7 thousands = _____

4) 63 tens + 5 thousands + 1,008 ones = _____

5) 15 ones + 5 tens + 4 thousands + 13 hundreds = _____

Computational Fluency

Fluency, as we use it here, includes three ideas: efficiency, accuracy, and flexibility:

- Efficiency implies that the student does not get bogged down in too many steps or lose track of the logic of the strategy. An efficient strategy is one that the student can carry out easily, keeping track of sub-problems and making use of intermediate results to solve the problem.
- Accuracy depends on several aspects of the problem-solving process, among them careful recording, knowledge of number facts and other important number relationships, and double-checking results.
- Flexibility requires the knowledge of more than one approach to solving a particular kind of problem, such as two-digit multiplication. Students need to be flexible in order to choose an appropriate strategy for the problem at hand, and also to use one method to solve a problem and another method to double-check the results. Fluency demands more of students than does memorization of a single procedure. Fluency rests on a well-built mathematical foundation with three parts: (1) an understanding of the meaning of the operations and their relationships to each other (2) the knowledge of a large repertoire of number relationships, including the addition and multiplication "facts" as well as other relationships (3) a thorough understanding of the base ten number system, how numbers are structured in this system, and how the place value system of numbers behaves in different operations -- for example, that $24 + 10 = 34$ or $24 \times 10 = 240$.

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 2.NBT.5	Add/subtract within 20 (know single-digit sums from memory) Add/subtract within 100
3	3.OA.7 3.NBT.2	Multiply/divide within 100 (know single-digit products from memory) 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

Application

- Students can use appropriate concepts and procedures for application even when not prompted to do so.
- Teachers 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.

Fluency Expectations or Examples of Culminating Standards

5.NBT.5 Students fluently multiply multi-digit whole numbers using the standard algorithm.

Directions: With your group, read and solve the math task. Think about how this task would demonstrate fluency.

A. $37 \times 4 = 1,480 \div 10$ True False

B. $215 \times 39 = 2,487 \div 3$ True False

C. $4,086 \times 7 = 32,202$ True False

D. $9,130 \times 86 = 785,180$ True False

Group Discussion

Shift # 3: Rigor - Expect fluency, deep understanding, and application

In your groups, discuss ways to respond to one of the following comments:

“These standards expect we just teach rote memorization. Seems like a step backward to me.”

“I’m not going to spend time on fluency - it should just be a natural outcome of conceptual understanding.”

Rigor Sample Problems

Solve 2 or 3 problems in each section.

Some questions to consider:

What is something that you observed from one of the problems you've tried?

How can assessing (through tests, HW problems, exit tickets) all 3 aspects of rigor affect student learning?

What does it look like when we ask students to work on procedural skill and fluency, conceptual understanding or application?

What standards do these problems align to?

Engaging with the shift: Making a true statement

$$\text{Rigor} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

This shift requires a balance of three discrete components in math instruction. This is not a pedagogical option but is required by the standards.

Using grade 3, find and copy the standards that specifically set expectations for each component.

Group Discussion

Math Shifts	What is this shift? Why this shift?	Opportunities	Challenges
1.Rigor: In major topics, pursue conceptual understanding, procedural skill and fluency, and application with equal intensity			