Examining the Common Core State Standards for Mathematics

February 2011

The **Common Core State Standards Initiative (CCSSI)** is a state-led effort coordinated by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO).

www.corestandards.org/the_standards

CCSSO and the NGA Center worked with representatives from participating states, a wide range of educators, content experts, researchers, national organizations, and community groups to develop these common standards for English Language Arts and Math.

These final standards reflect the invaluable feedback from the general public, teachers, parents, business leaders, states, and content area experts and are informed by the standards of other high performing nations. The National Education Association (NEA), American Federation of Teachers (AFT), National Council of Teachers of Mathematics (NCTM), and National Council of Teachers of English (NCTE), among other organizations have been instrumental in bringing together teachers to provide specific, constructive feedback on the standards.

Two Arkansas Department of Education employees – mathematics specialist, Thomas Coy, and English language arts specialist, Dana Breitwiser – served on advisory committees to review and refine the specific grade level learning standards for those subjects. They provided feedback on content and structure of the standards as they were being developed. The final standards reflect many of the suggestions made by Arkansas during the development phase.

On June 2, 2010, the National Governors Association and the Council of Chief State School Officers released the final Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects and Common Core State Standards for Mathematics.

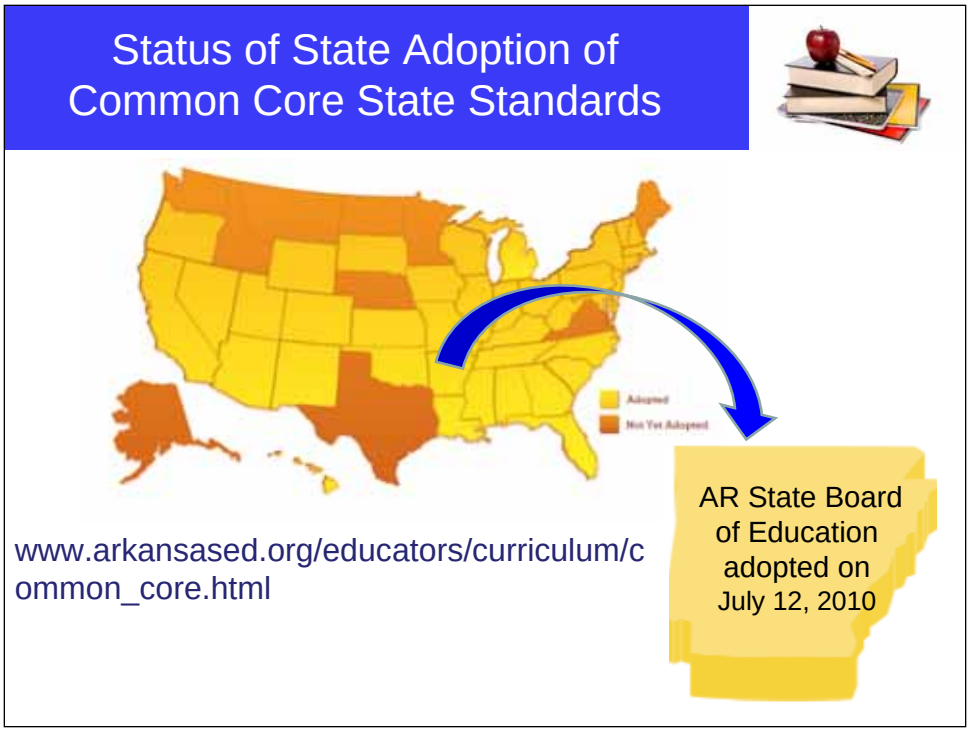
Mission Statement

The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

- Common Core State Standards Initiative

The goal is to make sure that every child across the country is given the tools they need to succeed.

These standards are a common sense first step toward ensuring our children are getting the best possible education no matter where they live.



Most states have adopted the common core state standards.

As of Jan 13, 2011, 40 states plus the Virgin Islands and the District of Columbia have adopted the Common Core State Standards. More states are in the process of adopting the CCSS.

As part of implementing the common core state standards, most states plan to change their assessments,

curriculum materials, professional development programs, and teacher evaluation systems.

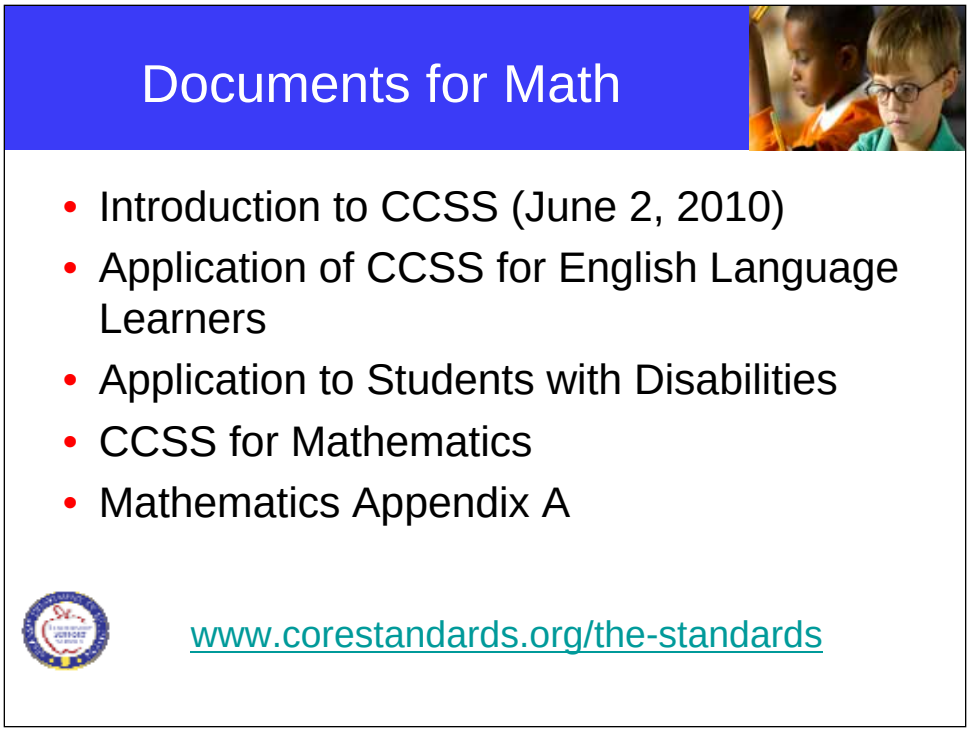
Many states anticipate it will take until 2013 or later to fully implement the more complex changes associated with the common core state standards.

Examining the CCSS for Mathematics

- ✓ Documents
- Design and Organization
- Terminology
- Nomenclature

This presentation will focus on building our knowledge about the Common Core State Standards in these four areas: Documents, Design, Terminology and Nomenclature.

We begin with a document walk of the essential pieces to include in your math notebook.



This slide lists the documents that you need to download from the core standards website.

Introduce each document (may display on document camera).

•Introduction to CCSS: Provides the rationale for the CCSS initiative and the criteria used to develop the college and career readiness standards, as well as the K-12 standards. It also mentions that there is a plan to revise the standards on a set review cycle.

•Application of CCSS for English Language Learners: This document sets the expectations for working with ELL students, namely requiring the same high standards, with differentiation in instruction as needed. This document provides guidelines for developing an instructional plan in ELA and Math that includes research-based best practices.

•Application for Students with Disabilities: This document sets the expectation for working with students with disabilities, namely access to the general education curriculum with instruction that incorporates supports, accommodations, and services required by law.

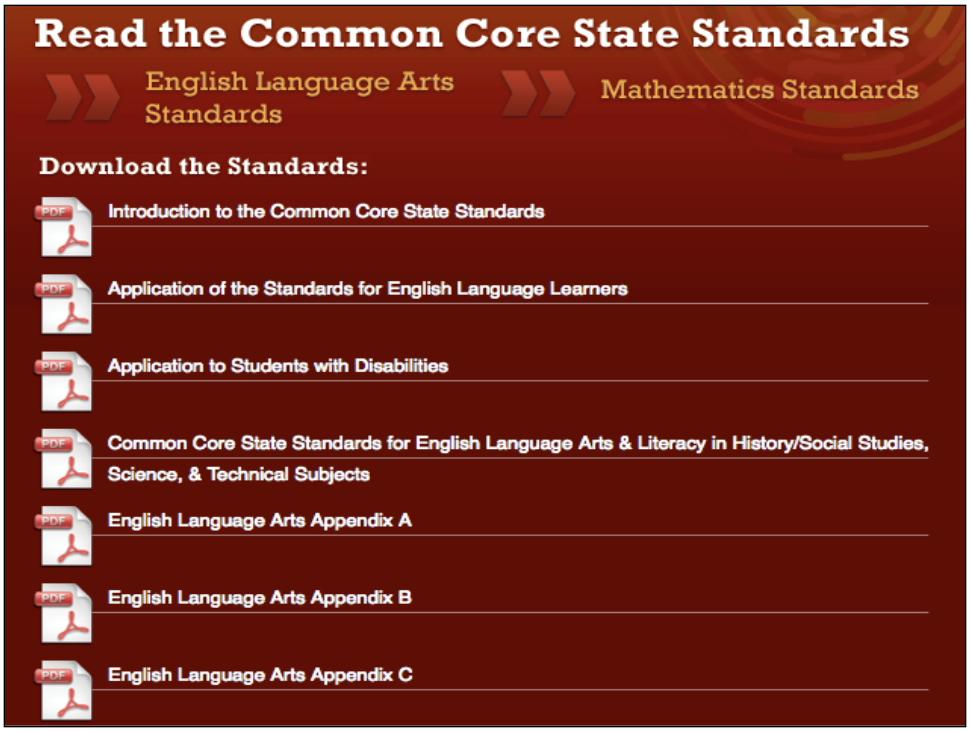
•CCSS for Mathematics: This documents outlines the expectations for students K-12.

•Mathematics Appendix A: This document provides suggestions for designing high schools mathematic courses or pathways based on the CCSS.

All of these documents are available on the www.corestandards.org website. See screen shots on the next three slides.

From the homepage, click on The Standards tab in the upper right corner.

From The Standards page, scroll down to find all the pdf documents bulleted on this page. See next slide for the list of pdf documents.



On this page, you will see the Introduction to the CCSS, Application to the Standards for ELL, and Application to Students with Disabilities.

If you continue to scroll down, you will see the CCSS for Mathematics and Appendix A.

Document Walk for Math

CCSS for Math

- Table of Contents – page 2
- Introduction – page 3
- Standards for Mathematical Practice – page 6
- Standards for Mathematical Content – page 9
- Glossary – page 85

The Table of Contents page provides an outline of the design and organization of the content included within the Mathematics Standards.

The introduction describes the purpose and intent of the CCSS for Mathematics.

The Standards for Mathematical Practice outlines the 8 recommended experiences that math educators at all levels should seek to develop in their students.

The Standards for Mathematical Content outline the grade specific standards and high school standards.

Glossary provides definition of key terms used in the document.

CCSS Appendix for Mathematics

- Appendix A: Designing High School Mathematics Courses Based on the Common Core State Standards

The additional supporting document, Appendix A to the CCSS for Mathematics, is not included in the table of contents. The Appendix A is not part of the main document, but is essential to full implementation.

Remember that this document is a separate PDF document to download.

Appendix A provides guidance for determining high school pathways.

Examining the CCSS for Mathematics

- Documents
- ✓ Design and Organization
- Terminology
- Nomenclature

Now that we have the appropriate documents, let's take a look at how the documents are organized.

Lead participants through a book walk or document walk.

Design for Mathematics

Standards for Mathematical Practice

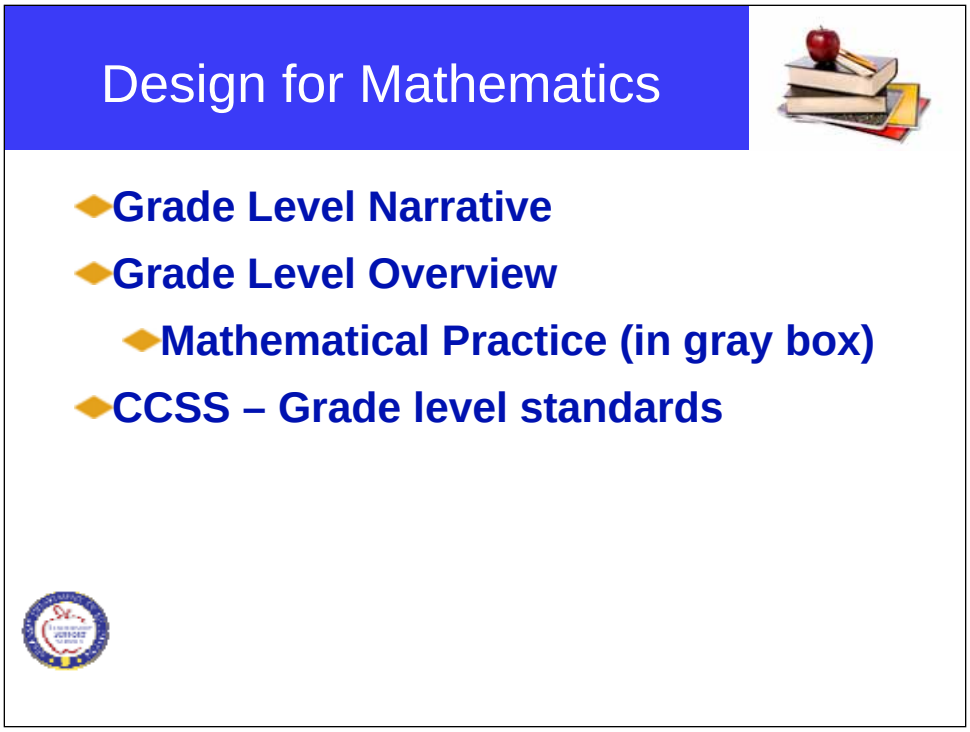
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students as their students grow in mathematical maturity and expertise.

Standards for Mathematical Content

- **Grade-Level K-8 Standards**
  - K-8 grade-by-grade standards organized by domain
- **High School Standards**
  - High school standards organized by conceptual categories

Page 6 – Standards for Mathematical Practice: During the planning and implementation of the standards for mathematical content, educators should provide opportunities for students to grow in mathematically maturity and expertise. The Standards for Mathematical Practice describe a variety of expertise every math educator should seek to develop in their students. This document offers eight suggestions for building the expertise of students.

Page 9 – Standards for Mathematical Content: The standards are organized by grade level for grades K-8. Standards are organized by domain. High school standards are organized by conceptual categories. To follow the traditional pathway of Arkansas High Schools, we will refer also to Appendix A for guidance.



As we walk through the document, turn to page 9 and let's see how the grade level standards are designed.

On page 9, we see the Grade Level Narrative. The narrative provides suggestions about the focal points for the grade. It gives suggestions about how much time and where to focus instructional time.

On page 10, we see the Grade K Overview. The grade level overview notes the domains and clusters.

Also on page 10, you will see the Standards for Mathematical Practice highlighted in the gray box. This reminds us to consider how we will engage students in these practices.

Then as we turn to page 11-12, we can read the Standards for Mathematical Practice for Kindergarten. Note the standards are grouped into clusters and organized into domains.

The Narrative outlines the focal points at each grade level…

Mathematics | Grade 6

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of

Now locate your grade level. Take a moment to read the narrative for the grade level.

Overview of K-8 Mathematics Standards

Each grade includes an overview of cross-cutting themes and critical areas of study

Grade 1 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract within 20.
- Work with addition and subtraction equations.

Number and Operations in Base Ten

- Extend the counting sequence.
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Tell and write time.
- Represent and interpret data.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. 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.
8. Look for and express regularity in repeated reasoning.

The Overview for your grade level indicates the domains and clusters.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek help to develop in their students as their students grow in mathematical maturity and expertise.

Grade Level Overviews

Grade K Overview

Counting and Cardinality

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- Work with numbers 11-19 to gain foundations for place value.

Mathematical Practices

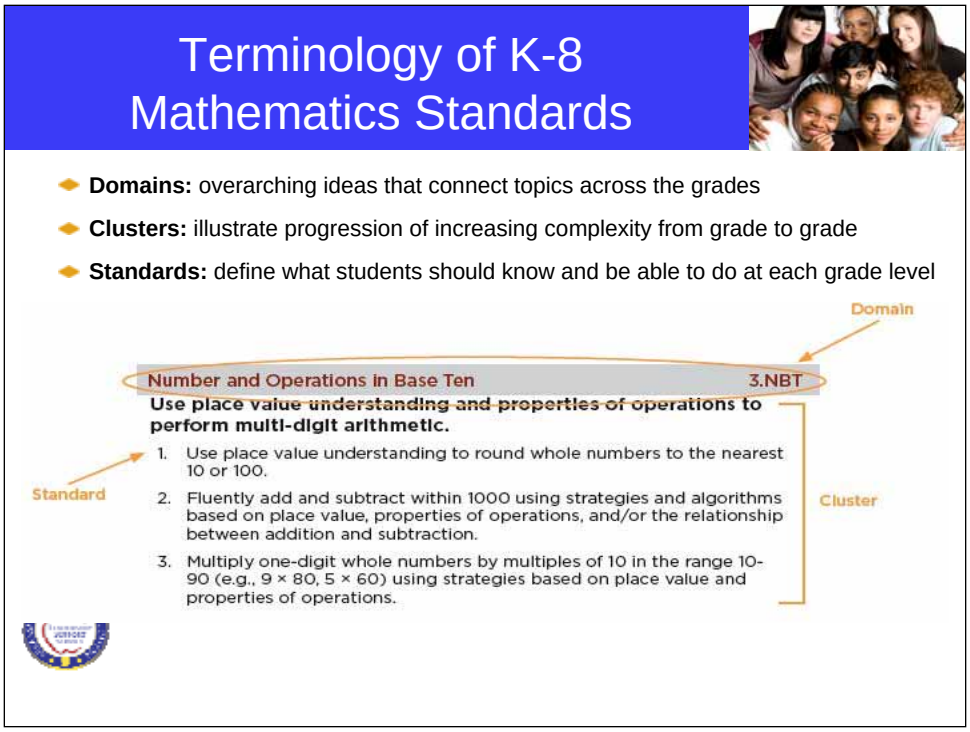
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look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

The overview for your grade level also reminds you to consider the mathematical practices as you plan for instruction.

Examining the CCSS for Mathematics

- Documents
- Design and Organization
- ✓ Terminology
- Nomenclature

As we walked through the document, we may have encountered new terminology. Let's take a few moments to review the terminology. The terminology of the CCSS will be very important as we collaborate and learn from each other.



In referring to the K-8 standards, we will be using the following terminology:

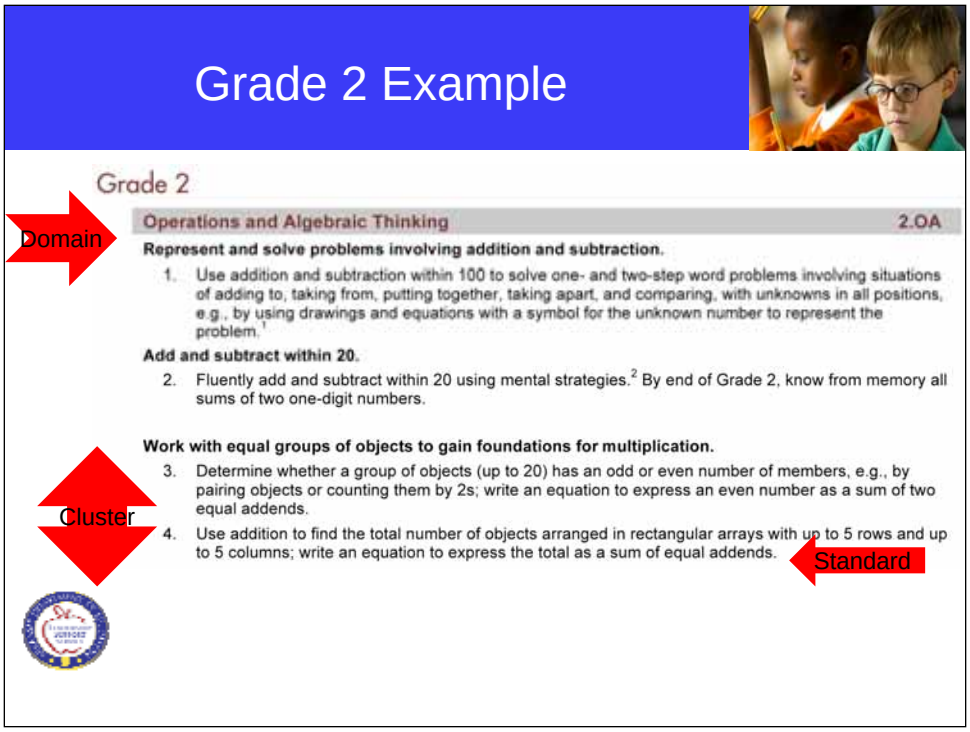
- **Domains:** overarching ideas that connect topics across the grades
- **Clusters:** illustrate progression of increasing complexity from grade to grade
- **Standards:** define what students should know and be able to do at each grade level

Mathematics K-8 Domains

K	1	2	3	4	5	6	7	8
Counting and cardinality								
Operations and Algebraic Thinking	Operations and Algebraic Thinking	Operations and Algebraic Thinking	Operations and Algebraic Thinking	Operations and Algebraic Thinking	Operations and Algebraic Thinking	Ratios and Proportional Relationships	Ratios and Proportional Relationships	
Number and Operations in Base Ten	Number and Operations in Base Ten	Number and Operations – Base Ten	Number and Operations – Base Ten	Number and Operations – Base Ten	Number and Operations – Base Ten	The Number System	The Number System	The Number System
			Number and Operations - Fractions	Number and Operations - Fractions	Number and Operations - Fractions	Expressions and Equations	Expressions and Equations	Expressions and Equations
								Functions
Measurement and Data	Measurement and Data	Measurement and Data	Measurement and Data	Measurement and Data	Measurement and Data	Statistics and Probability	Statistics and Probability	Statistics and Probability
Geometry	Geometry	Geometry	Geometry	Geometry	Geometry	Geometry	Geometry	Geometry

Domains: overarching ideas that connect topics across the grades

Each grade level focuses on 4-5 domains. The standards are organized within clusters in each domain to support the learning progressions.



A quick review for K-8.

Take a moment to look at a grade level and locate the domain, clusters, and standards.

Give participants a few moments to tab their notebooks, reflect and discuss the terminology.

Terminology of **High School** Mathematics Standards

Conceptual categories: overarching ideas that describe strands of content in high school

Domains/Clusters: groups of standards that describe coherent aspects of the content category

Standards: define what students should know and be able to do at each grade level

Standards indicated as (+) are beyond the college and career readiness level but are necessary for advanced mathematics courses, such as calculus, discrete mathematics, and advanced statistics. Standards with a (+) may still be found in courses expected for all students.

High School is organized in conceptual categories. Conceptual categories contain domains, clusters and standards.

Like standards are grouped into clusters and domains.

Mathematics High School Conceptual Categories

- Number and Quantity –N
- Algebra –A
- Functions –F
- Modeling – (across all conceptual categories)

Modeling standards are distributed under the five major headings and are indicated with a (★) symbol.

- Geometry –G
- Statistics and Probability –S

High school standards are organized in conceptual categories. Conceptual categories portray a coherent view of high school mathematics.

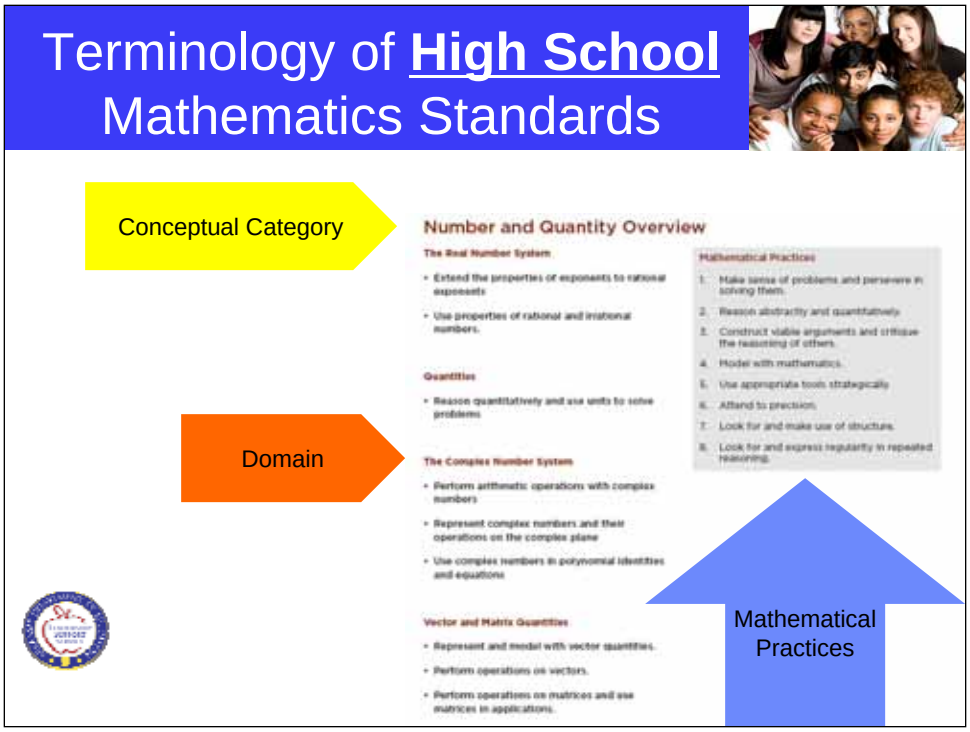
Modeling standards are distributed under the five major conceptual categories and are indicated with a (★) symbol.

Reference CCS Mathematics page 57 for the introduction.

Please note the narrative for High School – Number and Quantity on page 58.

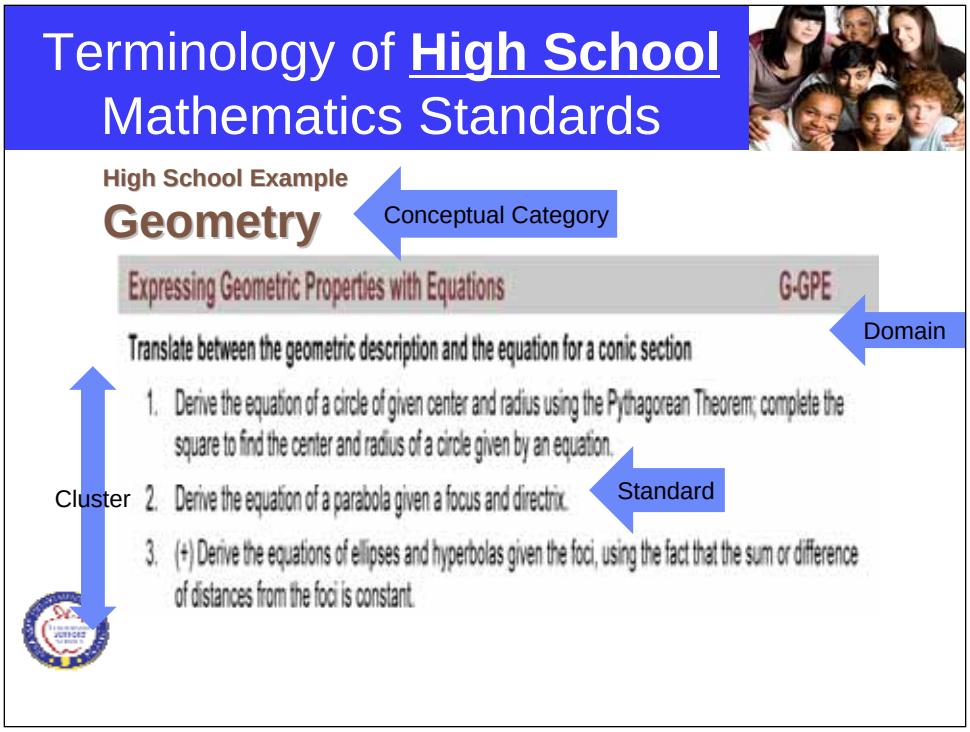
On page 59 you will see the Overview for Number and Quantity. The overview provides the domains and clusters. It also reminds you to consider the mathematical practices.

Then on page 60, you will see the mathematical content for Number and Quantity. This page identifies the domains, clusters and standards.

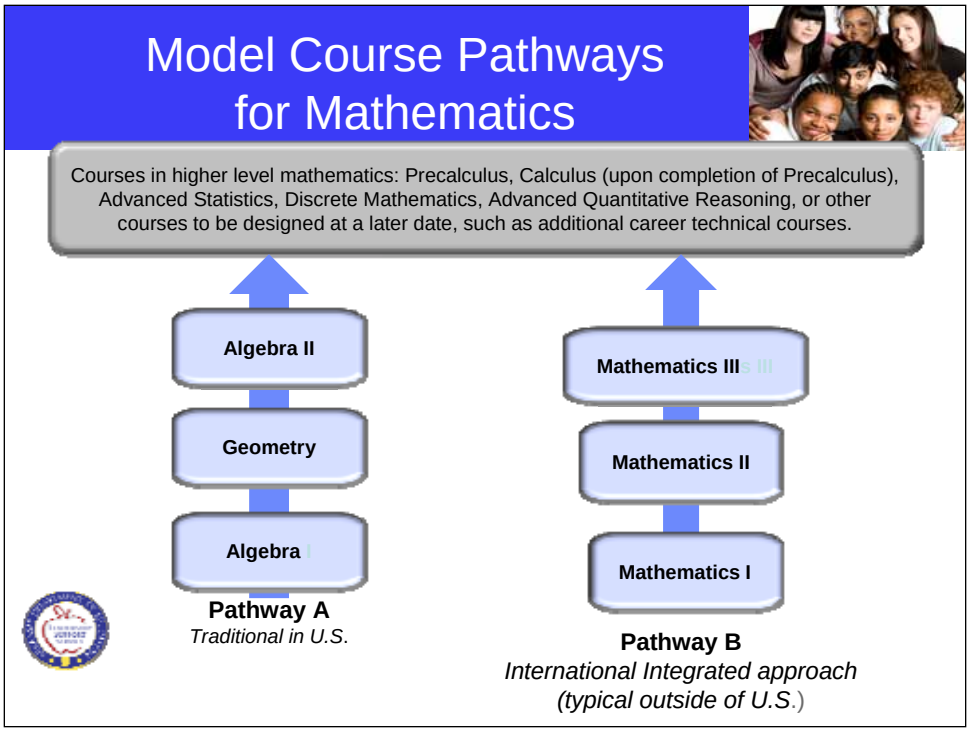


Each conceptual category includes an overview of the domains and clusters.
The standards (mathematical content) should be connected with the mathematical practices (see the gray box) during mathematics instruction.

Reference the CCS Mathematics Standards page 6.



Take a few moments to look at the design of the high school document and become familiar with the terminology for high school.



Remember that you will need to refer to Appendix A for the traditional pathway for high school courses.

Examining the CCSS for Mathematics

- Documents
- Design and Organization
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- ✓ Nomenclature

The nomenclature or how the standard is coded or labeled is different for. K-8 and high school mathematics.

Please note the ELA standards follow a different nomenclature than mathematics.

Sample Nomenclature K-8

K. CC. 1

Grade Level: **Kindergarten -K**

Domain: **Counting and Cardinality –CC**

Cluster: **Know number names and the count sequence.**

Standard: **1. Count to 100 by ones and tens.**

The nomenclature (labeling) of the standards for K-8 is Grade. Domain. Standard

Note: The cluster is not part of the nomenclature.

The sample is a kindergarten standard in the counting and cardinality domain. A standard nomenclature is used to assist all educators in communicating the standards they will be teaching.

Reference CCS Mathematics Standards, page 11.

Sample Nomenclature K-8

K. CC. 4a

Grade Level: **Kindergarten -K**

Domain: **Counting and Cardinality –CC**

Cluster: **Count to tell the number of objects.**

Standard: **4. Understand the relationship between numbers and quantities; connect counting to cardinality.**

a. When counting objects, say the number of names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

The nomenclature (labeling) of the standards for K-8 is Grade. Domain. Standard

Note: The cluster is not part of the nomenclature.

The sample is a kindergarten standard in the counting and cardinality domain. A standard nomenclature is used to assist all educators in communicating the standards they will be teaching.

Reference CCS Mathematics Standards, page 11.

Sample Nomenclature for High School

N. RN. 2

Course: **Algebra I**

Conceptual Category: **Number and Quantity -N**

Domain: **The Real Number System -RN**

Cluster: **Extend the properties of exponents to rational exponents.**

Standard: **2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.**

The nomenclature (labeling) of the standards for High School is Conceptual Category. Domain. Standard

Examining the CCSS for Mathematics

Documents

Design and Organization

Terminology

Nomenclature

This completes Part A of the Orientation to the CCSS. We have walked through the appropriate documents, examined the design and organization of the documents, reviewed the terminology and learned the nomenclature of the standards. You may want to refer to the side-by-side document as you begin to work with the CCSS Mathematics and the CCSS English Language Arts and Literacy in History/Social Studies, Science and Technical Subjects.

Please consider Part B of the Orientation to the CCSS as your next step.