

Common Core Standards for Mathematics

Brian Roget

*Assistant Director of Mathematics
Ohio Department of Education (ODE)*

Coherence

- Requires vertical growth that reflects the nature of the discipline
- Articulates a developmental progression of topics across grades and connects to other topics
- Emphasizes both conceptual understanding and procedural skills

Focus

- Identifies key ideas, understandings and skills for each grade or course
- Stresses deep learning (to address the mile wide, inch deep issue)
- Connects topics and standards within a grade or course
- Means applying concepts and skills within the same grade or course

Clarity and Specificity

- Entails clear, precise, and understandable language and symbols
- Requires sufficient detail to convey expected performance
- Maintains a relatively consistent “grain size”

Mathematics Standards

- **Standards for Mathematical Practice**

- Criteria for judging reasoning, problem solving, and engagement
- Mathematical process and “habits of mind”

- **Grade Level Standards**

- **Concepts:** Criteria for judging conceptual understanding
- **Skills:** Criteria for judging procedural fluency and problem solving

Mathematical Practices

- Mathematically proficient students:
 - Make sense of **problems** and persevere in solving them
 - **Reason** abstractly and quantitatively
 - Construct viable arguments and **critique** the reasoning of others
 - **Model** with mathematics

Mathematical Practices (cont.)

- Mathematically proficient students:
 - Use appropriate **tools** strategically
 - Attend to **precision**
 - Look for and make use of **structure**
 - Look for and **express regularity** in repeated reasoning

Format of K-8 Standards

- **Domains** are overarching big ideas that connect topics across the grades
- **Clusters** illustrate a progression of increasing complexity from grade to grade
- **Standards** state WHAT students should know and be able to do at each grade level
 - Also known as “content statements”

High School Standards

College and Career Readiness Stds. (Draft, September 17, 2009)	High School Standards (Draft, March 10, 2010)
Number	Number and Quantity
Quantity	
Expressions	Algebra
Equations	
Coordinates	
Functions	Functions
Shape	Geometry
Statistics	Statistics and Probability
Probability	
Modeling	Modeling

Format of High School Standards

- **Conceptual categories** are overarching big ideas that connect topics across courses
- **Clusters** group related standards
 - Illustrate progressions and organize mathematical practices
- **Standards** state WHAT students should know and be able to do at each grade level
 - Also known as “content statements”

High School Mathematics in the U.S.

- The status quo is not working
- Algebra 1 and Geometry courses
 - Reteach much middle grades content
- Algebra 2 courses typically
 - Reteach Algebra 1
 - Include some statistics and probability
 - Include optional topics
 - Pre-teach Precalculus content

Algebra 2 is two miles wide

Designing High School Courses

- High achieving countries teach the content of Algebra 1 and Geometry across grades 7-9
- Thus, the draft Standards include much algebra and geometry content in grades 7 and 8
 - Linear functions and equations
 - The Pythagorean Theorem
 - Congruence and similarity
 - Angle relationships

Mathematical Pathways

- Are drafts developed by Achieve committees
- Organize the content of the CCSS into coherent and rigorous courses
- Aim to bring coherence, focus, and clarity to high school mathematics
- Illustrate possible approaches—models, not mandates
- Are not prescriptions for curriculum or pedagogy

Mathematical Pathways

*Typical
in U.S.*

- Two model pathways under construction:
 - Pathway A: Two algebra courses and a geometry course, with statistics and probability in each
 - Pathway B: Three courses, each of which includes algebra, geometry, statistics, and probability
- Both pathways:
 - Require rethinking high school mathematics
 - Complete the Core and branch in the third year
 - Prepare students for a menu of fourth-year courses

*Typical
outside
U.S.*

Fourth-Year Mathematics Courses

- Fourth-year mathematics courses should engage students at the college- and career-ready level
 - Precalculus (or AP Calculus)
 - AP Statistics
 - Discrete Mathematics
 - Advanced Quantitative Reasoning
 - Courses designed for particular career technical pathways
 - ...

Discussion Questions

- What similarities do you see between the Common Core State Standards (and the Model Pathways), the Statway, quantitative literacy, and the NCTM's Focus on Reasoning and Sensemaking?

Discussion Questions

- How can K-12, two-year-college, and four-year-college faculty work together, seeking synergies among these various efforts and learning from each other?