

Demystifying the 2008 Mathematics Standard: Process and Product

The Process

A statewide committee of over 70 mathematics educators was involved in revising the 2008 Mathematics Standard. This diverse committee was composed of representatives from urban and rural areas, large and small districts, and charter schools. The committee included participants from Higher Education, curriculum directors, mathematics teacher leaders, Career and Technical Education teachers, second-career teachers, and classroom teachers (elementary, middle school, and high school).

The committee analyzed the 2003 Mathematics Standard and determined which items needed updating, which could remain as is, and those that would be eliminated due to overlap. Utilizing current research and guidance from national organizations/resources such as the National Council of Teachers of Mathematics *Principles and Standards*, the American Diploma Project, the National Assessment of Educational Progress (NAEP), the Curriculum Focal Points K-8 (NCTM), other states' standards, *Adding It Up* (National Research Council), and the Framework for 21st Century Learning, the committee began the process of revision. The process entailed revising and defining by grade level, the concepts and performance objectives for kindergarten through grade 12. Articulation through twelfth grade (College and Work Readiness) is an extension from the current standard (2003).

The accordion model of representation was employed with a rotation of members, maintaining a consistency from meeting to meeting so that the work could move forward. Comments from the public and from three external content reviewers were collected during March 2008. The revision members met to review each comment and determine what modifications to the standard were appropriate. The final draft of the standard was presented to the State Board of Education on June 24, 2008 and approved.

The Product

The comprehensive document (K-12) is designed so that teachers can view the continuum of learning across grade levels. Due to the addition of grades 11-12 (College Work Readiness), there are now two sections to the comprehensive document, grades K-6 and grades 7-12. There is an intentional clustering of performance objectives in order to emphasize certain key understandings at specific grade levels. In many cases, performance objectives were shifted from grade levels to allow a more concentrated focus. For instance, performance objectives pertaining to money were shifted from first grade to second grade. Probability was shifted from second and third grades to fourth and fifth grades. Fractions were shifted from first grade to grades three and four to support a deeper understanding of this complex topic.

The standard builds on the learning in previous grade levels, connects important ideas, and highlights new content each year. This coherency supports students in developing new understandings and skills. Looking down each individual column enables a teacher to see the content that students are expected to know and be able to do at any grade level.

The content in College Work Readiness (grades 11-12) is a new addition to the Mathematics Standard. This content is separated into the five main strands. Performance objectives highlighted in italics in the document have been identified as core to an Algebra II course. As districts/schools create additional high school mathematics courses, they may select from the comprehensive set of performance objectives contained within the five strands.

New to the 2008 Mathematics Standard is the development of more comprehensive grade level documents. The format of these documents will support implementation efforts. After each concept statement, there are summary expectations appropriate for that specific grade level. These summary statements provide a road map for instruction. There are now three columns of information. The first column lists the performance objectives with connections to other mathematics performance objectives and other content areas. The middle column is labeled "Process Integration" and highlights explicit connections to Strand 5, Concept 2 performance objectives. The majority of these Strand 5, Concept 2 performance objectives are new to the standard across grade levels. The third column provides instructional support to teachers in the form of "explanations and examples."

Close examination of the standard reveals a purposeful closure of topics rather than repeating the same performance objective from year to year. Carefully sequenced learning progressions exist throughout the 2008 Mathematics Standard. An example in Strand 3-Concept 1, begins in kindergarten with performance objective 1. An understanding of patterns and sequences is linked very thoughtfully to the previous year's learning and culminates in grades 11-12. The learning progressions often extend over a few grade levels or there might be an intentional skip of a grade level. There is also an increased emphasis of multiple representations throughout the strands and grade levels in order to support deeper mathematical understanding.

The concepts of systematic listing and counting and vertex-edge graphs have been more fully defined in the standard with the addition of new mathematical terminology. Even though the ideas of Hamilton and Euler paths and circuits are not new to the standard, the terminology is more explicit. These types of problems are real-world and application-based. The coloring of pictures and maps now begins with second grade where there is an intentional clustering of performance objectives at this grade level in order to build a firm foundation. The fundamental ideas of vertex-edge graphs are expanded through grades 11-12.

Below are major areas of focus/change that have been identified at different grade level bands:

- Grades K-2: Greater depth of exploration of quantity, place value, and equivalence with an increased focus on developing number facts with reasoning
- Grades 3-4: Increased emphasis on using models and representations across all strands, but specifically in the development of multiplication and division; introduction to decimals to the hundredths and using and connecting multiple representations with whole numbers, fractions, decimals and percents; composing and decomposing numbers using factors and multiples; introduction to simple ratios in 4th grade
- Grades 5-6: Focus on number with the addition of ratio in 5th grade; focus on number, specifically operations with fractions and decimals (addition and subtraction in 5th grade and multiplication and division in 6th grade, and the modeling of addition and subtraction of integers in 6th grade)
- Grades 7-8: Focus on proportional reasoning in 7th grade leading to an understanding of functions in 8th grade
- High School (grades 9-10): Strand 3 Concept 3; focus on multiple representations with a more explicit emphasis on logic; increased emphasis on quadratic functions and factoring as a new skill
- College Work Readiness (grades 11-12): Strand 3 Concept 2; focus on functions and differences between Algebra II and 4th year courses