# Board of Education Agenda Item

**Item:** _____K._____ **Date:** October 23, 2008

**Topic:** First Review of Proposed Revised *Mathematics Standards of Learning*

**Presenter:** Mrs. Deborah Bliss, Mathematics Coordinator

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**Origin:**

____ Topic presented for information only (no board action required)

__X__ Board review required by
- __X__ State or federal law or regulation
- ____ Board of Education regulation
- ____ Other: _____

__X__ Action requested at this meeting __Action requested at future meeting: _____

**Previous Review/Action:**

____ No previous board review/action

__X__ Previous review/action
Date March 19, 2008
Action Board of Education approved the timeline to proceed with the review process.

**Background Information:**
The Standards of Learning for mathematics were developed in 1995 and revised in 2001. The *Standards of Quality* require the Board of Education to review the Standards of Learning on a regular schedule. The *Mathematics Standards of Learning* are scheduled for review in 2009. As a result, on March 19, 2008, the Board approved a plan to review these standards during the 2008-2009 academic year. In accordance with the plan, the Department of Education took the following steps to produce a draft of the proposed revised *Mathematics Standards of Learning* for the Board's first review:

- Received online comments from stakeholders, including teachers, parents, and administrators that are summarized in Attachment A;
- Met with a teacher review committee that consisted of recommended individuals solicited from school divisions on August 5, 6, and 7, 2008, to review the public comment and consider recommendations and reports from Achieve, the College Board, ACT, as well as the National Assessment of Educational Progress (NAEP) Frameworks, the Curriculum Focal Points from the National Council of Teachers of Mathematics (NCTM), Principles and Standards for School Mathematics from NCTM, the Singapore Curricula, and the Report of the President's National Mathematics Advisory Panel;

- Solicited a postsecondary review committee comprised of mathematics and mathematics education faculty and met with the review committee on August 20, 2008;
- Solicited a business leaders review committee and sent a summary of the public comment with the current *Mathematics Standards of Learning*, requesting comments; and
- Developed a draft of the proposed revised *Mathematics Standards of Learning*.

**Summary of Major Elements:**
The attached draft of the proposed revised *Mathematics Standards of Learning* (Attachment B) consists of the following elements:

**Introduction**
The Standards of Learning for mathematics identify academic content for essential components of the mathematics curriculum at different grade levels for Virginia's public schools. Standards are identified for kindergarten through grade eight and for a core set of high school courses. Throughout a student's mathematics schooling from kindergarten through grade eight, specific content strands or topics are included. These content strands are Number and Number Sense; Computation and Estimation; Measurement; Geometry; Probability and Statistics; and Patterns, Functions, and Algebra. The Standards of Learning for each strand progress in complexity at each grade level and throughout the high school courses.

**Goals**
The *Mathematics Standards of Learning* address all students' needs today for stronger mathematical knowledge and skills to pursue higher education, to compete in a technologically oriented work force, and to be informed citizens. Students must gain an understanding of fundamental ideas in arithmetic, measurement, geometry, probability, data analysis and statistics, and algebra and functions, and develop proficiency in mathematical skills. In addition, students must learn to use a variety of methods and tools to compute, including paper and pencil, mental arithmetic, estimation, and calculators. The content of the mathematics standards is intended to support the following five goals for students: becoming mathematical problem solvers, communicating mathematically, reasoning mathematically, making mathematical connections, and using mathematical representations to model and interpret practical situations.

**Strands/Reporting Categories**
The *Mathematics Standards of Learning* for each course are grouped into categories that address related content and skills.

**Standards**
The *Mathematics Standards of Learning* for Virginia public schools describe the Commonwealth's expectations for student learning and achievement in grades K-12.

**Summary of the Proposed Revised *Mathematics Standards of Learning***
The major elements of the attached proposed revised *Mathematics Standards of Learning* include:

- Edits to enhance clarity, specificity, rigor, alignment of skills and content, and a reflection of the current academic research and practice;

- Emphasis on vertical alignment in grades K-7 to prepare students for Algebra I;
- Increased alignment of Algebra I and Algebra II; and
- Increase of focus at each grade level.

**Superintendent's Recommendation:**
The Superintendent of Public Instruction recommends that the Board of Education accept for first review the proposed revised *Mathematics Standards of Learning*.

**Impact on Resources:**
This responsibility can be absorbed by the agency's existing resources at this time. If the agency is required to absorb additional responsibilities related to this activity, other services may be impacted.

**Timetable for Further Review/Action:**
The *Mathematics Standards of Learning* review work plan calls for public hearings, final review, and adoption of the *Mathematics Standards of Learning* by the Board of Education by winter 2009.

Attachment A

**Summary of Online Comments**

**K-12 *Mathematics Standards of Learning***
**March 21, 2008-April 23, 2008**

A total of 957 comments were received electronically for the *Mathematics Standards of Learning* in Kindergarten through Advanced Placement Calculus during the public comment period. No comments were received via U. S. Mail.

**The number of comments submitted by grade level or course title is below:**

| Number of Comments | Grade Level or High School Course Name |
|---|---|
| 87 | Kindergarten |
| 81 | Grade 1 |
| 114 | Grade 2 |
| 100 | Grade 3 |
| 122 | Grade 4 |
| 68 | Grade 5 |
| 86 | Grade 6 |
| 65 | Grade 7 |
| 65 | Grade 8 |
| 14 | Algebra I |
| 9 | Geometry |
| 2 | Algebra II |
| 4 | Advanced Placement Calculus |

Nongrade or course specific comments (includes sets of general comments or letters from groups):

| | |
|---|---|
| Elementary | 50 |
| Middle School | 21 |
| High School | 19 |

**Groups submitting comments were:**

- Virginia Council of Mathematics Supervisors
- Alexandria City Public Schools mathematics teachers
- Salem City Public Schools mathematics teachers
- Chesterfield County Public Schools mathematics coordinators and specialists
- Montgomery County Public Schools mathematics teachers
- Stafford County Public Schools mathematics teachers
- Benjamin Franklin Middle School, Franklin County Public Schools, Grade 8 mathematics teachers
- Hanover County Public Schools mathematics specialists and lead mathematics teachers
- Arlington County Public Schools mathematics supervisor and mathematics specialists
- Albemarle County Public Schools mathematics teachers
- Walker Upper Elementary School, Charlottesville City Public Schools, Grade 6 mathematics team

**General comments included for the elementary school (K-5) Standards of Learning were:**

- Use the Curriculum Focal Points (National Council of Teachers of Mathematics 2007) as a guide for reviewing the Standards of Learning (focus on big ideas; fewer topics in each course in order to provide guidance on the importance of topics);
- Emphasize depth of content rather than breadth of topics; reduce topic redundancy between K-8 and high school courses;
- Increase counting numbers to 200 at Grade 1;
- Develop number relationships between addition and subtraction in contexts and using numerical decomposition;
- Require mathematics facts fluency in specific grades:
  - addition and subtraction to 20 in Grade 3;
  - multiplication and division through 12 x 12 in Grade 4;
- Move metric measurement to the elementary science standards where they are taught in context;
- Use *halves, thirds, fourths, eighths, tenths* rather than the symbols ($\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{8}, \frac{1}{10}$) in the Standards of Learning;
- Add *vertex*, *vertices, equation,* commutative properties of addition and multiplication, and the additive identity element (0) to Grade 3; associative properties of addition and multiplication and the multiplicative identity element (1) to Grade 4; the distributive property and the multiplicative property of zero to Grade 5; and
- Move percent from the middle grades to Grade 5.

**General comments included for the middle school (6-8) Standards of Learning were:**

- Use the Curriculum Focal Points (NCTM 2007) as a guide for reviewing the Standards of Learning (focus on big ideas; fewer topics in each course in order to provide guidance on the importance of topics);
- Emphasize depth of content rather than breadth of topics; reduce topic redundancy between K-8 and high school courses;
- Move all the classical constructions to high school Geometry;
- Reduce the number of new topics in Grades 6 and 7;
- Address measurement (U. S. Customary and metric) at all grade levels, K-8;
- Standardize vocabulary K-8;
- Strengthen probability concepts in Grade 8 (theoretical and experimental probability, Law of Large Numbers, counting techniques);
- Address box-and-whisker plots in Grade 8 only.

**General comments included for the high school courses were:**

- Use the *Algebra, Functions, and Data Analysis Standards of Learning* as a guide for organizing the Standards of Learning in the other high school mathematics courses (focus on big ideas; fewer topics in each course in order to provide guidance on the importance of topics);
- Emphasize depth of content rather than breadth of topics; reduce topic redundancy between K-8 and high school courses;
- Organize strong vertical alignment and articulation between K-8 and Algebra I as well as between Algebra I and Algebra II;
- Provide higher levels of challenge for students;
- Emphasize slope as a rate of change;

- Emphasize a functional approach to algebra content;
- Emphasize practical interpretations and applications of algebra content;
- Move measures of central tendency to middle school and emphasize line of best fit, correlation coefficient, and measures of variability in algebra;
- Remove constructions from Geometry; and
- Delete the *Advanced Placement Calculus Standards of Learning* since the College Board revises the content expectations every two years and publishes a new booklet at that time, but keep the course code.

# Proposed Revised Mathematics Standards of Learning

## for Virginia Public Schools

## First Review October 23, 2008

# Foreword

The Standards of Learning in this publication represent a ~~major~~ significant development in public education in Virginia. These standards focus on the mathematical knowledge and skills all students need for the future, and they have been aligned with national expectations for postsecondary success. The Standards of Learning provide a framework for instructional programs designed to raise the academic achievement of all students in Virginia and are an important part of Virginia's efforts to provide challenging educational programs in the public schools.

The Standards of Learning set reasonable targets and expectations for what teachers need to teach and students need to learn. The standards are not intended to encompass the entire curriculum for a given grade level or course or to prescribe how the content should be taught; the standards are to be incorporated into a broader, locally designed curriculum. Teachers are encouraged to go beyond the standards and select instructional strategies and assessment methods appropriate for their students.

The Standards of Learning are recognized as a model for other states. They were developed through a series of public hearings and the efforts of parents, teachers, representatives from higher education ~~officials~~, and ~~representatives of~~ business and industry leaders. The standards set clear, concise, and measurable academic expectations for young people. Parents are encouraged to work with their children to help them achieve these academic standards.

A major objective of Virginia's educational agenda is to give the citizens of the ~~c~~Commonwealth a program of public education that is among the best in the nation and that meets the needs of all young people in the ~~c~~Commonwealth. These Standards of Learning chart the course for achieving that objective.

# Mathematics Standards of Learning

## Introduction

The Standards of Learning for mathematics identify academic content for essential components of the mathematics curriculum at different grade levels for Virginia's public schools. Recommendations and reports from Achieve, the College Board, and ACT, as well as the National Assessment of Educational Progress (NAEP) Frameworks, the *Curriculum Focal Points* from the National Council of Teachers of Mathematics (NCTM), *Principles and Standards for School Mathematics* from NCTM, the Singapore Curricula, the *Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report* from the American Statistical Association, and the *Report of the President's National Mathematics Advisory Panel* were considered in identifying mathematics content necessary for success for all students in postsecondary pursuits.

Standards are identified for kindergarten through grade eight and for a core set of high school courses. Throughout a student's mathematics schooling from kindergarten through grade eight, specific content strands or topics are included. These content strands are Number and Number Sense; Computation and Estimation; Measurement; Geometry; Probability and Statistics; and Patterns, Functions, and Algebra. The Standards of Learning for each strand progress in complexity at each grade level and throughout the high school courses.

The *Mathematics Standards of Learning* Curriculum Framework is a companion document to the *Mathematics Standards of Learning* that amplifies the *Mathematics Standards of Learning* and defines the content knowledge, skills, and understandings that are measured by the Standards of Learning assessments. The Curriculum Framework provides additional guidance to school divisions and their teachers as they develop an instructional program appropriate for their students. It assists teachers as they plan their lessons by identifying essential understandings, defining essential content knowledge, and describing the intellectual skills students need to use. This supplemental framework delineates in greater specificity the minimum content that all teachers should teach and all students should learn.

The Standards of Learning are not intended to encompass the entire curriculum for a given grade level or course or to prescribe how the content should be taught. Teachers are encouraged to go beyond the standards and to select instructional strategies and assessment methods appropriate for their students.

## Goals

Students today require stronger mathematical knowledge and skills to pursue higher education, to compete in a technologically ~~oriented~~ sophisticated work force, and to be informed citizens. Students must gain an understanding of fundamental ideas in arithmetic, measurement, geometry, probability, data analysis and statistics, and algebra and functions, and develop proficiency in mathematical skills. In addition, students must learn to use a variety of methods and tools to compute, including paper and pencil, mental arithmetic, estimation, and calculators. Graphing utilities, spreadsheets, calculators, computers, and other forms of electronic information technology are now standard tools for mathematical problem solving in science, engineering, business and industry, government, and practical affairs. Hence, the use of