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2011-2012 Mathematics Standards of Learning Testing: Start of a New Trend Line in Student Achievement

The revised mathematics Standards of Learning (SOL) approved by the Board of Education in 2009 are a critical component of the commonwealth's effort to promote college-and-career readiness. The updated mathematics standards are fully aligned with the national Common Core State Standards and meet national and international benchmarks for content and rigor established by organizations such as the College Board.

The mathematics tests most students will take this year are based exclusively on the 2009 Mathematics SOL and the more detailed 2009 Mathematics SOL Curriculum Framework, and assess the new content and increased rigor of the 2009 standards — including content that was previously taught and tested at different grade levels.

The new assessments also include new, technology-enhanced items that require students to demonstrate critical-thinking and problem-solving skills — as well as mathematics content knowledge. These innovative questions and problems make up between 10-15 percent of the items on the new tests. On the spring 2012 assessments in grades 3-5, the technology-enhanced items are field-test items that will not impact students' scores.

Fall 2011 SOL Test Administration Results

While the new mathematics SOL tests in grades 3-8 will debut later this spring, middle and high school students on four-by-four block schedules have already experienced the increased rigor of the new Algebra I, Geometry and Algebra II tests.

The performance of the approximately 24,000 students who took these end-of-course assessments during the Fall 2011 SOL Non-Writing Test Administration (November 21, 2011-February 24, 2012) suggests that — as has happened previously when more rigorous standards and tests have been introduced — schools and school divisions may see a temporary drop in pass rates as local curriculum and instructional strategies are adjusted to meet higher expectations for learning and achievement.

The following table displays the pass rates of first-time test takers on the three mathematics end-of-course tests during the three most recent fall administrations.

Test	Fall 2011	Fall 2010	Fall 2009
Algebra I	49.2%	84.1%	82.1%
Geometry	63.0%	78.5%	81.0%
Algebra II	53.7%	84.5%	85.3%

Keep in mind that these pass rates represent the achievement of first-time test takers only and that students tested during fall administrations are not necessarily representative of the 277,000-287,000 students statewide who take end-of-course mathematics tests during the course of an entire year.

(more)

Nevertheless, the fall 2011 results support the Board of Education's expectation that the new assessments will mark the beginning of a new trend line in mathematics achievement. As Superintendent of Public Instruction Patricia I. Wright has pointed out, lower mathematics pass rates in 2011-2012 indicate that Virginia is expecting more of students — not that students are learning less.

How will the new Mathematics SOL and tests impact students?

As anticipated, results from the fall 2011 Algebra I, Geometry and Algebra II tests show that students found the new assessments challenging.

The 2009 Mathematics Standards of Learning and corresponding assessments are designed to ensure that Virginia public school students are truly college-and-career ready when they graduate from high school. Students today require more rigorous mathematical knowledge and skills to pursue higher education and to compete successfully in a technologically sophisticated work force.

Virginia teachers, school administrators and content specialists participated in the development of the new SOL mathematics tests by serving on committees that reviewed items and test forms to ensure that they measure student knowledge accurately and fairly.

Technology-enhanced items on the new grade 6-8 and end-of-course mathematics tests were field tested during 2010-2011 and are designed to mirror students' classroom experiences. For example, "drag and drop" items require students to sort, order, classify, or label to provide an answer. The "drag and drop" functionality also gives students the ability to create graphs from a given data set. "Hot spot" items require students to identify all possible correct answers from a given set or list, plot points on a grid, or highlight a specific feature in a diagram or figure. "Fill-in-the-blank" items require students to complete open-ended problems and type answers into the blanks. These items provide students with the flexibility of applying multiple strategies to solve problems prior to deciding on an answer.

The end-of-course cut scores for proficiency and advanced proficiency ("advanced/college path" on the Algebra II SOL test) adopted by the Board of Education in January 2012 are within the ranges recommended by committees of teachers and other mathematics educators.

Students are allowed multiple retakes of end-of-course tests they need to pass in order to earn a diploma. VDOE has extended the expedited retake window until March 2, 2012, for students who did not demonstrate proficiency during the fall 2011 administration. Seniors who were unsuccessful during the fall administration will have several additional opportunities before the end of the school year to retake tests needed to earn verified credits for graduation.

Performance-by-question data from the fall 2011 tests will help teachers and instructional leaders prepare students for these opportunities.

Will the new Mathematics SOL tests impact school and division accountability ratings?

Previous actions by the Board of Education to increase the rigor of the Standards of Learning program through the years have had a short-term impact on pass rates and the accountability ratings of schools and divisions.

For example, the shift in 2006 from cumulative assessments in reading and mathematics in grades 3, 5 and 8 to annual testing in grades 3-8 increased the rigor of the SOL program, especially in middle school mathematics, by testing deeper into the content at each grade level. Pass rates and accreditation ratings subsequently recovered as school divisions — with technical support from the Virginia Department of Education (VDOE) — increased the quality and depth of instruction.

The introduction in 2010-2011 of SOL history tests with more rigorous item types also resulted in lower pass rates in many schools. History pass rates are expected to rebound as teachers prepare students to apply their content knowledge in ways not previously assessed.

As it has in the past, three-year averaging — as allowed under Virginia's accountability program — will mitigate the impact of the new mathematics tests on federal adequate yearly progress (AYP) ratings under No Child Left Behind (NCLB) and state accreditation ratings for the 2012-2013 school year.

Virginia's accountability system also recognizes successful remediation programs that help students achieve minimum proficiency standards in mathematics (and reading). If a student fails a test required for graduation and successfully retests during the same school year, the result of the first test is not included in the school's accreditation and AYP calculations. A school also is credited for state accreditation purposes for successful remediation when a student passes a mathematics test after failing the assessment for the previous grade level.

The Code of Virginia allows the Board of Education to adopt special provisions related to the use of any SOL test or tests in the calculation of accreditation ratings for any period during which the standards or assessments in the content area are being revised and phased in. But the Board of Education must approve and provide notice to local school boards of any special provisions before the statewide administration of the tests.

Federal education law allows states to reset annual AYP objectives when new tests are introduced. Because of the significant changes made to the mathematics standards, the corresponding SOL tests introduced during 2011-2012 qualify as new assessments requiring new cut scores for proficiency and advanced proficiency. Resetting AYP objectives would require federal approval but this option is available to the state board in the event Virginia's NCLB waiver application is not approved.

How has VDOE helped schools implement the new Mathematics SOL?

Since 2009, VDOE has provided guidance and support related to curriculum, instruction and assessments to assist teachers and administrators prepare for and implement the new standards and tests.

- The 2009 Mathematics SOL and 2009 Mathematics SOL Curriculum Framework were posted on the VDOE website immediately following approval by the Board of Education. Draft versions of the documents were posted prior to board approval.
- The Mathematics Standards of Learning Crosswalk Between the 2009 and 2001 Standards document detailing additions, deletions and changes included in the new SOL was posted on the VDOE website in February 2010.
- Since 2009, VDOE has conducted 10 Mathematics SOL Institutes that provided targeted professional development for school division representatives to support the implementation of the 2009 Mathematics SOL. Professional development resources from each institute were posted online to facilitate ongoing professional development in school divisions.
- Revised mathematics test blueprints were posted on the VDOE website in September 2010 to accommodate curriculum development and instructional planning. School divisions were advised in May 2009 that they should begin teaching the new mathematics standards in 2010-2011 as field-test items on spring 2011 tests would include new content from the 2009 SOL.
- Sixteen instructional videos were developed and made available online in 2011 to help teachers present content from the 2009 SOL identified as instructionally challenging. In addition, previously available videos were updated to correlate to appropriate grade levels, based on the 2009 SOL.
- Sample lesson plans were developed and posted on the VDOE website to help teachers align instruction with the new mathematics standards by providing examples of how the knowledge and skills found in the 2009 SOL and Curriculum Framework can be presented to students in the

classroom. The sample lesson plans are accessible using a keyword search, or by selecting specific SOL objectives organized by grade level and reporting category. VDOE continues to add new lesson plans to this collection.

- Technical assistance documents were developed and posted on the VDOE website in 2010 to help teachers present content related to statistics in the new standards for Algebra I and Algebra II and to supplement previously adopted mathematics textbooks.
- Online practice test items were developed and made available on the VDOE website in March 2011 to provide examples of the new content and increased rigor represented by the 2009 Mathematics SOL and illustrate the new technology-enhanced items for grades 6-8, Algebra I, Geometry and Algebra II. Additional online practice tools are in development. Practice items are accompanied by guides for teachers to use in reviewing practice items with students. Additional online practice items, including examples of technology-enhanced items for grades 3-5, will be posted on the VODE website in the next few weeks.
- Ancillary Test Materials were developed and posted on the VDOE website in August 2011 for use in preparing students for the new mathematics tests. These include formula sheets for grades 6-8, Algebra I, Geometry, and Algebra II, as well as the table of Standard Normal Probabilities (z-table) for use on the Algebra II test for items requiring students to analyze properties of normal distributions and apply those properties to determine probabilities associated with areas under the standard normal curve.

How can teachers, principals and other educators successfully implement the new mathematics standards and prepare students for the new tests?

VDOE mathematics specialists emphasize the following as critical steps and strategies for success in implementing the new mathematics standards.

- The content of the written, taught and assessed curricula must be aligned with the 2009 Mathematics SOL Curriculum Framework. The written curriculum must be taught in every classroom.
- Classroom assessments should be updated to reflect the written curriculum and the increased rigor of the revised standards.
- Sustained professional development focused on instruction and assessment of the 2009 Mathematics SOL should be provided to teachers. Professional development should emphasize vertical articulation and pedagogy associated with developing understanding of content identified locally as areas of limited teacher expertise. School divisions should collaborate to develop and share professional development.
- Instructional strategies, lesson plans and assessments should be developed in communities of mathematics teachers. School divisions should facilitate collaboration among teachers within and among school divisions to develop and share instruction and assessment resources.
- Teachers should facilitate students' mathematical understanding through problem solving, communication and reasoning. Teachers should ask students to communicate their mathematical thinking as they solve problems. Students should be required to analyze, interpret, and develop processes for solving mathematical tasks based on their prior knowledge and experiences. When students “get stuck” on a problem, they should be prompted with a question that will assist them in analyzing their own thinking rather than with a suggestion that leads them directly to an answer.
- Teachers should provide instruction that engages students through relevant context, connects algorithmic procedures to mathematical concepts and incorporates appropriate technology.
- Teachers should use formative assessments to inform and improve their instruction. Analysis of student understanding and thinking through questioning and/or written responses may shed light on student misconceptions.
- School administrators should provide observational feedback to teachers that promotes mathematical communication, rigorous and relevant instruction and mathematical tasks, and the use of formative assessments to guide instructional decisions.

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