

Virginia

Standards of Learning Assessments

Blueprint

Grade 4

Mathematics Test

for the

2001 Mathematics Standards of Learning

This revised blueprint will be effective with the 2005-2006 administration of the Standards of Learning Tests.

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Grade 4 Mathematics Blueprint

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Standards of Learning (SOL) Test Blueprint

Introduction

What is a test blueprint?

A test blueprint is a guide for test construction and use. The Standards of Learning (SOL) test blueprints serve a number of purposes. They serve as a guide to test developers as they write test questions and construct the SOL tests. These blueprints also serve as a guide to educators, parents, and students in that they show:

- (a) the SOL covered by the test and which, if any, have been excluded;
- (b) which SOL are assigned to each reporting category;
- (c) the number of test items in each reporting category and on the total test;
- (d) general information about how the test questions were constructed; and
- (e) the materials that students are allowed to use while taking the test.

How is the test blueprint organized?

The blueprint contains the following information:

1. **Test Development Guidelines**: guidelines used by the testing contractor and the members of the Content Review Committees in developing the SOL tests. This section contains two parts:
 - A. **General Considerations** — lists general considerations that are used in developing the test as well as considerations specific to a particular content area.
 - B. **Ancillary Materials** — lists any materials that students are allowed to use while taking the test.
2. **Blueprint Summary Table**: a summary of the blueprint which displays the following information:
 - reporting categories for the test;
 - number of test items in each reporting category;
 - Standards of Learning (SOL) included in each reporting category. SOL are identified by numbers and letters that correspond to the original SOL document;
 - SOL which are excluded from the SOL test;
 - number of operational items on the test;
 - number of field-test items on the test; and
 - total number of items (operational and field-test items) on the test.

3. **Expanded Blueprint:** provides the same information as the Blueprint Summary Table except that the full text of each SOL is included.

What is a reporting category?

Each test assesses a number of SOL. In the test blueprint, SOL are grouped into categories that represent related content or skills. These categories are labeled *Reporting Categories*. For example, a reporting category for the Grade 4 Mathematics test is “Computation and Estimation.” Each of the SOL in this reporting category addresses computation using addition, subtraction, multiplication, or division or requires the student to estimate the answer to a problem. When the results of the SOL tests are reported, the scores will be presented in terms of scores for each reporting category and a total test score.

Are some SOL assigned to more than one reporting category?

In grade 4 mathematics, each standard, as well as each letter under a standard, is assigned to only one reporting category.

Will all SOL listed in the blueprint be assessed each time the SOL tests are given?

Each SOL will not be assessed on every SOL test form. To keep the length of a test reasonable, the test will measure a selection of SOL within a reporting category. However, every SOL that is not excluded in the blueprint is eligible for inclusion on each form of an SOL test. Over time all SOL in a reporting category will be assessed.

Grade 4 Mathematics Test Development Guidelines

A. General Considerations

1. All items included in this test will address the knowledge and skills specified in the 2001 Virginia Standards of Learning in Mathematics for grade 4.
2. Items will be examined for any content or context that stereotypes, offends, or unfairly penalizes students based on age, gender, economic status, race, ethnicity, religion, or geographic region.
3. The test will be untimed. The test will be administered in two sections, one in which four-function calculator use is permitted and one in which it is prohibited. Students will be provided with a brief break between sections.
4. There is no penalty for guessing. Students will be scored on the number of correct answers out of the total number of operational items on the test.
5. Students will be permitted to use a four-function calculator during the second section of the test.
6. Students will be permitted to use scratch paper at any time during the test.
7. Students will be permitted to use standard (e.g., inches) and metric rulers during the test.
8. Items will be grade-appropriate in terms of difficulty, interest, and reading level.
9. Where appropriate, “real-life” examples and situations that the student would likely encounter will be used to present data or ask questions.

B. Ancillary Materials

Refer to the current examiner’s manual or the Department of Education’s Web site for ancillary materials that may be used.

Grade 4 Mathematics Test Blueprint Summary Table

Reporting Categories	Number of Items	Grade 4 SOL
Number and Number Sense	8	4.1a,b,c 4.2a,b,c 4.3 4.4a,b,c
Computation and Estimation	12	4.5 4.6 4.7 4.8 4.9a,b,c
Measurement and Geometry	12	4.10a,b,c 4.11a,b,c 4.12a,b,c 4.13a,b 4.14 4.15a,b 4.16 4.17a,b,c 4.18
Probability and Statistics	8	4.19a,b 4.20
Patterns, Functions, and Algebra	10	4.21 4.22
SOL Excluded From This Test		None
Total Number of Operational Items	50	
Field Test Items*	10	
Total Number of Items	60	

*These field test items will *not* be used to compute students' scores on the test.

Expanded Blueprint

Reporting Category: Number and Number Sense Number of Items: 8

Grade 4 SOL in This Reporting Category:

- 4.1 The student will
- identify (orally and in writing) the place value for each digit in a whole number expressed through millions;
 - compare two whole numbers expressed through millions, using symbols ($>$, $<$, or $=$); and
 - round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand.
- 4.2 The student will
- identify, model, and compare rational numbers (fractions and mixed numbers), using concrete objects and pictures;
 - represent equivalent fractions; and
 - relate fractions to decimals, using concrete objects.
- 4.3 The student will compare the numerical value of fractions (with like and unlike denominators) having denominators of 12 or less, using concrete materials.
- 4.4 The student will
- read, write, represent, and identify decimals expressed through thousandths;
 - round to the nearest whole number, tenth, and hundredth; and
 - compare the value of two decimals, using symbols ($<$, $>$, or $=$), concrete materials, drawings, and calculators.

Reporting Category: Computation and Estimation Number of Items: 12

Grade 4 SOL in This Reporting Category:

- 4.5 The student will estimate whole-number sums and differences and describe the method of estimation. Students will refine estimates, using terms such as *closer to*, *between*, and *a little more than*.
- 4.6 The student will add and subtract whole numbers written in vertical and horizontal form, choosing appropriately between paper and pencil methods and calculators.
- 4.7 The student will find the product of two whole numbers when one factor has two digits or fewer and the other factor has three digits or fewer, using estimation and paper and pencil. For larger products (a two-digit numeral times a three-digit numeral), estimation and calculators will be used.
- 4.8 The student will estimate and find the quotient of two whole numbers, given a one-digit divisor.
- 4.9 The student will
 - a) add and subtract with fractions having like and unlike denominators of 12 or less, using concrete materials, pictorial representations, and paper and pencil;
 - b) add and subtract with decimals through thousandths, using concrete materials, pictorial representations, and paper and pencil; and
 - c) solve problems involving addition and subtraction with fractions having like and unlike denominators of 12 or less and with decimals expressed through thousandths, using various computational methods, including calculators, paper and pencil, mental computation, and estimation.

Reporting Category: Measurement and Geometry Number of Items: 12

Grade 4 SOL in This Reporting Category:

4.10 The student will

- a) estimate and measure weight/mass, using actual measuring devices, and describe the results in U.S. Customary/metric units as appropriate, including ounces, pounds, grams, and kilograms;
- b) identify equivalent measurements between units within the U.S. Customary system (ounces and pounds) and between units within the metric system (grams and kilograms); and
- c) estimate the conversion of ounces and grams and pounds and kilograms, using approximate comparisons (1 ounce is about 28 grams, or 1 gram is about the weight of a paper clip; 1 kilogram is a little more than 2 pounds).*

**The intent of this standard is for students to make ballpark comparisons and not to memorize conversion factors between U.S. Customary and metric units.*

4.11 The student will

- a) estimate and measure length, using actual measuring devices, and describe the results in both metric and U.S. Customary units, including part of an inch ($\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$), inches, feet, yards, millimeters, centimeters, and meters;
- b) identify equivalent measurements between units within the U.S. Customary system (inches and feet; feet and yards; inches and yards) and between units within the metric system (millimeters and centimeters; centimeters and meters; and millimeters and meters); and
- c) estimate the conversion of inches and centimeters, yards and meters, and miles and kilometers, using approximate comparisons (1 inch is about 2.5 centimeters, 1 meter is a little longer than 1 yard, 1 mile is slightly farther than 1.5 kilometers, or 1 kilometer is slightly farther than half a mile).*

**The intent of this standard is for students to make ballpark comparisons and not to memorize conversion factors between U.S. Customary and metric units.*

4.12 The student will

- a) estimate and measure liquid volume, using actual measuring devices and using metric and U.S. Customary units, including cups, pints, quarts, gallons, milliliters, and liters;
- b) identify equivalent measurements between units within the U.S. Customary system (cups, pints, quarts, and gallons) and between units within the metric system (milliliters and liters); and
- c) estimate the conversion of quarts and liters, using approximate comparisons (1 quart is a little less than 1 liter, 1 liter is a little more than 1 quart).*

**The intent of this standard is for students to make ballpark comparisons and not to memorize conversion factors between U.S. Customary and metric units.*

- 4.13 The student will
- identify and describe situations representing the use of perimeter and area; and
 - use measuring devices to find perimeter in both standard and nonstandard units of measure.
- 4.14 The student will investigate and describe the relationships between and among points, lines, line segments, and rays.
- 4.15 The student will
- identify and draw representations of points, lines, line segments, rays, and angles, using a straightedge or ruler; and
 - describe the path of shortest distance between two points on a flat surface.
- 4.16 The student will identify and draw representations of lines that illustrate intersection, parallelism, and perpendicularity.
- 4.17 The student will
- analyze and compare the properties of two-dimensional (plane) geometric figures (circle, square, rectangle, triangle, parallelogram, and rhombus) and three-dimensional (solid) geometric figures (sphere, cube, and rectangular solid [prism]);
 - identify congruent and noncongruent shapes; and
 - investigate congruence of plane figures after geometric transformations such as reflection (flip), translation (slide) and rotation (turn), using mirrors, paper folding, and tracing.
- 4.18 The student will identify the ordered pair for a point and locate the point for an ordered pair in the first quadrant of a coordinate plane.

<p>Reporting Category: Probability and Statistics Number of Items: 8</p>
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Grade 4 SOL in This Reporting Category:

- 4.19 The student will
- predict the likelihood of outcomes of a simple event, using the terms *certain*, *likely*, *unlikely*, *impossible*; and
 - determine the probability of a given simple event, using concrete materials.

4.20 The student will collect, organize, and display data in line and bar graphs with scale increments of one or greater than one and use the display to interpret the results, draw conclusions, and make predictions.

Reporting Category: Patterns, Functions, and Algebra

Number of Items: 10

Grade 4 SOL in This Reporting Category:

4.21 The student will recognize, create, and extend numerical and geometric patterns, using concrete materials, number lines, symbols, tables, and words.

4.22 The student will recognize and demonstrate the meaning of equality, using symbols representing numbers, operations, and relations [e.g., $3 + 5 = 5 + 3$ and $15 + (35 + 16) = (15 + 35) + 16$].