Virginia

Standards of Learning Assessments

Blueprint
Grade 5
MathematicsTest

Spring 2003

Grade 5 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. One, they serve as a guide to test developers as they write test questions and construct the SOL tests. Two, they 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?

There is a blueprint for each test (e.g., grade 3 English, grade 5 mathematics, grade 8 science, U.S. History). Each 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 three 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. Item Format — lists information on how items for the test are constructed.

   C. Ancillary Materials — lists any materials (e.g., calculators, rulers, protractors, compasses, dictionaries) that students are allowed to use while taking each test.

2. **Blueprint Summary Table:** a summary of the blueprint which displays the following information:

   - reporting categories for each 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 (letters are assigned to the "bullets" in the original 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.

   Expanded Blueprint: provides the same information as the Blueprint Summary Table except that the full text of each SOL is included. In addition, SOL that are excluded from the test are categorized by the reason they are not included.

What is a reporting category?

Each test covers a number of SOL. In the test blueprint, SOL are grouped into categories that address related content or skills. These categories are labeled Reporting Categories. For example, a Reporting Category for the Grade 5 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. Each SOL is assigned to only one reporting category.

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

Due to the large number of SOL in a content area for a grade span, *every* SOL will not be assessed on every SOL test form. By necessity, to keep the length of a test reasonable, each test will sample from the SOL within a reporting category. However, every SOL is eligible for inclusion on each form of an SOL test.

Grade 5 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 grades 4-5.
2. The items will be free of stereotyping or bias directed at a particular age, gender, economic status, racial, ethnic or religious group, or geographic region.
3. The test will be untimed. The test will be administered in two sections, one in which 4-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' scores will be based 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 protractor or angle ruler during the test.
6. Students will be permitted to use a four-function calculator during the last half of the test.
7. Students will be permitted to use scratch paper (plain paper, patty paper, lined paper, or grid paper) at any time during the test.
8. Students will be permitted to use standard (e.g., inches) and metric rulers during the test.
9. Items will be grade-appropriate in terms of difficulty, interest, and reading level.
10. Where appropriate, "real-life" examples and situations that the student would likely encounter will be used to present data or ask questions.

B. Item Format

1. Each item will be a multiple choice item containing four choices. Choices such as "None of the above," "All of the above," and "Not here" will **not** be used.
2. Answer choices will be arranged vertically beneath the item stems unless space considerations prevent such an arrangement.
3. Item stems will be in the form of questions or in the form of sentences that require completion. Incomplete sentences will be followed by a dash.
4. In most cases, numbers will be expressed as numerals.
5. Answer choices will be arranged in ascending or descending order, when appropriate.
6. Graphic displays, item stems, and answer choices will all appear on the same page.
7. Commas will be used in numerals of 4 or more digits.
8. Any decimal fraction less than 1 will include a leading zero, (e.g., 0.2).
9. Fractions will include only denominators of 12 or less.
10. Fractions will be written vertically.
11. Decimal fractions will not exceed 3 decimal places.
12. Sums and differences will not exceed 5 digits.
13. Multipliers will not exceed 2 digits.
14. Products will not exceed 5 digits.
15. Divisors will not exceed 2 digits.
16. Dividends will not exceed 4 digits.

C. Ancillary Materials

1. Rulers with standard and metric measurement
2. Scratch paper (Plain paper will be required unless replaced by patty paper, lined paper, or grid paper which are optional.)
3. Four-function calculators (i.e., add, subtract, multiply, and divide) or calculators having percent, square root, and +/- functions
4. Protractors or angle rulers

Grade 5 Mathematics Blueprint Summary Table

Reporting Categories	No. of Items	Grade 4 SOL	Grade 5 SOL
Number and Number Sense	**8**	4.1a,b,c 4.2a,b,c 4.3 4.4a,b,c	5.1a,b,c 5.2a,b
Computation and Estimation	**12**	4.5 4.6 4.7 4.8 4.9a,b,c	5.3 5.4 5.5 5.6 5.7
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	5.8 5.9 5.10 5.11a,b,c,d,e 5.12 5.13 5.14 5.15a,b,c,d,e 5.16
Probability and Statistics	**8**	4.19a,b 4.20	5.17a,b,c 5.18 5.19
Patterns, Functions, and Algebra	**10**	4.21 4.22	5.20 5.21a,b,c 5.22

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.

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

Grade Four SOL in This Reporting Category:

4.1 The student will
- a) identify (orally and in writing) the place value for each digit in a whole number expressed through millions;
- b) compare two whole numbers expressed through millions, using symbols (>, <, or =); and
- c) round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand.

4.2 The student will
- a) identify, model, and compare rational numbers (fractions and mixed numbers), using concrete objects and pictures;
- b) represent equivalent fractions; and
- c) 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
- a) read, write, represent, and identify decimals expressed through thousandths;
- b) round to the nearest whole number, tenth, and hundredth; and
- c) compare the value of two decimals, using symbols (<, >, or =), concrete materials, drawings, and calculators..

Grade Five SOL in This Reporting Category:

5.1 The student will
- a) read, write, and identify the place values of decimals through thousandths;
- b) round decimal numbers to the nearest tenth or hundredth; and
- c) compare the values of two decimals through thousandths, using the symbols >, <, or =.

5.2 The student will
- a) recognize and name commonly used fractions (halves, fourths, fifths, eighths, and tenths) in their equivalent decimal form and vice versa; and
- b) order a given set of fractions and decimals from least to greatest. Fractions will include like and unlike denominators limited to 12 or less, and mixed numbers.

Reporting Category: Computation and Estimation
Number of Items: 12

Grade Four 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.

Grade Five SOL in This Reporting Category:

5.3 The student will create and solve problems involving addition, subtraction, multiplication, and division of whole numbers, using paper and pencil, estimation, mental computation, and calculators.

5.4 The student will find the sum, difference, and product of two numbers expressed as decimals through thousandths, using an appropriate method of calculation, including paper and pencil, estimation, mental computation, and calculators.

5.5 The student, given a dividend of four digits or fewer and a divisor of two digits or fewer, will find the quotient and remainder.

Reporting Category: Computation and Estimation (continued)
Number of Items: 12

Grade Five SOL in This Reporting Category (continued):

5.6 The student, given a dividend expressed as a decimal through thousandths and a single-digit divisor, will find the quotient.

5.7 The student will add and subtract with fractions and mixed numbers, with and without regrouping, and express answers in simplest form. Problems will include like and unlike denominators limited to 12 or less.

Reporting Category: Measurement and Geometry
Number of Items: 12

Grade Four 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.*

Reporting Category: Measurement and Geometry (continued)
Number of Items: 12

Grade Four SOL in This Reporting Category (continued):

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 (1/2, 1/4, and 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
- a) identify and describe situations representing the use of perimeter and area; and
- b) 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.

Reporting Category: Measurement and Geometry (continued)
Number of Items: 12

Grade Four SOL in This Reporting Category (continued):

4.15 The student will
- a) identify and draw representations of points, lines, line segments, rays, and angles, using a straightedge or ruler; and
- b) 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
- a) 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]);
- b) identify congruent and noncongruent shapes; and
- c) 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.

Grade Five SOL in This Reporting Category:

5.8 The student will describe and determine the perimeter of a polygon and the area of a square, rectangle, and right triangle, given the appropriate measures.

5.9 The student will identify and describe the diameter, radius, chord, and circumference of a circle.

5.10 The student will differentiate between perimeter, area, and volume and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation.

Reporting Category: Measurement and Geometry (continued)
Number of Items: 12

Grade Five SOL in This Reporting Category (continued):

5.11 The student will choose an appropriate measuring device and unit of measure to solve problems involving measurement of
- a) length—part of an inch (1/2, 1/4, and 1/8), inches, feet, yards, miles, millimeters, centimeters, meters, and kilometers;
- b) weight/mass—ounces, pounds, tons, grams, and kilograms;
- c) liquid volume—cups, pints, quarts, gallons, milliliters, and liters;
- d) area—square units; and
- e) temperature—Celsius and Fahrenheit units.
  Problems also will include estimating the conversion of Celsius and Fahrenheit units relative to familiar situations (water freezes at 0°C and 32°F, water boils at 100°C and 212°F, normal body temperature is about 37°C and 98.6°F).

5.12 The student will determine an amount of elapsed time in hours and minutes within a 24-hour period.

5.13 The student will measure and draw right, acute, and obtuse angles and triangles, using appropriate tools.

5.14 The student will classify angles and triangles as right, acute, or obtuse.

5.15 The student, using two-dimensional (plane) figures (square, rectangle, triangle, parallelogram, rhombus, kite, and trapezoid) will
- a) recognize, identify, describe, and analyze their properties in order to develop definitions of these figures;
- b) identify and explore congruent, noncongruent, and similar figures;
- c) investigate and describe the results of combining and subdividing shapes;
- d) identify and describe a line of symmetry; and
- e) recognize the images of figures resulting from geometric transformations such as translation (slide), reflection (flip), or rotation (turn).

5.16 The student will identify, compare, and analyze properties of three-dimensional (solid) geometric shapes (cylinder, cone, cube, square pyramid, and rectangular prism).

Reporting Category: Probability and Statistics
Number of Items: 8

Grade Four SOL in This Reporting Category:

4.19 The student will
- a) predict the likelihood of outcomes of a simple event, using the terms *certain, likely, unlikely, impossible*; and
- b) 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.

Grade Five SOL in This Reporting Category:

5.17 The student will
- a) solve problems involving the probability of a single event by using tree diagrams or by constructing a sample space representing all possible results;
- b) predict the probability of outcomes of simple experiments, representing it with fractions or decimals from 0 to 1, and test the prediction; and
- c) create a problem statement involving probability and based on information from given problem situation. Students will not be required to solve the created problem statement.

5.18 The student will, given a problem situation, collect, organize, and display a set of numerical data in a variety of forms, using bar graphs, stem-and-leaf plots, and line graphs, to draw conclusions and make predictions.

5.19 The student will find the mean, median, mode, and a range of a set of data.

Reporting Category: Patterns, Functions, and Algebra
Number of Items: 10

Grade Four 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 $15 + (35 + 16) = (15 + 35) + 16$].

Grade Five SOL in This Reporting Category:

5.20 The student will analyze the structure of numerical and geometric patterns (how they change or grow) and express the relationship, using words, tables, graphs, or a mathematical sentence. Concrete materials and calculators will be used.

5.21 The student will
a) investigate and describe the concept of variable;
b) use a variable expression to represent a given verbal quantitative expression, involving one operation; and
c) write an open sentence to represent a given mathematical relationship, using a variable.

5.22 The student will create a problem situation based on a given open sentence using a single variable.