

Virginia

Standards of Learning Assessments

Blueprint

Algebra I Test

Spring 2003

©2003 by the Commonwealth of Virginia Department of Education, James Monroe Building, 101 N. 14th Street, Richmond, Virginia, 23219. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Please contact the Commonwealth of Virginia Department of Education at (804) 225-2102, Division of Assessment and Reporting, to request written permission.

Algebra I Blueprint

Table of Contents

| | |
|--|---|
| Standards of Learning (SOL) Test Blueprint Introduction..... | 1 |
| Algebra I Test Development Guidelines | 3 |
| Algebra I Blueprint Summary Table..... | 4 |
| Expanded Blueprint | 5 |
| Algebra I Formula Sheet..... | 8 |

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;
 - 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. 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.

Algebra I 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 Algebra I.
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.
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. Where appropriate, "real-life" examples and situations that the student would likely encounter will be used to present data or ask questions.
6. Items will be appropriate for adolescents in terms of difficulty, interest, and reading level.
7. Students will be permitted scratch paper at any time during the test.
8. Students will be permitted to use only graphing calculators during the test. The calculator's memory must be reset prior to test administration, clearing all memory contents not built into the calculator's system.
9. Students will be permitted to use standard (e.g., inches) and metric rulers during the test.
10. Students will be provided a formula sheet and an approximation of pi (π). A copy of the formula sheet follows the expanded blueprint.

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. Commas will be used in numerals of 4 or more digits.
6. Answer choices will be arranged in ascending or descending order, when appropriate.
7. Any decimal fraction less than 1 will include a leading zero.
8. Graphic displays, item stems, and answer choices will all appear on the same page.
9. Fractions will be written vertically.
10. Radicals beyond square roots will not be used.
11. The symbol for subtraction will be differentiated from the symbol for a negative number (e.g., $3 - 7 = -4$).

C. Ancillary Materials

1. Ruler
2. Scratch paper
3. Graphing calculator
4. Algebra I Formula Sheet

Algebra I Blueprint Summary Table

| Reporting Categories | No. of Items | SOL |
|-----------------------------------|--------------|--|
| Expressions and Operations | 12 | A.2 A.10 A.11 A.12 A.13 |
| Relations and Functions | 12 | A.5 A.15 A.18 |
| Equations and Inequalities | 18 | A.1 A.3 A.6 A.7 A.8 A.9 A.14 |
| Statistics | 8 | A.4 A.16 A.17 |

| | |
|--|-----------|
| 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: Expressions and Operations
Number of Items: 12**Algebra I SOL in This Reporting Category:**

- A.2 The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables. Students will choose an appropriate computational technique, such as mental mathematics, calculator, or paper and pencil.
- A.10 The student will apply the laws of exponents to perform operations on expressions with integral exponents, using scientific notation when appropriate.
- A.11 The student will add, subtract, and multiply polynomials and divide polynomials with monomial divisors, using concrete objects, pictorial and area representations, and algebraic manipulations.
- A.12 The student will factor completely first- and second-degree binomials and trinomials in one or two variables. The graphing calculator will be used as a tool for factoring and for confirming algebraic factorization.
- A.13 The student will express the square root of a whole number in simplest radical form and approximate square roots to the nearest tenth.

Reporting Category: Relations and Functions
Number of Items: 12**Algebra I SOL in This Reporting Category:**

- A.5 The student will create and use tabular, symbolic, graphical, verbal, and physical representations to analyze a given set of data for the existence of a pattern, determine the domain and range of relations, and identify the relations that are functions.
- A.15 The student will, given a rule, find the values of a function for elements in its domain and locate the zeros of the function both algebraically and with a graphing calculator. The value of $f(x)$ will be related to the ordinate on the graph.
- A.18 The student will analyze a relation to determine whether a direct variation exists and represent it algebraically and graphically, if possible.

Reporting Category: Equations and Inequalities**Number of Items: 18****Algebra I SOL in This Reporting Category:**

- A.1 The student will solve multistep linear equations and inequalities in one variable, solve literal equations (formulas) for a given variable, and apply these skills to solve practical problems. Graphing calculators will be used to confirm algebraic solutions.
- A.3 The student will justify steps used in simplifying expressions and solving equations and inequalities. Justifications will include the use of concrete objects; pictorial representations; and the properties of real numbers, equality, and inequality.
- A.6 The student will select, justify, and apply an appropriate technique to graph linear functions and linear inequalities in two variables. Techniques will include slope-intercept, x - and y -intercepts, graphing by transformation, and the use of the graphing calculator.
- A.7 The student will determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined. The graphing calculator will be used to investigate the effect of changes in the slope on the graph of the line.
- A.8 The student will write an equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.
- A.9 The student will solve systems of two linear equations in two variables both algebraically and graphically and apply these techniques to solve practical problems. Graphing calculators will be used as both a primary tool of solution and to confirm an algebraic solution.
- A.14 The student will solve quadratic equations in one variable both algebraically and graphically. Graphing calculators will be used both as a primary tool in solving problems and to verify algebraic solutions.

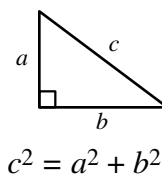
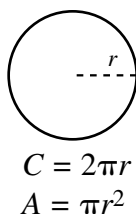
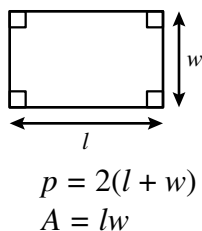
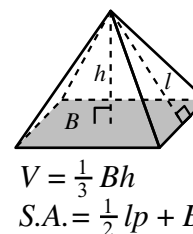
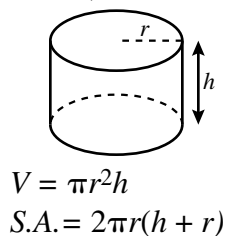
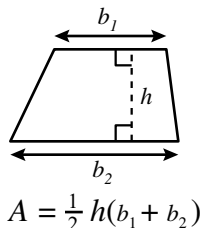
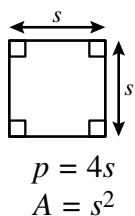
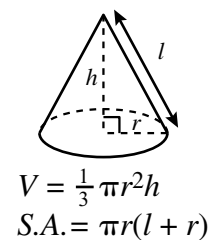
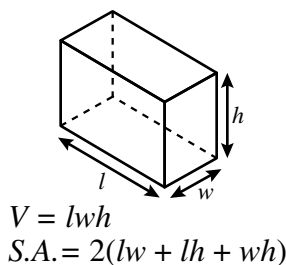
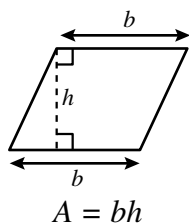
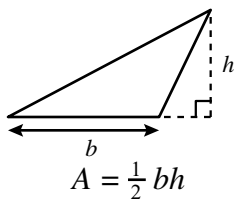
| |
|--|
| Reporting Category: Statistics Number of Items: 8 |
|--|

Algebra I SOL in This Reporting Category:

- A.4 The student will use matrices to organize and manipulate data, including matrix addition, subtraction, and scalar multiplication. Data will arise from business, industrial, and consumer situations.
- A.16 The student will, given a set of data points, write an equation for a line of best fit and use the equation to make predictions.
- A.17 The student will compare and contrast multiple one-variable data sets, using statistical techniques that include measures of central tendency, range, and box-and-whisker graphs.

Algebra I Formula Sheet

Geometric Formulas



Abbreviations

| | |
|-------------------|-----------------|
| milligram | mg |
| gram | g |
| kilogram | kg |
| milliliter | mL |
| liter | L |
| kiloliter | kL |
| millimeter | mm |
| centimeter | cm |
| meter | m |
| kilometer | km |
| square centimeter | cm ² |
| cubic centimeter | cm ³ |

| | |
|-------------|--------|
| ounce | oz |
| pound | lb |
| quart | qt |
| gallon | gal. |
| inch | in. |
| foot | ft |
| yard | yd |
| mile | mi. |
| square inch | sq in. |
| square foot | sq ft |
| cubic inch | cu in. |
| cubic foot | cu ft |

| | |
|--------------------|------|
| volume | V |
| total surface area | S.A. |
| area of base | B |
| | |

| | |
|--------|-----|
| year | yr |
| month | mon |
| hour | hr |
| minute | min |
| second | sec |

Pi

$$\pi \approx 3.14$$

$$\pi \approx \frac{22}{7}$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$