

Virginia

Standards of Learning Assessments

Blueprint

Algebra II Test

Spring 2003

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Algebra II Blueprint

Table of Contents

Standards of Learning (SOL) Test Blueprint Introduction.....	1
Algebra II Test Development Guidelines	3
Algebra II Blueprint Summary Table	4
Expanded Blueprint	5
Algebra II 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 (SOLs) included in each reporting category. SOLs are identified by numbers and letters that correspond to the original SOL document (letters are assigned to the “bullets” in the original document);
 - SOLs 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 II 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 II.
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 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. The symbol for subtraction will be differentiated from the symbol for a negative number (e.g., $3 - 7 = -4$).

C. *Ancillary Materials*

1. Rulers
2. Scratch paper
3. Graphing calculators
4. Algebra II Formula Sheet

Algebra II Blueprint Summary Table

Reporting Categories	No. of Items	SOL
Expressions and Operations	10	AII.1 AII.2 AII.3a,b AII.5 AII.17
Relations and Functions	16*	AII.8 AII.9 AII.15 AII.16 AII.19 AII.20
Equations and Inequalities	10	AII.4 AII.6 AII.7
Analytical Geometry	6	AII.10 AII.18
Systems of Equations/Inequalities	8	AII.11 AII.12 AII.13 AII.14

Total Number of Operational Items	50
Field Test Items**	10
Total Number of Items	60

*Five of the 16 items in the Relations and Functions Reporting Category will measure AII.19.

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

Reporting Category: Expressions and Operations**Number of Items: 10****Algebra II SOL in This Reporting Category:**

- AII.1 The student will identify field properties, axioms of equality and inequality, and properties of order that are valid for the set of real numbers and its subsets, complex numbers, and matrices.
- AII.2 The student will add, subtract, multiply, divide, and simplify rational expressions, including complex fractions.
- AII.3 The student will
- add, subtract, multiply, divide, and simplify radical expressions containing positive rational numbers and variables and expressions containing rational exponents; and
 - write radical expressions as expressions containing rational exponents and vice versa.
- AII.5 The student will identify and factor completely polynomials representing the difference of squares, perfect square trinomials, the sum and difference of cubes, and general trinomials.
- AII.17 The student will perform operations on complex numbers and express the results in simplest form. Simplifying results will involve using patterns of the powers of i .

Reporting Category: Relations and Functions**Number of Items: 16*****Algebra II SOL in This Reporting Category:**

- AII.8 The student will recognize multiple representations of functions (linear, quadratic, absolute value, step, and exponential functions) and convert between a graph, a table, and symbolic form. A transformational approach to graphing will be employed through the use of graphing calculators.
- AII.9 The student will find the domain, range, zeros and inverse of a function; the value of a function for a given element in its domain; and the composition of multiple functions. Functions will include exponential, logarithmic, and those that have domains and ranges that are limited and/or discontinuous. The graphing calculator will be used as a tool to assist in investigation of functions.

**Five of the 16 items will measure AII.19.*

Reporting Category: Relations and Functions (continued)**Number of Items: 16*****Algebra II SOL in This Reporting Category (continued):**

- AII.15 The student will recognize the general shape of polynomial, exponential, and logarithmic functions. The graphing calculator will be used as a tool to investigate the shape and behavior of these functions.
- AII.16 The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first n terms, finding the n th term, and evaluating summation formulas. Notation will include Σ and a_n .
- AII.19 The student will collect and analyze data to make predictions and solve practical problems. Graphing calculators will be used to investigate scatterplots and to determine the equation for a curve of best fit. Models will include linear, quadratic, exponential, and logarithmic functions.
- AII.20 The student will identify, create, and solve practical problems involving inverse variation and a combination of direct and inverse variations.

**Five of the 16 items will measure AII.19.*

Reporting Category: Equations and Inequalities**Number of Items: 10****Algebra II SOL in This Reporting Category:**

- AII.4 The student will solve absolute value equations and inequalities graphically and algebraically. Graphing calculators will be used as a primary method of solution and to verify algebraic solutions.
- AII.6 The student will select, justify, and apply a technique to solve a quadratic equation over the set of complex numbers. Graphing calculators will be used for solving and for confirming the algebraic solutions.
- AII.7 The student will solve equations containing rational expressions and equations containing radical expressions algebraically and graphically. Graphing calculators will be used for solving and for confirming the algebraic solutions.

Reporting Category: Analytical Geometry**Number of Items: 6****Algebra II SOL in This Reporting Category:**

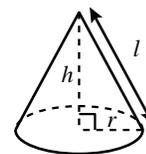
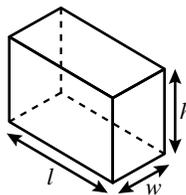
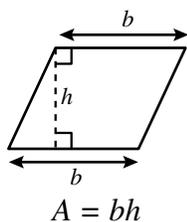
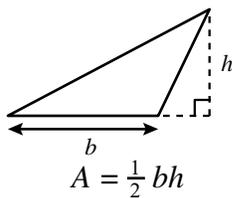
- AII.10 The student will investigate and describe through the use of graphs the relationships between the solution of an equation, zero of a function, x -intercept of a graph, and factors of a polynomial expression.
- AII.18 The student will identify conic sections (circle, ellipse, parabola, and hyperbola) from his/her equations. Given the equations in (h, k) form, student will sketch graphs of conic sections, using transformations.

Reporting Category: Systems of Equations/Inequalities**Number of Items: 8****Algebra II SOL in This Reporting Category:**

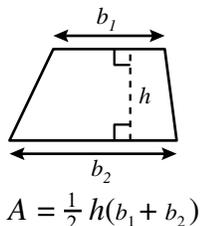
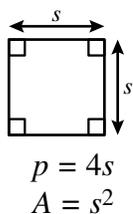
- AII.11 The student will use matrix multiplication to solve practical problems. Graphing calculators or computer programs with matrix capabilities will be used to find the product.
- AII.12 The student will represent problem situations with a system of linear equations and solve the system, using the inverse matrix method. Graphing calculators or computer programs with matrix capability will be used to perform computations.
- AII.13 The student will solve practical problems, using systems of linear inequalities and linear programming, and describe the results both orally and in writing. A graphing calculator will be used to facilitate solutions to linear programming problems.
- AII.14 The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. The graphing calculator will be used as a tool to visualize graphs and predict the number of solutions.

Algebra II Formula Sheet

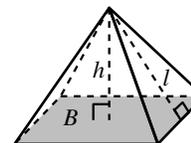
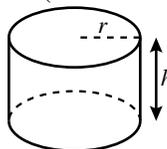
Geometric Formulas



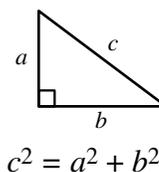
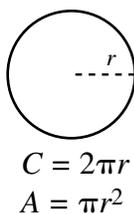
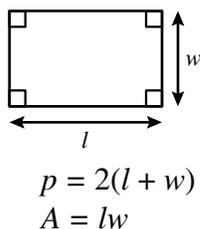
$S.A. = \pi r(l + r)$



$S.A. = 2(lw + lh + wh)$



$S.A. = \frac{1}{2}lp + B$



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

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