Virginia

Standards of Learning Assessments

Blueprint
Geometry Test

Spring 2003

Geometry Blueprint

Table of Contents

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.

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.

Geometry 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 Geometry.
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 to use standard (e.g., inches) and metric rulers during the test.
8. Students will be permitted scratch paper at any time during the test.
9. 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.
10. Students will be permitted to use compasses during the test.
11. Students will be provided a formula sheet and an approximation for 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. Decimal fractions will not exceed four decimal places.
11. Only radicals with an index of 2 will be used.
12. 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. Geometry Formula Sheet
5. Compasses

Geometry Blueprint Summary Table

Reporting Categories	No. of Items	SOL
Lines and Angles	**11**	G.3 G.4 G.11
Triangles and Logic	**12**	G.1a,b,c,d G.5a,b G.6 G.7
Polygons and Circles	**10**	G.8a,b,c G.9 G.10
Three-Dimensional Figures	**6**	G.12 G.13 G.14a,b
Coordinate Relations and Transformations	**6**	G.2a,b,c

Total Number of Operational Items	**45**
Field Test Items*	**10**
Total Number of Items	**55**

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

Reporting Category: Lines and Angles
Number of Items: 11

Geometry SOL in This Reporting Category:

G.3 The student will solve practical problems involving complementary, supplementary, and congruent angles that include vertical angles, angles formed when parallel lines are cut by a transversal, and angles in polygons.

G.4 The student will use the relationships between angles formed by two lines cut by a transversal to determine if two lines are parallel and verify, using algebraic and coordinate methods as well as deductive proofs.

G.11 The student will construct a line segment congruent to a given line segment, the bisector of a line segment, a perpendicular to a given line from a point not on the line, a perpendicular to a given line at a point on the line, the bisector of a given angle, and an angle congruent to a given angle.

Reporting Category: Triangles and Logic
Number of Items: 12

Geometry SOL in This Reporting Category:

G.1 The student will construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include
a) identifying the converse, inverse, and contrapositive of a conditional statement;
b) translating a short verbal argument into symbolic form;
c) using Venn diagrams to represent set relationships; and
d) using deductive reasoning, including the law of syllogism.

G.5 The student will
a) investigate and identify congruence and similarity relationships between triangles; and
b) prove two triangles are congruent or similar, given information in the form of a figure or
statement, using algebraic and coordinate as well as deductive proofs.

.Reporting Category: Triangles and Logic (continued)
Number of Items: 12

Geometry SOL in This Reporting Category (continued):

G.6 The student, given information concerning the lengths of sides and/or measures of angles, will apply the triangle inequality properties to determine whether a triangle exists and to order sides and angles. These concepts will be considered in the context of practical situations.

G.7 The student will solve practical problems involving right triangles by using the Pythagorean Theorem, properties of special right triangles, and right triangle trigonometry. Solutions will be expressed in radical form or as decimal approximations.

Reporting Category: Polygons and Circles
Number of Items: 10

Geometry SOL in This Reporting Category:

G.8 The student will
a) investigate and identify properties of quadrilaterals involving opposite sides and angles, consecutive sides and angles, and diagonals;
b) prove these properties of quadrilaterals, using algebraic and coordinate methods as well as deductive reasoning; and
c) use properties of quadrilaterals to solve practical problems.

G.9 The student will use measures of interior and exterior angles of polygons to solve problems. Tessellations and tiling problems will be used to make connections to art, construction, and nature.

G.10 The student will investigate and solve practical problems involving circles, using properties of angles, arcs, chords, tangents, and secants. Problems will include finding arc length and the area of a sector, and may be drawn from applications of architecture, art, and construction.

Reporting Category: Three-Dimensional Figures
Number of Items: 6

Geometry SOL in This Reporting Category:

G.12 The student will make a model of a three-dimensional figure from a two-dimensional drawing and make a two-dimensional representation of a three-dimensional object. Models and representations will include scale drawings, perspective drawings, blueprints, or computer simulations.

G.13 The student will use formulas for surface area and volume of three-dimensional objects to solve practical problems. Calculators will be used to find decimal approximations for results.

G.14 The student will
a) use proportional reasoning to solve practical problems, given similar geometric objects; and
b) determine how changes in one dimension of an object affect area and/or volume of the object.

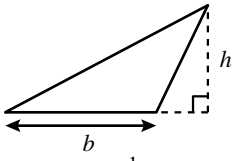
Reporting Category: Coordinate Relations and Transformations
Number of Items: 6

Geometry SOL in This Reporting Category:

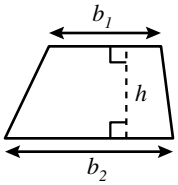
G.2. The student will use pictorial representations, including computer software, constructions, and coordinate methods, to solve problems involving symmetry and transformation. This will include
a) investigating and using formulas for finding distance, midpoint, and slope;
b) investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and
c) determining whether a figure has been translated, reflected, or rotated.

Geometry Formula Sheet

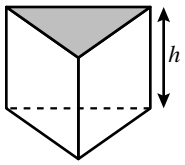
Geometric Formulas



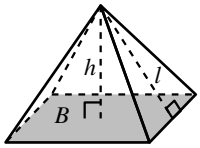
$A = \frac{1}{2}bh$



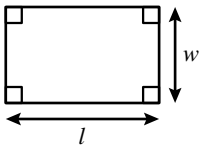
$A = \frac{1}{2}h(b_1 + b_2)$



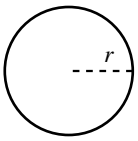
$V = Bh$
$L.A. = hp$
$S.A. = L.A. + 2B$



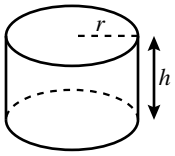
$V = \frac{1}{3}Bh$
$L.A. = \frac{1}{2}lp$
$S.A. = L.A. + B$



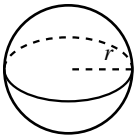
$A = lw$
$p = 2(l + w)$



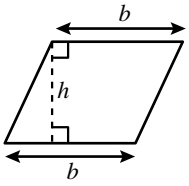
$A = \pi r^2$
$C = 2\pi r$



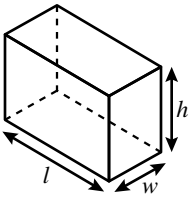
$V = \pi r^2 h$
$L.A. = 2\pi rh$
$S.A. = 2\pi r(h + r)$



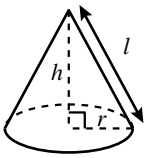
$V = \frac{4}{3}\pi r^3$
$S.A. = 4\pi r^2$



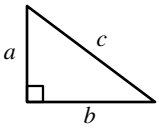
$A = bh$



$V = lwh$
$S.A. = 2lw + 2lh + 2wh$



$V = \frac{1}{3}\pi r^2 h$
$L.A. = \pi rl$
$S.A. = \pi r(l + r)$



$c^2 = a^2 + b^2$

Geometric Symbols

Example	Meaning
$\angle A$	angle A
$m\angle A$	measure of angle A
$\overline{AB}$	line segment AB
AB	measure of line segment AB
$\overleftrightarrow{AB}$	line AB
$\triangle ABC$	triangle ABC
$\square ABCD$	rectangle $ABCD$
$\square ABCD$	parallelogram $ABCD$

Example	Meaning
$\overrightarrow{AB}$	vector AB
	right angle
$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$	Line AB is parallel to line CD.
$\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$	Line AB is perpendicular to line CD.
$\angle A \cong \angle B$	Angle A is congruent to angle B.
$\triangle A \sim \triangle B$	Triangle A is similar to triangle B.
	Similarly marked segments are congruent.
	Similarly marked angles are congruent.

Abbreviations

Volume	V
Lateral Area	$L.A.$
Total Surface Area	$S.A.$
Area of Base	B

Pi

$\pi \approx 3.14$

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

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