Syllabus

Virginia Geometry, Semester A

Course Overview

Virginia Geometry, Semester A, provides an in-depth discussion of the basic concepts of geometry. In the first unit, you'll examine the transformation of geometric objects in the coordinate plane. In the next unit, you'll explain the criteria for triangle congruence and write mathematical theorems and proofs. At the end of the course, you'll prove the similarity of two triangles by using the properties of similarity transformations.

Course Goals

By the end of this course, you will be able to do the following:

- Analyze the history, career applications, and logical structure and development of geometry.
- Define and represent the transformations of geometric figures in a plane.
- Use geometric descriptions of rigid motions to transform figures.
- Explain the criteria for triangle congruence.
- Write mathematical proofs, and apply that knowledge to simple geometric relationships.
- Prove theorems about lines and angles, triangles, and parallelograms.
- Make formal geometric constructions with a variety of tools and methods.
- Verify experimentally the properties of dilations given by a center and a scale factor.
- Use the definition of similarity in terms of similarity transformations to decide whether two given figures are similar.
- Prove theorems about triangles using similarity relationships.
- Use congruence and similarity criteria for triangles to solve problems and prove relationships in geometric figures.

Math Skills

Two semesters of Algebra is a prerequisite for Virginia Geometry, Semester A. Before beginning this course, you should be able to do the following:

- Identify $|x|$ as the distance from x to 0 on a number line.
- Work with whole-number exponents and the laws of exponents.
- Perform arithmetic with polynomials, including factoring.

- Solve linear equations and inequalities in one variable.
- Use coordinate plane terminology.
- Represent linear relationships graphically and with equations.
- Graph functions using basic calculator skills.

General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word processing software, such as Microsoft Word or Google Docs.
- Understand the basics of spreadsheet software, such as Microsoft Excel or Google Spreadsheets, but having prior computing experience is not necessary.
- Perform online research using various search engines and library databases.
- Communicate through email and participate in discussion boards.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation, found at the beginning of this course.

Credit Value

Virginia Geometry, Semester A, is a 0.5-credit course.

Course Materials

- notebook
- graphing calculator, TI-83 or equivalent recommended
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft Excel or equivalent

Course Pacing Guide

This course description and pacing guide is intended to help you keep on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

Unit 1: Introduction to Geometry and Transformations

Summary
This unit starts with the history, career applications, and development of geometry. You will learn precise definitions for the basic geometric concepts and then analyze, represent, and compare the transformation of objects in the coordinate plane. You'll also examine the types of transformations of different geometric figures and define them. Lastly, you'll specify a sequence of transformations to carry a given figure onto another.

Day	Activity/*Objective*	Type
1 day: 1	**Syllabus and Student Orientation** *Review the Student Orientation and Course Syllabus at the beginning of this course.*	Course Orientation
3 days: 2–4	**Introduction to Geometry** *Become acquainted with the history, career applications, and logical structure and development of geometry.*	Lesson
3 days: 5–7	**Basic Geometric Concepts** *Know precise definitions for the concepts of angle, circle, perpendicular line, parallel line, and line segment.*	Lesson
3 days: 8–10	**Representing Transformations in a Plane** *Represent transformations in a plane and compare transformations that preserve distance and angle to those that do not.*	Lesson
3 days: 11–13	**Returning a Polygon to its Original Position** *Describe the rotations and reflections that carry a given rectangle, parallelogram, trapezoid, or regular polygon onto itself.*	Lesson
4 days: 14–17	**Defining Rigid Transformations** *Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.*	Lesson
3 days: 18–20	**Predicting Results of Rigid Transformations** *Predict the result of a rigid transformation and specify a sequence of transformations to carry a given figure onto another.*	Lesson
5 days: 21–25	**Unit Activity and Discussion—Unit 1**	Unit Activity/ Discussion

Day	Activity/*Objective*	Type
1 day: 26	**Posttest—Unit 1**	Assessment

Unit 2: Congruence, Proof, and Constructions

Summary

In the second unit, you'll use rigid motions to transform figures and decide whether the figures are congruent. You'll explain the criteria for triangle congruence and use the definition of congruence in terms of rigid motions to check the congruency of two triangles. You will also write mathematical proofs and prove theorems about lines and angles, triangles, and parallelograms. Lastly, you will use different methods to make geometric constructions.

Day	Activity/*Objective*	Type
3 days: 27–29	**Transformations and Congruence** *Use geometric descriptions of rigid motions to transform figures and use the definition of congruence in terms of rigid motions to decide if two figures are congruent.*	Lesson
4 days: 30–33	**Sides and Angles of Congruent Triangles** *Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.*	Course Activity
3 days: 34–36	**ASA, SAS, and SSS Criteria for Congruent Triangles** *Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.*	Lesson
4 days: 37–40	**Lines, Angles, and Mathematical Proofs** *Learn to write mathematical proofs and apply that knowledge to simple geometric relationships.*	Lesson
3 days: 41–43	**Proving Theorems about Lines and Angles** *Prove theorems about lines and angles.*	Lesson
4 days: 44–47	**Proving Theorems about Triangles** *Prove theorems about triangles.*	Lesson
4 days: 48–51	**Proving Theorems about Parallelograms** *Prove theorems about parallelograms.*	Lesson

Day	Activity/*Objective*	Type
3 days: 52–54	**Geometric Constructions with Lines and Angles** *Make formal geometric constructions with a variety of tools and methods.*	Lesson
5 days: 55–59	**Unit Activity and Discussion—Unit 2**	Unit Activity/ Discussion
1 day: 60	**Posttest—Unit 2**	Assessment

Unit 3: Similarity and Proof

Summary

In this unit, you will verify the properties of dilations and use the properties of similarity transformations to check the similarity of two triangles. Then you'll prove theorems about triangles using similarity relationships. At the end of the unit, you'll solve problems using congruence and similarity criteria for triangles.

Day	Activity/*Objective*	Type
4 days: 61–64	**Properties of Dilations** *Verify experimentally the properties of dilations given by a center and a scale factor.*	Lesson
4 days: 65–68	**Similarity and Similarity Transformations** *Use the definition of similarity in terms of similarity transformations to decide whether two given figures are similar.*	Lesson
3 days: 69–71	**Scale Drawings** *Solve problems that involve scale drawings of geometric figures.*	Lesson
4 days: 72–75	**AA, SAS, and SSS Criteria for Similar Triangles** *Use the properties of similarity transformations to establish the AA, SAS, and SSS criteria for two triangles to be similar.*	Course Activity
4 days: 76–79	**Similarity, Proportion, and Triangle Proofs** *Prove theorems about triangles using similarity relationships.*	Lesson
3 days: 80–82	**Using Congruence and Similarity with Triangles** *Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.*	Lesson
5 days: 83–87	**Unit Activity and Discussion—Unit 3**	Unit Activity/ Discussion

1 day: 88	**Posttest—Unit 3**	Assessment
1 day: 89	**Semester Review**	
1 day: 90	**End-of-Semester Exam**	Assessment

Syllabus

Virginia Geometry, Semester B

Course Overview

Virginia Geometry, Semester B, provides an in-depth discussion of analytical geometry. In the first unit, you'll explore trigonometry and the properties of triangles. You'll then use logic to determine the accuracy of given information and solve real-world problems. At the end of the course, you'll use coordinate geometry to prove geometric theorems.

Course Goals

By the end of this course, you will be able to do the following:

- Determine different triangle and quadrilateral properties, and use them to solve problems.
- Explain and use the relationship between the sine and cosine of complementary angles.
- Use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems if one of the two acute angles and a side length are given.
- Decide whether information drawn from a passage is true, false, or cannot be determined.
- Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects.
- Use coordinates to prove simple geometric theorems algebraically, including proofs involving circles.
- Prove the slope criteria for parallel and perpendicular lines, and use them to solve geometric problems.
- Compute the perimeters of polygons and the areas of triangles, rectangles, and sectors.
- Identify and describe relationships among inscribed angles, radii, and chords.

Math Skills

Virginia Geometry, Semester A, is a prerequisite for Virginia Geometry, Semester B. Before beginning this course, you should be able to do the following:

- Mathematically define rotations, reflections, translations, dilations, and slides.
- Prove theorems about lines, angles, triangles, and parallelograms.

- Create formal geometric constructions with a variety of tools and methods.
- Understand the definitions of trigonometric ratios, and use them to solve problems.
- Solve quadratic equations by factoring or using the quadratic formula.
- Understand that the probability of a chance event is a number between 0 and 1.

General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word processing software, such as Microsoft Word or Google Docs.
- Understand the basics of spreadsheet software, such as Microsoft Excel or Google Spreadsheets, but having prior computing experience is not necessary.
- Perform online research using various search engines and library databases.
- Communicate through email and participate in discussion boards.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation, found at the beginning of this course.

Credit Value

Virginia Geometry, Semester B, is a 0.5-credit course.

Course Materials

- notebook
- graphing calculator, TI-83 or equivalent recommended
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft Excel or equivalent

Course Pacing Guide

This course description and pacing guide is intended to help you keep on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

Unit 1: Trigonometry and Geometric Modeling

Summary
In this unit, you'll use triangle and quadrilateral properties to solve problems. You will define trigonometric ratios for acute angles and explain the relationship between the sine and cosine of complementary angles. At the end of the unit, you'll use trigonometric ratios and the Pythagorean theorem to solve problems.

Day	Activity/*Objective*	Type
1 day: 1	**Syllabus and Student Orientation** *Review the Student Orientation and Course Syllabus at the beginning of this course.*	Course Orientation
4 days: 2–5	**Triangle Properties** *Determine different triangle properties and use them to solve problems involving triangles.*	Lesson
4 days: 6–9	**Properties of Polygons** *Use properties of quadrilaterals and angle relationships in convex polygons to solve problems.*	Lesson
5 days: 10–14	**Trigonometric Ratios** *Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.*	Lesson
4 days: 15–18	**Sine and Cosine of Complementary Angles** *Explain and use the relationship between the sine and cosine of complementary angles.*	Lesson
4 days: 19–22	**Solving Problems with Right Triangles** *Use trigonometric ratios and the Pythagorean theorem to solve right triangles in applied problems if one of the two acute angles and a side length are given.*	Lesson
5 days: 23–27	**Right Triangles and Their Properties** *Learn about and use properties of right triangles including special triangles, their altitudes, and the Pythagorean theorem.*	Course Activity
5 days: 28–32	**Unit Activity and Discussion—Unit 1**	Unit Activity/ Discussion
1 day: 33	**Posttest—Unit 1**	Assessment

Unit 2: Logic and Extending to Three Dimensions

Summary

In this unit, you'll use logic to determine the accuracy of given information. You will learn the applications of area, surface area, and volume by solving real-world problems. Finally, you'll use the volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Day	**Activity/***Objective*	Type
4 days: 34–37	**Mathematical Thinking and Logic** *Decide whether information drawn from a passage is true, false, or cannot be determined.*	Lesson
5 days: 38–42	**Applications of Area, Surface Area, and Volume** *Solve real-world and mathematical problems that involve area, volume, and surface area of two- and three-dimensional objects.*	Lesson
4 days: 43–46	**Using Volume Formulas** *Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*	Lesson
5 days: 47–51	**Unit Activity and Discussion—Unit 2**	Unit Activity/ Discussion
1 day: 52	**Posttest—Unit 2**	Assessment

Unit 3: Coordinate Geometry and Circles

Summary

In the last unit of this course, you'll use the equation of a circle and the coordinates of circles to solve problems and algebraically prove simple geometric theorems involving circles. You'll then prove the slope criteria for straight lines and find the ratio in which the line segments are partitioned. You will find the area and perimeter of geometric figures and analyze the relationship between inscribed angles, radii, and chords. At the end of the unit, you'll determine arc length using the relationship between the angle intercepted by the arc and the radius.

Day	Activity/*Objective*	Type
4 days: 53–56	**Equation of a Circle** *Derive the equation of a circle of given center and radius and complete the square to find the center and radius of a circle given by an equation.*	Lesson
4 days: 57–60	**Using Coordinates to Prove Geometric Theorems** *Use coordinates to prove simple geometric theorems algebraically, including proofs involving circles.*	Lesson
5 days: 61–65	**Slope Criteria for Parallel and Perpendicular Lines** *Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.*	Lesson
4 days: 66–69	**Dividing a Line Segment Based on a Ratio** *Find the point on a directed line segment between two given points that partitions the segment in a given ratio.*	Lesson
5 days: 70–74	**Using Coordinates to Compute Perimeters and Areas** *Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.*	Lesson
4 days: 75–78	**Relationships Among Inscribed Angles, Radii, and Chords** *Identify and describe relationships among inscribed angles, radii, and chords.*	Lesson
4 days: 79–82	**Relating Arc Length and Area to Radius** *Use similarity to derive the fact that the length of the arc intercepted by an angle is proportional to the radius. Derive the formula for the area of a sector.*	Lesson
5 days: 83–87	**Unit Activity and Discussion—Unit 3**	Unit Activity/ Discussion
1 day: 88	**Posttest—Unit 3**	Assessment
1 day: 89	**Semester Review**	
1 day: 90	**End-of-Semester Exam**	Assessment