College Geometry requires a performance assessment. The course covers 4 competencies.

Introduction

Overview

College Geometry covers the knowledge and skills necessary to apply geometry to model and solve real-life problems, to do formal axiomatic proofs in geometry, and to use dynamic technology to explore geometry. Topics include:

- axiomatic systems and analytic proof;
- non-Euclidean geometries;
- construction, analytic, and synthetic methods for investigating and proving properties and relationships of two- and three-dimensional objects;
- geometric transformations, tessellations, and using inductive reasoning;
- concrete models;
- and dynamic technology to conduct geometric investigations.

College Algebra and Pre-Calculus are prerequisites for this course.

Getting Started

Welcome to College Geometry! Each activity in this course provides you with the essential learning resources to master geometric competencies. These activities include reading from the uCertify interactive textbook, watching videos from your course instructor, and accessing a few other materials curated from the web.

You will show your competency in this course by completing five performance tasks. Each set of learning resources has been carefully selected to help you prepare for the performance tasks and give you the knowledge and ability to support secondary students in learning geometry.

Teaching Dispositions Statement

Please review the Statement of Teaching Dispositions.

Course Instructor Assistance

As you prepare to demonstrate competency in this subject, remember that course instructors stand ready to help you reach your educational goals. As subject matter experts, instructors enjoy and take pride in helping students become reflective learners, problem solvers, and critical thinkers. Course instructors are able to share tips on approaches, tools, and skills that can help you apply the content you are studying. If your first try for your assessment does not go well, course instructors act as a support system to help you prepare for another attempt. Course instructors are excited to hear from you and to work with you.

Preparing for Success

The information in this section is provided to detail the resources available for you to use as you complete this course.

Technology for Learning

If you do not already have one, acquire an appropriate calculator for use on WGU exams. There is no objective exam for this course, but it is good to learn how to use a calculator to solve problems in this course.

Download and install a copy of Geometer's Sketchpad computer software, an interactive geometry software you will utilize throughout the course. It is also used in many geometry classrooms throughout the United States.

1. Download the Geometer Sketchpad 5.02 software by clicking on the appropriate link below for the operating system of your computer.
    - WINDOWS: http://gsp5.s3.amazonaws.com/InstallSketchpad.zip
    - MAC: http://gsp5.s3.amazonaws.com/GSP5.dmg
2. If prompted to Save or Run the file, choose the Save option and then click on the InstallSketchpad.exe file from the Downloads folder.
3. When you are prompted to register Sketchpad, use the License Name and Authorization Code provided below in your License Details. Use all characters and spaces as shown. We recommend that you copy and paste the License Name and Authorization Code to ensure that you register Sketchpad correctly. **IMPORTANT NOTE: This license is only good for ONE (1) download/activation. Do NOT install the software on more than one computer or you may be charged for the additional download.**

- License Name (CASE SENSITIVE): WESTERN GOVERNORS UNIVERSITY
- Authorization Code: D4PRY5-XYBU45-69MKC9-M114RT

Learn how to transfer geometric illustrations from their original source into the word processing software you use. This allows you to create elegant and professional lesson plans, as well as good-looking performance task submissions. Here are three recommendations to explore:

- Make a picture using Geometer's Sketchpad or any drawing program so you can simply copy and paste the image into your document.
- Take a screenshot (PrtSc key on PCs) to put what you are seeing into computer memory, paste that into a simple painting program, and copy only the part you need; paste that into your document.
- Use a snipping tool, which will put the graphics you have selected into memory so you can paste the image directly into your paper.

Pacing Guide

The pacing guide suggests a weekly structure to pace your completion of learning activities. It is provided as a suggestion and does not represent a mandatory schedule. Follow the pacing guide carefully to complete the course in the suggested time frame.

Your primary learning resource is the online textbook *College Geometry 2*, published by uCertify. Read only as directed within the activities. The following pacing guides provide two

suggested frameworks for moving through the course content efficiently. The first guide moves through the material in a way that guides you to finish the tasks from least to most challenging. The second pacing guide option moves through the textbook from start to finish.

Option One

Week 1

- Introduction
- Preparing for Success
- Geometry Foundations
- Analytic Geometry
- Task 3

Week 2

- Transformational Geometry
- Tasks 4 and 5

Week 3

- Axiomatic Systems

Week 4

- Task 1 (recommend using Geometer’s Sketchpad from Week 2 to help dynamically explore the possibilities before you start writing a formal proof)

Week 5

- Properties of Geometric Shapes (Lines and Angles; Non-Euclidean Geometry; The Circle)
- Properties of Geometric Shapes (Triangles; Congruence and Similarity; Proofs)

Week 6

- Task 2 (recommend using Geometer’s Sketchpad from Week 2 to help do constructions and create illustrations for at least the first part of the proof)
- Properties of Geometric Shapes (Quadrilaterals and Higher Order Polygons; Three-Dimensional Shapes)

Option Two

Week 1

- Introduction

- Preparing for Success
- Geometry Foundations
- Axiomatic Systems
- Task 1

Week 2

- Properties of Geometric Shapes (Lines and Angles; Non-Euclidean Geometry; The Circle)

Week 3

- Properties of Geometric Shapes (Triangles; Congruence and Similarity; Proofs)
- Task 2

Week 4

- Properties of Geometric Shapes (Quadrilaterals and Higher Order Polygons; Three-Dimensional Shapes)

Week 5

- Analytic Geometry
- Task 3

Week 6

- Transformational Geometry
- Tasks 4 and 5

Supplemental Activities

There may be times when you need more information or practice than what is provided in the course. In addition to consulting with your course instructor when you need help, you can access optional and supplemental activities by using the word "supplemental" in the Course Search box. These activities can be enriching, but they are not essential for becoming competent.

Competencies and Objectives

This course provides guidance to help you demonstrate the following 4 competencies:

- **Competency 218.1.1: Axiomatic Systems**
  The graduate applies the axiomatic nature of geometry to analyze the fundamental concepts and principles of Euclidean and non-Euclidean geometries.

Objectives:

- Evaluate the validity of a deductive argument.

- Identify arguments as inductive or deductive.
- Define undefined terms, postulates, theorems, and definitions.
- Describe how knowledge is built in an axiomatic system.
- Predict triangle properties given an alternative to the parallel postulate.
- Match geometries with their unique characteristics.

- **Competency 218.1.2: Properties and Relationships**
  The graduate applies synthetic and analytic methods to construct proofs and solves problems involving the properties and relationships of two-dimensional objects.

Objectives:

- Use analytic methods to calculate the midpoint and length of a line segment.
- Use analytic methods to determine if two lines are parallel, perpendicular, or neither.
- Classify angles and angle relationships.
- Solve problems involving parallel lines, transversals, and their angles.
- Perform common line and angle constructions using a straightedge and compass.
- Generate proofs involving parallel lines, transversals and their angles.
- Perform common constructions involving circles using a straightedge and compass.
- Identify lines and angles associated with circles.
- Solve a problem involving circles.
- Use analytic methods to prove a theorem involving circles.
- Use synthetic methods to prove a theorem involving circles.
- Find measurements related to circles.
- Use coordinate geometry to solve a problem involving circles.
- Classify triangles, and describe line segments and properties associated with triangles.
- Solve a problem using line segments and properties associated with triangles.
- Use a straightedge and compass to construct lines associated with triangles.
- Generate a proof involving triangle properties.
- Classify quadrilaterals into categories using the hierarchy of quadrilaterals.
- Use the properties of quadrilaterals to solve a problem.
- Prove a theorem involving properties of quadrilaterals.
- Solve a problem given a higher order polygon.

- **Competency 218.1.3: Congruence and Similarity**
  The graduate proves theorems involving congruence and similarity of geometric objects and applies them to solve problems.

Objectives:

- Rationalize why combinations of congruent corresponding parts do or do not prove triangle congruence or similarity.
- Solve a problem using congruent or similar triangles.
- Prove two triangles are similar or congruent.
- Use triangle similarity or congruence to prove a theorem or statement.
- Prove the Pythagorean theorem using multiple methods.

- Solve a problem using the Pythagorean theorem.
- Solve a problem using special triangles (30-60-90, 45-45-90).

- **Competency 218.1.6: Geometric Transformations**
  The graduate applies geometric transformations to explore and analyze objects and solve problems.

Objectives:

- Identify the transformations that relate two objects.
- Describe the object and its properties that result from a set of transformations.
- Express symmetry in terms of transformations.
- Determine if two-dimensional objects will tessellate.
- Determine the center and magnitude of a dilation.
- Use examples and counterexamples to explore and verify assertions.
- Use inductive reasoning and patterns to develop conjectures.
- Use concrete models and dynamic technologies to draw conclusions about a conjecture.
- Describe the process, reasoning, and results of geometric investigations.

Geometry Foundations

Use this section to brush up your geometry skills if you are rusty, or as a resource to turn to if you encounter unfamiliar concepts later in this course.

Geometry Foundations

Read the following in *College Geometry 2*:

- Chapter 1 ("Introduction")
- Section 2.1 ("Reasoning") of Chapter 2

Axiomatic Systems

Geometry is axiomatic in nature. That means it is built in a rigorous way so that fundamental concepts and principles can be analyzed precisely and justified carefully.

Axiomatic Systems

Read "1.1.1 Introduction to Axiomatic Systems" by Dr. Timothy Peil.

Read "1.1.2 Examples of Axiomatic Systems" by Dr. Timothy Peil.

Watch the following WGU videos by Course Instructor David Francis:

- Axiomatic System Example (Undefined Terms)"
- Axiomatic System Example (Proof 1)"
- Axiomatic System Example (Proof 2)"
- Axiomatic System Example (Proof 3)"

Complete: Performance Task 1

Complete the following task in Taskstream:

- Performance Task 1

If you do not pass the task, meet with your course instructor.

Properties of Geometric Shapes

Carefully defining and clearly understanding geometric properties and definitions about objects such as lines, angles, circles, triangles, quadrilaterals, and other polygons makes it possible to construct proofs and solve problems about the congruence and similarity of these geometric objects.

Lines and Angles

Read the following in Chapter 2 of College Geometry 2:

- Section 2.2 ("Building Blocks of Geometry")
- Section 2.3 ("Starting Points")
- Section 2.4 ("Early Constructions and Proofs")

Complete the following in *College Geometry 2*:

- Chapter 2 Exercises

Non-Euclidean Geometry

Read the following in Chapter 2 of *College Geometry 2*:

- Section 2.5 ("Non-Euclidean Geometries")

Read the following in *Elementary Geometry for College Students*:

- Pages 118–120 of Chapter 2 ("Parallel Lines")
- Discussion at the end of 2.6 ("Non-Euclidean Geometries")

If you have experience with Geometer's Sketchpad, you may also want to download the file that allows you to explore the Poincare Disk Model of Hyperbolic Geometry. Also, please study the following facts:

- One of the fundamental differences between Geometries is how the version Fifth Postulate affects angles and, specifically, how it affects the sum of the interior angles of a triangle.
    - In Euclidean Geometry, the sum is exactly 180 degrees.
    - In Hyperbolic Geometry, the sum is strictly less than 180 degrees.
    - In Spherical Geometry, it is strictly greater than 180 degrees.
- One of the fundamental similarities between Geometries is that the sum of supplementary angles always equals 180 degrees.
- One of the fundamental differences between Geometries is that in Hyperbolic Geometry, interior angles of triangles can equal zero, but that in Euclidean and Spherical Geometry, interior angles of triangles are strictly greater than zero.

The Circle

Read the following in Chapter 3 of *College Geometry 2*:

- Section 3.1 ("The Circle in Detail")
- Section 3.2 ("Area of a Circle")
- Section 3.3 ("Chords and Tangents")
- Section 3.4 ("Theorems of Circles")
- Section 3.5 ("Coordinate Geometry of Circles")

Triangles

Read the following in Chapter 3 of College Geometry 2:

- Section 3.6 ("Triangles")
- Section 3.7 ("Types of Triangles")
- Section 3.8 ("General Triangle Properties")
- Section 3.9 ("Triangle Theorems")

Complete the following in College Geometry 2:

- Chapter 3 Exercises

Congruence and Similarity

Read the following in Chapter 4 of College Geometry 2:

- Section 4.1 ("Forms of Congruency")
- Section 4.2 ("Forms of Similarity")
- Section 4.3 ("Pythagorean Theorem")
- Section 4.4 ("Theorems")
- Section 4.5 ("Special Right Triangle Relationships")

Complete the following in College Geometry 2:

- Chapter 4 Exercises

Proofs

Read and complete the Proof Worksheet by CPM Educational Program, Inc.

Complete: Performance Task 2

Complete the following task in Taskstream:

- Performance Task 2

If you do not pass the task, meet with your course instructor.

Quadrilaterals and Higher Order Polygons

Read the following in *College Geometry 2*:

- Chapter 5 ("Higher Order Polygons")

Complete the following in *College Geometry 2*:

- Chapter 5 Exercises

Three-Dimensional Shapes

Read the following in *College Geometry 2*:

- Chapter 6 ("Three Dimensional (3D) Shapes")

Complete the following in *College Geometry 2*:

- Chapter 6 Exercises

Analytic Geometry

The study of geometry using a coordinate system is called "analytic geometry." It is also called "Cartesian geometry" in honor of René Descartes who first used a coordinate system to relate algebra and geometry in the seventeenth century.

Analytic Geometry

Read the following pages in *Elementary Geometry for College Students*:

- Pages 449–455 of Section 10.1 ("The Rectangular Coordinate System")
- Page 456 Exercises 1–10

Read the following pages in *Elementary Geometry for College Students*:

- Pages 458–464 of Section 10.2 ("Graphs of Linear Equations and Slope")
- Page 465 Exercises 10–20

Read the following pages in *Elementary Geometry for College Students*:

- pages 466–472 of section 10.3 ("Preparing to Do Analytic Proofs")
- pages 472-473 Exercises 1-12

Complete: Performance Task 3

Complete the following task in Taskstream:

- Performance Task 3

If you do not pass the task, meet with your course instructor.

Transformational Geometry

Geometric transformations can be applied to explore and analyze objects and solve problems.

Geometric Transformations

Read Chapter 7 in *College Geometry 2* and complete the exercises for Chapter 7. Pay particular attention to isometries as you learn about all the different kinds of transformations.

The word "isometric" comes from the prefix "iso," meaning the same or equal, as in the equal sides of an isosceles triangle, and the root "metry," meaning measure, as in the way the metric

system is a way to measure things. So putting those two parts together into an "isometry" gets you an "equal measure" transformation, meaning that the measures of lengths and angles stay the same when this kind of transformation is applied.

The reflections, translations, and glide reflections in Section 7.2 are examples of isometries, as are the rotations in Section 7.3.

Geometer's Sketchpad Transformations

Learn how to use dynamic geometry software to perform geometric transformations. Your goal is to be able to complete Geometer's Sketchpad Lab on Transformations, which is adapted from material by the publisher to focus on the skills most relevant to your required competencies in this course. To help you gain that competence, you might need the following resources:

- Getting Started Tutorials by the publisher
- Sketchpad Tips by the publisher
- Geometer's Sketchpad Tools, WGU's summary of material by the publisher
- GSP Lab 7 (on doing transformations)
- Isometries in GSP (9 minutes)

Complete: Performance Task 4

Complete the following task in Taskstream:

- Performance Task 4

If you do not pass the task, meet with your course instructor.

Complete: Performance Task 5

Complete the following task in Taskstream:

- Performance Task

If you do not pass the task, meet with your course instructor.

Final Steps

Congratulations on completing the activities in this course! The content of this course has prepared you to complete the course's assessments. If you have not already completed the assessments, schedule and complete your assessments now.