Math 340: Higher Geometry   Fall 2015
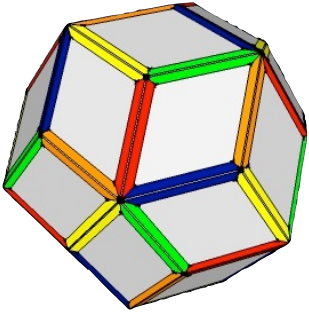
Instructor:	Kevin Hartshorn
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Course Meeting:	MWF 8:55-10:05am
	PPHAC 330
Course Site:	https://sites.google.com/a/moravian.edu/math-340-fall-2015/
Office Hours:	PPHAC 215
	MW 8:00-9:00am or TuW 2:00-3:00pm,
	or by appointment

This will be an inquiry-based approach to the concepts and ideas underlying classic Euclidean geometry — specifically notions of congruence, similarity, and transformations. We will take basic concepts from high school geometry, such as the Pythagorean Theorem, and work to develop multiple perspectives, applications, and connections.

Overview

Consider the *Common Core Standards* for Mathematics (the national standards for mathematics education that have been adopted by most states, including Pennsylvania), which call for

> An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts— interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.
>
> Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

For those pursuing certification in education, this course is meant to provide a grounding in *geometric thinking*. Instead of addressing the many specific definitions or theorems in high school mathematics, we will develop tools, techniques, and a frame of mind that should serve in your course development regardless of the particular geometric topics you plan to cover in class.

Key Ideas for the course

In a single semester, it is impossible to do more than scratch the surface of the range of ideas and topics available in geometry. We will thus focus in this class on the core concepts of geometry: straightness, angle, distance. I hope through this course to help you internalize the following key ideas.

- We can use a combination of *constructive* and *transformative* approaches to tackle many questions in geometry.

- Even the most complicated geometric concepts usually boil down to a fundamental understanding of triangles and circles.

- Without precise definitions and careful proofs, our intuition will often lead us to false conclusions.

Course Objectives

To help explore the key ideas of the course, we will work to meet the following outcomes over the course of the semester.

- We will be able to select and use the appropriate tools and techniques to make geometric arguments and solve geometric problems.

- We will be able to make use of fundamental geometric concepts to prove statements in different contexts (i.e.: using different approaches to Euclidean geometry).

- When presented with a new problem or concept we will demonstrate the transition from experimentation to theoretical proof.

- We will use writing as a means of exploring new geometric ideas and concepts.

- We will use writing and revision to gain a deeper understanding of material in the class.
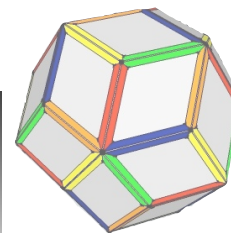
- We will demonstrate improvement in our writing and thinking about mathematics from a deliberate process of discussion and revision.

Components of course

Required materials and texts

The required text for this course is *Euclidean and Transformational Geometry: A Deductive Inquiry*, by Shlomo Libeskind. ISBN 978-0-7637-4366-6.

We will be using *Geogebra* in this class. Each person needs to install *Geogebra* on their laptop or tablet device for use in completing homework assignments and working on in-class activities. *Geogebra* is free on most platforms (Windows/Mac/Linux, as well as iOS/Android/Windows tablets). Go to http://www.geogebra.org/download to download and install the software.

Each day in class, you will need the following materials:

- **Pencil and eraser**. *Do not use pen in this class!* Bring every day to class.

- **Loose-leaf paper**. You need lots of scratch paper for in-class discussion. This can be "recycled" paper from printouts, lined paper that you have purchased, or graph paper. Bring paper every day to class.

- A laptop or tablet device with *Geogebra* installed.

Google Drive and Google Site

All class material and information, including homework/reading assignments and details on course policies will be available on the [class web page](#).

You will also share a Drive folder with me. This folder will be used to post *Sketchpad* homework files, as well as your final portfolio of work.

Grading and Assessment

Your course grade will be computed based on a raw percentage score, broken down as shown in the table below.

20%	Class preparation (based on submitted reading reflections)
20%	In-class work
35%	Written work (including two drafts of each homework assignment)
25%	Final portfolio
100%	**Total weight for course**

For each aspect of the course, you will accrue points, and your grade will be based on the percentage of total possible points you manage to accrue. As a general guideline I have provided the minimum percentage for each grade below.

A	A–	B+	B	B–	C+	C	C–	D+	D	D–
95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%

Note that the final assignment of grades will be determined based on the performance of the entire class and the judgement of the professor.
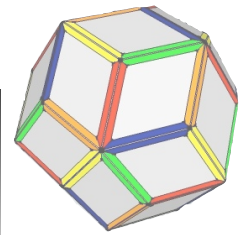
Class preparation

For each section of the book, you will be asked to write a short reflection. This may include questions you have about the reading, points of the reading you find particularly important or interesting, or responses to classmates' questions/comments.

Each submitted response will garner 3 points toward the class preparation score. One point will be deducted if

- The response is submitted late,

- The response does not demonstrate careful reflection on the reading, or

- The response does not include at least three questions, insights, or comments on classmate's work

Further details can be found on the class web page.

In-class work: Attendance and participation

Attendance is vital for this course. By missing class, you not only detract from your own learning, but you deprive your classmates of the opportunity to learn from your contribution. Group work will be essential to the class — by missing a class, your group's work will suffer.

Each day of class, you will earn 3 points toward class participation. You will lose a point if

- You do not satisfactorily perform in your group role for the day, or

- You arrive late to class

If you miss a class, you will get a zero for class participation that day. There is no opportunity for "making up" a missed class. If you will be missing class for an extended period of time, please contact me as soon as possible so we may discuss options.

All information about the progress of the class is available on the class web page. If you miss class for any reason, it is your responsibility to keep up with the course work.

Written Work

Each problem set assigned will have two drafts:

Draft 1: This will be due at the beginning of class. You will garner up to 3 points based on a good-faith completion of the entire assignment.

Draft 2: After revision of the first draft, you will submit a second draft electronically to the Google Drive. You will garner up to 3 points for each problem submitted based on quality of writing and accuracy of your proof/solution.

Details on the homework process are available on the class web page.

Final Portfolio

On the last day of class, you will submit a collection of solutions that best represents your learning trajectory for the course. This will include a sample of solved problems that represents (a) work from each of the first 5 chapters of the text and (b) work that represents both your ability and your growth in this class.

You will also be asked to write a reflection on your work through the course and include this in the portfolio.

As the semester progresses, we will discuss more details on the portfolio as well as the format for submission.
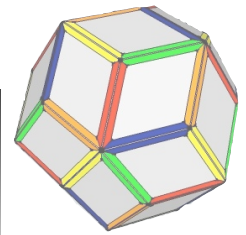
Course policies and information

Academic Honesty

Students will be expected to adhere to the standard of the Academic Honesty policy as described in the Student Handbook (*http://www.moravian.edu/studentlife/handbook/academic/academic2.html*). Any violations of this will result in severe penalties on the assignment, a report to the Dean, and the very real possibility of failing the course.

How this policy applies to homework problems: Your work on the each draft of the homework should be individual work. Specifically,

- *You should work alone on the first draft.* This means . . .
  - No consulting with anyone other than the professor of the course
  - No use of internet resources
  - No consulting of books other than the required book for the class
  - Use of *Geogebra* or *Geometer's Sketchpad* is acceptable and expected.

- *Your second draft should reflect your own writing.* This means . . .
  - You should not work with your group members while you complete the second draft.
  - You may consult with the Writing Center to help clarify your writing.
  - You may consult with your professor, your classmates (other than your group members), or other friends/ family to help with the editing/revision process.
  - You may not use internet resources or other textbooks to work through the solution.
  - Use of *Geogebra*, *Geometer's Sketchpad*, *LaTeX*, or *Google Docs* is expected (as appropriate).

Other reminders

- Students who wish to request accommodations in this class for a disability should contact Ms. Elaine Mara, Assistant Director of Academic & Disability Support, located on the first floor of Monocacy Hall (extension 1401). Accommodations cannot be provided until authorization is received from the Academic & Disability Support office.

- Visit my office: I would love to help address individual issues or answer questions you have about the course or to hear feedback about which aspects of the course are or are not going well. You have a great deal of power to determine the path this class takes — take advantage of it.

- You can communicate with me via e-mail (*hartshornk@moravian.edu*). You can also reach me through Google Hangouts using the same address.

- This syllabus is subject to change through the semester. The latest version of the syllabus will be posted on the class web page.

- Final determination of your course grade is subject to my discretion as professor of the course.