

University of Maine
Department of Mathematics and Statistics
Syllabus MAT 475 (Higher Geometry), Sect. 1 (CRN: 16603)
Fall 2006

What, Where, Who?

Text: Alfred S. Posamentier, *Advanced Euclidean Geometry* (Key Curriculum Press, 2002)

Description: This course will provide a college-level introduction to geometry and suitable for prospective high school teachers. The emphasis will be on review and (considerable) extension of the Euclidean and triangle geometry as taught in high school. In addition we will look into natural extensions such as the geometry of polygons (particularly quadrilaterals), non-Euclidean geometry and spatial geometry. The last two topics are not in the book. Of course, the above is only a tentative outline of the course. Changes may have to be made in the course of the semester.

Objectives:

In line with current views on geometry teaching, emphasis will be on exploration and induction, rather than on strict deduction.¹ At the end of the course, students should have developed a variety of exploratory techniques in geometry. Whatever results are suggested by the inductive method, however, should be proved and we will definitely do some pretty substantial mathematical reasoning. At the end of the course, students should have developed some sense of rigorous reasoning. In addition to providing tools to study geometry, it is an equally important goal of this course to equip the students with a catalog of standard results. At the end of the course, students should be familiar with a variety of standard results in triangle geometry (Menelaus, Ceva, Nine-Points Circle, Morley etc.) and other parts of geometry.

Time/Location: MWF, 12:10-1pm in NV 206

Instructor: Eisso J. Atzema, office: Neville Hall 328, e-mail: First Class; tel.: 581-3928

This is my eighth year here at the University of Maine. Originally I am from the Netherlands, where I also obtained my degrees. My specialties are History of Mathematics and Geometry. Currently I am working on the history of mathematics teaching in the USA from 1880 to 1920 (with a focus on arithmetic and early geometry). I am also working on an overview of the history of the study of quadrilaterals. Finally, over the summer I started preparing a somewhat unconventional geometry textbook to parts of which you may be exposed this semester. Like I do most semesters, this semester I teach two introductory level courses and one advanced course.

Office Hours: I am available for questions and more extensive help almost any time I am not teaching. This semester my teaching schedule is as follows:

| | | |
|-------|-------|-----------------|
| MTWF: | 11-12 | Calculus II |
| MTWF: | 2-3 | Calculus II |
| MWF | 12-1 | Higher Geometry |

I will make an effort to be in my office (or close by) on MF from 10-11. Of course, if you want to make sure that I have time to see you, you can also make an appointment (best by e-mail).

First Class: I have set up a First Class conference for MAT 475 and all of you have the conference icon on your desktop. Ideally, this conference serves as a forum on which you can discuss mathematics with your classmates. Also, I will use the conference for posting materials, such as web pages and Sketchpad files. I may also want to require you to submit Sketchpad homework through the conference.

How?

Attendance: As always, attendance is highly recommended.

Technology: For this course, the dynamic software package called Geometer's Sketchpad will

¹ See [Malkevitch], [Mammani].

be our default tool. Version 4 of this package (the most recent one) is available on all computers in NV 110, NV 116 and the labs in Shibles. You can also buy your own copy or the much cheaper Student Edition (which runs from a CD). Rather than using ruler and compass, you will be asked to turn in work done using this package. In addition to Sketchpad we may use some other materials, particularly if we get to cover some spatial geometry.

Testing/Grading: For this course, there will be no in-class exams. You will be assessed on the basis of regular homework assignments and the occasional quiz (perhaps).

Make-up work will be allowed only in extreme circumstances. Final letter grades are determined as follows: 60-69 > D, 70-79 > C, 80-89 > B, 90-100 > A. In borderline cases, I use plus and minus grades at my own discretion.

Homework: I plan on assigning homework on a weekly basis, although probably not more than 10 or 11 batches in all. I will post the assignments by the end of each week and they will be due before Friday's class of the following week. Homework might include routine exercises from the hand-outs, Sketchpad explorations and, in the parlance of the early 20th century, so-called "originals": exercises with a twist which require a little bit more creativity (or "originality"). Of course co-operation on the homework is allowed, but please use your own words in your own write-up as much as possible. If there are computations, sketches or anything else that you either copied or shared in their entirety, please let me know. The same applies to work that you completely did together with somebody else. The situation that I am hoping to avoid is to find solutions to a problem that are verbatim the same, without any explanation as to how that came to pass. It is okay if (every now and then) you copy or share (parts) of the homework.

However, as a way to be able to tell that everybody put in their fair share, I do want to see proper acknowledgment, both from the receiving and the giving party.

Accommodation: If you wish to request an accommodation for a disability, please contact either your instructor or Ann Smith, Coordinator of Services for Students with Disabilities (Onward Building, 1-2319) as early as possible in the semester.

Some References (needs updating):

- H.S.M. Coxeter, *Introduction to Geometry* (Wiley, 1961)(the standard for the mid-20th century – extremely hard to read)
- H. Perfect, *Topics in Geometry* (New York: Pergamon Press, 1963)(a much easier introduction to much of the same material as Coxeter)
- J. Malkevitch, *Geometry's Future* (Lexington: COMAP, 1992) (concerns about the teaching of geometry)
- J. King, D. Schattschneider (Eds.) *Geometry turned on. Dynamic Software in Learning, Teaching, and Research* (MAA, 1997) (= MAA Notes, no. 41) (as the title suggests)
- C. Mammana & V. Villani, (eds.), *Perspectives on the Teaching of Geometry for the 21st Century* (Dordrecht: Kluwer, 1998) (very broad and equally pretentious)
- W. Meyer, *Geometry and its Applications* (San Diego: Harcourt, 1999) (focus on useful applications of (non-standard) geometry)
- C.A. Gorine (Ed.) *Geometry at Work. Papers in Applied Geometry* (MAA, 2000) (= MAA Notes, no. 53) (ditto)
- J.L. Heilbron, *Geometry Civilized. History, Culture, and Technique* (Oxford: Clarendon Press, 2000)(easy and entertaining overview of the development of geometry – wonderful illustrations, but too biased toward formal geometry to be reliable as history.)