Math 3200 Course Syllabus

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1 Essential Information

Course Instructor	Dr. Sean Fitzpatrick *Contact:* via email[1] *Office:* University Hall C540
Student Hours	Monday 1:00–3:00 pm, Tuesday and Thursday 2:00–3:30 pm, Friday 10:00 am – 12:00 pm, and Wednesday by appointment[2].
Course Website	via Moodle[3]
Course Textbook	*The Four Pillars of Geometry*, by John Stillwell. The book can be downloaded for free at https://link.springer.com/book/10.1007/0-387-29052-4 as long as you're on the University of Lethbridge network. (Access is provided through a library subscription.)
Class Meetings	Monday, Tuesday, and Thursday at 9:00 am in SA7212.
Course Description	As per the Academic Calendar: Introduction to classical geometry from the axiomatic point of view. Lines and affine planes. Separation, order, similarity, congruence. Isometries and their classification. Groups of symmetries. Projective, hyperbolic and inversive geometries. Prerequisite: Math 2000.

2 Welcome!

Welcome to the University of Lethbridge. Oki, and welcome to the University of Lethbridge. Our University's Blackfoot name is Iniskim, meaning Sacred Buffalo Stone. The University of Lethbridge acknowledges and deeply appreciates the Siksikaitsitapii peoples' connection to their traditional territory. We, as people living and benefiting from Blackfoot Confederacy traditional territory, honour the traditions of people who have cared for this land since time

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[3] moodle.uleth.ca

immemorial. We recognize the diverse population of Indigenous Peoples who attend the University of Lethbridge and the contributions these Indigenous Peoples have made in shaping and strengthening the University community in the past, present, and in the future.

Welcome to the course! Welcome to Math 3200, Geometry. Geometry is an ancient subject, which has been around about as long as agriculture. The literal translation of the name is "Earth measurement". The material we will study ranges from the ancient (Euclid and Ancient Greece) to the relatively recent (linear algebra and modern geometry date from the late 19th century). I hope we'll be able to have fun exploring it together.

There are many of us in this class, coming from many different backgrounds and situations. I want my classroom to be as inclusive as possible. If the "default settings" for the class don't work for you, please don't hesitate to ask for accommodation.

As usual, everything you need to know for the course will flow through our Moodle[1] learning management system. Make sure you check in regularly to keep on top of what's happening in the course.

Don't hesitate to reach out if you have questions. I'll do my best to answer all of your course-related questions as quickly as possible. If you have questions that are not related to the course, you can ask those too, and I'll try to answer, or to direct you to someone who can. Some resources can be found on the University's Health and Safety website[2].

3 Navigating the course

For most students, getting the hang of writing proofs is the biggest challenge in the course. To learn to *write* proofs, we must first learn to *read* proofs. Reading a proof is not like reading a novel, or even a paragraph in a science textbook. Reading a proof requires active engagement. To quote Paul Halmos, "Don't just read it; fight it!"

Each time you read a proof, question every single line. Why do we start here? Where are we trying to get to? Why is this conclusion justified? Where did we use the hypothesis?

We begin the course with Euclid, and will look at some of the proofs in *The Elements*. Euclid is both hailed as the original example of careful axiomatic development of a subject, and criticized for not meeting modern standards of mathematical rigor. Question his proofs! Does a diagram used in the proof assume a special case? Will the same argument, or similar, work in other cases? What assumptions are being made without being explicitly stated?

Our textbook is not always easy reading, but it is important to keep at it, and to do your best to read the book ahead of time. Do the exercises as you go! Many of them will be assigned as homework anyway.

4 Course description

Classical (Euclidean) geometry is a great playground for learning rigorous proof. The books of Euclid's *Elements* formed a canonical textbook, used for over two millennia as part of a standard mathematics education.

From Euclid, we see how to begin from a set of *postulates* (those truths that we hold to be self-evident), and proceed from there to see what else can be deduced. In Euclidean geometry, we will see how to use a (digital) compass and straightedge to construct things like equilateral triangles.

We will also explore geometry beyond Euclid. It turns out that at least one of Euclid's axioms was not as self-evident as it seemed! Mathematicians spent centuries trying to prove that Euclid's "parallel postulate" could be derived from his other axioms. It was only at the end of the 19th century that some thought to ask a simple question: what happens if the parallel postulate is

[1] `moodle.uleth.ca`
[2] `uleth.ca/services-for-students/health-safety`

false? By removing it, we are able to pass from the "Flatland" of Euclidean geometry to other worlds, where space can be curved, parallel lines can intersect, and all sorts of fun can happen.

We will cover the first six chapters of the course textbook. As time permits, we will also look at selected topics from chapters 7 and 8.

We will spend most of our time in the classroom actively working on geometry. On Mondays we will discuss the readings assigned for the week, and I will give a brief presentation on some of the material. Tuesdays you will spend most of your time working on proofs and other exercises. This work will be done in groups, using the whiteboards in the classroom. Thursdays will be used for assignments. We will alternate between "lab" assignments, which will be completed using GeoGebra, and written assignments, which will focus more on writing proofs.

5 Grading

The various graded components of the course are explained below.

"Lab" Assignments (30%)	Lab assignments will involve using GeoGebra to produce geometric constructions. There will be 7 labs in total. There will be class time set aside for work on the labs. You will be expected to work in groups on the lab assignments. Labs will take place on Thursdays. See the Course schedule for details.
Written Assignments (20%)	Written assignments will involve proofs of theorems, and other problem-solving tasks. There will be 4 assignments in total. Assignments will be completed outside of class. They can be done in groups, although this is not required.
Quizzes (30%)	Quizzes will be written in class on Thursdays, roughly every other week. (Each Thursday will be either a lab or a quiz. See the Course schedule for details.) Quiz problems will reflect the homework problems from the textbook, and the questions you have worked on during class time. There will be 5 quizzes in total.
Project (20%)	There will be a project due at the end of term. Usually the project takes the form of a written essay, but this is not a requirement. (In the past, project submissions have included posters, software development, crafts, including crochet and origami, and even a children's book.) The only requirements are that it needs to be about geometry, and it needs to be about a topic not already covered in the course. I strongly recommend doing the project in groups, but I am willing to accept individual submissions. You will need to choose a group, and a project topic, by the end of February. Everyone is encouraged to meet with me prior to reading week for topic suggestions, especially if you're not sure what you want to work on.

Each of the grade components above will be assigned a numerical score. These will be added to get a score out of 100. Your score out of 100 is converted into a letter grade according to the following table.

Table 5.1 Conversion of percentage scores to letter grades in Math 3410

A+	97-100
A	92-95
A-	88-91
B+	84-87
B	80-83
B-	76-79
C+	72-75
C	68-71
C-	64-67
D+	60-63
D	50-59
F	0-49

A note on due dates Most due dates are flexible, and provided primarily for your benefit, to he with planning. (A course without deadlines can be a disaster for those w procrastinate.) The quiz dates won't move, though, so it's very importa to stay on top of the reading and exercises.

Other grading policies.

Revisions For quizzes, labs, and assignments, you will be invited to submit revisions for any incorrect work. Revisions must be submitted within ***one week*** of receiving your feedback.
There will be resubmission forms available on Moodle. You may either:

1. Submit a revision for ***one*** problem, in which case your revised grade will replace the original score, or
2. Submit revisions for all problems, in which case each correct revision will earn you back 50% of the points originally lost.

You may not use revisions to submit work for a question you initially skipped. For a revision to be accepted, you must first attempt the problem. You are also not allowed to submit revisions to make up for a grade of zero assigned due to academic misconduct.

Dropping lowest grades I will drop your lowest grade in each grade category (except the project). Missing grades will be counted as zero, so (for example) if you miss a test, the grade for your missed test will be dropped.

6 Course policies (an FAQ)

This section deals with questions about accommodations, missed tests, and other exceptional (yet common) cases.

1. *This week is super busy and I don't think I can finish the homework on time. Can I have an extension?*

   Yes. There's a form for that, provided on Moodle. I don't need to know why you need the extension; just what you want extended, when you want it extended to, and whether you need anything from me to help complete the work.

2. *What happens if I get sick?*

   I'll do my best to be accommodating of any illness that interrupts your studies. There is no need to provide details of the illness. If you miss a week or more of work, please get in

touch to make a plan for catching up. One of the biggest challenges in math is that once you fall behind, it's difficult to catch up on your own.

If you're staying home to avoid spreading illness to others (thank you!), but well enough to attend class, I'll try to provide you with a video link via Teams or Zoom.

3. *What exactly does academic honesty mean?*

   In short, that any work you represent as your own, is your own. Much of your work can be done in groups, but not all of it. I will assume that you have access to a calculator, including online tools Symbolab, or Wolfram Alpha, or our Jupyter notebooks.

   Use of these tools is acceptable, but take care that you are not overly reliant on them. What is not acceptable is having someone else do your work for you. This includes tutors, classmates, friends, family members, and online "homework help" sites. If you submit work that somebody else did for you, you are committing an academic offence. ***This includes getting AI to write your assignments.***

   Penalties for academic dishonesty are outlined in the Academic Calendar[1]. Depending on the severity of the offence, penalties for a first offence can range from a grade of zero on an assessment, to an F in the courses. Academic offences are also reported to the Dean of Arts & Sciences. They keep a record of each offence, and students with multiple offences can be subject to supplementary discipline.

4. *Does that mean I'm not allowed to get help with my homework?*

   Not at all! But keep in mind that your course instructors will be available for help, free of charge. (OK, maybe not free of charge, but you've already paid for it with your tuition.) We will be responding on the discussion forum regularly, There will be time to ask questions in every class, and there will be online office hours. The Student Success Centre will also be running free help sessions (details TBA).

   Some of you may still decide to pay for tutoring, and that's fine. But you have a duty to disclose sources of help on an assignment, and the individual tests are still tests, even if you won't have someone watching over your shoulder.

   You should probably avoid the various paid "homework help" websites. Most of these don't offer help. They offer worked solutions for a price. Getting those solutions won't help with your understanding. More importantly, the people working for these sites are paid (poorly) per solution, and they often provide incorrect and/or badly written work. (We saw plenty of examples of this last Spring, and yes, all those students now have discipline reports on file.)

5. *What do I do if I can't write a test during the scheduled time?*

   If you know in advance that you will not be able to write during the test window, let me know, and I'll arrange for an alternate time. If you miss a test due to illness, your test score will be replaced by your exam grade, or the average of your other three tests, whichever is higher.

6. *What if I miss the final exam?*

   Trick question: we don't have one.

7. *Do I need a doctor's note?*

   No. This wastes health care resources and your time. Just email me to say you were sick, and spare me the details. However, if you miss more than one test due to illness, we'll need to meet to discuss how to adjust your grade.

[1] `uleth.ca/policy/resources/student-discipline-policy-academic-offences-undergraduate-students`

8. *I receive learning accommodations. What arrangements can I make?*

   First, make sure that you have registered with the University's Accessible Learning Centre[2]. No need to let me know: they notify me of every student with accommodations.

   If there are any adjustments I can make to facilitate your learning, please do not hesitate to get in touch with me. All students deserve an equal opportunity to learn. Note that the HTML textbook is designed with accessibility in mind, and should work with screen readers.

9. *Life intervened and I can't keep up this week. What do I do?*

   Send me an email. Extensions are usually granted as long as they're granted ahead of time. Online homework extensions need to be in place before solutions become available. Book an appointment with me as soon as you feel like you're falling behind and I'll do my best to get you up to speed.

7 Course schedule

We will follow the schedule below as closely as possible. On *Monday*, we will usually review the assigned readings, and I may give a brief follow-up lecture. On *Tuesday*, I will provide problems that you will work on in class. Our classroom is well set up for this work to be done in groups, on the whiteboards. I will usually assign two or three problems, and we will take time for discussion between problems. The *Thursday* classes will either be a quiz or a lab, depending on the week.

The sections listed below for each Monday should be read prior to class. Problems on Tuesday will be frrom those same sections, so I haven't included any further detail for Tuesdays.

Table 7.1 Schedule for Winter 2025

Monday	Tuesday	Thursday
Jan. 6: Sections 1.1 – 1.3		Jan. 9: Lab 1
Jan. 13: Sections 1.4 – 1.5		Jan. 16: Quiz 1 (Chapter 1)
Jan. 20: Sections 2.1 – 2.4		Jan. 23: Lab 2
Jan. 27: Sections 2.5 – 2.8		Jan. 30: Quiz 2 (Chapter 2)
Feb.3: Sections 3.1 – 3.4		Feb. 6: Lab 3
Feb. 10: Sections 4.1 – 4.3		Feb. 13: Lab 4
Feb. 24: Sections 5.1 – 5.2		Feb. 27: Quiz 3 (Ch. 3, 4)
Mar. 3: Sections 5.3 – 5.5		Mar. 6: Lab 5
Mar. 10: Sections 5.6 – 5.8		Mar. 13: Quiz 4 (5.1 - 5.5)
Mar. 17: Sections 6.1 – 6.4		Mar. 20: Lab 6
Mar. 24: 7.1 – 7.4		Mar. 27: Quiz 5 (Ch. 6, 7)
Mar. 31: 8.1 - 8.3		Apr. 3: Lab 7

Assignment due dates: January 22, February 12, March 12, April 2.
Project outlines due: February 25. Projects due: April 4.

[2] `ulethbridge.ca/accessible-learning-centre`