General Information

COURSE	MATH 348 — Topics in Geometry
SEMESTER	Summer 2010 — Section 001
PREREQUISITE	MATH 133 or equivalent or permission of instructor
CREDITS	3.000
INSTRUCTOR	Norman Do
OFFICE	Burnside Hall 1125
TELEPHONE	514 398 2998
EMAIL	ndo@math.mcgill.ca
OFFICE HOURS	Tue 1400-1500, Thu 1400–1500 or by appointment
CLASSROOM	Burnside Hall 1B24
CLASS HOURS	Mon 1105–1325, Tue 1105–1325, Wed 1105–1325, Thu 1105–1325
	Monday 3 May to Tuesday 1 June *except for Monday 24 May*
WEBPAGE	http://www.math.mcgill.ca/ndo/MATH-348.html

Learning Outcomes

I hope that, by the end of the course, students should

- understand all of the topics in geometry described below;
- know a little about some of the major players in mathematical history;
- appreciate the mysterious notions of theorem and proof; and
- think that maths is awesome.

Instructional Method

The course includes 16 sessions, each one lasting for an epic 140 minutes. These will generally consist of a lecture in which I talk about the course material, a tutorial in which we talk about solving maths problems, and some much needed break in between.

Course Materials

There is no required textbook for the course, so you can save your hard-earned money. Instead, I will publish concise notes of varying quality after each lecture on the course website, outlining the content of the lecture. However, these in no way constitute a replacement for going to the lectures. At various stages throughout the course, I might suggest books or websites which reinforce and/or complement the material delivered in lectures. The course website, which will also include electronic copies of any handouts, can be found at the following URL.

http://www.math.mcgill.ca/ndo/MATH-348.html

Assignments and Evaluation

Your evaluation for this course will be based on assignments, a test, and an examination.

- **Assignments**
  There will be three assignments, each graded out of 20. You are not discouraged from talking about assignment problems with other students, but every solution that you hand in must be your own work.[1] Every page submitted should clearly indicate your name, your student number, the course number, and the assignment number.[2] Late assignments will not be accepted, unless under particularly extreme circumstances.
  - Assignment 1 will be handed out at the end of class on Tuesday 4 May and is due at 11:00am on Tuesday 11 May. It will test the material delivered in lectures 1.1 to 1.4.
  - Assignment 2 will be handed out at the end of class on Tuesday 11 May and is due at 11:00am on Tuesday 18 May. It will test the material delivered in lectures 2.1 to 2.4.
  - Assignment 3 will be handed out at the end of class on Tuesday 18 May and is due at 11:00am on Tuesday 25 May. It will test the material delivered in lectures 3.1 to 3.4.
- **Test**
  There will be a test graded out of 40. You will not be allowed to use calculators, computers, notes, or other aids. No provision will be made for a student who is absent on the day of the test.
  - The test will occur in class on Thursday 20 May.
    It will test the material delivered in lectures 1.1 to 3.3.
- **Examination**
  The examination will be graded out of 100. You will not be allowed to use calculators, computers, notes, or other aids. There will not be a supplemental examination in this course.
  - The examination will occur on Wednesday 2 June or Thursday 3 June.
    It will test the material delivered in lectures 1.1 to 4.4.

Your final mark will consist of

$$\text{50\% examination + 30\% assignments + 20\% test} \qquad \textbf{OR} \qquad \text{100\% examination,}$$

whichever is greater. Your final grade will be a letter grade based on your final mark.

Course Content

We will be looking at the following four rather different topics in geometry.

- Euclidean Geometry
- Symmetry in Geometry
- Polyhedra, Graphs and Surfaces
- Tiling and Dissection

In an ideal world, we would be able to cover all of the course content outlined below. More realistically, we might have to deviate from the plan a little, depending on time constraints and student response.

[1] McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. Please see `www.mcgill.ca/students/srr/honest/` for more information.

[2] In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

	1. EUCLIDEAN GEOMETRY
Mon 3 May	**1.1. Euclid's Elements**... in which we start at the very beginning, where Euclid started, with the axioms and build the world of geometry
Tue 4 May	**1.2. Triangles and Circles**... in which we study two of the most basic and fundamental objects of geometry — namely, triangles and circles
Wed 5 May	**1.3. Triangle Centres**... in which we discover that the humble triangle has at least four very special points, each with very special properties
Thu 6 May	**1.4. Geometric Gems**... in which we use our geometric knowledge to discover wondrous things before returning to the very beginning, where Euclid started, with the axioms
	2. SYMMETRY IN GEOMETRY
Mon 10 May	**2.1. Isometries**... in which we learn the mathematics of flipping, sliding, turning and gliding, as well as what this all has to do with symmetry
Tue 11 May	**2.2. Symmetry and Groups**... in which we begin with the simple notion of symmetry and end with the abstract algebraic notion of a group
Wed 12 May	**2.3. Symmetry in the Plane**... in which we examine symmetry in the plane and prove a theorem of Leonardo da Vinci
Thu 13 May	**2.4. Crystals, Friezes and Wallpapers**... in which we consider the symmetry of crystals, friezes — those long decorations found where the wall meets the ceiling — and wallpapers
	3. POLYHEDRA, GRAPHS AND SURFACES
Mon 17 May	**3.1. From Polyhedra to Graphs**... in which we glue together polygons to make polyhedra and introduce the notion of a graph
Tue 18 May	**3.2. Graphs and Maps**... in which we further develop graph theory and then use our results to hunt down all of the Platonic solids
Wed 19 May	**3.3. Surfaces and Topology**... in which we define the notion of a hole, discover the mysterious one-sided surfaces and play with the rubbery world of topology
Thu 20 May	**3.4. The Classification of Surfaces**... in which we hunt down all of the surfaces and then consider what it's like to live in three dimensions
	4. TILING AND DISSECTION
Tue 25 May	**4.1. Tiling Rectangles**... in which we decide whether or not a rectangle can be tiled with smaller shapes, using colored pencils and other tricks
Wed 26 May	**4.2. Scissors Congruence**... in which we explore the seemingly simple notions of area and volume with the help of scissors and glue
Thu 27 May	**4.3. Tiling the Plane**... in which we find shapes which tile the plane and encounter some crazy aperiodic tilings
Mon 31 May	**4.4. My Favourite Problems**... in which we see a handful of my favourite problems in geometry, both solved and unsolved
	REVIEW
Tue 1 June	**Review**