

INSTRUCTOR: Janice Sklensky

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OFFICE HOURS: M 12:30-1:20, T 11:00-11:50, W 3:30-4:20, Th 9:30-10:20.

If you can't make any of my office hours, we can arrange an appointment.

COURSE MATERIALS: The readings are all on electronic reserve. In order to read them, go to the library's web page, at <http://www2.wheatoncollege.edu/Library>. From there, choose *course reserves - Search ERs: Electronic Course Reserves - Electronic Reserves and Course Materials - Instructor=Janice Sklensky - Math 122B*. At that point, you will be asked for a password.

Instead of buying a book, you need to buy various supplies: a ruler, graph paper, a small calculator, to start with; if I think of more, I'll let you know. The ruler and the calculator must be brought to class every day.

OPTIONAL READING: *The da Vinci Code* by Dan Brown, *Flatlands* by Edwin Abbott, *The Golden Ratio* by Mario Livio, *Arcadia*, by Tom Stoppard are just a few books or plays you might enjoy.

OVERVIEW

In this course, we will explore several math topics that are connected to visual art. The topics we will study will include (but may not be limited to):

- Systems of Proportions: we will begin by reviewing the concepts of proportionality and ratios. We will then investigate how artists and architects can use proportion in their work, and learn about several specific systems of proportionality that have been used by artists or architects through the millenia.
- The Golden Ratio (also known as the Divine Proportion): we will learn Euclid's definition of the Mean and Extreme Ratio and investigate how this leads to the famous constant φ , the Golden Ratio. We will investigate whether it appears in the Great Pyramid, as well as (as much as possible) investigating whether it seems to appear in the Parthenon, and various art works by Leonardo daVinci, Georges Seurat, Piet Mondrian, and Juan Gris. We may also investigate the connection between the Golden Ratio and sequence of numbers 1, 1, 2, 3, 5, 8, 13, 21, ... We will also review the concept of similar shapes from geometry, and use it see how the Golden Ratio answers a question posed by the Greeks involving similar rectangles.
- Perspective: we will learn the 3-dimensional coordinate system, and learn how we can combine this idea with geometry to develop some very precise rules for drawing with depth. We will use our ideas both to do some drawing and to investigate the perspective in classic art works.

- **Non-Euclidean Geometry and the Fourth Dimension:** we will learn about a type of geometry that does not assume parallel lines never meet, and see where that idea takes us, and also explore the concept of a fourth spatial dimension. We will discuss how the cubists were inspired by these ideas.
- **Fractals:** we will learn about self-similarity, fractional dimension, iteration, and complex numbers. We will then see how these ideas lead to some very cool pictures, and create some ourselves. We will also see some pictures from hundreds of years ago that appear remarkably fractal in nature, and discuss how mathematicians and computer scientists use the idea of fractals to create very realistic looking clouds, mountains, and trees, and other natural objects that can be used in graphics.

COURSE STRUCTURE, GOALS, AND EXPECTATIONS:

The main goals for this class are to

- use your interest in art to motivate learning mathematics that can be used to create, analyze, or understand various works of art, thus honing your logical abilities,
- help you gain an appreciation for how beautiful math can be by actually being able to *see* some of what it can do,
- begin to give you a feel for how universal a language math is, rather than the isolated field many people believe it to be.
- give you a deeper and more layered appreciation for some of the art you see.

In this class, as with all others, how much you actually learn is entirely up to you. Math is a subject you can only learn by doing—observing me (and others) may give you a start, but it is certainly not enough. Class will combine lecture with time for in-class work so that you may *do* what you've been hearing about.

The rule of thumb for how much work you should expect to spend on any college class is 2 to 3 hours of work outside of class for every hour in class. No matter what your experience has been in other classes,

Plan to spend at least 8 hours a week on this class outside of class!

Of course, some weeks you may spend more than 8 hours on this class, especially when studying for an exam or working on a project, while others you may spend less, but it's best if you have the time set aside to work on this class.

IS THIS THE RIGHT MATH COURSE FOR YOU?

This course is intended for students who are interested in art or art history. If you are not especially interested in these topics, this probably is *not* the best math class for you. The more background you have in art and/or art history, the more you will get out of this

class, I believe. For that reason as well as the fact that some majors require or recommend specific math courses, it's often a good idea to wait to take this class until you are at least a sophomore. But if you're a first-year whose heart is set on taking this class now, don't worry – it's certainly accessible to you.

CLASS PARTICIPATION

As with any class, you will get more out of it if you actively participate. To encourage you, I am including class participation in your overall grade. This includes paying attention, asking constructive questions in and out of class, answering questions that I pose, listening respectfully to your classmates, working with classmates to investigate problems when I ask you to, giving helpful feedback to classmates when that is required, having a general aura of interest, and other similar aspects of good academic citizenship.

I plan to pay attention each day to the ebb and flow of communication and participation; active and constructive participation will earn you a point, lack of participation will earn you no points, and active destructive participation (talking while I'm talking or otherwise distracting class-mates, asking questions that essentially ask me to repeat what I already said because you weren't paying attention or weren't there, repeated tardiness or absence, a lack of focus during in-class work times, for instance) will take away a point from your total.

PROBLEM SETS

While part of this class will focus on how math has appeared in art, most of the focus will be on learning the math itself – and to help you with this, I will be collecting homework. There are numerous reasons to collect and grade problem sets: so that your grade does not rest solely on exams and a few projects; to give you feedback as to whether you're understanding the material; to give me feedback as to whether anyone is having trouble, and to let me know whether I need to spend more (or less) time on material.

I have found that collecting homework every day is overwhelming to you, to me, and to the homework grader. For that reason, you will have *weekly* problem sets, due Fridays at the beginning of class. Let me emphasize, however, that the problem sets do reflect an entire week's worth of material, and should be worked on steadily throughout the week.

Your weekly problem sets will alternate between being done individually and in groups.

PROJECTS:

With this being a course that covers mathematics as it connects to art, creating some art work using the mathematical ideas you've learned is a fun and challenging way to put the material you've been learning into action. There will be many opportunities throughout the semester for you to do just this!

In order to give you the opportunity to (to some extent) choose those projects which most appeal to you, I will mention possibilities for projects as they come up, and you can choose which you want to do. Generally, projects will be due within 1 or 2 weeks of when I announce them. You may also propose projects to me, if I've missed a good possibility.

Here's how it will work. This portion of the class will be worth 20% of your final grade. To get the full 20%, you need to receive 100 points on projects (just as, to receive the full

25% on homework, you must get full credit on every problem set). How do you get those points? Most projects will consist of using mathematical ideas to construct a work of art, and of writing a description of the math involved that could be easily read and understood by your friends in the class. For each project that you do, I will assign you points based on the correctness of the math, the extent to which you incorporated math in the work, the clarity of your explanation, and also the effort you put into the art, and to some extent the quality of the art.

EXAMS AND FINAL:

During the semester, I will give three exams to make sure that you are putting together the concepts and skills we have covered. The primary emphasis of the exams will be for you to show me how well you've mastered the underlying mathematical ideas. The final will be cumulative. The dates of all exams are fairly firmly scheduled, and are listed on the course syllabus.

Notify me in advance if you will be missing an exam. If your reason for missing is acceptable, we will arrange that you take the exam **early**. If you miss an exam without notifying me in advance, I reserve the right not to give you a make-up exam. I will not give any student more than one make-up exam during the semester.

ATTENDANCE:

Clearly, missing this class is not a wise idea – particularly since we don't really have a book that you can turn to in the event you *do* miss class. If you **do** miss class, you are responsible for the material that was covered. *Warning:* – I can only keep one day's worth of events in my head and may not remember something important, so ask your friends as well as me.

EVALUATION

I expect to use the weights below, although I reserve the right to change my mind if the semester does not go as expected.

Class Participation	5%
Problem Sets	25%
Projects	20%
Midterm Exams	30%
Final Exam	20%

If you question the fairness of any grade, bring it to me **within a week** of receiving it.

HONOR CODE

I expect you to abide by the Honor Code. *Remember: If you see a violation of the Honor Code occurring, you are bound by the Honor Code to report it.*

As part of the honor code, you are required to write *I have abided by the Wheaton College Honor Code in this work*, followed by your signature, on all written assignments. Every time you do, you should be pondering the question "how exactly does the honor code apply to *this* assignment, and did I *really* abide by it?" If, upon consideration, you do not feel you can truthfully write and sign the pledge, please come speak to me immediately!

So, specifically, how does the Honor Code apply in this class?

For all assignments: You may discuss the work with classmates, and you may use references that help you figure out how to do a problem on your own, but you may not use any references (people, other people's projects or assignments, books, the web) which either give you the answer or lead you directly to the solution. When you do use references (as described above), you *must* cite them.

For all group work: You must make every effort to meet with your group at all meetings. You may not purposely exclude any member from a meeting.

You may not divide the work!

You must make every effort to participate and aid in finding the solutions. If you don't understand what someone else is saying, you must ask them to explain it. If someone asks you to explain your ideas, you must take the time to explain it. In the end, you must understand all the work that is being submitted under your name. Taking credit for work you do not understand is much the same as plagiarism.

Homework: For the individual problem sets, you must write the results on your own, in your own words. For the group problem sets, after your group has jointly figured out every problem, one person will be responsible for recopying your work. This primary author must change from week to week.

Dividing Up Group Points: Do not give, or take, credit that is not due.

Projects: Both the art work and the explanation of it must represent your own work.

Midterm and Final Exams: You may not use any notes, books, or colleagues as reference during the exams, unless I allow a "cheat sheet", in which case, it must conform to my stated rules. You may not look at anybody's exam until after all exams have been returned. You may not use a calculator unless I specify that you may, and you may not use the memory aspect of a calculator.