

Prerequisite

450 Math SAT score or 20 ACT score or credit for an acceptable college level math course or an adequate score on the Nazareth College Mathematics Assessment Test (MAT)

Course Description

Mathematics is a distinctly human activity that everyone engages in at some level ranging from the subconscious and intuitive to the extreme limits of rational intellectual activity. For thousands of years mathematics has demonstrated its power to enrich the minds of men and women and to modify the human condition. Yet, few people have an accurate feeling for the history, nature, goals and accomplishments of mathematics. *What exactly is mathematics? What do mathematicians do? Why do people do mathematics?* These are the fundamental questions addressed in this course.

Since it is difficult to understand a subject without knowing its history, we include a study of some of the people and periods in the history of mathematics. We examine rigorous thought and mathematical proofs, the foundations of mathematics. We study the natural numbers, the basic building blocks of mathematics. This discussion leads to the concept of infinity. What does it mean to be infinite? Why would a mathematician care? We investigate various types of geometry throughout the ages and see how they have influenced cultures and mankind's view of the world and universe. At the end of the course, we re-visit our fundamental questions.

Course Outline**I. What Is Mathematics? What Do Mathematicians Do? Why Do People Do Mathematics?**

We will address these questions throughout the course. We will learn about many of the people who made significant developments in the discipline of mathematics, and we will highlight aspects of mathematical reasoning that do not occur in other disciplines.

II. Solving Problems

What is a problem? Is it the word problem at the end of each assignment? Most people in society view life problems as being separate from mathematical problems, and thus they do not see mathematical analysis as useful in solving life problems. By analyzing the different approaches to studying mathematical problems, students will be invited to transport these methods of thought beyond the math setting to their larger life experiences.

III. Mathematical Proofs and Rigorous Explanations

Students will discuss, think through, write about, wrestle and come to grips with their own understanding of how to make mathematical arguments. We will study some famous formal mathematical proofs, and we will study interesting questions that require convincing answers, or at least convincing engagement with the questions. Each student will develop his or her own "mathematical voice". Success will be measured in part by how many mathematical conversations students can engage their families and friends in throughout the semester.

IV. Studying Some of the Greatest Ideas in Mathematics Deeply

Everyone is capable of thinking mathematically, even if she or he is not a math major. Rather than studying “the next” topic in mathematics (algebra, trigonometry, precalculus, calculus,...), we explore ground-breaking moments in the historical development of mathematics. In essence, we are studying the analogies of works by Bach, Beethoven, Mozart, ... or Michelangelo, Van Gogh, Renoir, ...

V. Writing To Learn

In this writing-intensive course we will use a variety of writing techniques and assignments to help each student develop her or his own understanding of the mathematics presented. We will use free-writing to engage prior knowledge and pose questions, write and share first thoughts in small groups before presenting them to the class, write informal reports on mathematicians and short essays relaying back individual understanding of the class discussions, and prepare two formal papers which synthesize ideas of mathematics and cultures.

Course Objectives

The student will:

- ◆ engage in discussions about mathematical ideas
- ◆ demonstrate deep understanding of several significant mathematical concepts and proofs
- ◆ develop skill in thinking, reading, speaking and writing mathematics
- ◆ appreciate that mathematics is developed and wrestled with by human beings
- ◆ work effectively in a small group
- ◆ experience techniques of thinking that can be used in other areas of life beyond this course

Perspectives I Course

The Mathematical Experience is a Perspectives I course, part of the Liberal Studies Core Curriculum at Nazareth College. In this course the student will develop ability to pursue truth from a variety and depth of perspectives, find distinctive ways to ask questions and seek answers, read from original sources in the discipline of mathematics, think critically, solve problems, speak and write with clarity and precision, reason quantitatively, formulate rational arguments, and analyze and synthesize information and knowledge.

Class Information

Instructor: Dr. Cheri Boyd

Office: Smyth 349 B

Phone: 389-2560 (office), 334-8013 (home, before 9:30 PM)

E-mail: clboyd@naz.edu

Office hours: Monday 11:30 – 12:30

Wednesday 10:30 – 11:30

Thursday 1:00 – 2:00

and by appointment

Materials

Each student should bring a scientific calculator that can take square roots and calculate logs to class. Index cards (5x7) will be needed for making report cards on mathematicians throughout the semester.

Reading Assignments

The required text is *The Heart of Mathematics: An Invitation to Effective Thinking* by Edward Burger and Michael Starbird, ISBN 1-55953-407-9, Key College Publishing. Normally you will be reading sections of the text for each class meeting. Reading assignments are noted in the schedule.

Students are also required to read *The Man Who Counted* by Malba Tahan and *Flatland* by Edwin Abbott. You will have several weeks to complete reading each book. Starting and ending dates for reading are noted in the schedule. You are required to take notes while reading these two books, and to produce them in class on the date indicated. Instructions and topics for taking notes will be provided.

Writing Assignments

Homework: Problems from the text will be assigned and collected. Work on them alone first, then discuss your ideas with your group members. Also check your solutions in the Math Center (Smyth 362) *before* coming to class. Handwritten, informal solutions to homework problems are expected. *Use your own words! Duplicate homework solutions are not acceptable and will be discarded for zero credit for all parties involved.*

No late homework will be accepted. To allow a bit of leeway with this, the two lowest homework scores will be dropped. If you must miss a class, your homework is still due at that class. Send your homework in with someone else, or leave it for me at my office ahead of time.

Cards on Mathematicians: You will research a number of mathematicians throughout the semester. Hand write on a 5 x 7 index card the following information about each mathematician:

Name

Place and date of birth

Place and date of death

Anecdotes: one or two brief memorable stories that make the person real

Mathematics: describe the important mathematics developed by this person (use your own words, include appropriate diagrams)

A quote attributed to this person

The source(s) you used (include URL, author, and title)

Use your own words, provide your own understanding. Do not just copy from your sources. A list of internet and paper sources will be provided.

You can bring these cards with you to the tests and the final exam.

(They will be collected with your test or exam.)

Short Essays: We will discuss a number of significant mathematical proofs and concepts in class during the semester. You will increase your own understanding of these proofs and concepts through writing **short essays** that I will respond to in writing. These essays provide you with informal assessment of your mathematical writing and comprehension *before* you write on these same topics during a test or exam.

Formal Papers: You will write two 3-5 page papers on topics associated with our course. The first will be your own chapter of the book *The Man Who Counted* (see separate handout) and the second will be a research paper on the life and work of a female mathematician. Each of these two papers will be written initially as rough drafts, produced for peer review in class and individual conferencing with me before turning in a final draft.

You will also address the theme questions for the course, What is Mathematics? ,What Do Mathematicians Do? and Why Do People Do Mathematics? in an essay at the end of the semester.

Class Procedure

Lecture, class discussion, and small group activities will be utilized throughout the semester. Active participation is expected. A portion of class time will be spent working collaboratively. Research shows that students learn higher order thinking skills when they work in small groups. Students have opportunities to ask other people questions, to get different ideas for solving problems, and to learn how to articulate their own ideas. These skills are valuable in many situations outside the classroom.

General Expectations

This course requires *independent thinking*.

Workload Expectations

A rule of thumb for college courses is that you will study two to three hours for each credit hour assigned to a class. Since this is a three-credit course, you should expect to spend between six and nine hours outside of class each week working on (reading and writing) assignments. Some of you will spend more or less time. Please keep track of your time and let me know how it's going. I will try to adjust the assignments accordingly.

Evaluation

Course grades will be based on a variety of sources:

Homework	7%
Attendance/Participation	5%
Cards on Mathematicians	8%
Short Essays	10%
Formal Papers	25%
Three Tests	30%
Final Exam	15%

Grade Scale

Letter grades correspond to percentages as follows:

93–103	A	distinguished work
90-92	A-	
87-89	B+	
83-86	B	better than average work
80-82	B-	
77-79	C+	
73-76	C	average work
70-72	C-	
67-69	D+	
63-66	D	below average work
60-62	D-	
0-59	F	failing

Safe Environment/Study Groups/Working Together

Research shows that helping your fellow students learn is an excellent way for you to learn mathematics. I encourage you to work together regularly, to be comfortable asking questions in front of one another, and to respect your classmates' learning styles and pace. I will have you set up study groups and ask you to meet once a week to do homework, review class notes, and touch base with your progress in the course.

Extra Help

Please come to my office! I am glad to meet with you outside of class to work on problems and discuss any questions or concerns you are having. You may come to my office during office hours without any advance notice. Please see me before or after class (or call) to set up an appointment at an alternate time if my scheduled office hours are not convenient.

Free Math Center Tutoring

Math majors are available for walk-in tutoring (no appointment necessary) in the Math Center (Smyth 362) many hours of the day and evening. Some weekend hours are also available. Copies of the schedule will be handed out in class, posted near the door, and stacked on the tables in the Math Center. You can even ask the tutor to help your study group if you meet in the Math Center for a study group meeting!

Paid Tutors through Academic Advising

The Academic Advisement Office arranges one-on-one tutoring for a small fee (financial hardship waivers are available). Typically a student who has previously done well in the course is assigned to tutor a current student.

Attendance/Participation Policy

Attendance is required and participation is absolutely necessary for a successful course experience. Since you will be working regularly with other people, your absence hurts your entire group. Attendance and participation count for 5% of your course grade. There are 27 class meetings this semester.

If you participate in 37 or more classes, you will earn the full 5%.

If you participate in 35 or 36 classes, you will earn 4% (out of 5%).

If you participate in 33 or 34 classes, you will earn 3% (out of 5%).

If you participate in 31 or 32 classes, you will earn 2% (out of 5%).

If you participate in 29-30 classes, you will earn 1% (out of 5%).

If you participate in fewer than 29 classes, you will earn 0% (out of 5%).

Arriving late or leaving early will count as a partial absence.

This applies to unexcused absences (e.g. oversleeping, just not showing up, leaving early for a vacation). If you must miss a class for a valid reason (determined by me), you can make up the work that you missed and the absence will not be counted against your course grade. See details below.

Missing Class / Making Up Absences

If you need to miss all or part of a class for a valid reason (illness, family emergency, athletics trip, job interview, etc.) you can make up the class work, and this will not count as an absence. You must call or see me before the missed class, or as soon as possible after an emergency situation. Let me know when and why you will be gone, and find out what we'll be covering that day so you don't fall behind. You must also contact someone in your group to let them know you will be absent. **Assignments are still due** even if you need to miss a class. Make arrangements (with a group member or someone else in

class) to turn in your homework at the regular class meeting and get the notes and any handouts or new assignments. I expect you will read the notes and work on the new assignments, and see me with any questions *before* the next class meeting.

Unexcused absences (vacations, oversleeping) can not be made up. Check with me before missing the class to be safe. Remember, if you miss class, send your homework to class with someone else.

Appropriate arrangements will be made in the case of *extended* absence due to a serious illness or personal problem. Please talk to me at the earliest possible indication of such a situation.

Missing a Test

If you must miss a test for a valid reason determined by me, you will need to take a make-up test at the earliest possible time after missing the test. Notify me as soon as possible, preferably before the missed test, certainly by the end of the test day. Missing a test for an invalid reason will result in a grade of zero for that test.

Clean Up Policy

This class tends to be quite casual. You will be working in groups and talking regularly. Food and drink are allowed as long as they are not disruptive. Make sure all drinks have lids to prevent spills. At the end of class, please throw away all trash.

Disabilities

If you need to make any special arrangements for participating in this course due to a documented disability, please let me know during the first two weeks of the semester. I am glad to make any necessary modifications to help you perform at your highest level.

Policy Changes

I reserve the right to make necessary changes as they arise during the semester. Changes to any items above will be announced in class.