

MATH 464-931
INTRODUCTION TO THE HISTORY OF
MATHEMATICS (online)

Revised Fall 2008

Three Semester Hours Credit

Author and Instructor: Bill Blubaugh

Four Written Assignment Units
Proctored Mid-Course and Final Tests
Reaction Paper
Lesson Plan (or Biographical) Paper
Paper on the development of a topic of mathematics

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Disability Access Center (970) 351-2289 as soon as possible to better ensure that accommodations are implemented in a timely fashion.

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ABOUT YOUR INSTRUCTOR

INSTRUCTOR:

Bill Blubaugh
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Welcome to the History of Mathematics and to Independent Study. I would like to begin by sharing a little about myself.



I completed a Bachelor of Science Degree in Mathematics and Science at Kent State University in northeastern Ohio and a Master of Science, also from Kent State University, in Mathematics and Education. In 1984, I received a Ph.D. in Mathematics Education from the University of Colorado at Boulder. My professional experience includes ten years of teaching at the high school level in basic mathematics through calculus, two years of teaching mathematics education at the University of Colorado at Boulder as a graduate student, three years of teaching mathematics education at the University of Texas at Austin, and twenty-one years of teaching mathematics and mathematics education courses at the University of Northern Colorado.

I especially enjoy the content and history of mathematics as well as working with high school, undergraduate, and graduate students. I enjoy writing and am the author of several articles published in such journals as *The Mathematics Teacher*, *Mathematics and Computer Education*, and *School Science and Mathematics*, in addition to numerous presentations for state, regional, and

national learned society conferences. My research interests include the use of technology to teach mathematics, mathematical problem solving, and the assessment of needs of secondary school mathematics programs in Colorado.

My wife, Karen, and I have been married twenty-five years and we have three children. Cathy is 21, Becky is 19, and Matthew is 17. We especially enjoy golfing, hiking, camping, and skiing in the mountains.

Feel free to contact me at any time by email (bill.Blubaugh@unco.edu), phone (office: 970-351-2028, home: 970-667-8793), fax (970-351-1225), or Internet (<http://www.unco.edu/NHS/mathsci/facstaff/Blubaugh/index.html>).

INTRODUCTION TO THE COURSE

As one who has enjoyed mathematics all my life, I have come to recognize the importance of the people involved in its discoveries and inventions. Numerous cultures including Egyptian, Greek, Chinese, and Hindu, and individuals such as Aristotle, Euclid, Pascal, Napier, Fermat, Newton, and Descartes have developed mathematics into an exciting area of study to be extended, as well as a powerful tool to be used for such “simple” tasks as balancing our checkbooks, to more complicated tasks that involve the development of sophisticated technology used by scientists in space exploration, or by biochemists in medical technology.

By looking back at the history of mathematics we are more able to appreciate the years and lives devoted by many individuals and the contributions that they have made in providing the quality of life we have today. Consider a typical day’s activity and envision how it might be different without the contributions of mathematics.

I have found that in integrating just a capsule of mathematics history to my teaching has enriched many of the mathematics courses I teach. One way is to recognize

an individual who has simplified the process of solving particular types of problems. Another way is to recognize the different discoveries and representations of specific mathematical notions such as pi. A third method is to note the progression of a notation system from sentences to words to symbols. When integrated properly within a mathematics course, capsules of history will enable students to not only become informed and connected to mathematics' past, but will enable them appreciate its relationship to the topic they are studying and hopefully to the lifetime of applications they will encounter. Mathematics didn't just happen! Those who are able to connect the transformations of mathematical topics with time and can place mathematics achievements in historical perspective seem to have a greater appreciation for the subject.

I hope you will enjoy this course as much as I have appreciated the information it offers.

INFORMATION SPECIFIC TO THIS COURSE

**COURSE NUMBER
AND PREFIX:**

MATH 464

TITLE AND CREDITS:

Introduction to the History of Mathematics (3 sem. hrs.)

PREREQUISITES:

A working knowledge of college geometry, algebra, and trigonometry are required. Course experience in calculus is helpful.

**COURSE
DESCRIPTION:**

MATH 464-036 is a survey of the history of mathematics from antiquity to the present time, emphasizing the development of mathematical concepts, the types of mathematics problems encountered in the past, and the people and cultures who have helped make mathematics what it is today.

The course consists of three related but different parts described below.

Part One consists of working mathematics problems that are contained in four study unit assignments. To appreciate and understand the history of mathematics you need experience in working some of the mathematical problems of the time. The four sets of ten problems each provide this experience by your working mathematics problems dating from 3000 B.C. to A.D. 1700.

Part Two consists of two non-overlapping tests of the mathematical, the individual, and the cultural contributions of the time. These two tests contain no mathematics to manipulate or to calculate, but require your knowledge of the specific mathematics topics, the individuals, and cultural contributions of the times. To appreciate and understand the history of mathematics you need to know what specific mathematical contributions were made, approximately when they were made, and by what individuals or cultures.

Part Three consists of three papers. A two to three page reaction paper or textbook assignment, and two of the following three paper assignments. A five to seven page lesson plan, biography, or paper on the historical or cultural development of a mathematics topic. These three papers can be submitted in any order and at any time during the course.

**REQUIRED
TEXTBOOK:**

Katz, Victor J. 2009. *A History of Mathematics: An Introduction (3rd edition)*. ISBN 0-321-38700-7.
Published by Pearson Education, Inc. (Addison-Wesley).

Special Sections:

Appendices (A1 – A3)

A1: For Teaching – Courses and Topics

A2: Sample Lessons to Incorporate History

A3: Time Line – Highlighting significant events from
3000 BCE to 2000 CE.

Answers to Select Problems on pages 949 – 960.

Chronological List of Names on inside, back cover of book

**CITATION
INFORMATION:**

When you find an item which interests you, record the complete citation information.

For journal articles, include the following information:

- § author of the article,
- § title of the article,
- § title of the journal, volume, number, and date of the issue in which the article appears,
- § the pages on which the article appears.

For book, include the following information:

- § author of the book,
- § title of the book,
- § publisher, place of publication, and publication date.

Identifying your own library readings does take more time and effort but the advantage is that you can select items which are more relevant to your interests.

APA Style

There are several formats to use when citing items in your reference list or bibliography. One style, The Publication Manual of the American Psychological Association, 5th edition, referred to as APA Style, is shown below. (<http://books.apa.org/books.cfm?id=4200061>)

Journal article:

Conrath, J. (1992). Effective schools for discouraged and disadvantaged students. *Contemporary Education*, 63 (2), 137-144.

Book:

Cummins, J., & Sayers, D. (1995). *Brave new schools: Challenging cultural illiteracy through global learning networks*. New York: St. Martin's Press.

MORE ABOUT COURSE REQUIREMENTS:

§ Mathematics Exercises

You are required to work and submit for grading four sets of mathematical exercises. To appreciate and understand the history of mathematics, you will need experience in working some of the mathematical problems of specific time periods dating from 3000 B.C. to the present. The four sets of ten problems each will provide this experience. These four assignments will be worth 50 points per set for a total of 200 points.

§ Midcourse and Final Tests

You are required to complete two proctored examinations (either online in Blackboard or pencil-and-paper), the first one at midcourse and then the final. These two tests contain **no** mathematics to manipulate or to calculate, but require you to be knowledgeable about the specific mathematics topics, the individuals, and cultural contributions of the times. To appreciate and understand the history of mathematics, you need to know what specific mathematics contributions were made, approximately when, and by whom (individuals and cultures). Each test is worth 100 points and will contain 10 true/false questions (2 points each), 5 multiple choice questions (3 points each), 5 short answer questions (5 points each), and 4 detailed essay questions (10 points each).

§ Writing Assignment I

You are required to complete **one of the following two** assignments: either assignment is worth 50 points.

- (a) Write a two to three page paper that is coherent, logical, and in a persuasive manner that is your honest reaction to material presented in one of the short articles, enclosed with this course description/requirements packet. It is an opportunity to reflect upon your understanding and knowledge of the history of mathematics and how you see it fitting into classroom environments. This need not include explicit references, but must present logical, original thinking on your part;

or

- (b) Read one of the last topic chapters of the Modern Mathematics section (chapter 17 - 25) of the book, describe a few of the main features of the chapter (about a page in length), and solve any three problems at the end of that chapter.

§ Writing Assignments II and III

You are required to complete and turn in **two of the following three** assignments. Each is a writing assignment consisting of a five to seven page college level paper, and each is worth 100 points, for a total of 200 points.

Please note: If plagiarism (especially a copy of a single paper taken directly from the Internet or another source) is determined, than a grade of **F** for the course will be given.

- (a) A paper on the historical or cultural development of a mathematics topic, or on a group's contribution to mathematics: such as women in mathematics or the mathematical contributions of the Irish.
- (b) A lesson plan with a strong history of mathematics component. If you are taking this course in preparation to teach secondary school mathematics, this lesson plan should be one of the two assignments you complete.
- (c) A biographical paper on any mathematician (see list of possible people, below). This is your opportunity to focus on any mathematician from antiquity to the present.

**INSTRUCTIONS FOR
THE LESSON PLAN
ASSIGNMENT:**

This assignment involves a write-up on a topic addressing and connecting mathematics, history, and pedagogy.

The write-up needs the following sections:

1. Mathematical background (1 page) – a very brief summary of the actual content knowledge and notation covered, elaborating only for what is not common basic knowledge.
2. Historical background (2-3 pages) – an overview of relevant historical etymological origins of the mathematics topic you have selected, major cultures, and mathematicians involved.
3. Pedagogical implementation issues (2-3 pages) – In an actual classroom with a full period at your disposal, how would you use history in introducing the topic? What are potential pitfalls and benefits? What manipulatives, technology, or other resources could be useful?
4. Provide copies of the handouts you would use in the lesson.
5. List of references – There should be at least 4 different references (ideally, not all the same “type” of source; i.e., not all journal articles, not all books, or not all Internet, etc.) used in the paper, with specific references indicated at the proper places.

**BIOGRAPHICAL PAPER
REQUIREMENTS:**

Paper Contents:

The paper should contain a balance between the background on a mathematician’s personal life and his/her contributions to mathematics. There should be at least 4 different references (ideally, not all the same “type” of source; i.e., not all journal articles, not all books, or not all Internet, etc.) used in the paper, with specific references indicated at the proper places. You may choose from the following list of people:

Neils Abel, Maria Gaetana Agnesi, Archimedes, Thomas Bayes, Johann Bernoulli, Junos Bolyai, George Boole, Georg Cantor, Gerolamo Cardano, Augustin-Louis Cauchy, Arthur Cayley, Paul Cohen, Rene Descartes, Albrecht Durer, Euclid, Leonard Euler, Pierre Fermat, Fibonacci (Leonardo of Pisa), Ronald Fisher, Galileo Galilei, Evariste Galois, Carl Friederich Gauss, Sophie Germain, Kurt Gedel, William Hamilton, David Hilbert, Johann Kepler, Sonja Kovalevsky, Joseph Louis Lagrange, Pierre Simon de Laplace, Gottfried Wilhelm Liebniz, Nikolai Ivanovich Lobachevsky, Benoit Mandelbrot, John Napier, Isaac Newton, Amalie Emmy Noether, Blaise Pascal, Karl Pearson, Henri Poincard, George Polya, Jean-Victor Poncelet, Pythagorus, Srinivasa Ramanujan, Georg Bernhard Riemann, Mary Fairfax Somerville, James Joseph Sylvester, Alan Turing, John Von Neumann, Karl Weierstrauss, and Grace Chisholm Young.

Format and Style:

Your paper is to be five to seven pages in length (excluding title page and reference list page), typed and double spaced, with one-inch margins on each side and using a ten- or twelve-point font. Take care to avoid spelling errors, grammatical errors, fragmented sentences, run-on sentences, etc. Be careful, since the spell checker will not catch common diction errors as: discrete/discreet, you're/your, their/they're/there, principal/principle, and effect/affect. Your paper should contain a well organized and coherent introduction and conclusion. Avoid a bland beginning ("He was born in the year ____ in the city ____ to Mr. and Mrs. ____"). Writing is to be in your own words; writing that is simply "cut and paste" from a general encyclopedia is obviously unacceptable (and usually obvious). Also, avoid overly generic flowery language ("He was the most intelligent man who ever lived and his accomplishments transformed the universe...") without a specific supporting reference. Overly opinionated and/or informal language should also be avoided.

Always cite the source of a direct quotation along with the quotation. In text, give the author, year, and page number in parenthesis. Include a complete reference in the reference list.

Display a direct quotation of more than 40 words in a free-standing block of written lines and omit the quotation marks. Start such a block quotation on a new line, indented 5 spaces from the left margin. Type the entire quotation double-spaced on the new margin and indent the first line of any subsequent paragraphs, within the quotation, five spaces from the new margin.

**LIBRARY/COMPUTER
RESOURCES (FOR
YOUR INFORMATION):**

Check the library closest to you for access to the list of journals provided below, or go online to UNC's at <http://library.unco.edu/>

The following journals regularly have articles relevant to history of mathematics, and therefore may be useful to you for this course.

The American Mathematical Monthly
Annals of the History of Computing
Archive for History of Exact Sciences
Arithmetic Teacher
Centaurus
College Mathematics Journal
Historia Mathematica
History and Pedagogy of Mathematics Newsletter
Isis (Current Bibliography of the History of Science and its Cultural Influences)
Math Horizons
The Mathematical Gazette
The Mathematical Intelligencer
Mathematics Magazine
Mathematics Teacher
School Science and Mathematics
Scientific American
Scripta Mathematica

You may want to check out the following web sites on mathematics history from the Internet. These are just a few of the many sites addressing the history of mathematics.

<http://www-groups.dcs.st-and.ac.uk/~history/>
<http://aleph0.clarku.edu/~djoyce/mathhist/mathhist.html>
<http://aleph0.clarku.edu/~djoyce/mathhist/chronology.html>
<http://www.maths.tcd.ie/pub/HistMath/>
<http://www.maths.tcd.ie/pub/HistMath/Links/>

GENERAL INFORMATION ABOUT TECHNOLOGY

This class is designed to take place completely over the computer on Blackboard (and some e-mail). If you are having difficulty accessing materials on the site, uploading attachments, or any other technical problems, please call the UNC helpline at (970)-351-4357. There is a link with helpline information when you sign in to Blackboard, or you may go here:

<http://www.unco.edu/blackboard/index.htm> For questions about course content, clarification of requirements, and any other course related feedback, please contact me by email.

GENERAL DIRECTIONS FOR PREPARING WRITTEN ASSIGNMENTS:

- Problems (mathematical exercises) may be submitted in pencil or as an email attachment. Please use a number 2 lead so I can read your numbers without eye strain.
- Your papers should be formatted for double spaces using a standard 10 or 12 point font with 1 inch margins on all four sides. Please use your own words, but if you feel a quotation is necessary, use quotation marks and cite the source. When ready, just attach your paper to an email and send it to me.
- If you have any questions for me, email me.
- Be sure your name is on each page of your written work.
- Make a copy of each unit's work to save as a back-up in case an assignment is lost in the mail. The university cannot be responsible for your work should this happen, and occasionally it does.
- You will be submitting three written assignments and four sets of mathematical exercises in addition to a midterm and final exam. You can submit as many of these nine assignments as you like electronically to me in Blackboard or as email attachments.

- Along with your first assignment, please write a short paragraph about yourself, explaining why you have chosen to take this course, your educational background, and anything else you might share with an instructor and the class if you were taking this course in a regular classroom setting. There is a place in Blackboard for this information if you prefer to use the Internet.

**EVALUATION
CRITERIA:**

Mathematics Assignment Units	200 points
Midcourse Test	100 points
Final Test	100 points
Writing Assignment I	50 points
Writing Assignment II	100 points
<u>Writing Assignment III</u>	<u>100 points</u>
Total	650 points

Course Grade by Percent

	A : 92.5 to 100 %	A- : 90.0 to 92.4%
B+ : 87.4 to 89.9%	B : 82.5 to 87.5%	B- : 80.0 to 82.4%
C+ : 77.4 to 79.9%	C : 72.5 to 77.5%	C- : 70.0 to 72.4%
D+ : 67.4 to 69.9%	D : 62.5 to 67.5%	D- : 60.0 to 62.4%
F : below 60%		

Course Grade by Points

	A : 650 – 601 points	A- : 600 – 585 points
B+ : 584 – 568 points	B : 567 – 536 points	B- : 535 – 520 points
C+ : 519 – 503 points	C : 502 – 471 points	C- : 470 – 455 points
D+ : 454 – 438 points	D : 437 – 406 points	D- : 405 – 390 points
F : under 390 points		