Instructor: Professor Graeme D. Bird, PhD  
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email: bird@fas.harvard.edu

Class:  
Monday - 5:30 PM - Sever Hall 203
Review:  
Thursday - 7:35 PM - Sever Hall 215

(Volumes One and Two)  Other readings will be distributed in class.

Other Materials: Lecture notes and assignments distributed in class  
Straightedge and Compasses (for geometry lectures and assignments)  
Sandbox, Stick, and Pebbles (just kidding)

Suggested Extra Reading:

This is an excellent history of mathematics, starting with the very beginnings of mathematics and taking the reader right into the 20th century. For our purposes chapters 4-8 are particularly relevant, covering Greek mathematicians from Thales to Archimedes. Some of the material may be somewhat challenging to follow, but it is well worth a thoughtful perusal.

This is a fascinating and well-written account of some of the most significant mathematical discoveries throughout the centuries, from Pythagoras and Euclid up to Cantor and the concept of "multiple infinities." Each chapter provides some intriguing historical background, complete with eccentric behavioral quirks, and concludes with a "Great Theorem" - an easy to understand but profound mathematical discovery which has had a lasting influence, both on the study of mathematics itself, and on fields beyond.

Course Description:

The purpose of this course is to explore one of the great contributions of the Greeks, namely their mathematics. Although other earlier civilizations had significant achievements in mathematics, for example, the Egyptians and Mesopotamians (and perhaps the Indians - whether any of their mathematical discoveries actually preceded those of the Greeks is still debated), our focus will be on the peculiarly Greek way of using and thinking about mathematics. Therefore a regular part of our course will involve reading short selections from Greek philosophers and mathematicians, seeking to understand what is being said, and then working to solve a variety of mathematical problems, naturally without any of the modern technological tools such as calculators. Assignments will generally include 2 sections: a) a reading to be commented upon, and b) a set of problems to be solved. Some problems will involve the construction of geometrical figures by drawing, others will be concerned with finding a numerical answer to a question, and still others will require the writing of a proof - constructing an argument by means of a set of logical steps.
Some of you will already have taken one or more courses in other aspects of ancient Greek culture, such as literature, archeology, or history, and I hope this course will help to broaden your view of Greek thought and civilization as a whole. A course looking at the mathematical achievements of the Greeks lends itself to discussion of many related questions. What discoveries actually are due to previous civilizations such as the Egyptians or Babylonians? How does philosophy relate to mathematics? What are some of the mystical and religious features of some of the early Greek mathematicians? How could the same people who believed that mathematics was a way of understanding reality also believe in Zeus, Athena, and Aphrodite? While all these questions are interesting and important, and we may discuss some of them briefly during the course, we will try and keep our focus upon the way the Greeks did mathematics - how they thought about numbers, how they did calculations, how they drew geometrical shapes, and how they used mathematics to help them understand the real world. However, I hope that you will be inspired to seek answers for some of these other related questions as well, since any search into such issues is bound to be rewarding.

**Homework, Lectures, and Exams:**

There will be weekly assignments, given out in class and due the following Tuesday. The review session, which is optional, can be used for questions about the assignment, as well as discussion about lecture topics, and perhaps examination of one or more readings relating to the class material. There will be two tests during the semester, on March 14 and April 18. These will include one or more short passages for comment, plus a selection of problems to be solved. The final exam will be on May 23 (second week of exam period).

**Grading:**

The course grade will be assigned as follows:

Homework - 30%
Exam 1 - 20%
Exam 2 - 20%
Final Exam - 30%

Total = 100%

Graduate-credit students prepare a series of lesson plans showing how a section of the course material could be taught in high schools.

**Important Dates:**

- Exam 1 March 14
- Exam 2 April 18
- Final Exam May 23
### MATH E-6 COURSE OUTLINE

**Mondays - 5:30 PM - Sever Hall 203**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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| **January 31** | (01) **Introduction**: mathematics before the Greeks;  
the first Greek mathematician;  
the Greek alphabet and its use in representing numbers;  
basic operations |
| **February 7** | (02) **The second Greek mathematician**: numbers and music;  
classification of numbers:  
odd, even, oblong, triangular, square, prime, composite |
| **February 14** | (03) **"Special" Numbers**: perfect, amicable, the infinity of prime numbers |
| **February 21** | (04) Presidents Day / National Holiday / No Class |
| **February 28** | (05) Means: arithmetic, harmonic, geometric, et al;  
proportions; GCF, LCM |
| **March 7**  | (06) Geometry I: construction of lines, angles, squares, triangles, circles |
| **March 14** | (07) Geometry II: polygons within a circle; the pentagon;  
the "Golden Section"  
Exam 1 |
| **March 21** | (08) Geometry III: triangles and the Pythagorean theorem |
| **March 28** | (09) Spring Break / No Class |
| **April 4**  | (10) Irrational Numbers:  
the "incommensurability" of \( \sqrt{2} \) and \( \sqrt{5} \)  
(\( \sqrt{\cdot} \) = square root) |
| **April 11** | (11) Approximations to the number \( \pi \) - Archimedes |
| **April 18** | (12) Geometry IV: The five "Platonic solids"  
Exam 2 |
| **April 25** | (13) Volumes of spheres, cylinders, and cones |
| **May 2**   | (14) Problems and paradoxes relating to infinity |
| **May 9**   | (15) Euclid's "Parallel Postulate"  
- the possibility of non-Euclidean geometry |
| **May 16**  | (16) Review Session |
| **May 23**  | (17) Final Examination |

*Revised 5-9-05*