

Preparing for the Mathematics Concentration

(2009-2010)

This document is for you if you are considering becoming a concentrator in Mathematics and want a little more information. If you are in the Spring semester of your Freshman year, or are beginning your Sophomore year, and are interested in Mathematics, then this document will help to answer the questions “What does the Mathematics concentration have to offer?”, “What are the key courses in the Mathematics curriculum?”, “What should I do now, to prepare for the Mathematics concentration”, and “Where can I get more information and advice?”

But this is a “quick-start” document. For more in-depth information, please look at the other pamphlets that are available either from the Undergraduate Studies Coordinator (Svetlana Alpert, room 503 in the Science Center), or from the undergraduate section of the Department’s web site at <http://www.math.harvard.edu/>. In particular, you should look at:

- the pamphlet *Courses in Mathematics*, which describes some of the courses and advises you on how to structure a good program; and
- the pamphlet *Concentration in Mathematics*, which gives fuller answers to some of the general questions and gives some specifics about the concentration requirements and the departments facilities.

Why Mathematics?

Concentration in mathematics is an excellent preparation for a career in academia or in industry. Because physics, chemistry, computer science, economics, and even social sciences rely heavily on mathematical methods, a math concentration can provide an invaluable background for many different fields of endeavor. Concentrators who do not choose to continue in mathematics have often gone on to graduate work in other academic subjects, to actuarial and computer science careers, or to professional training in law, business or medicine. A math concentration is very flexible and has a reasonably small number of requirements, so there are ample opportunities to take electives in related and unrelated fields.

What are the concentration requirements?

In brief, the basic requirements are twelve regular, letter-graded half-courses, of which eight must be courses labeled as Mathematics and four may be math courses or courses drawn from an approved list of related subjects, details of which are published in the

Handbook for Students. Concentrators must include at least one half-course at the 100-level in each of three areas: analysis, algebra and geometry. There is an expository requirement that must be completed by the end of the Junior year, and candidates for Honors are required to write a senior thesis. More details are given in the pamphlet *Concentration in Mathematics*, and the exact description is contained in the *Handbook for Students*.

We also have students taking joint concentrations such as Physics+Math, Math+CS, Philosophy+Math and others. See the pamphlet *Concentration in Mathematics* for more details.

What courses should I be taking as a Sophomore?

If you wish to keep the door open to concentrating in Mathematics, you will want to take some Mathematics in the Fall of your Sophomore year. Here is some advice. It should be read alongside the department's pamphlet "Courses in Mathematics".

- **If you began with Math 1a or 1b** and have not yet completed the Math 21a,b sequence, then that is probably your best course. At the same time, you should consider taking the Fall course Math 101, which offers a taste of higher mathematics and will familiarize you with proofs; it can be taken concurrently with Math 21.
- **If you have completed Math 21a,b**, then you may want to consider Math 101 (just mentioned), Math 112 (Real Analysis, a spring course) or Math 121 (Linear Algebra) in the Fall. These courses teach proof-writing skills, and are designed for students with a Math 21 background. Other courses that are accessible with at this level are Math 152 (Combinatorics), Math 154 (Probability) and Math 130 (Classical Geometry).
- **If you have completed Math 23a,b or Math 25,ab**, then you should certainly look at Math 122, which is the first of two courses on Abstract Algebra. Many further courses in Mathematics depend on it. If you have done well in your Freshman math courses and can take on more, you might consider also Math 131 (Topology) or perhaps Math 114 (Measure, Integration and Banach Spaces) in the Fall. For many students, however, Math 122 by itself will be more appropriate.
- **If you took Math 55a,b** you should look at Math 114 and Math 131 in the Fall, and perhaps Math 123 and 132 in the Spring.

Look at the pamphlet *Courses in Mathematics*, as well as the course catalog, for more information on the many other courses that are available and how to structure a complete

program. If you are not yet sure that Mathematics is the concentration for you, then bear in mind that courses such as Mathematics 122, 121 and 112 provide tools that will be useful in many other disciplines.

How can I keep in touch?

Advising Fortnight During Advising Fortnight (Monday, April 9th to Friday, April 20th) there will be several opportunities to meet and talk to members of the department. In particular, there will be an “open house” with refreshments in the Mathematics Department’s common room (fourth floor of the Science Center) from 3-4pm on Thursday, April 12th, and there will be walk-in office hours during the following week.

Communication and e-mail Send an e-mail with your name, your fas.harvard.edu e-mail address and your year at Harvard to Svetlana Alpert (svetlana@math), and ask to be put on our mailing list. The mailing list provides concentrators and potential concentrators with information about upcoming events.

Math Club and Math Table The department has an undergraduate Math Club that meets every Tuesday at 5:30 pm in the Mather House Dining Rooms A & B. It is an opportunity to hear talks over dinner, by undergraduates and faculty. See the pamphlet *Concentration in Mathematics* for more details. If you would like to give a talk at Math Table, please contact Professor Noam Elkies (elkies@math).

Concentrators’ Party At the beginning of the Fall semester, the Mathematics Department holds a party for math concentrators in the lounge on the 4th floor of the Science Center. Please come and meet other math majors and faculty members. Refreshments provided.

Advising All Mathematics concentrators are assigned a faculty member as advisor, to help with course selection and other matters. In addition, all Sophomores and Juniors come in for a scheduled 20 minute advising session with two faculty members, to track progress and discuss future steps. The Director of Undergraduate Studies is also available for advising.

For more information Visit the undergraduate pages of the department’s web site for copies of pamphlets covering other topics, including advice about Freshman math courses, senior theses, honors requirements, graduate school and more. The pamphlets are also available from the Undergraduate Studies Coordinate, Svetlana Alpert (svetlana@math) in room 503 of the Science Center. Further questions can be addressed

to Svetlana Alpert or to the Director of Undergraduate Studies, Professor Peter Kronheimer, either at office hours or by email at kronheim@math.harvard.edu.