

Math Advising

The Mathematics Department hopes that our incoming students will take mathematics courses that are challenging but digestible given a willingness to work hard. In particular, a student should not take a course that requires at the outset a great deal of unfamiliar mathematics. By the same token, a student should not take a course that focuses for the most part on familiar material. This said, the Mathematics Department urges all incoming students to take advantage of Harvard's Mathematics Placement Test, and to likewise take advantage of the science and Math Placement advising that is available in the Science Center the week before classes begin. Members of the Mathematics Department will be available during this period to consult with students. (See the department website www.math.harvard.edu/sectioning for advising hours.)

Generally, students begin their mathematics education here with a deeper study of calculus and related topics in courses such as Mathematics Ma; 1a; 1b; 19a,b; 20; 21a,b; 23a,b; 25a,b; and 55a,b. Students with a strong and versatile precalculus background and some calculus experience should, in most cases, begin at level 1a or above.

The Harvard Mathematics Placement Test results recommend the appropriate starting level course, this signified by advised placement in either Mathematics Ma, 1a, 1b, or 21. Keep in mind that a recommendation for Mathematics 21 signifies that the appropriate fall semester course should be chosen from the selection Mathematics 19a, 20, 21a, 21b, 23a, 25a and 55a, and also Applied Math 21a. Such a recommendation also allows for Math 101.

The courses mentioned above are described as follows:

Mathematics Ma, Mb, is a two-term sequence which integrates calculus and precalculus material and prepares students to enter Mathematics 1b.

Mathematics 1a introduces the basic ideas and techniques of calculus while **Mathematics 1b** covers applications and techniques of integration, sequences, series and differential equations.

Mathematics 21a covers the basics of multivariable calculus. Meanwhile, **Mathematics 21b** covers the basics of linear algebra with applications to differential equations.

There are a number of other options available for students whose placement is into **Mathematics 21**:

Mathematics 19a,b are courses that are designed for students concentrating in the life sciences, chemistry, and the environmental sciences. (These courses may be recommended over Math 21a,b by the various life science, environmental science, and

chemistry concentrations). Math 19a is taught both fall and spring semesters. It can be taken before, after, or instead of Math 21a,b. Math 19b is taught solely in the spring semester. Math 19b is a replacement for Math 21b, and no one should take both.

Math 19a focuses on differential equations, related techniques and modeling with applications to the life sciences. Math 19b teaches linear algebra, probability and statistics with a focus on life science examples and applications.

Mathematics 20 covers selected topics from Mathematics 21a and 21b for students particularly interested in economic and social science applications. Note that this course is not a replacement for either Math 21a or 21b. Math 20 should not be taken after Math 21a,b. Those wishing to enroll in Math 21a,b after taking Math 20 should consult first with a Mathematics Department advisor.

Mathematics 23 is a theoretical version of Mathematics 21 which treats multivariable calculus and linear algebra in a rigorous, proof- oriented way.

Mathematics 25 and 55 are theory courses that should be elected only by those students who have a particular interest in, and enjoyment of abstract mathematics, as well as a solid understanding of one-variable calculus. These courses assume a willingness to think rigorously and abstractly about mathematics, and to work extremely hard. Both courses study multivariable calculus and linear algebra plus many very deep related topics. Mathematics 25 differs from Mathematics 23 in that the work load in Mathematics 25 is significantly more than in Mathematics 23, but then Mathematics 25 covers more material. Note however that any given course that asks for Math 25 as a prerequisite accepts Math 23 as well. Meanwhile, Mathematics 55 differs from Mathematics 25 in that the former assumes an extremely strong proof oriented mathematics background. Entrance into Mathematics 55 requires the consent of the instructor.

Applied Mathematics 21a,b: These courses are very much like their Math 21a,b namesakes. The Math 21a,b series most likely gives a somewhat more sophisticated treatment of any given topic. On the other hand, the Applied Math 21a,b series focuses somewhat more on applications.

Math 101 is an introduction to rigorous mathematics, axioms, and proofs, via topics such as set theory, symmetry groups, and low-dimensional topology. It is often taken as a “bridge course” for students who have taken Math 21a and 21b before they take 100-level courses. However, it can also serve as a window into mathematics for students who have had some calculus and would like to see another face of mathematics, regardless of whether or not the plan is to continue in mathematics. It should not be taken by students in 25 or 55.

The suitability of Mathematics 55 and higher numbered courses is not addressed by the placement examinations. Students who have had substantial preparation beyond the level of the Advanced Placement examinations are urged to consult the Head Tutor in Mathematics concerning their initial Harvard mathematics courses. Students should take

this matter very seriously. The Mathematics Department has also prepared a pamphlet with a detailed description of all its 100-level courses and their relationship to each other. This pamphlet gives sample lists of courses suitable for students with various interests. It is available at the Mathematics Department Office. Many 100-level courses assume some familiarity with proofs. Courses that fulfill this prerequisite include Mathematics 23, 25, 55, 101, 112, 121, and 141. Of these, note that Mathematics 101 may be taken concurrently with Mathematics 1, 19, 20, or 21.

The Mathematics Department does not grant formal degree credit for taking a course that is listed as a prerequisite of one you have already taken without *prior* approval. The Department's policy is that a student who receives Harvard credit for a calculus course is not normally permitted to then take a more elementary course for credit. A student who has passed Mathematics 21a, for example, will normally not be allowed to take Mathematics 1a, or 1b for credit. The Mathematics Department is prepared to make exceptions for sufficient academic reasons; in each case, however, a student must obtain written permission from the Mathematics Head Tutor in advance.

For more information on mathematics courses and the department, please see: www.math.harvard.edu or "Which Math Course is For You?" on the Advising Programs Office website: www.fas.harvard.edu/advising.

Sectioning

1. In most departments at Harvard, sections are small, discussion-based groups that meet outside of lecture. Sectioning at Harvard varies, depending on the class and the department. In classes with sections, it is important for students to consult with the appropriate departments about when and how they should section.
2. At www.section.fas.harvard.edu, the Registrar's Office maintains an **electronic sectioning application**, which allows students to section for many courses online.
3. For **Expository Writing sectioning**, please consult the Expository Writing web page: <http://www.fas.harvard.edu/~expos>.
4. For **Romance Language** classes: To choose a section for a lettered or numbered language course in **French, Italian, Portuguese, and Spanish**, students should fill out an online sectioning form on the respective course web pages. Once students have filled out and submitted the form, they will receive notification of the date, time, and location of the first class meeting by email.
5. Sectioning for **German A and Ca (formerly Da)** occurs on Monday, September 15th, from 1:00 – 4:00 pm in Barker Center, Room 110.
6. For **Math** classes: After an introductory meeting during the first week of classes, Math Ma, 1a, 1b, 21a and 21b are taught entirely in sections. To section for **Math Ma, Math 1a, Math 1b, Math 21a and Math 21b**, students must section by computer during the period starting Monday, August 31st, and **no later than 1:00 pm on Thursday, September 3rd**. Note that students can re-section as often as they like during this time, causing their previous entry to be erased. Instructions for sectioning can be found online at <http://www.math.harvard.edu/sectioning/>.