

Graduate Traineeships in Mathematics at the University of Virginia

In recent years we have received funding from the U. S. Department of Education to run our program of Graduate Traineeships in Mathematics, which is an enhancement of our standard Ph.D. program. We'd like to explain how our ordinary program functions, and then how this is enhanced by the Traineeship Program.

Standard Ph.D. Program

First academic year: Beginning students take core courses in algebra, analysis, and topology, providing the foundation for all further graduate work, while supported by a teaching assistantship which typically involves running 2 hours per week of discussion sections of calculus.

Second academic year: Students continue to take a range of basic courses chosen with potential areas of specialization in mind. The General Examinations (elsewhere known as Ph.D. qualifying exams) are the most important hurdle students face on the way to a Ph.D. (outside the dissertation itself). The General Exams preferably are passed either in August before the academic year starts, or the following January. All students attend MATH 700, an introduction to the practice and profession of college teaching. The students' teaching responsibility involves 3 or 4 contact hours per week, typically teaching one's own 100-level math course.

Third academic year: Students integrate themselves with the research life of the department, through advanced courses and participation in seminars with students and faculty. Often students have chosen a thesis advisor and are doing independent reading aimed towards acquiring the specialized background needed for research.

Fourth and beyond: We view 5 or 6 years as the normal time needed to complete graduate work. In the fourth year students read the literature directly related to a thesis topic and take a qualifying examination (a lesser hurdle, designed to insure that they are adequately prepared for their topic), often consisting of an oral presentation of advanced material related to their research. Students are then ready to jump directly into dissertation research.

Before describing the the Traineeship program, we need to note that our grant is subject to periodic renewal, so we describe the program as currently funded.

Standard Traineeship Program

First Summer: The program starts right away in the summer before regular graduate studies begin.

MATH 550E Problems in Algebra A course with emphasis on creating proofs of the basic theorems in algebra, preparing students for MATH 751.

MATH 530E Problems in Real Analysis A course with emphasis on creating proof of the basic theorems in real analysis, preparing students for MATH 731.

We assume Trainees have already had some sort of exposure to abstract algebra and analysis; the purpose of these summer courses is not to teach any particular *subject matter*, but rather to have students get lots of practice in creating proofs, working lots of theoretical problems to build up a repertoire of proof strategies and techniques. This has been a successful way to bring entering students up to a level to take our proof-intensive 700-level courses in September.

In addition, during the summer students are given an orientation to teaching, preparing them for their academic year teaching responsibilities.

Second Summer: Students attend courses giving intensive preparation for the Ph.D. General Examinations which are held in late August. These courses give students a chance to work through many problems in more depth than is possible during the academic year, and have been very successful in improving performance on the Generals.

MATH 730E Problems in Analysis This gives applications of the theory presented in MATH 531, 731, and 734 to specific examples in real and complex analysis. The course emphasizes problem-solving and preparation for the General Examination in Analysis. Problems will be based on those from past Generals.

MATH 750E Problems in Algebra This is a continuation of the theory presented in MATH 751–2, intensively training students to apply the theory to proving theorems in algebra, especially in preparation for the General Examination in Algebra. Problems will be based on those from past Generals.

Beyond the third year: We have “Dissertation Year Fellowships” freeing a limited number of students for one semester during their last year of graduate school from all teaching duties.

The program has been very successful at shortening the time needed for students to complete their Ph.D. In addition, it has helped ease the transition to teaching. University of Virginia students are widely recognized as superb teachers, and the program has helped our students to maintain this standard of excellence.