Abstract

This document represents the department’s current summary of policies, deadlines, and procedures to be followed by graduate students in the mathematics graduate program. Any questions that are not suitably answered by this document should always be referred to the GPC (Graduate Program Committee) for clarification. This document is updated as department policy evolves.

1 General References and Resources

There are a number of online references for graduate students which supplement this handbook.

- **General Information for Graduate Students** (Contains this handbook, TA and certification information and resources, etc.)

- **Department Documents** (Access controlled intranet: Contains Department documents including current committee memberships, TA assignments and mentors, etc.)

2 An overview of the graduate program

The mathematics graduate program at Dartmouth College is a small, selective program that serves students who wish to complete a Ph.D. in pure or applied mathematics. The program is structured to serve both those who envision a career involving research and teaching as well as those who wish to continue their research in industry. The program at Dartmouth is a five-year program in which students are enrolled in each of the Summer, Fall, Winter, and Spring terms. Students admitted to the PhD program are offered support through a
Dartmouth Fellowship or other grant for up to 5 years provided they continue to make satisfactory progress towards their degree.

During their first year, students develop a strong background in at least three research areas, selected from among algebra, analysis, topology, and two broad areas of applied mathematics which include numerical analysis, stochastic processes and uncertainty quantification, analytic study of PDEs, and general methods in applied mathematics. After their first spring, students choose three of those areas in which to complete a preliminary exam. During their second year the path followed by those in pure mathematics begins to diverge from those in applied mathematics. Students in applied math will be involved in a summer research project whose written summary and extension will be the basis of a presentation and oral exam. Students in pure mathematics form an Advancement Committee and craft an individually tailored Advancement Examination which can take a number of different forms. Students continue to broaden their mathematical knowledge through course work or research projects. By the end of the second year, a student will also complete a seminar which provides training for how to become an effective communicator and classroom teacher, secure an advancement committee consisting of a thesis adviser and two other faculty members, and advance to candidacy for the Ph.D. Graduate students are appointed as faculty to teach one Dartmouth course independently in each of their 3rd, 4th (and often 5th) years. Most of our graduate students finish the work that comprises their thesis during the 5th year, the last year in which the department offers financial support.

Areas which students have recently chosen for their dissertation research include algebraic number theory, algebraic topology, arithmetic geometry, combinatorics, complex networks/systems, functional analysis, knot theory, logic, mathematical biology, numerical analysis, Riemannian geometry, set theory, and signal processing. For our recent graduates, review their thesis abstracts and adviser and job information. Further online information is at math.dartmouth.edu/graduate-students.

3 Before you arrive

Many students arrive at Dartmouth with significant advanced mathematics preparation, and those who feel they already know the material to be covered by some of our standard first-year courses are encouraged to take the preliminary exam just before the start of fall term.

As a caveat, the applied math program at Dartmouth is small and highly personalized, so taking the preliminary exam after having completed the first year courses makes much more sense. In particular the contents of Math 106 and 116 both change in alternate years.

The written exams cover:

- Algebra (Math 71 and topics from 101)
• Analysis (Math 63 and topics from 103)
• Applied Math (Math 106, 116, 126, and 136)
• Topology (Math 54 and topics from 104)

Consult recent syllabi for these courses. Any parts passed in the fall will not need to be retaken at the end of spring, but more importantly this information will influence the courses you choose in your first year.

4 The first year of graduate study

In broad strokes, as a first year student, you will take nine courses, help TA for courses in two of the Fall, Winter, and Spring terms, and prepare for a preliminary exam in three core areas covered by your first-year courses. Exams are typically offered just before the start of summer term in such a way that no student takes two on one day.

The department offers approximately sixteen graduate courses each year, seven of which are aimed at core topics covered by the end of year preliminary exam. Core graduate courses fall into two categories, some with a fixed syllabus and others whose syllabus alternates from year to year, making it possible to take the second offerings in later years to add to the breadth of your mathematical knowledge. Advanced courses are typically topics courses based in part on student interest.

4.1 Advisers

In general, an individual first-year adviser is assigned to each graduate student to help them transition to graduate school and serve as a general adviser until the student has an advancement/thesis committee more closely aligned with their research pursuits.

These advisers help students work out academic plans (which are supposed to be written and filed with the department), and be a sounding board and neutral third party to help resolve issues surrounding work as a graduate student. If a graduate student is not compatible with his or her assigned adviser, they can ask for a different one by contacting the Graduate Representative (listed in the first lines of the web page Information for Current Graduate Students).

In addition to a student’s personal adviser, there is an Adviser to Graduate Students and an Graduate Representative whose roles are described in the Appendix.

4.2 Pure or Applied — Choosing among research areas

The first thing to note here is that, while there is a clear difference between traditional pure mathematics and traditional applied mathematics, reflected in
two different paths for your first two years of graduate study, the two are part of a multi-dimensional continuum. **You will not actually choose between pure and applied math. You will choose a thesis area that falls somewhere within this continuum.**

During your first year, you may be interested in some areas that are more pure and some that are more applied. You do not have to choose an area of concentration right away. You can keep your options open between pure and applied. To do this, look at the courses and advice sections for both pure and applied math, and discuss with your adviser what you should be doing in the way of attending seminars and searching out possible research projects. When you choose courses, keep in mind that your thesis committee in your eventual area of research will probably require you to fill in any gaps in your course preparation, and do your best to leave as few gaps as possible.

**The one choice you must make during your first year is whether to take the “pure math” preliminary exam or the “applied math” preliminary exam.** If you are really keeping your options open, you should take enough core courses to cover the material in both exams. Being interested in both pure and applied areas does not mean you can pick an assortment of preliminary exams sampling from both. Passing preliminary exams in applied math, for example, will only reinforce the breadth of background of a student who ultimately writes a thesis in pure math. If that student has also taken the core courses in pure math and done well, their thesis committee is unlikely to object to their having taken the “wrong” exam.

During your second year, you must begin to narrow your options somewhat. Before the summer that begins your second year, you must decide whether to arrange the summer research project described in the advancement procedure for applied math. Again, doing a summer project in mathematical biology does not rule out eventually writing a thesis in signal processing, or in algebraic combinatorics. However, not doing any summer research project may affect whether applied mathematics faculty members are willing to accept you as a thesis student. You should be talking to prospective thesis advisers and thesis committee members about this.

Note that if you are not following the applied mathematics path by doing a summer research project, then you must follow the pure mathematics path by taking Math 117. The guidelines for pure mathematics call for you to assemble an advancement committee, including a tentative adviser. You should be working on this during the summer that begins your second year, at the latest. This does not mean you have to choose your thesis area that summer. It is quite possible to include more than one tentative adviser, who may work in quite different areas, on your committee. The committee will help you design a second-year program, and an advancement examination (which may include different options), that will allow you to make a choice closer to the end of your second year. Taking this option does not rule out writing a thesis in an applied area, provided your committee includes a possible adviser in that area who has agreed to your plan.

Once you enter your third year, you should begin work in a specific thesis
area. It is difficult, although not impossible, to change areas after your third year, and still have time to complete a quality thesis. The choice of research area is not a lifetime commitment. Many Dartmouth faculty members work now in areas quite different from their thesis research.

4.3 Courses and Advice — Applied Math

Students interested in doing research in applied mathematics, specifically in the areas of computational mathematics, data analysis and assimilation, imaging, or uncertainty quantification, must have a working knowledge of material taught in certain core courses. Courses appearing in traditional applied mathematics programs include numerical analysis, partial differential equations, and methods in applied mathematics. In addition, courses like stochastic processes and uncertainty quantification are more germane to the research interests of current Dartmouth faculty, although they too are becoming more common in applied math programs.

4.3.1 Introductory Courses

Among the first-year core applied math courses a student should take are:

- Math 106: Stochastic Processes and Uncertainty Quantification
- Math 116: Numerical Analysis
- Math 126: Partial Differential Equations
- Math 136: Methods in Applied Mathematics

Note that the content of Math 116 and Math 106 alternates in even and odd years, so students should take each of these courses twice, completing the core course requirement in two years.

In addition to the courses listed above, there may also be courses of interest in pure mathematics or offered in other departments that should be strongly considered, especially in those topics related to their research application domain. Such course offerings will vary from year to year, so it is a good idea to discuss opportunities with your first-year adviser (or potential thesis advisory committee) each term before registering for classes.

In all, as a first-year student, you will take nine courses, six of which must be classroom courses. Beyond those six, a student may choose other classroom courses of interest, or sign up for supervised reading courses.

4.3.2 Follow-on courses

All students in applied math need to take the alternate topic offerings of Math 106 and Math 116 (in their second year). But even in the first year, there may
be courses of interest offered in other departments that should be strongly considered, especially in those topics related to their research application domain. Such course offerings will vary from year to year, it is a good idea to discuss opportunities with your first-year adviser (or potential thesis advisory committee) each term before registering for classes.

4.3.3 Seminars

Applied mathematics students are required to attend the weekly applied mathematics seminar. They are also strongly encouraged to participate in Math 150, which is a student-run applied math topics seminar course.

4.3.4 Research Projects

Students interested in doing research in applied mathematics should seek out opportunities early — in their first year — to get involved in ongoing research projects, and should start working on their own (often related) research projects even if ultimately they do something else for their dissertations. The best way to do this is to attend group meetings and learn about various research investigations within the group. Note that applied math faculty are often interested in collaborative projects, and many group meetings are held with two or more professors, students, and postdocs. The best way to find out about group meetings is to talk with more advanced students and find out what they are working on. Advanced students and postdoctoral fellows are available and encouraged to support first and second-year students as they begin their own investigations. All students have the opportunity to present their research findings at group meetings and at the applied math seminar.

4.3.5 Summer Research/Internship

While formally part of the second year and described more fully in the section on the second-year summer research/internship, students who wish to work in applied mathematics need to participate in an approved, supervised summer research project. While the project may be supervised by any professor in mathematics, the students are strongly encouraged to seek out interdisciplinary opportunities, especially in research labs. It is imperative that students who wish to do an internship discuss this with either their first year adviser or some potential committee member by February 1 of their first year (sooner is better). The applications for internships are often due by mid February.

4.4 Courses and Advice — Pure Math

While the spectrum of research areas in pure mathematics is far broader than the contents of the core first-year courses in algebra, analysis and topology, these six courses form an essential core on which further study builds.
4.4.1 Basic Courses

The basic courses in algebra, analysis, and topology are:

- Math 101: Algebra
- Math 103: Analysis
- Math 104: Topology

The subject matter for these courses is aimed at advanced undergraduates and beginning graduate students.

4.4.2 Follow-on Courses

Sequels to the basic courses are:

- Math 111: Topics in Algebra
- Math 113: Topics in Analysis
- Math 114: Topics in Topology

The content of these courses will vary from year to year, with at least an alternation of topics from year to year.

These six courses can be supplemented both by approved upper-level undergraduate courses as well as other graduate courses divided between introductory and advanced topic courses. There is also flexibility to add depth by taking supervised reading courses highly tailored to student interest (see Math 127, 137). A full course load for a graduate student is nine courses per year; there is also a breadth requirement for all students which requires a minimum number of classroom courses each year; that number for first-year students is six.

Choosing courses for the year should be done in consultation with the first-year adviser. He or she can get a sense of the student’s background, how prepared they are to take the standard courses, and suggest appropriate courses that get their career off to a solid start while also helping the student look through the options for the entire first year.

4.4.3 Seminars

Students are strongly encouraged to sit in on various research seminars offered by the department. This will give a sense of the kind of research in which various faculty are involved, and what might be areas of interest to pursue. This will also aid in the student’s efforts to constitute an Advancement committee which shepherd the student through the second-year advancement process.
4.5 TA and grading responsibilities

First and second-year graduate students have two terms of responsibility in which they assist with undergraduate courses. As a TA, the responsibilities generally include staffing walk-in tutorials for two hours three times per week and helping grade all exams. Preparation for each tutorial session is an assumed part of your responsibility. TAs may also have the opportunity to host review sessions prior to midterms. Total weekly time commitment averages ten hours per week.

While the general model is to TA twice in each year, in certain circumstances a student may negotiate to replace one term of TAing for a term of grading homework for an upper-level undergraduate or beginning graduate course. This negotiation is between the student, the course instructor, and the student’s first/second-year adviser. In the case that the instructor is the adviser, the Adviser to Graduate Students will serve as the third member. The idea is that all three must agree that this is a mutually beneficial arrangement.

Note that in the term you TA for the second time (each year), you must register for Math 107. This is the official way in which the department tracks that you have completed this degree requirement. Your grade (pass/fail) in Math 107 is based on the assessment of the instructors for whom you have TAed, and on end-of-term evaluations filled out by the students with whom you have interacted.

4.6 The preliminary exam — Applied Math

The preliminary exam in applied mathematics consists of topics from three of the four core first-year courses: Math 106, 116, 126, and 136. The likely format will be a three-hour written exam with two questions each from the chosen areas.

4.7 The preliminary exam — Pure Math

First-year students in pure mathematics will be required to take a written preliminary exam covering basic algebra, analysis, and topology, limited to topics normally covered in Math 101, 103, and 104, together with ancillary courses such as Math 71, 63, and 54. The exam will be offered at the end of spring term, and again at the beginning of fall term.

The exam will be set and graded by an ad hoc Pure Math Preliminary Exam Committee, to include the instructors in Math 101, 103, and 104, and a representative of the GPC. This committee will report the results of the exam to the GPC, who will decide which students have passed the exam. The exam will be written, though its precise format is still under consideration.

4.8 What if a student fails the preliminary exam?

If a student does not pass the preliminary exam in the spring, the GPC will look at the student’s work in the program so far, including their performance
on the exam. Most likely, the GPC will say nothing more than that they should try again in the fall. In that case, the student should continue their efforts just as if they passed the exam. Talk to your adviser. Pursue your summer research project or take Math 117; begin working on forming an Advancement Committee; talk to prospective thesis advisers, and take their advice about what to work on during the summer. Of course, you should also spend some time over the summer preparing to retake whatever part of the exam you did not pass. In exceptional cases the GPC may have additional requirements or expectations for you, or agree to a different course of action.

If a student retakes the exam in the fall and still does not pass, the GPC will determine whether it is in everyone’s best interest for the student to continue in the program past the end of fall term. In order to continue, the student will need at least two things. One is an Advancement Committee, including at least one person who agrees to supervise the thesis if the student passes the Advancement Examination. The other is a plan for addressing the deficits shown by the exam performance, which must be approved by both the Advancement Committee and the GPC.

5 The second year of graduate study

The goal for all second-year students is to advance to candidacy for the Ph.D by the end of spring term. Pure and applied math students have many requirements in common, but as students enter their second year — which begins in the summer term — some of the procedures to be followed begin to specialize. We begin by describing specialized procedures followed by ones common to all second-year students.

5.1 Advancement procedures— Applied Math Specific

In addition to course, TA, pedagogical training requirements noted later in this section, the following describes the outline of expectations for students wishing to work in applied math.

5.1.1 Summer

Students will participate in an approved, supervised summer research project. While the project may be supervised by any professor in Mathematics, students are strongly encouraged to seek out interdisciplinary opportunities, especially in research labs.

The GPC needs to grant approval for each proposed project. Students must submit to the GPC a one-to-two page written research plan, which has been signed and approved by a prospective Advancement Committee (two professors, or by the prospective adviser and the external supervisor.)
Satisfactory completion of the research project must include a written report summarizing the research which was conducted, followed by an oral defense on the project later in the second year. The research supervisor will also submit a grade report assessing the student’s work.

5.1.2 Fall

The student will give an oral presentation on the summer research project sometime during the fall term of their second year, perhaps as part of the applied math seminar; the summer research supervisor is invited, but not required to attend. Immediately following the public presentation, the general audience will be dismissed and the prospective advisory committee will continue to ask questions stemming both from the research project, as well as more fundamental questions in the student’s area of focus.

5.2 Advancement procedures — Pure Math Specific

In addition to course, TA, pedagogical training requirements noted later in this section, the following describes the outline of expectations for students wishing to work in pure math. A large part of the process of advancing to candidacy in pure mathematics requires students to pass an individually-tailored Advancement Examination, supervised by a three-person Advancement Committee. The committee needs to be assembled and approved by the GPC by the end of fall term.

5.2.1 Advancement Committee

Each student will assemble an Advancement Committee to aid and assess their preparation for writing a dissertation, including making up for any deficits revealed by the preliminary exam.

The student identifies two faculty members whose research encompasses the student’s desired research area(s) who will work with the student to determine the format, content, and requirements of the Advancement Examination. A third faculty member from a different (though perhaps allied) research area is added to complete the Advancement Committee.

5.2.2 Advancement Examination

The student’s Advancement Committee is responsible for administering an individually-tailored Advancement Examination. The plan for the Advancement Exam, approved by the Advancement Committee, must be submitted to the GPC for approval before the end of the fall quarter of the second year.

The student must attempt the Advancement Exam before the end of winter quarter of the second year. If a student does not pass, the committee may decide
to allow the student a second attempt, which must take place before the end of the spring term of the second year.

It is understood that given a successful conclusion to the Advancement Examination, at least one member of the Advancement Committee is willing to serve as the student’s thesis adviser. The signed consent of the prospective adviser (and secondary adviser) is necessary for advancement to candidacy.

5.2.3 Practical considerations

- The student starts to assemble their advancement committee with a choice of two potential advisers. This process should probably begin by the summer. If the student does not yet have a idea of with whom they might want to work, the summer seminar, Math 117, may provide some insight into the research interests of faculty the student has not yet met. In any case, this is another prime opportunity to talk to your first-year adviser who can help sort out your interests and options, and help begin to formulate plans.

- If plans change and a new potential adviser is still one of the other members of the chosen Advancement Committee, no formal changes are needed. If the new potential adviser is not currently a member of the committee, a new plan will be called for, and submitted to the GPC for approval.

5.3 Advancement Procedures — All students

5.3.1 Courses

All full-time students must enroll in three courses each term.

- For second-year students, there is a classroom course requirement of four courses. This means the other courses can (if desired) be chosen from among reading courses (127), independent reading (137) or independent project (148) as appropriate.

  If you are taking for only one reading course in a term, register for Math 127. If two of your courses are reading courses, register for Math 127 and 137. **Note:** the courses (127, 137, 148) require a faculty supervisor and syllabus; grades are reported by the faculty supervisor.

- Remember that students following an applied track need to take 106 and 116 for a second time since the content alternates between even and odd years. Similarly the content of Math 111, 113, and 114 typically alternates and will add considerably to the student’s breadth. Students following the pure track need to take the summer seminar, Math 117.

- Finally, in the term a student takes DCAL’s *Teaching Science Seminar*, they should register for Math 147, which will designate that they have completed the theory end of the teaching seminar. Math 147 does not count as one of the four required classroom courses.
5.3.2 TA and grading responsibilities

These responsibilities are exactly the same as in the first year, remembering to register for Math 107 (tutoring) in the second term in which you TA. Second year students will also serve as natural mentors to the first-year graduate TAs.

5.3.3 Pedagogical Training and Requirements

Students must successfully complete both theoretical and practical components of pedagogical training as part of their graduation requirements and to be eligible to teach their own course in the later years of their time at Dartmouth.

**Pedagogical Training — theory**

For the theoretical portion, students will attend one of the offerings of Dartmouth’s Center for the Advancement of Learning’s (DCAL) Future Faculty Teaching Seminar, offered at least twice a year. This seminar covers the basic pedagogical literature with an emphasis on application within STEM fields and incorporates brief but rigorous opportunities for lesson design, practice, and feedback. Students should register for Math 147 in a term in which they take the seminar.

**Pedagogical Training — Math specific training**

To anchor these ideas within the mathematical curriculum, students will participate in a practicum experience mentored by a regular faculty member. Students should register for Math 148 in the term in which they do this training, and it may take several forms. For example, our traditional summer math camp will run whenever faculty are available to mentor and supervise. Other instances are fall under the umbrella of a supervised teaching assistant assignment, which has three components.

- First, the student needs to autonomously design (some) curricular elements.
- Second, the student needs to teach these elements to a subset of the students enrolled in the course, typically during x-hours.
- Third, the student must receive feedback from a faculty member and respond to it via revision of the material.

**Resources:** We note that the department already has in place teaching mentors, which have been used in varying capacity over the years. The teaching mentors should coordinate with the student and course instructor for establishing expectations and goals for the practicum, and should regularly communicate with the student during the term.

**Logistics:** Students should discuss with their adviser how they might go about fulfilling this requirement. Student teaching assistant assignments must coordinate with course scheduling, so some flexibility is needed. To
ensure objective feedback, a representative from DCAL will be asked to observe graduate student taught classes. A discussion between the graduate student, course instructor, student teaching mentor (if appropriate), and DCAL representative will follow.

Benefits: The plan provides flexibility while also ensuring that our Ph.D students have plenty of opportunities to interface with students. Moreover, the plan plays to our students’ strengths and will allow them to stand out on job applications. The students may also provide a great resource for undergraduates in courses that have not traditionally had TAs, for example, by teaching MATLAB in some of the applied mathematics courses, or running problem solving sessions in some mid-level courses.

5.3.4 Certificate in Mathematical Pedagogy

Those students who aspire to secure positions with a significant teaching component may wish to pursue a higher level of pedagogical training. To facilitate this, we’ve created a certificate program within the Guarini School of Graduate and Advanced Studies. Upon completion of the requirements, a student receives a certification and notation on their transcript. The requirements for the certificate are included in the document shown below. To download a copy, use the download link.
Graduate Certification in Pedagogy: Mathematics

<table>
<thead>
<tr>
<th>Departmental Training components</th>
<th>Hours</th>
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<tr>
<td>Departmental Training for Teaching Assistants</td>
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<tr>
<td>Departmental Ethics Training</td>
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<tr>
<td>TA Seminar (with each instance of TA role)</td>
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<tr>
<td>DCAL Future Faculty Teaching Series</td>
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<td><strong>Practicum</strong> (complete at least 200 hours)</td>
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<tr>
<td>Serve as a teaching assistant (mandatory)</td>
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<td>Serve as a Graduate Teaching Fellow</td>
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<tr>
<td>Math Camp</td>
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<td>Outreach in local school system(s)</td>
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<tr>
<td>DCAL Learning Community for Future Faculty (facilitator)</td>
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<td>Other GPC approved activity</td>
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<td>Term 1</td>
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<tr>
<td>Observation with written reflection (TEC)</td>
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<tr>
<td>Term 2</td>
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<tr>
<td>Observation with written reflection (TEC)</td>
<td>200 hours</td>
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<tr>
<td><strong>Professional Development Opportunities</strong> (complete 3 over time in program)</td>
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<td>DCAL Learning Community for Future Faculty (attendee)</td>
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<td>DCAL Teaching Statement workshop series</td>
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<td>DCAL Syllabus Design series</td>
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<td>Sample Syllabus (if available)</td>
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<td>Annotated sample course materials</td>
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<td>Teaching Evaluations</td>
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**Figure 5.1** Checklist for obtaining certification in pedagogy


6 The final three years

6.1 Courses

There is a breadth requirement manifested as a classroom course requirement for all graduate students; it is present to encourage students to enhance their mathematical background. It is the breadth of mathematical knowledge which allows students to better see connections between different areas of mathematics, and often spawns the most interesting research.

There is also a practical side to this requirement. Teaching a course for the first time requires significantly more preparation time than one for which you already have a good perspective and source materials. Taking good notes in classroom courses provides a wealth of resources.

For first-year students the breadth requirement is six classroom courses; for second-years it is four. Over the course of the last three years, students are required to take a total of eight classroom courses. A student whose accumulated total falls below three courses per year must petition the GPC for an exception which is granted only if the student has a viable plan to make up the deficit in the following year.

Since full-time students are required to register for three courses each term, once you have advanced to candidacy, you should make up the difference between the 3 course load and classroom courses from among Math 156 (Graduate Research), Math 157 (Thesis Research), and/or Math 158 (Independent Research).

Finally, remember that neither the teaching seminar (Math 147) nor your own teaching assignments count towards this total. Please remember to register for Math 149 each time you teach for the department; this tracks the teaching requirement for graduation.

6.2 Teaching

Graduate students typically teach one course in each of their final three years of study, and these experiences can be quite varied depending upon the level of the course as well as whether it is a multi-sectioned course or not. Students should register for Math 149 in the terms that they teach; Math 149 does not count towards the classroom course requirement.

Graduate student teaching assignments are made after faculty teaching schedules have been settled. Generally what remains is a large pool of courses. Specific teaching assignments are informed by a number of sources: feedback about the student in the teaching seminar and practica, previous TA or teaching evaluations, as well as graduate student requests. The department chair asks for teaching preferences of the graduate students from among the pool of available courses, and just as with faculty, those requests are honored as best they can; assignments of students to courses must satisfy many constraints. However, if you have a specific request, e.g., if you prefer not to co-teach with your adviser,
make that request known to the chair. It may not be possible to honor it, but it never hurts to ask.

6.2.1 Course Supervisor

A course supervisor is a faculty member who oversees a course taught by postdocs, junior faculty or graduate students, but is not actually teaching the course. The course supervisor reviews the syllabus (in its broadest sense), previews all exams, and advises on assignment of final grades.

6.2.2 Course Chairs

A course chair is a faculty member who oversees a multi-sectioned course. The course chair sets the syllabus (in its broadest sense). Of course in lower-level courses, the topics syllabus is essentially fixed by department consensus, but there can be some variation in how what type of homework is done (e.g., WeBWorK or written homework) and how the course is evaluated.

There is not always agreement among all faculty teaching a multi-sectioned course about how a course should be constructed and run, but by department policy all sections are subject to common evaluation, so the course chair sets the procedures and syllabus to be followed in that offering of the course.

6.2.3 Teaching Mentors

A teaching mentor is assigned to all graduate students who teach. The role of the mentor is especially critical in the first teaching experience, and can vary with subsequent teaching opportunities based upon evaluations of previous teaching.

Graduate students are often fond of thinking they should be in full control of the courses they teach. That is more than a little like someone getting a driver’s license and feeling they are an accomplished driver having only passed a road test. There is always more to learn about your profession.

Teaching mentors have many duties which dovetail with that of course supervisors and course chairs. The syllabus is set by the course supervisor or chair. In a multi-sectioned course, exams are drafted in consultation with the teaching faculty, and final decisions left to the course chair. In a single-section course, the faculty member drafts the exam which is then reviewed by the teaching mentor who gives feedback to the instructor. The teaching mentor also reviews final grades to make sure they align with department guidelines and to help the instructor resolve borderline cases. All these roles of the teaching mentor apply uniformly to any graduate student who is teaching.

The role of the teaching mentor can vary depending upon the needs of the instructor as perceived either by the instructor or the mentor. In particular, a teaching mentor is expected to be highly involved with those teaching for the first time, with the degree of involvement negotiable for those who have taught previously and have strong teaching evaluations. To be an effective mentor, they
should visit the class two to three times during the term. The ideal schedule is for a first visit to occur within the second week of term. This has provided time for the instructor to set the tone of the class and develop some rapport. A class is observed and the mentor takes notes. Following the class, the student and mentor meet and discuss the class. Ideally, a mentor starts by asking what were the goals of that day’s class and how effective the instructor felt they were in accomplishing those goals. Ideas of things that they thought went well or not are mentioned. Then in that context, the mentor can review how they felt the class went, and make suggestions for different ways to accomplish certain goals. A followup visit should occur in another couple of weeks. If things are going well, there may be no other visits unless requested. If problems still seem apparent, more visits and brainstorming sessions may be needed.

Yes; it is a bit unsettling to have someone in your classroom observing you, but evaluation is a part of life and certainly part of your career. The goal of the mentor is to help you become a better communicator, something from which all parties benefit.

6.2.4 Teaching Evaluation

The department has a teaching evaluation committee whose job it is to visit the classroom of all graduate students, postdocs, and junior faculty members. Their role is to visit a typical class, and following a discussion with the instructor, write a review which often forms a core piece of a teaching letter.

There are often a large number of classes for the committee to visit, and you are best served by getting feedback in the first half of the term, so if a member of the teaching evaluation committee does not contact you about setting up a visit within the first two weeks of the term, contact the chair of the committee to help move things along.

6.2.5 Outline of responsibilities and expected time commitments

The amount of time one commits to teaching varies among instructors, and any faculty member will freely admit that the first time they teach a course, it requires far more time and energy than subsequently. Typically, most graduate students are teaching courses for the first time, and so the preparation will be more demanding than for someone having taught the course before. But the key here is the effort is demanding, but not all-consuming.

Students should place their efforts in perspective. For those who will choose an academic path, their normal responsibilities each term include teaching one or more classes, doing research, advising students, as well as other department duties. Learning to balance those responsibilities is also an essential part of becoming a professional mathematician. Starting now is a good idea.

All this is to say that you cannot make teaching your one class a 40 hour per week job. That kind of time commitment is unrealistic, and not remotely proportional to your responsibilities. Of course you want to do a good job with
your class and you should. But you cannot (and should not try to) do everything and try every technique. It takes a long time for someone to develop fully into a good teacher, and some lessons are learned only upon reflection of hobbled previous efforts.

What are the demands of teaching a course?

- Preparing lectures and handouts
- Writing homework problems, solutions, grading
- Office hours
- Website maintenance, exam writing and grading

In a multisectioned course, some of the labor is distributed: one person writes homework problems, another the solutions, still another updates the web pages. If you are on your own, you need to learn to balance. Not everything needs to be TeXed or a Beamer presentation. Handwriting notes, handouts, solutions etc saves an enormous amount of time.

6.2.6 The Honor Principle and your course

The last thing you want to think about when teaching is the possibility of an honor code violation, but be very clear such violations do occur and many are the result of a lack of clarity in how the honor principle applies to your course.

First, you should make a point to read the academic honor principle. Then you should decide how it applies to your course. Can students collaborate on homework? projects? exams? How should credit be attributed? What resources are allowed?

Once you decide how the honor principle should apply to your course, make this very explicit on your course syllabus. Then make sure you talk about it in class. All this reduces the chances that a potential violation is a result of lack of clarity.

Still on occasion, things do occur. Virtually identical [incorrect] answers on exam problems, homework/exam solutions too sophisticated for the student of using notation not seen in the text. For cases in which you think a student’s answer was informed by information on the internet (presuming it was not allowed), you can probably find the source online. Still what do you do?

Having read the honor principle, you know you are not to resolve the matter on your own, though asking students for clarification is allowed. Your first action is to bring the matter to your course chair or supervisor who will advise you further. If need be, the department chair can give further opinion.

If it is decided that this is a likely violation of the honor principle, contact the office of Community Standards and Accountability which will give you information for how to submit your materials.
6.3 Travel: Conferences, Invited Talks, Interviews

Travel for whatever purpose requires booking flights, making hotel reservations, and planning for local transportation costs and meals. In many instances funding is available to graduate students, but such funding is generally in the form of reimbursement, meaning you need to carry the load in the short term.

While there are times you can arrange for the College to pick up some of the interim costs, there can be trade-offs, and certainly hotel, local transportation and meals are all expenses you will have to carry until reimbursed. So it makes good sense to start building a travel fund of your own to help smooth out the bumps.

The largest expense generally is travel to and from a conference. If you are taking an authorized professional trip, one option available to you is to book your flight through the College travel office. With Tracy’s authorization, the cost in the short term is carried by the department, which you then reimburse when you receive funding from the outside entity.

Note that since this is a corporate booking, it may not be the cheapest option for air travel, which means while the College is carrying the short-term load, more of your reimbursement will go to travel costs. On the other hand, if you want to book your own flight through wing-and-a-prayer air, you are free to do so, but then it is your credit card which is carrying the debt until you receive reimbursement.

6.3.1 Conferences

Conferences are wonderful opportunities to make new and meet old colleagues, learn about the work of others and present your own work. Some of the people you meet eventually may write letters for you, either for jobs or for when you come up for tenure, so keep in mind that conferences are a professional activity.

When you find a conference of interest and want to attend, the first question is whether you are allowed to be away from campus? Is your adviser aware and in agreement that this is a valuable activity? Are you teaching, TAing? How will those responsibilities be handled?

If you are going to a conference, the following sources of funding should be investigated, pretty much in this order:

- Graduate student support obtained from the conference organizers: More and more conferences offer graduate student support, but you have to apply for it and often obtain a letter recommending you as a viable participant. Such funding can supplement travel, housing and meals, or just some subset of those.

- Sometimes there is money to help defray costs available from the department. Application is made by contacting the graduate representative, and funding is limited.
• At least once during your Dartmouth career, the graduate office provides some funding to defray the costs of a professional conference. Most graduate students use this to attend a national meeting of their professional society.

6.3.2 Invited Talks (colloquia/seminars)

You may be invited to give a seminar or colloquium talk. In this situation, most if not all of your expenses will be reimbursed, but you must carry the short-term load, so between booking a flight and waiting for the University to reimburse you, certainly two to three months will elapse. Generally hotel and meals are covered locally and not borne by you.

6.3.3 Interviews

Eventually, you will be interviewing for jobs. Sometimes perspective employers will have you book flights through their travel agents saving you the costs, but not always, so again your credit card could be carrying the load for 2-3 months. And if you are lucky enough to have many interviews, these costs can be significant, so some advanced planning is worth your while. Again meals and hotel are generally handled by the local host, so do not add to your interim costs.

6.4 Language Exam

The formal requirement for a reading knowledge of a foreign language exam has been eliminated.

It should be understood that mathematics is written in many languages, and the need to be able to read papers in languages other than English remains an important tool. Some Advancement committees may expect students to demonstrate some level of proficiency in reading mathematics written in languages other than English.

7 Chain of communication

Many situations arise in which you will want to seek advice. The issue may be informational, to resolve a conflict, or dealing with a situation with which you have no experience.

Admittedly, it seems natural to first turn to your fellow graduate students, but more times than not this is a source of misinformation or at least information biased by their small window of experience. A definitive source of information about the policies of the graduate program is the Graduate Program Committee (GPC). But there are also many other sources of information, somewhat influenced by the circumstances. We consider a few.
7.1 General Questions
If you are a first or second-year student, natural choices of people from whom to seek advice are your first-year adviser, the adviser to graduate students, the GPC and the department chair.

For students who have advanced to candidacy, your first-year adviser and adviser to graduate students is generally replaced by (members of) your advancement/thesis committee.

7.2 Issues with your adviser
If you find yourself at odds with your primary thesis adviser, you should first consult your secondary adviser or other member of your advancement/thesis committee to get their read on the situation. Having heard your side of things, they will probably chat with your adviser and get their perspective on the matter at hand, and then get back to you to help resolve the issue.

In the event that informal means do not resolve your issue to your satisfaction, there are more formal procedures for resolving issues which gradually escalate. Please refer to the section devoted to Grievances.

7.3 How to handle a possible honor-code violation
One of the last things anyone who is teaching wants to encounter is a suspected honor code violation. Review the statement of the academic honor principle, and see the section above for details on how to handle the situation.

8 Deadlines and benchmarks by year
8.1 Year 1
- Take nine courses including at least 6 classroom courses; fill in with (supervised) Math 127, 137, 148 as needed to maintain required three course load each term.

- TA for two courses registering for Math 107 in the second term you TA.

- Get involved with seminars and see what various research groups are doing.

- Applied Math students should plan for their summer research project/internship for the coming summer. It is imperative that students who wish to do an internship discuss this with either their first-year adviser or a potential committee member by February 1 since application deadlines for internships are often due by mid-February. Students also need to submit a plan for the summer project which has been approved by the two-person advisory committee to the GPC for approval by the end of spring term.
• Pure Math students will take the summer seminar Math 107, and should be thinking about the formation of their Advancement Committee who will help guide the student through the second year advancement process.

• Take preliminary exam in either pure or applied Math.

### 8.2 Year 2 — Applied Math

• Take nine courses including at least 4 classroom courses; among these should be the second offerings of Math 106 and 116 as well as other topics courses; fill in with (supervised) Math 127, 137, 148 as needed to maintain required three course load each term.

• TA for two courses registering for Math 107 in the second term you TA.

• Written report of your summer research, to be followed by oral presentation and exam in the fall.

• Complete theoretical and practical aspects of pedagogical training. Register for Math 147 when taking the DCAL seminar. Be aware of ongoing requirements if a certificate in pedagogy will be sought.

### 8.3 Year 2 — Pure Math

• Take nine courses including at least 4 classroom courses; among these could be second offerings of Math 111, 113, and 114 as well as other topics courses; fill in with (supervised) Math 127, 137, 148 as needed to maintain required three course load each term.

• TA for two courses registering for Math 107 in the second term you TA.

• Assemble your three-person Advancement Committee, formulate the details of your Advancement Exam and submit the approved plan to the GPC by the end of fall term.

• Complete all the requirements of the Advancement exam by the end of winter term; exceptions must be granted by the GPC.

• Complete theoretical and practical aspects of pedagogical training. Register for Math 147 when taking the DCAL seminar. Be aware of ongoing requirements if a certificate in pedagogy will be sought.

### 8.4 Years 3-5

• Take at least 8 classroom courses over the three-year span keeping your average to 3 courses per year; fill in with (supervised) Math 156, 157, 158 as needed to maintain required three course load each term.

• Register for Math 149 each time you are teaching for the department.

• Continue your research, write up results and post to the arXiv, attend seminars and relevant conferences.
9 Master’s Degree

All students who advance to candidacy will receive a Master’s Degree at the end of the second year.

If a student in pure math fails the advancement exam or a student in applied math fails to do a satisfactory job in their oral presentation of summer research, the student’s committee may still recommend to the GPC that the student be granted a master’s degree.

Students who decide that they do not wish to try to advance may choose instead to assemble a committee for the sole purpose of determining whether they should be granted a master’s degree.

10 Graduate Certification in Pedagogy

10.1 Overview

Those students who aspire to secure positions with a significant teaching component may wish to pursue a higher level of pedagogical training. To facilitate this, we’ve created a certificate program within the Guarini School of Graduate and Advanced Studies. Upon completion of the requirements, a student receives a certification and notation on their transcript. Students with an interest in this certification should discuss the matter with their adviser.

The requirements for the certificate are included in the form below. A typical path through our course of training for a student interested in the certification might be:

- **Year 1:** Two terms serving as a Teaching Assistant, typically in calculus courses and (if possible) paired with a more senior student. Attendance of the TA Training Seminar in the Fall term.

- **Year 2:** Two terms serving as a Teaching Assistant, one of which will incorporate a more intensive collaboration with the instructional team. Attendance of the TA Training Seminar in the Fall term. Students will attend the DCAL course for one offering.

- **Year 3:** The student is eligible to teach a section of their own course, likely under the supervision of the faculty member who is the course supervisor.

- **Year 4:** Depending on the student’s performance in their first independent teaching experience, the student may have a similar experience in year 4 or be trusted with more autonomy (e.g. with a stand-alone course).

- **Year 5:** Depending on the student’s performance in their first two independent teaching experiences, the student may have a similar experience in year 5 or be trusted with more autonomy (e.g., with a stand-alone course).
• **Interspersed throughout:** Students will pursue the other components of the certification.

### Graduate Certification in Pedagogy: Mathematics

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<tr>
<th>Departmental Training components (complete all)</th>
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<tr>
<td>Departmental Training for Teaching Assistants</td>
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<td>Departmental Ethics Training</td>
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<tr>
<td>TA Seminar (with each instance of TA role)</td>
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<td>DCAL Future Faculty Teaching Series</td>
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<td>Serve as a Graduate Teaching Fellow</td>
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<tr>
<td>Math Camp</td>
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<tr>
<td>Outreach in local school system(s)</td>
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<tr>
<td>DCAL Learning Community for Future Faculty (facilitator)</td>
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<td>Other GPC approved activity</td>
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<td>Term 2</td>
<td></td>
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<tr>
<td>Observation with written reflection (TEC)</td>
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<td>DCAL Teaching Statement workshop series</td>
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<td>DCAL Diversity Statement workshop series</td>
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<td>DCAL Syllabus Design series</td>
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<tr>
<td>Workshop on Communicating your Research to Broad Audiences</td>
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<td>Other DCAL and Guarini workshops</td>
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<td>Teaching Statement</td>
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<td>Sample Syllabus (if available)</td>
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<td>Annotated sample course materials</td>
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<td>Teaching Evaluations</td>
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### Figure 10.1 Certificate
11 Work-life balance

This section is included at the request of graduate students. It should be viewed more as an editorial piece though it contains many statements of fact.

The phrase “work-life balance” is at best a misnomer in academics. The profession you want to enter demands passion, a passion for your work that can sustain you through the disproportionate requirements of time needed to succeed in this profession. Time demanded of you by your career can often not be predicted nor easily partitioned from the time devoted to things outside your career. Complicating an interpretation of the phrase “work-life” even more are that there are many who equate work and life, or more pointedly, there are many mathematicians for whom doing math is life.

To get down to some specifics, your work-life balance is influenced by your goals and aspirations as well as the requirements of your job. As a professional mathematician, your motivation for a heavy investment in your career may be job security, such as tenure and promotion (even fame, rarely fortune); as a graduate student the motivation is probably to get a degree and a “good” job. But unlike an undergraduate finishing and getting a job which might be their end goal, for you this is simply a first step, but a critical one.

So part of the work-life balance is a matter of choice. For you this balance is also influenced somewhat by your adviser whose job it is to train you to the best of their ability and enable as many opportunities as they can. Styles by which faculty train graduate students vary dramatically, from a virtual hands-off approach (ask me questions if you have them), to those who want weekly progress reports, to those who are even more prescriptive. Students who are supported on research grants or are in research collaboration with their adviser often have additional pressures. Especially grants in applied mathematics are awarded in expectation of deliverables with deadlines. Missing deadlines can result in a loss of funding, which could have obvious effects for graduate student funding. Extra effort is often required to help finish research close to a projected timeline.

Presumably you are aware of your adviser’s proclivities before signing on. Perhaps a good conversation is to ask what a prospective adviser’s plans are for you as their student? What are your own plans and aspirations? The job market is highly competitive with one measure of the strength of a job applicant given by their productivity. It should also be clear that the quality and strength of the letter of recommendation which your adviser can write is directly related to your success and productivity as a student. Pressure to work hard should come from you; this is your chosen profession.

Let’s think about various aspects of the career of a professional mathematician. Here we talk about the work aspects, leaving to you to discern how life fits into this picture.

Success in research is certainly influenced by the amount of time devoted to it, but not determined by it. And in the absence of brilliant insight, you work
long, hard hours to catch a glimpse of possible approaches to a problem. And let’s not forget that grants are important to everyone’s career. Most applied mathematicians are expected to generate revenue in terms of grant dollars, and research universities expect faculty to obtain grants as evidence of the value of their research. And of course writing grants takes time, but more importantly you are writing a grant which makes promises on which you need to deliver if you expect to get future grants.

For many, perhaps most, of you there will be a teaching side to your career. Components include lecture writing, creation and grading of homework and exams, perhaps overseeing a research group, mentoring undergraduates and graduate students outside of classroom courses, and committee work.

Depending upon the type of department you are in, different weights are assigned to each of the research-teaching tasks, but taken all together, these tasks require a huge amount of time.

The bottom line is that the life of a professional mathematician can be an incomparably wonderful experience, but you should be well aware of the costs as manifested in a work-life balance. In particular, doing (at least most of) the jobs that comprise your career should be a passion; without such a passion, devoting huge amounts of time to your career will not prove satisfying.

A Committees and Advisory Personnel

A.1 Graduate Adviser

The Adviser to Graduate Students acts as a mentor to graduate students not yet advanced to candidacy, gives them help and guidance, and advocates on their behalf with the Graduate Program Committee. The Adviser also is responsible for approving course selection.

- Keep in touch with all the graduate students, and with instructors of graduate courses. Know who is doing well, who is in trouble, and who is interested in what field. Try to make sure graduate students know and are comfortable with you.

- Together with the graduate program representative, meet with incoming graduate students, as a group and individually, to discuss the grad program in general and course choices in particular. Make sure the students file a report with their plans for the first year.

- Discuss course choices with graduate students before registration. Sign registration cards (at least for all grad students who do not yet have a thesis adviser.)

- Approve “permission only” courses, which include all reading and independent study courses. Taking a reading or independent study or research
course means finding a faculty member to supervise the effort, and who will provide a pass/fail grade at the end of term.

- Discuss advancement plans with students. Push them to anticipate deadlines and be proactive about constituting a committee. Remind the applied students that applications for summer internships are often in mid February.

- Be the GPC’s source of information on student progress, especially at evaluation time. Keep the Graduate Program Representative informed about important and/or problematic issues.

- Be the graduate students’ representative, as needed, in their relations with the GPC, with the Graduate Office, with their instructors and students, with the department as a whole.

A.2 Graduate Program Committee (GPC)

The Graduate Program Committee evaluates graduate student progress on a regular basis, makes decisions on issues such as leave of absence and advancement schedules, and entertains changes in graduate program practice or policy.

- Evaluate the progress of all graduate students at least once a year. For students already admitted to candidacy, this means asking their thesis advisers about their progress. Typically, a written summary of the annual fall meeting of the student with their advancement committee is sent to the GPC.

- Be up to date on students’ progress on meeting deadlines. Take action regarding those who fall behind, warnings first, action later.

- Evaluate students for advancement to candidacy. Generally, if they have secured a primary and secondary adviser (part of their Advancement Committee), they will have satisfied all requirements of the advancement committee.

- Make decisions and send official letters regarding student requests for leave of absence, extension of deadlines, questions of academic status (e.g., probationary status), other special requests.

- Make decisions on a fifth year of support. Students who seem to be floundering at the end of the third year should be reminded that a fifth year of support does depend on making reasonable progress (ask the thesis adviser whether a nudge is in order.) The occasional exceptional student to whom we might want to give a sixth year of support should be referred to the department as a whole for a decision; the Graduate Program Representative needs to ask the Graduate Office for permission if the support is to come from a Dartmouth Fellowship, and permission will probably not be granted.
• Entertain suggested changes in graduate program policy and practice. Make decisions on small items; refer larger items (including anything reflected in the ORC, and any change in requirements) to the department for a vote.

A.3 Graduate Representative

The Graduate Program Representative basically runs the graduate program. Specifically, the GPR is the liaison among the various relevant committees, and to the department chair and the office of the Dean of Graduate Studies.

• Be the official “Graduate Program Representative” listed with the Graduate Office. Make sure they know this every year.

• Be the one to consult with the Graduate Office, as necessary, about issues such as incompletes (when the course instructors don’t handle incompletes themselves), leaves of absence, etc.

• Make sure the Graduate Office gets all the paperwork it needs. It needs copies of letters about leaves of absence, letters about academic status, other official letters.

• Assign tutoring and teaching jobs to graduate students. Consult with the department chair about which classes get TA’s and what slots are available for graduate student teachers, consult with the adviser to graduate students, teaching course instructors and graduate students themselves (and read files of incoming grad students) to determine graduate student interests and abilities. Make sure everybody in sight is informed about assignments and expectations. (TA assignments: Course instructors/chairs, department chair, department staff, TA’s. Teaching assignments: Course supervisors, department chair, department staff, grad student teachers.) Remind the chair as necessary to assign teaching mentors to all grad student teachers.

• Consult with the department chair on the scheduling of graduate courses.

• Keep in touch with the Administrative Assistant about grant support for graduate students.

• Keep the stipend projection spreadsheet updated. Consult with the department chair and the Admissions Committee chair about how many students to admit each year.

• Accompany the Admissions Committee Chair and the Administrative Assistant to the annual meeting with the Graduate Dean about admissions, etc. Be informed about progress of current graduate students and projected admissions targets for this meeting.
• Be in close touch with the Graduate Program Secretary; this varies from being an unofficial job supervisor in some areas to getting the secretary’s advice and approval in others.

• Be the backup for graduate students having difficulties with the Adviser to Graduate Students.

• Oversee the graduate program portions of the department’s web page.

• Stay in the loop and informed about everything having to do with the graduate program.

A.4 Teaching Evaluation Committee

The Teaching Evaluation Committee regularly evaluates the teaching of all new and visiting faculty and the teaching and tutoring of graduate students. As such it is an important committee which is active throughout the year.

Ideally, a prearranged classroom visitation should occur within the first few weeks of the term (when modifications can still be made if needed), but after the instructor has had a chance to develop some rapport with his/her class, say after 3-4 lectures. Based upon the visit, members give feedback to the instructor and prepare a written evaluation which is included in their file. For graduate students this goes to the department AA and for faculty it goes to the department administrator. A copy should also be given to the chair.

These evaluations provide a valuable resource especially for JWsYs and graduate students who will need a teaching letter among their application materials for a new job, and are an excellent means of catching any problems which may be brewing while there is still time to make changes. They are also used by the graduate program representative in deciding on future teaching assignments.

It is also the intention that the teaching evaluation committee evaluate the performance of graduate student TA’s each term they tutor. We are now using TA evaluations to help in this regard.

The harder part of the job is to remember to do this at the beginning of each term, and not just in the fall. Obviously instructors who have not been contacted about a visit and desire or need one, should contact the teaching evaluation committee chair.

B Formal Policies

B.1 Formal (ORC) Department Degree Requirements

Dartmouth College offers programs of graduate study leading to the Ph.D and A.M. degrees in mathematics. With rare exceptions, the A.M. is the first step in the Ph.D. program. The Ph.D. program is designed to meet the need for mathematicians who are highly qualified in both teaching and scholarship. The College
provides an environment in which a doctoral candidate can pursue professional study in mathematics and prepare to be an effective teacher.

B.1.1 Degree Requirements for MA

In addition to the general College requirements for the master’s degree, the department requirements for the A.M. in mathematics are as follows:

- Satisfactory completion of three out of five pairs of core courses: (101, 111), (103, 113), (104, 114), (106, 116), (126, 136). (See Note (1))
- Successful completion of the Advancement Examination at a Master’s level.
- Non-course requirements which parallel those of those continuing in the Ph.D. program. In particular, students must receive credit for Mathematics 107 once during each year while enrolled.
- Completion of at least five terms in good standing. (See Note (2))

Note (1): Normally this requirement for the A.M. is completed in the first year. Study may be extended into the second year, only if approved. Syllabi for these ten courses are available from the Department of Mathematics.

Note (2): In addition to five terms in residence, students must obtain credit in fifteen courses of graduate quality with a limit of at most five replaced by approved research or special study.

B.1.2 Degree Requirements for PhD

The requirements for the Ph.D. degree in mathematics are as follows:

- Successful completion of the A.M. degree (described above).
- Successful completion of the Advancement Examination at the Ph.D level.
- Admission to Ph.D. candidacy by the departmental Graduate Program Committee as a result of its review, which takes place at the end of the spring term of the second year of graduate study. This review will take account of all the relevant information that the Graduate Program Committee can gather, such as the student’s record in courses and seminars, the student’s performance during the advancement process, and an estimate of the student’s ability to write an acceptable thesis.
- Completion of a doctoral thesis of acceptable quality, and its defense in an oral examination.
Successful completion of the teaching seminar and teaching two courses in the three years after passing to candidacy. Preparation for the teaching seminar includes such activities as TAing in the years before admission to candidacy. This requirement is met by receiving credit for Mathematics 107 once during each year preceding admission to candidacy, credit for Mathematics 147, and credit for Mathematics 149 twice during the three years following admission to candidacy.

B.2 Departmental Amplification of Degree Requirements

The following statements represent current department policy. While policy does change from time to time based upon votes of the faculty, any exceptions to this policy must be explicitly approved by the GPC.

1. Every graduate student is required to register and complete three courses per term. Before the end of the first year, students are expected to take at least three out of five pairs of core courses: (101, 111), (103, 113) (104, 114), (106, 116), (126, 136) as well as three more courses of their choice. In addition, each student should register for 107 during the second term of each year in which they serve as a teaching assistant. Students should take at least four classroom courses during their second year [noting that the content of 106, 116, 111, 113, and 114 alternate topics in even and odd years], and roughly three classroom courses in each of the years after advancing to candidacy (a minimum of 8 classroom courses are required in years 3-5). Students are expected to register for Math 147 when taking DCAL’s Future Faculty Teaching Seminar during their second year, and must also complete math-specific pedagogical training (Math 148) that year in order to be eligible to teach in subsequent years. Finally, students must register for Math 149 in each teaching term (see also item 6).

Students who supplement standard coursework with reading courses (127, 137) must have a supervisor for each such course. While these are expectations for typical graduate students, the Adviser to Graduate Students may grant alternate course plans at his/her discretion.

2. Students must take a preliminary exam at just before the start of their first summer in the program. The pure math exam covers topics in algebra, analysis, and topology, while the applied math exam covers three of four topics covered by 106, 116, 126, and 136. For students who do not pass the exam at the start of summer, it is expected that they will retake the exam at the start of fall term.

The path for second year students differs in fine detail for pure and applied students, but roughly speaking all students will form an Advancement/Thesis committee and must successfully complete an individually tailored Advancement Exam at a level appropriate for a Ph.D. as a prerequisite to advancement to candidacy.
3. Advancement to Candidacy: On the basis of all available information, the Graduate Program Committee decides whether it is in the student’s best interest and Dartmouth’s best interest for a student to continue studying towards a Ph.D. degree at Dartmouth. The largest part of this process is the successful completion of the Advancement exam at a level appropriate for a Ph.D. Another essential part is the selection of a thesis adviser, a secondary adviser, and the approval of the Graduate Program Committee. The primary and secondary thesis advisers must indicate their acceptance of the student by signing the adviser form obtained from and returned to Graduate Secretary prior to GPC consideration.

4. Students whose native language is not English may be required to take an ESL (English as a Second Language) course offered through the Graduate Studies Office prior to teaching for the department.

5. The Graduate Office establishes requirements for the composition of a dissertation committee and for the presentation and submission of the thesis.

   No student may schedule their thesis defense until all other requirements for the degree have been satisfied.

6. Students prepare for the teaching seminar through activities such as TAing in the years before admission to candidacy. Students receive credit for Math 107 for acceptable performance in two quarters of TAing each year before admission to candidacy. They receive credit for Math 147 by completing DCAL’s Future Faculty Teaching Seminar and for Math 148 for completing the math-specific pedagogical training. They receive credit for Math 149 for acceptable performance in one quarter of teaching each year after admission to candidacy. The Graduate Program Committee may occasionally approve substitution of other professional activities to meet TAing or teaching requirements, subject to the proviso that each student must earn credit for Math 107 at least once, credit for Math 147, and credit for Math 149 at least twice.

B.3 Grievances

Here are departmental guidelines about what you should do if you have a grievance.

First of all, what is a grievance? You may have a grievance if you feel that you are being treated unfairly or inappropriately, whether by a faculty member, a fellow student, or anyone else with whom you interact as a graduate student. These grievances can be anything from alleged violations of the terms of agreements and guidelines, to more subtle disputes about the fairness of an adviser’s oversight, perceived issues of departmental favoritism, remuneration, joint publication, bias concerning gender, race, sexual orientation, et cetera, or concerns about personal conduct.
The first thing to do with a possible grievance is to try to solve it informally within, or with the help of, the department. Two important points about this are:

- We will maintain your confidentiality to the utmost of our abilities.
- If you try for an informal resolution and are not satisfied, you can then go on to formal procedures.

Here are the steps we suggest you follow:

- Try to resolve the issue with the other person or people directly involved. If you can’t do this, or it seems too risky to attempt it, then go on to the next step.

- Consult your adviser, the Adviser to Graduate Students or the Graduate Program Representative. You should feel free to talk to any of these people with whom you feel comfortable and who you feel has enough distance from the problem to be an effective adviser. If this person can’t help you reach an effective resolution, go on to the next step.

- Talk to the Department Chair or to the Graduate Program Committee. The department chair or the GPC may be able to suggest some appropriate action by the department that will resolve the situation. This is still an informal resolution, and if you are still dissatisfied, it is time to take matters out of the department.

- Talk to the Assistant Dean of Graduate Studies (Gary Hutchins.) He will try once again to help you reach an informal resolution, and if that fails, will be able to tell you what formal action to take. This may be to request a hearing from the Dean of Graduate Studies, to approach the Office of Institutional Diversity & Equity, or to follow some other formal procedure.

Addendum from the Office of Graduate Studies

If the Dean, working together with the aggrieved student and appropriate faculty member(s) or representatives of the mathematics graduate program, is unable to reach a satisfactory resolution, the student can request in writing a formal hearing and ruling by the Dean of Graduate Studies and the Committee on Student Grievances. Formal hearings are conducted as described in the Graduate Handbook (see sections titled “Committee on Student Grievances” and “Formal Hearing” under Academic and Conduct Regulations).

Please note that reports of scientific misconduct, violations of the academic honor principle, and certain issues of professional and personal conduct (sexual harassment, discrimination, and others described in the graduate handbook under code of conduct — non-academic regulations) are handled in the Graduate Office as described in the graduate handbook. Graduate students are encouraged to use the informal channels described in their program’s grievance policy.
to discuss these issues, to clear up possible misunderstandings, to clarify potential grievances, and to decide whether further steps are necessary. A student who after such discussion feels there may be a violation or a grievance requiring some action should report this to the Graduate Office.