

University of Wisconsin-Madison

Mathematics Department

**Graduate Student
Handbook**

**Revised August 2009
by
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Dear Graduate Students,

Welcome to the Department of Mathematics! I hope that you've had a good summer, and are looking forward to a demanding and rewarding experience in our graduate program. To ease your transition into graduate school, this Handbook was prepared for you by department staff, input from graduate students, and the support of the Graduate Program Committee.

I believe that this Handbook will be an important resource to you. It provides information about the graduate program, your responsibilities and opportunities as a TA, the department, and life in Madison. In addition to policies and details about the requirements of the graduate program, it also contains advice from other graduate students who have learned the ins and outs of being a student here.

As the Graduate Studies Coordinator, my role is to guide you through the maze of departmental and university rules and to support your effort in any way that I can. Indeed, all the members of the faculty want your stay here to be as productive as possible. If you have any questions or concerns, feel free to ask any of us and we will be glad to help.

Finally, you are here because of your love of Mathematics and because we all believe that you have the talent and dedication to earn a PhD. I trust that you will live up to this promise and I wish you a wonderfully successful graduate career.

Sincerely,

Ken Ono
Graduate Studies Coordinator

I. You as a Student

The Department of Mathematics offers the Master's and Ph.D. degree. This Handbook is primarily focused on the Ph.D. program, although most of the information also applies to the Master's program as well. After the overview below, the specific requirements for these degrees are described in the next section, Guide to Graduate Programs in Mathematics. The subsequent sections give more detail about the requirements. Other sections give hints, suggestions, and advice from other graduate students. This advice has worked for graduate students in the past, and while not all of that advice will work for you, we hope that you will find some of it helpful.

Overview There are seven general areas of specialization within the department: Analysis, Algebra, Applied Mathematics, Computational Mathematics, Logic, Geometry / Topology, and Mathematics Education. The requirements for the Ph.D. are almost the same in all seven areas. The exception is Mathematics Education which has some different course and research requirements. These differences are spelled out in more detail in the following section. Briefly, the requirements for a Ph.D. are:

- Take a total of 54 graduate credits, or generally 18 courses. This includes courses in math and in a minor. Math courses numbered above 300 are for graduate credit.
- Complete a minor. A minor is usually 12 credits (4 courses), although this differs in some minors. The minor department determines what is required for a minor.
- Pass any two of six qualifying exams. Exams are offered in Analysis, Algebra, Applied Mathematics, Computational Math, Logic and Geometry / Topology.
- Pass a Specialty Exam. This exam is constructed by your dissertation advisor in your chosen area of research.
- Complete a dissertation. Once you have completed all of the requirements other than the dissertation (all courses, minor, qualifying exams, and specialty exam), you will be classified by the Graduate School as a Dissertator. Dissertators receive higher rates of pay, and register for only three credits per semester.

Guide to Programs in Mathematics

Course Requirements Most graduate students take 3 courses (9 credits) each semester. At that rate, you would finish your course requirements in three years. In selecting your courses, there are some things you should keep in mind:

- Three 700-level or above courses (9 credits) can be a demanding load for people who are working as TAs. This is especially the case in your first year, when you may be adjusting to teaching, the general demands of graduate study, and life in Madison.
- Some students choose to take only 2 courses (6 credits) in a semester, while other students (usually those with fellowships) take four courses (12 credits). While the faculty encourage you to take three courses, two courses is an acceptable choice. In fact, the graduate school considers 6 credits (2 courses) to be a full-time load for TAs. The Math Dept. requires a minimum of six credits per semester except dissertators.
- If you want to strengthen particular areas of your background in preparation for qualifying exams, there are some 500 and 600 level courses that may be helpful. These are identified in the Qualifying Exam section of the Handbook (or check with each area for specifics). A limited number of courses at this level count for graduate credit, so you can take them as part of your required 54 credits.
- You might want to start thinking about your minor early. Since you are required to take 4 courses (12 credits) for most minors, it will speed things along for you if you start taking courses in your minor by the beginning of your second year.

PhD PROGRAM

Degree Requirements

1. **Qualifying Exams** All students must pass qualifying exams in two of six areas. The areas are algebra, analysis, applied mathematics, computational mathematics, logic, and geometry/ topology. These exams are given the week or two before the beginning of classes each semester. The exams are written and the time allowed for each exam is six hours. They are based on the first year graduate curricula and prerequisite undergraduate courses. (For example, the first year graduate course in algebra along with undergraduate linear algebra should prepare one for the algebra exam, and so on.) Qualifying exams may be taken as often as necessary. There is a deadline by which one must pass their exams. (See exam section.) Passing grades may vary from year to year according to the difficulty of the exams.
2. **Specialty Exam** Pass a specialty exam in the intended area of research. This exam is given by a committee of three faculty, usually one of whom is or will be the dissertation advisor. The exam may be either written or oral, but as a rule it is almost always the latter.
3. **Research and Dissertation** Under the guidance of a faculty member of this department, complete a significant piece of original research and render it in a written form that others can easily understand.
4. **Minor**
 - Option A** - in a single department, the Mathematics Department or an outside department. Option A requirements are set by the host department and typically call for 12 credits. An Internal Math minor requires 12 credits in courses numbered above 700 in an area DIFFERENT from those of the two qualifying exams.
 - Option B** - requires a minimum of 12 credits in one or more departments which may include the Mathematics Department. Option B requirements are set by the Graduate Program Committee of the Mathematics Department. To avoid disallowed courses, students should obtain approval in the early stages, by submitting a four course plan to the Graduate Program Committee Chair.
5. **Courses and Grades** Complete 54 credits of graduate work. These credits are typically in mathematics or an approved minor. (Under certain circumstances, credit for courses taken elsewhere as a graduate student may count towards the total of 54. This transfer of credits requires the approval of the Graduate Studies Coordinator and will only be applied towards your coursework after two qualifying exams have been passed.) Courses outside mathematics can be counted toward the 54 credits, up to a maximum of 12 credits, if approved by the Graduate Studies Coordinator or the Graduate Program Committee. This applies only if the 12 credit minor is inside the Mathematics Department, and the outside courses are in a field directly related to the student's dissertation research. Achieve a grade point average of 3.3 or better in mathematics and cross listed courses.
6. **Residence** The Graduate School requires a minimum of 32 graduate level credits (no audits or pass/fail courses) taken as a graduate student at UW-Madison.

Preliminary Examination

Students have passed their Preliminary Examination if they passed the two qualifying exams, the specialty exam and fulfilled the minor or major course requirements. This now means you can apply for dissertator status.

Satisfactory Progress Criteria

Graduate students in mathematics are required to make satisfactory progress. Students not making satisfactory progress will be placed on probation. If this probationary status is not resolved by the end of the semester in which it is initiated, the student will not be allowed to continue as a graduate student in mathematics and any guarantee of support will be terminated. Exceptions to the rules will be made only in

rare circumstances and must be initiated through written appeals to the Graduate Coordinator or the Graduate Programs Committee. Graduate students in mathematics must meet all university requirements. (See Satisfactory Progress in the [Graduate School Catalog](#).) In addition, satisfactory progress in the Mathematics Department requires the following:

1. Course and Grade Requirements

- (a) During their first year, PhD students must take at least two mathematics courses numbered 700 or higher each semester. (6 credits per semester)
- (b) During their second year, PhD students must take at least one mathematics course numbered 700 or higher each semester, for a total of at least three mathematics courses numbered 700 or higher during the year.
- (c) Thereafter, all PhD students must take at least one mathematics course numbered 700 or higher each semester.
- (d) Every student must take at least 6 credits (2 courses) each semester until reaching dissertator status. In any semester after reaching dissertator status a student must take exactly 3 credits.
- (e) Maintain a cumulative grade point average of 3.3 or better.

2. Examinations – Qualifier Exams

- (a) All students are required to pass at least one qualifying exam by the beginning of their fourth semester (the spring semester of the second year), and two by the beginning of their sixth semester (the spring semester of the third year).
- (b) Failure to pass at least one qualifier by the beginning of the fourth semester results in the immediate withdrawal of guaranteed support, although students will continue to be supported during the fourth semester.
- (c) A student who has passed no qualifying exam by the beginning of the fourth semester is no longer in the PhD program. The student may register for the fourth semester as a Master's student to earn a Master's degree.
- (d) Failure to pass two qualifiers by the beginning of the sixth semester results in the immediate withdrawal of guaranteed support, although students will continue to be supported during the sixth semester.
- (e) A student who has not passed two qualifying exams by the beginning of the sixth semester is no longer in the PhD program. The student may register for the sixth semester to earn a Master's degree by the end of that semester.
- (f) Students who have not passed two qualifying exams by the beginning of the sixth semester will not be allowed to enroll in either the Master's or PhD program for the seventh semester or thereafter.

3. Dissertation Advisor, Dissertator Status and Defense Committees

- (a) A student must have a dissertation advisor by the end of the sixth semester.
- (b) At no time after the sixth semester (end of third year) may a student be without a dissertation advisor for more than one semester. If you change advisors at any time, you must notify the Graduate Program Administrator, 214 VV.
- (c) Students must satisfy all the requirements for dissertator status by the end of the eighth semester (end of fourth year). Specifically, the student must have finished all degree requirements other

than the dissertation.

- (d) A student can count Math 990 as satisfying 1(c) for at most two semesters while a dissertator.
- (e) A PhD thesis committee should consist of five approved faculty members: major advisor, two readers, and two additional faculty members. One member of the committee should represent the student's minor area.

4. Time Limits

Students must complete their PhD in no more than eight years (16 semesters).

The PhD with Specialty in Mathematics Education

Three of the requirements differ somewhat from those of the other specialties, and there is, in addition, a dissertation proposal requirement.

1. **Specialty Exam** Before taking the specialty exam, complete a short research study under the guidance of a member of this department. The exam will be partly on this study.
2. **Minor** The minor must be in departments other than mathematics, and the subject of the minor should bear on mathematics education.
3. **Courses** This requirement is the same as for the other specialties except that the required 54 credits should include 18 credits in courses that relate to mathematics education, and at least one of the courses must be on research techniques in education. The 18 credits may come (wholly or in part) from courses included in the minor.
4. **Dissertation Proposal** Prepare a dissertation proposal describing the investigation to be made and the methods to be used in obtaining and interpreting data. The department chair will appoint a committee of three or more faculty to act on the proposal. The committee shall include the likely dissertation director and faculty from department in which the candidate has done course work bearing on mathematics education.

MASTER'S DEGREE

Degree Requirements

1. **Residence** Complete 16 graduate level credits (300 level or above, no audits or pass/fail) taken as a graduate student at UW-Madison.
2. **Courses** Complete 30 or more graduate credits. These must include 18 or more credits in mathematics (or cross listed courses). Graduate credit is given for courses numbered above 300.
3. **Pass** with a grade of B or higher four of the following core courses: Math 703, Math 704, Math/CS 714, Math/CS 715, Math 721, Math 722, Math 725, Math 741, Math 742, Math 751, Math 752, Math 761, Math 770, Math 771, Math 773, Math 776.
4. **Minor** Complete 18 or more credits that provide training in (a) some specialty within mathematics, or (b) some outside specialty on which mathematics bears. The specialty in (b) may be academic or vocational.
5. **Computing** Complete an advanced computer science course which involves substantial programming in a structured language such as Pascal or C. Suitable courses are: CS 367, CS 536, CS 537, CS 564, CS 704, CS 714, CS 715, CS 719, CS 730, CS 799, CS 883, or CS 884. Other courses require prior approval of the Graduate Studies Coordinator. This requirement is waived if two qualifying exams are passed.
6. **Grades** Achieve a cumulative grade point average of 3.3 or better in mathematics and cross listed courses.

Master's Advisor and Minor

Candidates should discuss their desire for a Master's degree with their Academic Advisor before completing the various requirements. The advisor will help the candidate design a program satisfying the minor requirement (#4 above). A Master's of Art Degree Form and Request for Masters warrant, approved by the advisor, must be filed with the department (Graduate Program Administrator) before the beginning of the semester in which you want to receive the degree or graduate.

Time Limit

The Master's degree should be completed in two years. Candidates who do not complete it in three will not be allowed to continue.

Satisfactory Progress Criteria

1. Maintain a grade point average of 3.3 or better.
2. Complete two courses for six graduate credits each semester.
3. Complete the program in three years.

Remark For information on a "Joint Master's Degree in Mathematics and Education" please contact both the Mathematics Department and the Department of Curriculum & Instruction.

GRADUATE COURSE DESCRIPTIONS

Graduate course descriptions can be found on the Mathematics Department website at:

<http://www.math.wisc.edu/graduate/>, scroll down to Courses, click on Math Dept. Course Descriptions.

A Guide to Topics for the Qualifying Examinations

The following describes the format and scope of [Qualifying Exams](#) in each of the six areas of graduate study. It is department policy that qualifiers be based on curriculum from the first year graduate sequences and any undergraduate prerequisites. Students, who have mastered those courses, should be able to pass the exams. Faculty members, who write the exams, are expected to implement this policy, and to adhere conscientiously to the guidelines that follow. Students, in turn, are expected to interpret each exam problem in a reasonable fashion, so as not to trivialize any solution. Copies of past exams and a record of previous passing scores are available from the department by request.

Qualifying Exams (affectionately known as Qualls) are given twice a year and typically take place the week or two before classes begin each semester. A precise schedule is posted months in advance. Students are allowed six hours to take the exam. Food can be brought in to help fuel the brain. Faculty, who grade the exams, are expected to release the results before the last date for students to drop or withdraw from courses without receiving a DR or W on their transcripts, and within two to three weeks in any case.

The books listed for each area below should be more than sufficient to cover topics that will appear on the exam. It should be emphasized, however, that the exams are intended to test general knowledge and competence rather than any particular set of books or courses.

ALGEBRA

The Algebra Qualifying Exam consists of five problems, all of which are to be attempted. There will be one problem in each of: Group Theory, Ring Theory, Field Theory, and Linear Algebra. The fifth problem usually combines several of these topics. The exam is based on material usually covered in undergraduate abstract algebra, linear algebra, and first year graduate algebra (741-742). (Math 541-542 are prerequisites for 741-742.) A thorough knowledge of most of the items below should be sufficient to pass.

I. Group Theory

Lagrange's theorem. Action of groups on sets. Sylow theorems. Elementary properties of p -groups, nilpotent groups and solvable groups. Symmetric and alternating groups. Elementary properties of infinite groups.

II. Ring Theory

- a) Noncommutative rings--Artinian rings. Wedderburn theorems. Chain conditions for modules. Composition series and the Jordan-Hölder theorem for operator groups. Jacobson radical. Primitive rings and the Density theorem. Zorn's lemma.
- b) Commutative rings--Prime ideals. PID's and UFD's. Noetherian rings, Hilbert Basis theorem and the Lasker-Noether theorem. Algebraic integers and basic properties of Dedekind domains. Modules over PID's and the fundamental theorem of abelian groups. Hilbert Nullstellensatz.

III. Field Theory

Algebraic extensions. Splitting fields. Separability. Galois extensions and the fundamental theorem of Galois theory. Primitive element theorem. Solvable polynomials. Cyclotomic polynomials. Geometric constructions. Algebraic closures. Purely inseparable extensions. Finite division rings.

IV. Linear Algebra

Vector spaces. Linear transformations and matrices. Eigenvalues and eigenvectors. Jordan and rational canonical forms. Bilinear and quadratic forms. Dual spaces. Inner products.

References:

Artin, *Galois Theory*

Hoffman and Kunze, *Linear Algebra*

Isaacs, *Algebra: A Graduate Course* (skip Ch.15 & 25)

Hungerford, *Algebra* (skip Ch.10)

Rotman, *Group Theory* (Ch. 1-8)

ANALYSIS

The Analysis Qualifying Exam involves the tools from a) advanced calculus, b) Math 721, and c) one of the two courses: Math 722 (Complex Analysis) and Math 725 (Real Analysis). Choose one at the time of exam registration. The exam usually consists of nine questions and six are to be attempted. There will be at least two from each of a), b) and c), though some problems may involve tools from more than one area. The content of 721, 722, and 725 certainly varies somewhat from instructor to instructor. Most questions will come from the lists below. Beyond this, there may be questions from time to time involving other basic tools and techniques. Proficiency in **Basic Advanced Calculus** and Basic 721 and one of Basic 722, Basic 725 should suffice in order to pass the exam.

I. **Basic Advanced Calculus**

Infinite series, theorems of Bolzano-Weierstrass and Heine-Borel, uniform continuity, uniform convergence, Weierstrass theorem (density of polynomials in $C[a,b]$), Ascoli's theorem, the Riemann integral, differentiation of series and integrals, the contraction principle, the implicit and inverse function theorems, change of variables in multiple integrals, line and surface integrals, Stokes theorem in 2 or 3 variables.

II. **Basic 721**

Measures, the Lebesgue integral, Lebesgue measure in R^n , notions of convergence (pointwise, almost everywhere, in measure, in mean, ...), the monotone convergence theorem, Fatou's lemma, the Lebesgue dominated convergence theorem, Egorov's theorem, Lusin's theorem, product measures, the theorems of Tonelli and Fubini, Jensen's inequality, L^p spaces, the Riesz representation theorem, density of certain function spaces in others (including approximation by smooth functions), convolutions, differentiation and maximal function. Hilbert spaces, orthogonality, orthonormal sets, Bessel's inequality and Parseval's formula.

III. **Basic 722**

Cauchy-Riemann equations (both homogeneous and inhomogeneous), Cauchy's theorem, Cauchy's formula, the residue theorem, singularities, local behavior, the principle of maximum, Schwarz's lemma, analytic continuation (including the Schwarz reflection principle), Runge's theorem, theorems of Weierstrass and Mittag Leffler, normal families, conformal mapping, harmonic functions.

IV. **Basic 725**

* Banach spaces: linear mappings, linear functionals, dual space, adjoint mapping; Hahn-Banach theorem; Baire category theorem, open mapping, closed graph, and uniform boundedness principles; duality and weak topologies, Alaoglu's theorem; basic operator theory (compact operators, perturbations of invertible operators); calculus in Banach spaces (contraction principle and inverse function theorem); Hilbert spaces and Banach spaces of functions (Hoelder spaces, L^p spaces, $C(K)$ and its dual).

* Fourier transforms: Fourier transform and basic properties on R^d , inversion theorem, and Plancherel's theorem.

* Distributions: basic theory, Sobolev spaces, Sobolev embeddings.

References--see corresponding topics in:

Ahlfors, *Complex Analysis*

Folland, *Real Analysis*

Gamelin, *Complex Analysis*

Royden, *Real Analysis*

Rudin, *Principles of Math. Analysis*

Rudin, *Real and Complex Analysis*

Rudin, *Functional Analysis*

Stein, *Real analysis*

Stein, *Complex analysis*

APPLIED MATHEMATICS

The Applied Mathematics Qualifying Exam consists of six problems, all of which are to be attempted. The exam is based on material usually covered in undergraduate ordinary differential equations, partial differential equations, complex variables, and the first-year graduate sequence in Applied Mathematics (Math 703-704).

I. ODE Theory

Existence and uniqueness for ODE; Linear systems; Solutions of equations and systems with constant coefficients; Variation of parameters; Green's functions for ODE and solution of boundary value problems.

II. Fourier Series and Transform Method; Separation of Variables for PDE

Theory of Fourier Series; Orthogonal functions; Sturm-Liouville theory and connections with Fourier series; Special Fourier bases (Bessel functions, Legendre polynomials); Fourier transforms (Fourier and Fourier sine and Fourier cosine); Laplace transform and solution of initial-boundary value problems for equations; Evaluation of integrals via complex variables techniques.

III. Calculus of Variations

Minimization problems in finite and infinite dimension; Constrained minimization - Lagrange multipliers; Euler-Lagrange equations of an infinite dimensional variational problems (cases of systems of ODE's and systems of PDE's).

IV. Advanced Techniques for Solutions of Partial Differential Equations

Green's functions for elliptic, parabolic and hyperbolic problems; Conformal mapping theorem and solution of 2d Laplace equation; Method of characteristics; Self-similarity methods; Traveling waves; Dispersive waves and dispersion relations.

V. Elements of Analytical and Continuum Mechanics

Balancing laws of continuum physics; Equation of incompressible and compressible fluid mechanics; Potential theory; Modeling of spring-mass systems; Modeling of the vibrating string.

VI. Asymptotic Methods

Regular perturbations; Asymptotics of integrals (Laplace method, Stationary phase).

References

Churchill, *Fourier Series and Boundary Value Problems*
 Gelfand and Fomin B, *Calculus of Variation*
 Kevorkian, *Partial Differential Equations*
 Levinson and Redheffer, *Complex Variables*
 Pinsky B, *Partial Differential Equations and Boundary Value Problems*
 Stakgold, *Green's Functions and Boundary Value Problems*
 Strang, *Introduction to Applied Mathematics*
 Zanderer B, *Partial Differential Equations*

COMPUTATIONAL MATHEMATICS

The Computational Mathematics Qualifying Exam is administrated jointly between the Department of Mathematics and Department of Computer Science. Students from both departments will take the exam at the same time, but students will be given more problems than required to finish in order to fill the gap between different rules of the two departments. The problems for students from the two different departments will be slightly different.

The Mathematics Department students will have six hours to complete the exam; the material is based on Math/CS 714 and Math/CS 715. Math 714 / 715 is based on undergraduate knowledge of numerical analysis, which is covered in Math 513 / 514.

The Computer Science students will have three hours to complete the exam; the material is based on Math/CS 513, 514, 714, 717.

Covered Materials for Math Students

I. Numerical Methods for Ordinary Differential Equations

- Basic ODE Theory: well-posedness
- Explicit and implicit methods, stability, Runge-Kutta and multistep methods, stiff problems

II. Finite Difference Methods for Parabolic Partial Differential Equations

- Numerical differentiations, uniform and nonuniform meshes
- Consistency, stability and convergence
- Multidimensional problems: ADI and fractional step methods

III. Finite Difference Methods for Hyperbolic Partial Differential Equations

- Linear hyperbolic equations and their numerical discretizations
- Basic theory for nonlinear hyperbolic equations: shock formation, weak solution and entropy condition, Riemann problem
- Shock capturing methods: Godnov and Roe methods, slope limiters, flux-splitting
- Hamilton-Jacobi equations and the level set method for front propagation

IV. Spectral Methods for Partial Differential Equations

- Fast Fourier transform
- Fourier spectral method, pseudospectral methods, Chebyshev method

V. Numerical Algebra

- Direct and iterative methods for linear systems, eigenvalue problems, sparse matrices, Conjugate gradient methods, nonlinear algebraic equations

VI. Finite Element Methods For Elliptic Partial Differential Equations

- Variational formulation, Galerkin methods, energy estimate and error analysis, implementation,
- Discontinuous Galerkin, multigrid methods, boundary element method

VII. Monte Carlo Methods and Molecular Dynamics

- MC methods for integrations, random sampling, The Metropolis algorithm, molecular dynamics

References

Basic Numerical Analysis

1. Bradie, *Friendly Introduction to Numerical Analysis*, Prentice Hall, 2003.
2. Burden and Faires, *Numerical Analysis*, Brooks Cole, 2004.

Finite Difference Methods

1. LeVeque, *Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems*, SIAM, 2007.

2. Strikverda, *Finite Difference Schemes and Partial Differential Equations*: 2nd edition, SIAM, 2004.

Spectral Methods

1. Trefethen, *Spectral Methods in MATLAB*, SIAM, 2000.
- 2.. Fornberg, *Practical Guide to Pseudospectral Methods*, Cambridge University Press, 1998.

Finite Volume Methods

1. LeVeque, *Finite Volume Methods for Hyperbolic Problems*, Cambridge University Press, 2002.

Finite Element Methods:

1. Eriksson, Estep, and Hansbo, and C. Johnson, *Computational Differential Equations*: 2nd edition, Cambridge University Press, 1996.
2. Zhangxin Chen, *Finite Element Methods and Their Applications*, Springer, 2005.

Monte Carlo Methods:

1. Kalos and Whitlock, *Monte Carlo Methods*, J. Wiley & Sons, New York, 1986.

GEOMETRY/ TOPOLOGY

To pass the qualifying exam in Geometry / Topology students must choose (at the time they register for the exam) either the algebraic topology option or the differential topology option. Usually, the actual exam consists of six questions: three from basic topology and three from either algebraic topology or differential topology (as appropriate). Students are asked to write solutions to four of them. The exam is based on (a) background material usually covered in advanced calculus, undergraduate topology (e.g. 551) and undergraduate algebra courses (e.g. 541), and (b) topics from the first year graduate topology sequence (751, 752, 761), as identified below. Note that familiarity with basic concepts of point set topology (e.g. metric spaces, completeness, connectedness, and compactness) will be assumed, although these may not be treated in 751, 752, 761.

- I. Basic Topology:** quotient topology and examples such as suspensions, joins, smash products, compactly generated topologies, neighborhood retracts. cell complexes, fundamental group, covering spaces, amalgamated products, finitely presented groups, Seifert-Van Kampen Theorem, elements of knot theory, calculations and applications.
- II. Algebraic Topology:** categories and functors, chain complexes, tensor and exterior products, Hom, Ext, Universal Coefficient Theorem, K\"{o}nneth Theorem, The Eilenberg-Steenrod Axioms and the Mayer-Vietoris Theorem, cellular chain complexes and the homology of CW complexes, computations of the homology of simple spaces such as spheres, surfaces, projective spaces, lens spaces, etc. applications to nonretraction, cup and cap products, duality theorems such as Poincare duality, Lefschetz duality and applications, Euler class and the Lefschetz Fixed-Point Theorem.
- III. Differential Geometry and Topology:** inverse function theorem, local coordinates, induced structures, tangent bundle, regular values, transversality, classical Lie groups, tubular neighborhoods, vector fields and flows, differential forms and de Rham cohomology, integration of forms and Stokes Theorem, relationship to singular homology, de Rham theorem, Riemannian metrics.

References:

Bredon, *Topology and Geometry*
 Guillemin and Pollack, *Differential Topology*
 Hatcher, *Algebraic Topology*
 Vick, *Introduction to Algebraic Topology*
 Spivak, *A Comprehensive Introduction to Differential Geometry, Volume I*

LOGIC

The Logic Qualifying Exam will consist of a *basic* section plus three *advanced* sections, one in Model Theory, one in Computability Theory, and one in Set Theory. Students taking the exam will answer the questions in the basic section plus the questions in *one* of the advanced sections. Students will indicate *beforehand*, when they register for the logic exam, which one of the advanced sections they intend to take.

The elementary section covers material taught in 770, plus undergraduate knowledge. The advanced Model Theory, Computability Theory, and Set Theory sections correspond, roughly, to the contents of 776, 773, and 771, respectively. Thus, two logic courses (770 plus one of 776, 773, 771) should be adequate preparation for the exam.

Students should be prepared to answer questions on the following topics. Since these topics may be presented in different ways from year to year, the student should read broadly from the references to supplement the course work.

I. Elementary

Propositional and first-order logic syntax and semantics, Completeness and Compactness Theorems, Löwenheim-Skolem Theorem, Incompleteness Theorem, decidable and undecidable theories, axioms of ZFC, ordinal and cardinal arithmetic.

References:

Ebbinghaus, Flum and Thomas, *Mathematical Logic* (Chs.1-6 and 10)

Shoenfield, *Mathematical Logic* (Chs.1-6)

Kunen, *Set Theory* (Chs. 1 and 3)

II. Computability Theory

Recursive and r.e. sets, Turing degree and jump, Recursion Theorem, strong reducibilities, arithmetic hierarchy, index sets, simple and (hyper) hypersimple sets, easy forcing arguments in recursion theory, finite and infinite injury, Friedberg-Muchnik and Sacks Splitting Theorem, Sacks Jump and Sacks Density Theorems, recursive ordinals.

References:

Soare, *Recursively Enumerable Sets and Degrees* (Chs.1-8)

Rogers, *Theory of Recursive Functions and Effective Computability* (Ch.11)

III. Set Theory

Martin's Axiom, Suslin and Aronszajn trees, absoluteness and reflection, constructible universe, and one-step forcing constructions.

References:

Kunen, *Set Theory* (Chs.1-7)

Jech, *Set Theory* (Chs. 1-4)

IV. Model Theory

Elimination of quantifiers, types, recursive saturation, elementary chains and extensions, ultraproducts, saturated and special models, model completeness, categoricity in power, indiscernibles, o-minimal theories.

References:

Chang and Keisler, *Model Theory* (Chs.1-3, 4.1, 4.3, 5.1, 6.1.1-2, 7.1)

Marker, *Model Theory, An Introduction*

Study Strategies

Previous qualifying exam survivors have identified these invaluable strategies to help you prepare for the exams:

- (i) **Access old exams at** <http://math.library.wisc.edu/reserve/qualifying-exams.html> and at <http://www.math.wisc.edu/~miller/old/qual>. You can also check out a copy of the old exams from the library. These can give you a good idea of the types of questions you're likely to see, help you review the content, and get a feel for the structure of the exams. There are multiple copies of the exam books in the library. Be sure to check through them carefully, since some of them are missing an exam or two (or their solutions).
- (ii) **Form a study group with other students who are preparing for the same exam.** By working with other students on old exams, homework problems, and general concepts, you will strengthen your understanding and preparation for the exam.
- (iii) **Talk with graduate students who have passed the exam in that area.** They can provide you with valuable hints and insights, and might even offer to answer questions you have as you study.
- (iv) **Ask faculty questions.** While there are fewer people around the department in the summer and over winter break, there are professors around, and you may find many of them helpful as you're studying. Don't hesitate to ask! You have nothing to lose.

Exam Tips

In addition, here are some specific tips for each of the exams. While some of these "facts" are subject to change, they do reflect patterns in the exams over the past few years, so use them as guidelines.

Algebra The exam is generally five questions, with at least one problem in each of groups, rings, linear algebra, and Galois theory (the fifth question is a combination of these four). Groups, rings, and Galois theory are covered in the first year courses (741-742), but linear algebra is not. If you need more work in linear algebra, consider taking Math 542, which will help fill in the necessary background.

Analysis The exam is based on 721 (real analysis) and your choice of 722 (complex) or 725 (functional analysis). There are usually nine problems, three based on introductory analysis / advanced calculus courses (such as 521/522), three on a first real analysis course (such as 721) and three on (your choice of) 722 (complex analysis) and 725 (second course in real analysis). You will be asked to solve six problems.

Applied Mathematics The number of questions varies from exam to exam, but you usually will have some choice of questions to answer--be sure to read the directions carefully. A good background in complex analysis can be a big help. If your background in this area is weak, you will need to do some extra reading, or consider taking Math 623.

Computational Mathematics The exam is based on Math/CS 714 and 715. There are usually five to six problems. Previous exams could be of help in knowing the type of problems being tested.

Logic The elementary section of the exam is based on 770 (foundations) and the second section is based on one of 771 (set theory), 773 (recursion theory), and 776 (model theory). Each section contains three questions, of which you must choose two. The exam is generally quite consistent, but as with all quals, varies slightly depending on who taught the first-year courses.

Geometry / Topology You will choose either the algebraic topology option (751-752) or the differential topology option (751-761). Each option will have three questions from 751 and three questions from the other course (752 or 761) and you will be asked to do two questions from each part. It is common for exam questions to come from the previous semesters' homework problems, as well as recent exams.

Dissertation Advisor

Your dissertation advisor plays a very important role in the later part of your graduate program. Your advisor will determine the form and content of your Specialty Exam, will direct the work of your dissertation, and (along with your dissertation committee), will determine the amount of work required for your dissertation. It is therefore important to find an advisor with whom you can work productively over a long time--this is the most important relationship in your professional life!

You should start identifying a general area you'd like to work in, probably by the end of your second year. As you look for a dissertation advisor, we recommend that you think about the questions on the list below. For many of these questions, there is neither a "right" nor a "wrong" approach. Rather, there are some characteristics of an advisor that will work better for some students than others, depending on the students' work style, interests, and needs. To explore these things, you might speak with faculty and with other graduate students. Look up the advisor's work in the library. Talk with him/her in detail. Ask around a lot--the more you learn, the more likely you are to find an advisor who you can enjoy working with. Some things to think about:

- (i) What is the advisor's work style? For example, some advisors provide a lot of structure for their students, or are very involved in their student's work, while others offer you independence and have a hands-off approach.
- (ii) How many students does the advisor have? What other commitments does she or he have? How much time does he or she have available to spend with students?
- (iii) How long has it taken the advisor's former students to finish? Enough said here.
- (iv) How active is the advisor's research program? How does his/her interests match with your own? If the problem you start working on doesn't go as planned, will the advisor be able to help you re-direct your work, or to find alternatives?
- (v) What type of Specialty Exam does the advisor require? The exam is typically oral, although the specific format is up to your advisor. Check with your advisor well in advance, so you'll know what will be expected of you.
- (vi) Attend lots of classes/ seminars with professor of interest, see if you like them...can you understand what they are teaching? Do you like how they teach?
- (vii) Keep in mind that your advisor has a big influence on your experience in grad school and afterward.
- (viii) Students can approach a potential advisor and ask to do a reading course with them to see how both (professor and student) interact.

★ **Once you have chosen an advisor or if you EVER change advisors, inform the Graduate Program Administrator. ★**

Major Milestones in your Graduate Program

& required forms obtained and submitted to the Graduate Program Administrator

Master's Degree

- Time Limit: should finish in two years, but can not be more than three
- Submit a Master's of Arts Degree Form and a Master's Degree Warrant Request to Graduate Program Administrator (214 VV) at the beginning of semester that you plan on finishing the requirements.
- The Master's Degree Warrant Request eventually goes to the Graduate School to issue a warrant but the Graduate Program Administrator sends it there, not the student. (A warrant is a form, in which to get the necessary signatures of your advisor and Graduate Studies Coordinator, to indicate to the Graduate School that this is official that you did indeed finish the degree requirements.)

PhD Degree

Passing the Qualls

- Pass at least one qual by the beginning of your fourth semester
- Pass at least two quals by the beginning of your sixth semester

Dissertator Status

- A student must have a dissertation advisor by the end of the sixth semester.
- Requirements needed to obtain dissertator status:
 - _____ Pass 2 qualifying exams
 - _____ Minor coursework completed or will be completed by end of semester
 - _____ Have no incompletes (I), unreported (NR) or progress (P) grades on your transcript
 - _____ Pass a specialty exam
 - _____ 54 credits completed (including approved transfer credit (see below))
 - _____ Have at least a 3.3 cumulative grade point average
- Submit a PhD Minor Agreement Form and a Request for Preliminary Warrant Form to the Graduate Program Administrator, (214 VV) **FOUR WEEKS** before you plan on taking your specialty exam. You need to know the date of the exam. The date should be four weeks or more after you submit these forms.
- If you have graduate work from another university that you would like transferred, take a Transfer Credit Form, copy of transcript from that university, and a course description (from that university) to the Graduate Studies Coordinator to have the work approved. Submit this form with the two forms above.
- Once the Warrant comes back from the Graduate School – you need to take it and the Specialty Examination Report Form to the exam. If you pass, have the members of the committee sign the warrant and your advisor verify you took the exam and passed. Turn in both forms to the Graduate Program Administrator immediately after the exam. The dissertator status will be approved to begin the semester following the semester in which you filed the warrant. The only exception to this is if the warrant is submitted after the Graduate School's final semester deadline. Be sure to ask!

Graduating

Master's

- ☑ Advise the Graduate Program Administrator of your plan to graduate at the **BEGINNING** of the semester in which you plan to do so.
- ☑ Inform Graduate Program Administrator if you plan on walking in Graduation ceremony.
- ☑ Respond promptly to email requests for information from Graduate Program Administrator during last semester.
- ☑ Submit the Master's Degree Warrant Request Form (this is the warrant request form) and the Master of Arts Degree Form to the Graduate Program Administrator (214 VV) at least **TWO MONTHS** before the end of semester.
- ☑ Fill out a Master's Record form and give to the Graduate Program Administrator, 214 VV.

PhD

- ☑ Advise the Graduate Program Administrator of your plan to graduate at the **BEGINNING** of the semester in which you plan to do so. If you plan on graduating in the summer, notify the Administrator by at least midway through the Spring Semester.
- ☑ File the PhD Final Oral Committee Approval Form (this is the warrant request form) with the Graduate Program Administrator (214 VV) at least **FOUR WEEKS** before the date of your defense.
- ☑ Inform Graduate Program Administrator if you plan on 'walking' in ceremony and who will escort you.
- ☑ Respond promptly to email requests for information from Graduate Program Administrator during last semester.
- ☑ Once the warrant comes back, you will receive a packet of information that you must follow in order to deposit your thesis with the Graduate School.*
- ☑ Fill out a PhD Record Form and give to the Graduate Program Administrator, 214 VV.
- ☑ Once you defend your thesis, have all the committee members sign your warrant, follow the directions in the packet and take your warrant to the Graduate School during your thesis appointment.
- ☑ * Be careful when you submit (this is called "to deposit") your thesis to the Graduate School. If you submit it too early, you won't be able to teach during the semester. Once you submit the thesis, you are considered done with your program and are no longer considered a graduate student in the eyes of the graduate school. Not being a student = no teaching = no income/insurance.
- ☑ If for some reason you need to postpone graduation, you'll need to talk to the Graduate Program Administrator about any potential implications.

Leaving the University

If you decide to leave the university or cease to be a Math Dept graduate student for any reason (except temporarily during the summers), do the following before you leave:

- ☑ Inform Graduate Program Administrator, (214 VV) that you are leaving.
- ☑ Fill out the Departure Checklist and return to the Chair's Assistant, 218 VV.
- ☑ If you are an international student, inform International Student Services Office of your intent.
- ☑ Talk to the Payroll Manager (207 VV) to discuss health insurance continuation and the costs.
- ☑ Inform Receptionist that you are leaving & give forwarding address.
- ☑ Return any borrowed textbooks to the Receptionist, 213 VV. Failure to return textbooks could result in a hold on your student records.
- ☑ Return any library books to the library.
- ☑ Clean your desk (inside and out), clean ALL the surfaces of the desk with a chemical spray and cloth, and clean your office area. Inform the Chair's Assistant when you are planning to vacate from your office.
- ☑ Do not leave anything in your office, on the desk, or in the hallway that you do not want! Please dispose of it yourself.
- ☑ Return your keys to the Chair's Assistant. Failure to return keys could result in a hold on your student records. This would make it difficult for you to request transcripts or degree certifications.
- ☑ You will have your math email account until September of the year you graduate. Contact the Computer Administrator to make arrangements to set up a forwarding account so your old math email will go to the new email address.

II. You as an Employee

Jobs in the Department Most math graduate students work as teaching assistants for some or all of their time at the UW. This section contains information about being a TA and the types of jobs available in the math department. Here you'll also find information about the TAA, the union of TAs and PAs (Project Assistants) at the UW.

Responsibilities

General Many TAs in the math department, and virtually all first-time TAs, work in conjunction with a faculty member, teaching in a lecture-discussion format. Generally the faculty member will lecture to a large class (often over 200 students), while TAs meet with their students in small groups (less than 25). The basic duties of a TA include answering students' questions, giving quizzes, collecting and grading homework, and holding office hours to answer questions and provide general assistance. If you teach in a lecture-discussion format, your job also includes going to the lecture. While this might seem like a waste of your time, it's important for you as a TA to know what went on in lecture so you can anticipate and better answer students' questions. Also, many of your students will take the opportunity before and after lecture to come and ask you questions. Many TAs will use this time to grade or prepare their sections while listening to the lecture.

As a TA you will usually have a lot of flexibility in terms of how you want to run your classes. Find things that work for you and your students--whether it's working problems at the board, having students work and discuss problems, or something else. Many graduate students in the department are willing, even eager, to talk about ways they've run their classes, and some will gladly let you visit their class for inspiration. It's important that you foster an atmosphere where the students feel safe to ask questions and participate, without making them totally dependent on your assistance.

Finally, remember that for the most part, your students won't be like you. Most of them are not intending to major in math, and many of them are afraid of it. Keep in mind that things that may have seemed easy for you will be anything but easy for them. Some students will be afraid of you, or will feel intimidated to ask questions, so try to make an effort to dispel these fears.

Some Teaching Assistant Duties

Each TA gets instructions applying to his/her specific teaching situation from the faculty supervisor in charge of his/her courses. These details vary considerably from course to course and from faculty member to faculty member. Grading policies, use of homework, and division of work between lectures and discussions are leading examples of this class of items.

Math Department TAs are understood to have intelligence, judgment and experience of how mathematics is taught and they are expected to use those qualities in their work. Most of the time, these native qualities will suffice to produce the necessary answers, and where there is any doubt, TAs should consult their supervisor or coordinator. The matters covered here are not these specific but issues which are common to all Math Department TAs.

1. All TAs, except first year TAs, those teaching Math 113, 210 and WES sections, are required to participate in the Math Lab for six (6) hours during the semester. Information concerning the Math Lab will be forthcoming at the beginning of the semester.
2. TAs are expected to keep a record of their students' grades on the grade sheet issued to them; to keep this record available for their supervisor or department chair on request; and to file the grade sheet (and final exams) in room 205 VV at the end of the semester. The Receptionist has the grade sheets in 213 VV.

3. TAs are to keep an up-to-date roster of students attending their sections. The rosters are available online at my.wisc.edu.
4. For TAs in lecture - discussion courses (Math 114, 171, 210, 211, 221, 222, 234, 275, 276, 375, 376, 319, 320, 321, 340) the supervisor is the appropriate lecturer in the course. For TAs and FAs (Faculty Associates) teaching Math 112, the supervisor is Joel Robbin. For TAs teaching Math 113, the supervisor is Jean-Pierre Rosay. See <http://www.math.wisc.edu/~trgcoord/>.
5. TAs can borrow a copy of the text for their course and should return it at the end of the semester. See the Receptionist (213 VV) to check out books.
6. A number of facilities--building keys and passes, office space, use of the copy room, telephones (but not for long distance calls)--are made available to TAs while they are engaged in teaching, but these do not carry over after teaching stops. Consumable items, such as copy room supplies, are for use only in connection with a TA's teaching assignment.
7. Each TA is expected to keep scheduled and announced office hours each week (see [*Mathematics TA Workloads schedule*](#)), to meet the needs of most students and to be prepared to make reasonable efforts to see a student who can not make the scheduled office hours. Note that scheduled office hours can be used for preparation, grading, etc. if students do not fill the time.

Appointments

Most graduate students in the math department have a guarantee of four or five years of financial support, provided they pass the initial semester-long probationary period. Typically graduate students who are making significant progress toward the PhD can get support in the sixth or even seventh year, at least in the fall semester. In the spring, there are far fewer teaching positions and the graduate students who have guaranteed support may fill all of them. If you have finished your guaranteed support period and there are not enough positions to go around, priority will be given based on (a) teaching performance, judged by student evaluations, (b) your academic progress, as viewed by your advisor, and (c) how long you have been a graduate student in the department, with preference to those who have been here a shorter time.

Appointments (teaching assignments) for the fall semester are generally made in August, and those for the spring semester are made in December. Within the first weeks of the semester, you should receive a formal letter of appointment describing your exact TA appointment, the amount you will be paid, and other relevant information. Check this letter to make sure it fits with your expectations. The acceptance form must be signed and returned to the department.

Teaching Opportunities

TAs and PAs are paid based on the number of hours they are expected to work. Many jobs in the math department are 50% appointments, which translates to 20 hours per week over the 18 week semester. Other appointments are determined proportionally. A chart detailing workload expectations for the various appointments appears on page 35.

There are a wide variety of teaching assignments open to graduate students, especially after you have a couple of years of experience and good teaching evaluations. Some of these jobs are quite competitive, so it pays to find out who hires for each job and express interest early and often. For many but not all positions, announcements come out via email or via flyers in your mailbox. Here is a description of the positions generally available for TAs to teach. There are so many variables that we have broken the description into three dimensions: courses, special programs, and special assignments. (Updated descriptions will be available at <http://www.math.wisc.edu/~tacoord/TApositions.htm>)

Courses

Undergraduates place into math courses based primarily on a placement test given by the UW system. In this description, “class” generally refers to a section of 20 - 25 students while “lecture” implies an enrollment of 80 - 250. Unless otherwise noted, what is called a “typical” TA assignment corresponds to a 50% appointment. Approximately in order of increasing performance on placement tests the beginning courses are:

Math 095

This is viewed by the campus as “remedial”: Any student who is accepted as a student at UW-Madison should have learned this material long ago. It is arithmetic and algebra, roughly 7th - 9th grade mathematics. It is taught in classes that meet three hours per week. It counts as three credits toward a student’s load but does not count toward graduation. This course is not normally taught by TAs but has been occasionally.

Math 101

Intermediate Algebra, for students who did not do too well or do not remember what they had in high school algebra classes. Classes meet three hours per week. A typical TA assignment would be two such classes.

Math 112

College Algebra, viewed (along with trigonometry) as essential material for success in calculus. Some students, however, are not calculus-bound but are taking this course to meet a requirement for their major. Three class hours per week. A typical TA assignment is two classes: This is a 56% appointment and so may conflict with some TA’s visa restrictions.

Math 113

Trigonometry, classes meeting two hours per week. Again primarily viewed as preparation for calculus, but some students are taking the course to meet other requirements. Typical assignment: Three sections.

Math 114

Essentially a combination of 112 and 113, for students whose placement scores indicate they need this material to succeed in calculus but are at the high end of that group and can absorb it in a different format. The students attend a lecture, taught by faculty, three hours a week and discussion classes, taught by a TA, two hours a week. The typical TA assignment is two discussion sections: TA attends the lecture and teaches one group of students twice a week at one time and another group twice a week at another time.

Math 171 & Math 217

This course is for those who just miss placing directly into calculus. They are somewhat weak on their algebra and trigonometry skills. In the two semesters (171 in fall, 217 in spring) they will reach the same level as those who have taken the mainstream calculus course 221, with algebra and trigonometry material brought in where it is needed during the course. A student finishing 217 would proceed to 222. The format is lecture/discussion, like 114.

Math 221

This is the main entry point into the calculus sequence, for students who enter with good preparation or take pre-calculus courses to prepare them. Traditionally it has emphasized the physical sciences in its examples, but it is taken by all students going on in mathematics or science and it has evolved to include more connections to biological and social sciences. The material is differential and integral calculus of functions of a single variable. The format is lecture/discussion, like 114.

Math 210

Math 210, 211, 213 are a separate set of courses, not in the main sequence based on 221 and 222. Math 210 requires preparation almost equivalent to 221 but without demanding trigonometry. The topics in 210 include elementary set counting and probability, some matrix calculations and Markov processes, and mathematics of finance. Math 210 students meet in a lecture three hours per week but only one hour in a discussion class. The typical TA assignment is four discussion sections.

Math 211

Calculus for students not in the traditional sciences. The preparation required is the same as for 221. In one semester this gives a very broad but not deep treatment of calculus. While 221 will have done differential and integral calculus of one variable with a few applications, 211 will include some multi-variable material. The examples will be more oriented toward the social sciences. The format is lecture / discussion, like 114.

Math 213

This is a second semester of calculus for students who have had 211 (or a similar course elsewhere) as their first semester rather than a more traditional science-oriented calculus course like 221. It is taught with one discussion per week, like 210.

Math 222

Math 222 is the second semester in the main sequence for students in the sciences or mathematics. It assumes the background provided by 221. The material covered includes techniques of integration, infinite sequences and series, introductory differential equations, analytic geometry, and vector algebra and geometry in the plane and 3-space. The format is the same as for 114.

Math 234

This is the third and last semester in the standard sequence. Assuming the material from 221 and 222, it does calculus for functions of several variables and some vector calculus. It is required for most upper level math courses. It is taught in the same format as 210.

Math 275, 276, 375, 376

Registration in this honors calculus sequence requires special permission from the department. The sequence covers essentially the same material as Math 221, Math 222, Math 234, Math 319, and Math 340, but with much more emphasis on understanding mathematical ideas, and less emphasis on computation. For more information contact one of the department's Honors advisors, Dr. Gloria Mari-Beffa (maribeff@math.wisc.edu) or Dr. Alex Nagel (nagel@math.wisc.edu).

Math 319, 320, 321, 340

These are courses in differential equations, linear algebra, applied vector calculus and complex variables. These courses are sometimes taught with TA discussion sections.

Special Programs

There are several special programs that cut across the course distinctions:

WES

The Wisconsin Emerging Scholars program selects students who seem mathematically able but who might not succeed in math courses for some other reason such as cultural expectations. A WES section in 221, for example, would take part in the same lecture as other 221 sections but in addition would have a class meeting more hours per week and emphasize students working in groups to solve problems. Details vary according to what course the WES section is a part of. The WES director is Shirin Malekpour, malekpou@math.wisc.edu.

Residence Halls Sections

In several courses there will be sections designated for, and mostly populated by, students from a particular dormitory floor or other residence grouping. The students are expected to form study groups in their residential setting. In some cases the residence hall has a classroom which could be used for some or all meetings of the discussion section. The TA may also choose to hold some office hours in the residence hall. A res-hall section is just like any other section so far as the typical assignment goes.

FIG/SCI

UW-Madison is making a special effort to offer more small classes and special sections for beginning students. First-year Interest Group (FIG) and Small Class Initiative (SCI) sections can be organized by faculty within almost any course.

Other

A few sections have some space within them reserved for special groups, such as the Academic Advancement Program, but are not entirely devoted to that group. If you are interested in working with particular student groups, this may offer you the opportunity.

Special Assignments

In addition to the multitude of courses and special sections, sometimes a TA has a special assignment in an otherwise typical class.

Calculus Coordinators

A calculus coordinator is a mentor to a group of new TAs. The standard assignment for a new TA is to teach two sections of Math 221 or 222. They will be assigned to the same lecture as an experienced TA. The coordinator will take part in pre-semester training of new TAs, will mentor the new TAs as the semester proceeds, provide additional informal training, and will assist the lecturer in operation of the course. A calculus coordinator will typically teach two classes of his/her own, and is paid an additional 8% for mentoring. Since there are significant numbers of new TAs only in the fall semester, these positions only exist then.

Algebra Coordinators

In some semesters a TA will be hired to assist the faculty member in charge of Math 101 or Math 112. Duties include organizing exams and other course activities. The TA typically teaches one section but gets paid as if he/she were teaching two.

Workload

The chart on page 35 shows the amount of time you are expected to put into various aspects of your job. In a given assignment the time spent on one task might be increased if another were decreased. A 50% TA is being paid for 360 hours in the semester. It is a good idea to keep track of your hours. TAA stewards can provide a calendar for this purpose. If you find you cannot do what is asked of you within the allotted hours, talk to your supervisor. If you think the chart needs revision, talk to your supervisor and to a TAA steward. You might also want to be part of the Committee on TA Policies and Procedures (CTAPP), the department committee responsible for workload issues.

Resources

McBurney Center The McBurney Disability Resource Center is, as its name implies, a center on campus that works with students with a wide range of disabilities, including learning disabilities. Chances are good that at some point one of your students will use McBurney's resources. They have established practices for accommodating students with a wide range of disabilities, most of which do not entail any extra work for you as a TA. If you have any concerns or questions about accommodating students with any sort of disability, call the center at 263-2741.

TA Resource Website There is a comprehensive website available to Math Dept TAs. It has details about everything you would need to know about being a TA in the Math Dept. It was created by a fellow current Math graduate student, Zaji Daugherty. Check it out: <http://www.math.wisc.edu/~daughert/TAsite/>

Administrative Details

Audio-Visual Equipment Sign-up sheets for reserving these can be found just inside the door to the reception office. You can sign up to reserve the relevant piece of equipment, and if necessary get a key to the storage area from the Chair's Assistant in room 218. TV-VCR is located in B128, get the key from room 218.

Overhead projectors (the old fashioned kind) are in room 213, get from the Receptionist. LCD computer projectors are reserved and retrieved from the Math Library, room B224.

Copying All Math Department employees have access to the department's Copy Center, located in room 215. To have something photocopied, fill out the request form available just inside the room. Be sure to give the folks in the Copy Center enough time to make your copies; generally 24 hours is sufficient. For a small job they might be able to do it with in a couple of hours. Larger jobs take longer, especially at busy times such as the beginning, middle, and end of the semester. There is also a copy machine in room 205 available for departmental use. To operate this machine you will need a code, available from the Receptionist in room 213. TAs can make up to 200 copies on this machine per month before being charged. You do not want to make all of your class copies on this machine as your 200 copy limit will max out very fast.

Math Library During the academic year, the library (B224 Van Vleck) is open Monday - Thursday 8:30 a.m. - 8:30 p.m.; Friday 8:30 a.m. - 5:00 p.m.; Sunday 3:00 p.m. - 7:00 p.m. Intersession and summer hours are Monday - Friday 8:30 a.m. - 5:00 p.m.

Printing Policy Each user is allowed 250 free pages per month (each side of a double-sided sheet is counted as one page). Beyond that, they are charged 5 cents per page truncated to the nearest whole dollar. A bill is sent via email on the first of each month to those people who have incurred charges. Pay the Department Administrator that amount.

Reserving Rooms You can reserve classrooms for review sessions, makeup exams, or any other purpose. Forms for reserving classrooms are available on the counter by room 213 (the main reception window on the second floor). You should fill out the form at least 48 hours in advance. If you want a room for a regularly occurring event or if you need a very large room, you should reserve it as early in the semester as possible. You can also reserve the conference room (307) or the seminar rooms (901 and 903) directly through the Receptionist. Room 901 has a built-in LCD computer projector and is larger. This room is locked at 3:30pm daily but the key is available in the Library.

Textbooks and solution manuals for classes you teach are available to *borrow* from the Receptionist in room 213. Calculators, office keys and after hours passes are available from the Chair's Assistant in room 218.

Evaluations

TAs are evaluated once per semester in two ways. Students are given the opportunity to fill out TA evaluation forms towards the end of the semester. Faculty also fill out evaluation forms for the TAs they supervise. Student evaluation forms are sent to be computer analyzed. Both sets of evaluations are read by two members of the TA Evaluation Committee. A rating is assigned by the committee based on the numerical computer generated scores and comments of students and faculty.

TAs will receive the results at the end of the semester after the grades have been posted online and exams have been filed.

The Graduate Administrator will send an email informing TAs when TA evaluations will be done. Follow the instructions given and be aware of deadlines! If evaluations are not returned on time, this creates problems for all the TAs to get their results back on time. The process is time consuming, labor intensive and any delay at any point could result in the process not being completed by the end of the semester.

Payroll & Benefits

The Payroll & Benefits Manager (207 VV) is in charge of benefits. Talk to the Manager if you have any questions about your salary payment or benefits. Some benefits you should especially be aware of are:

Health Insurance Graduate employees have a choice of several HMOs in the Dane County area as well as a Standard Plan (allows you to see any doctor of your choice, etc.) The insurance does include some limited dental coverage (See Group Health Insurance Plans & Provisions furnished to you upon arrival and every October.) There is a fee charged to everyone which is set by the State of Wisconsin. NOTE: Plans change their rates every year and your cost could change yearly. It is possible to change plans each year in October. It is always good to check your plan each year to see if coverage has changed. The amount you pay is part of your Teaching Assistant Contract if you are a TA. For more information, see: <http://www.bussvc.wisc.edu/ecbs/benefits/newemp-introduction-G.html>

Tuition Waiver Any TA, PA, or RA (research assistant) with an appointment of 33.33% or greater is entitled to have their tuition waived. Thus, if you're employed by the department, you should only have to pay segregated fees, which amount to around \$500 per semester for full-time non-dissertators and \$250 per semester for dissertators. (It depends on the number of credits you take.) See http://registrar.wisc.edu/students/fees_tuition/segfees2.php for details.

Direct Deposit Your paycheck will be automatically deposited into your bank account. The Payroll Manager has the form you need to fill out to set this up. You'll need a deposit slip or canceled check from the account you want your paycheck to go into. It takes a few weeks to get it set up.

September Loan Your first paycheck will be October 1. First-time TAs can get an advance of part of this amount; check with the Payroll Manager for more information. Note, however, that this advance is only available to people starting their very first appointment at the UW.

Sick Leave The contract with the university gives TAs sick leave of six days per semester, which accumulates but is not more than 12 days per year. If you need to miss teaching your section(s) because of illness or injury (yours or someone in your immediate family), you can choose to use this sick leave. Ordinarily, especially for short illnesses, instead of taking sick leave people will simply find an unpaid substitute which is acceptable to the Course Supervisor (i.e. lecturer) and Prof. Gong or fulfill duties at a different time or by other means which are acceptable to the teaching supervisor.

However, you should be aware that the option of taking sick leave exists. If you need to take sick leave which cannot be arranged in advance, call Sharon Paulson (263-3054) AND contact the TA Supervisor, Xianghong Gong, (262-3545, gong@math.wisc.edu) as soon as possible. Taking sick leave does not require you to find a substitute. However, you should notify Prof. Gong as soon as possible and provide assistance to identify a substitute.

Missing Classes If you need to miss classes due to a reason other than sick leave (e.g. attending a conference), you need to provide your *Course Supervisor AND Prof. Gong* with a class coverage plan. Cancelling classes is not acceptable.

Other Benefits The TAA (union) contract gives students other financial benefits which are rarely taken advantage of by graduate students but are definitely available to those who want them. They include Employee Reimbursement Accounts (also called Flex or Medical Spending accounts), retirement savings accounts, life insurance, accidental death & dismemberment insurance, and Wisconsin Deferred Compensation. If you are interested in them, see <http://benefits.wisc.edu/grads> and the Math Dept's Payroll Manager for details.

TA Training

Course Coordinator As new TAs in the math department, you will be assigned to an experienced TA who serves as your coordinator and mentor during your first semester. Make as much use of your coordinator as you can: observe their classes and ask them to observe yours. This is a good, early opportunity to get feedback on your teaching from people who know the ropes.

Diversity Training For TAs to move from the *regular* to the *experienced* pay rate, they must have taught for one and two-thirds semesters, and they must complete the employer's diversity training. For new TAs, departments may continue to permit a "grace period" for individuals who have the requisite prior teaching experience. Information about this diversity training will be available early each semester from the Payroll Manager or look at this website: http://www.oed.wisc.edu/workshop_sched.html

L&S Training Each fall semester, the College of Letters and Science operates a one-day training session which is open to all TAs, new and experienced, in the College. (This includes the Math Department.) The training includes a number of sessions run by experienced TAs, and gives you a chance to learn from some of the best TAs on campus. Usually one or two of them are from the Math Department. The L&S TA Training usually takes place on the Thursday of Welcome Week. Attendance is **MANDATORY** for all students who will be a TA for the first time.

Summer Teaching There are a few opportunities to teach during the summer session; the emphasis here is on few. These jobs are generally given to people later in their grad school career (after the third or fourth year was once the most common time). Information about these jobs is generally made available sometime in April by the Summer Chair.

Other Jobs in the Department

Grading Many undergraduate courses hire graders. If you'd like to apply for a job as a grader, fill out the form available in the wall rack outside room 218 VV and return it to the Payroll Manager (207 VV).

(Informal) Tutoring The Math Department maintains a list of graduate students who tutor. You decide how much you want to charge. Some students make a lot of extra money this way. You should receive a form during the first couple weeks of the semester which can get you put on the list. (ask the Receptionist for details.)

Math Tutorial Program The Tutorial Program is a support program for students enrolled in courses up through Calculus. Students who participate attend regularly scheduled tutorial sessions led by TA instructors and academic staff. These jobs are supervised by David Camacho (camacho@math.wisc.edu). Talk to him for more information about working for this program.

Placement The department hires one graduate student to coordinate placement of undergraduate students into the appropriate courses. This involves working at summer orientation (SOAR) to help place incoming freshmen into appropriate math courses as well as doing similar advising during the year. During the year, it's a 22.11% PA position, usually added to a 33% TA position (for example, one section of Math 221).

Other Sources of Funding

Campus jobs outside the department It is possible for math graduate students to work for other departments. Jobs outside the department can be hard to find out about, but some TA and PA jobs are advertised on the web at <http://jobcenter.wisc.edu/>. The union contract requires any department which expects to hire students other than its own to advertise their jobs on this web site. There are also some listings on the Graduate Student Collaborative website: <http://www.grad.wisc.edu/gsc/gradconnections.html>.

Fellowships and RAs Some fellowships and RA positions are available for students in the department. These can be tricky to find out about. Your best bet is to talk to your advisor or to Ken Ono, the Graduate Studies Coordinator. You can also check the resources available at the Office of Fellowships and Funding Resources, <http://www.creeca.wisc.edu/funding.html>.

TAA (Teaching Assistants' Association)

What is it? The TAA is the union of graduate employees at UW-Madison. It represents all TAs and PAs (Project Assistants) on campus. As your representative in the collective bargaining agreement, the TAA bargains the contract which sets the terms of your employment.

Contract You should receive a copy of the current contract before the start of the semester. The contract is important: it details both your rights and your responsibilities as an employee. Read your contract!

Membership Membership in the TAA is open to all graduate students, even if you aren't a TA or a PA. To become a member, sign a membership card, available from union stewards or the TAA office. Members of the TAA pay 1.5% of their salaries in union dues; non-member TAs and PAs pay the same amount as a Maintenance of Membership fee, because the union contract and grievance procedure are open to all employees, regardless of membership status. If you aren't a TA or a PA, then your membership will cost \$7.50 per month. Members of the TAA have the right to attend and vote at membership meetings, and have the final say on approval of the contract.

Contact information for the Math Department's steward representation in the TAA can be obtained from the TAA. These representatives change each year.

Math Dept stewards can answer any questions you have about the union and its activities, give you a membership card or other union literature, and are good people to talk to if you have any potential job-related conflicts. If the Math Dept's stewards aren't available go directly to the TAA. The TAA office, at 254 W. Gilman (corner of State and Gilman), can be reached at 256-4375 or taa@taa-madison.org. Their website is www.taa-madison.org/

III. You as a Person

As a graduate student, it's sometimes easy to get so caught up in school that you can forget that there is life outside of school. This chapter is intended to remind you to maintain some balance between your personal and professional lives, and to give you some pointers for getting settled into Madison. It also provides information about some important resources.

[Madison](#) might not be a large city, but it has a lot of things to do and see. There are cultural events on campus and at the [Overture Center](#); sporting events; art, science, natural history, and history museums; parks, the [arboretum](#), and [botanical gardens](#); a free [zoo](#); hiking, biking, and cross-country skiing; a [Farmer's Market](#) on the Capital Square every Saturday morning from April-October; and [lots of other things](#). How can you find out about these activities? One good place to start is pick up a copy of Madison's free weekly newspaper, [the Isthmus](#), which is available in many stores, in campus buildings, and on street corners.

If you have any questions about life on campus or in Madison, another great place to start is the [Visitor & Information Programs office](#) (VIP), located in the Red Gym, near [Memorial Union](#). They are open M - F 8am - 5pm and Saturday 11am - 2pm. Their [Student Orientation Handbook](#) is a valuable resource for information including entertainment, recreational and varsity sports, student organizations (including those for cultural groups, international students, LGBT students, women, veterans, and people with disabilities), health services, jobs, transportation, safety, and housing. It's also a great place for referrals to counseling services, including drug and alcohol and sexual assault issues. You can find all this information on the web, at <http://www.wisc.edu/visitingCampus/> or call them at 263-2400. You can also email any questions you have to askbucky@uwmad.wisc.edu

Counseling Services Counseling services are available through Counseling and Consultation Services (C&CS), located at 115 North Orchard Street, (265-5600, TTY number 265-3300). C&CS offers brief psychological treatment, personal counseling, and psychiatric services to UW-Madison students. Frequent services include help in overcoming depression, managing anxiety and other psychological issues, and in developing greater self-awareness, independence, and self-direction. They also provide personal problem counseling, couples relationship counseling, marriage and family counseling, cross-cultural counseling, and alcohol and drug assessment and referral. Specialized groups have included: graduate women support, women and self-esteem, interpersonal relationships, stress management, survivors of troubled families, rebuilding relationships. C&CS also provides crisis response at the above phone numbers. Services provided are covered by the student health fee (included in your student fees). <http://www.uhs.wisc.edu/ex/counseling>

Graduate Student Collaborative (GSC)

The GSC was started in 1998. Generally speaking, the Council will deal with any concerns related to graduate students at UW, including dispersing travel grants for attending conferences, holding grant writing seminars, providing information about the job application and interview process, and organizing social events. For more details, check out their web page: <http://info.gradsch.wisc.edu/education/gsc/index.html>. A great reference is the [Graduate Student Handbook](#) (<http://info.gradsch.wisc.edu/education/gsc/gradguide/index.html>) for everything that has to do with graduate students.

Housing Resources for housing are available in local newspapers and on [craigslist](#). [Start Renting](#) is a free magazine that you can pick up at many street corners. It lists apartments by region and by price. The Isthmus has apartment and roommate listings also. Many campus buildings have posters advertising housing availabilities. The VIP has extensive listings for housing and roommates as well. Graduate and family housing is available in [Eagle Heights](#) & University Apartments, call the [Division of University Housing](#) (262-2522) for information (or look on their website at <http://www.housing.wisc.edu/universityapartments/>). Another great resource was written by a fellow Math graduate student, <http://www.math.wisc.edu/~daughert/guide/>.

Resources for International Students The [International Student Services office](#) (ISS) (located in the Red Gym; 262-2044, iss@odos.wisc.edu) is probably the most valuable resource for international students. They offer a wide variety of services to international students at the University of Wisconsin-Madison. The ISS staff provides information and programs to international students about the campus and community and provides support and assistance concerning visas and related immigration issues. Madison Friends of International Students (MFIS) is a non-profit organization of volunteers from the Madison area who befriend and help UW-Madison international students, scholars and their families. MFIS provides a variety of services and programs aimed at making the International Community's stay in Madison more enjoyable.

Resources for Lesbian, Gay, Bisexual, and Transgender Students

The Lesbian, Gay, Bisexual, and Transgender Campus Center (265-3344; lgbtcc@rso.wisc.edu; <http://lgbt.wisc.edu/>) provides support, social, educational and research services to the campus community, and serves as UW-Madison's first stop for those looking for information about campus LGBT organizations. The Memorial Union office on the 2nd floor includes a library, a television and DVD player, plenty of comfortable seating, open computers, and has a staff of students and professionals that work to bring events, speakers, and programs to campus. The Center also publishes a weekly events e-letter and offers support and social groups.

Students with Disabilities The [McBurney Disability Resource Center](#) (1305 Linden Drive.; 263-2741; 263-6393 (TTY); mcburney@odos.wisc.edu) is the campus resource for students and non-employees with physical, psychological, sensory and learning disabilities. Program goals include providing academic, physical, electronic and attitudinal access to students with disabilities in an environment accentuating variations, not limitations.

McBurney staff members work closely with students, staff and faculty to develop disability-related service recommendation plans including, but not limited to, alternative testing, note-takers, interpreters and Brailled or taped course materials. Additional services include disability-related counseling, peer mentoring, para-transit, accessible parking, self-advocacy training and promotion of disability issues and accommodations. The front desk staff always attempts to do quick research to make referrals regarding any question about accessible parking, housing, (non UW) community-related disability resources.

The center also provides disability-related training, information and referral for university staff and faculty and serves as a clearinghouse for resources on disability issues. Generally, students seeking accommodations request assistance from the Center. However, students may also negotiate directly with individual faculty members and departments.

Faculty and students may request support from McBurney staff in evaluating and providing accommodation requests. Verification of the need is based on disability documentation provided by the student. Requests should be made either to faculty or to the McBurney Center in a timely manner, preferably before the beginning of the semester. See <http://www.mcburney.wisc.edu/> for more information.

UW Campus Transcripts To order an unofficial transcript (called a Student Record) you may request one through the [My UW-Madison](#) web portal and it will be e-mailed to you. Go to the Student Center module. Click on the "My Academics" section, then click on "Request Student Record." See website <http://kb.wisc.edu/helpdesk/page.php?id=4107> for complete instructions as well as how to order official transcripts.

IV. The Math Department

The Math Department is one of the larger departments in the College of Letters and Science, boasting over 50 tenured faculty, 140 graduate students, and a large administrative staff to keep everything in order. In addition, there are post-docs (called "Van Vleck's" because of the titles of their appointments), academic staff and lecturers, who teach classes but are not tenure-track, and an occasional random stranger looking for Van Hise (that's the other tall, rectangular shaped building). Finding people is simple--a list of everyone (called a directory) should be next to every elevator in the building, and includes office numbers, email addresses, and office phone numbers. If you aren't sure what someone's name is, the photographs (mug shots) on the 2nd floor (next to the receptionist's desk) can be invaluable. They are also on our webpages:

<http://www.math.wisc.edu/~apache/gallery/fac.html> & <http://www.math.wisc.edu/~apache/gallery/grad.html>

Administrative Staff If you need help with practically anything, the friendly staff on the second floor are ready and willing to help. Most important is the Graduate Program Administrator, who is continuously learning just about everything there is to know about the rules and regulations of being a grad student. The Receptionist is a wealth of information... all you have to do is ask politely.

<u>Name</u>	<u>Title</u>	<u>Room</u>	<u>Phone</u>
Castillo, Mark	Grants & Extramural Support	220	3-6953
Grenie, Mike	Payroll & Benefits Manager	207	3-3058
Paulson, Sharon	Reception, Information, Copy Ctr. Manager	213	3-3054
Pittman, Sheri	Timetable Representative	203	3-6374
Rice, Linda	Copy Center Staff	215	3-6859
Rice, Mary	Graduate Program Administrator	214	3-8884
Wendt, Joan	Assistant to the Chair	218	3-3051
Whelan, Vicky	Department Administrator	223	3-2023

Administrative Faculty Besides being a Professor, some faculty have other administrative roles in the department.

<u>Name</u>	<u>Title</u>	<u>Room</u>	<u>Phone</u>
Gong, Xianghong	TA Supervisor	413	2-3545
Jin, Shi	Department Chair	511	3-3302
Nagel, Yvonne	Computer Administrator	515	3-7490
Ono, Ken	Graduate Studies Coordinator	325	2-2604
Robbin, Joel	Associate Chair	313	3-4698

Committees As at most universities, this department is run by an unwieldy number of committees. Unlike at some places, however, **YOU** have the opportunity to serve (volunteer) on several of these committees. The Committee on TA Policies and Procedures (CTAPP) deals with all general TA-related issues, including overseeing the appointment levels for all TAs. The TA Evaluation Committee (TAEVAL) reads the student evaluations for all TAs in the department, and decides on all teaching and service awards (usually at the end of the spring semester). The Graduate Program Committee (GPC) deals with issues related to the graduate program. For instance, if you wanted to push for having the qualifying exams given three times a year, the GPC would be the place to go. All decisions made by these committees are subject to the real authority in the department, the Executive Committee which is limited to tenured faculty. If you are interested in serving as a graduate student representative to one of these committees, watch for announcements via email, or it may be more effective to talk directly with the committee chair. Committee chairs change each year. For up-to-date information, check the Committee Assignments on the Department's website

Complaints Complaining seems to be an essential part of life. While most of your complaints will undoubtedly be heard only by your classmates and office mates, there are avenues within the department for you to take your serious complaints. In addition to the ones listed below, you can also bring your concerns to the attention of the committees listed above, when appropriate.

For complaints about TAs see:

Xianghong Gong, TA Supervisor, 413 VV, 262-3545, gong@math.wisc.edu

For complaints about Faculty see:

Joel Robbin, Associate Chair, 313 VV, 263-4698, robbin@math.wisc.edu

For complaints about Discrimination and/or Sexual Harassment see:

Shi Jin, Department Chair, 219 VV, 263-3057, jin@math.wisc.edu

Diane Rivard, 320 VV, 263-3849, rivard@math.wisc.edu

Faculty With such a large department, most areas of mathematics are covered by at least one faculty member and usually more. If you have questions for any faculty member, you can frequently find them in their offices or contact them via email (usually but not always lastname@math.wisc.edu). Check the Department's Directory for exact email addresses. Most faculty will be happy to meet with you and answer your questions.

Miscellaneous Information

Activities In addition to the informal gatherings that are always taking place (e.g. eating lunch at noon on the 9th floor), there are organized events (like Sidewalk Math) that take place around Van Vleck during the semester. Notification is usually via email, posted on the math website or by the elevators on the 2nd floor.

After Hours Passes Although rarely enforced, there is an arcane rule on campus that to be in a campus building after hours (i.e. after the outside doors are locked), you have to have an After Hours Pass. Every incoming graduate student is issued a pass valid for one year. To be issued a new one, see the Chair's Assistant in 218 VV. Most grad students don't actually have one. They just run the (small) risk of being kicked out by Campus Police & Security.

Awards Ceremony Near the end of the spring semester, there is an Awards Ceremony to honor both graduate and undergraduate students who have received research or teaching awards.

Colloquium These weekly talks are usually given by visitors about their recent work. They are supposed to be aimed toward a general audience, so that even graduate students can follow the beginning of the talk. By the end, it's unusual if more than a handful of the faculty are still following closely. These talks present an excellent opportunity for grad students to get a flavor of what research mathematics is like, and what types of questions are being worked on. (<http://www.math.wisc.edu/~paulson/colloquia>)

Computer Labs There are two public computer labs in Van Vleck, rooms 322 and B101. Your GUT key works to open the labs' doors. The labs are generally open during the day. Room B107 is a technology lab classroom that you can use for your classes but you must reserve B107 with the Receptionist (room 213 VV). You can get the key from the Math Library.

Cookies On Wednesday and Friday afternoons at 3:30pm, cookies (don't get your hopes up on good cookies though) are served in the 9th floor lounge. It's a great chance to talk to people informally, get to know some of the faculty on a more personal basis, and eat free food.

Graduate Student Events Check your email for announcements about informal parties, gatherings, or Math Dept. events. Sign-up for 'grad-chat' email to receive emails about book / furniture sales and other student sponsored informal events / inquiries. The Graduate email list (graduate@math.wisc.edu) is not to be used for student sponsored party announcements, book / furniture sales, and other miscellaneous announcements.

Ninth Floor Lounge The 9th floor lounge is to be used as a gathering spot for eating lunch, discussing academic or social pursuits, and having dept sponsored events. It is not a place for overnight sleeping. Eating is certainly allowed if you clean up after yourself. Cookie crumbs, discarded newspapers, beverage containers, napkins, plates, etc. are regularly found in the lounge. These items need to be cleaned up when finished. There is no custodial service that cleans this room. They merely dump the trash and recycling. It's everyone's responsibility to keep it looking clean and orderly!

The Math Dept is not the only group that uses this space. It is a university meeting space and can be used by other departments for a variety of uses. Reservations for this room are made through the Chair's Assistant. Don't assume the room is always available when you want it. Check with the Chair's Assistant first. Check the sign on the inside and outside of the door for other event information. It is very disturbing and impolite to the room users if random people walk in during their event.

There is a kitchen area attached to the lounge. This can be used by all in the department. Be aware of the expresso coffee buying policy (see signs). Please be considerate to other users: do not eat food that is not yours; clean up after yourself especially in the microwave; and if you store food in the refrigerator – eat or discard before it turns into a science project. If there is an event in the lounge, please consider your noise levels when in the kitchen...the sound travels.

Offices You have been assigned a desk in an office with other graduate students. You will not be able to move offices. **It is your responsibility to keep it clean.** Please be aware that we do not have any custodial service that cleans the offices. All they do is dump the trash and recycling. Be considerate of the other students with whom you share the office. Keep your belongings on or immediately around your desk. Do not monopolize shelf space. The offices should NOT be fire hazards with things left everywhere. Be careful not to store food in desks as this entices the mice & other pest populations to visit.

Seminars Every area has at least one seminar in which faculty, visitors, and older graduate students give talks about recent research. Usually, the Geometry, Topology, Algebra, and Logic seminars are listed in the timetable (you can register for them for credit), while the Analysis and Applied seminars are not. Talk to faculty in each area to find out specifics about these seminars. Informal seminars on particular topics are sometimes setup (via email) by smaller groups of students and faculty.

TA Workload Chart per semester and class **Don't use this chart...it's been updated in Sept 2009!**

Course	101	112	112	113	113	113	114, 171, 211, 217, 221, 222, 275, 276, 375, 376	114, 171, 211, 217, 221, 222, 275, 276, 375, 376	114, 171, 211, 217, 221, 222, 275, 276, 375, 376	130, 131	130, 131	132	210	213, 234	213, 234	WES 114, 171, 211, 217, 221, 222	WES 213, 234 (1 WES, 1 not)	221, 222 (satellite)	240	319, 320, 321, 340 (proposed)
# Sections	2	1	2	1	2	3	1	2	3	1	2	2	4	2	4	1	2	1		4
Contact	90	45	90	30	60	90	30	60	90	45	90	60	60	30	60	105	60	75	30	60
Preparation	60	45	60	30	40	50	40	45	50	45	60	50	75	50	65	60	80	120	60	85
Proctoring	10	10	10	8	8	8	5	5	5	10	10	10				5		5	5	
Administration and Meetings	20	10	20	4	6	12	13	24	35	10	20	20	15	10	15	25	30	15	20	15
Grading	80	60	120	32	60	100	48	95	142	80	150	150	90	55	90	55	80	90	170	70
Office Hours and Review Sessions	90	60	90	30	56	90	49	76	103	40	60	60	75	40	75	55	55	45	30	75
*Math Lab	10	10	10	10	10	10	10	10	10	10	10	10	0	10	10	10	10	10	0	10
Attending Lecture							45	45	45				45	45	45	45	45	0	45	45
Total Hours	360	240	400	144	240	360	240	360	480	240	400	360	360	240	360	360	360	360	360	360
FTE	50.0%	33.3%	55.6%	20.0%	33.3%	50.0%	33.3%	50.0%	66.7%	33.3%	55.6%	50.0%	50.0%	33.3%	50.0%	50.0%	50.0%	50.0%	50.0%	50.00%

*Math lab is replaced by training for new TAs

TA Coordinators' responsibilities vary:

Math 101 Coordinator: Teach one section, assist faculty course supervisor, 50% appointment

Math 112 Coordinator: Teach one section, assist faculty course supervisor, 55.6% appointment

Math 113 Coordinator: Teach two sections, assist faculty course supervisor, 50% appointment

Math 221/222 coordinator: Teach two sections, mentor new TAs, 58.13% appointment

all numbers in chart are in number of hours per semester