DEPARTMENT OF MATHEMATICS
UNIVERSITY OF OREGON
MAJOR ASSESSMENT PROPOSAL

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1. Information about the Major

The mathematics major has four tracks, all of which result in a B.S. in Mathematics, but which have different emphasis. The department serves about 290 majors (the number varies considerably from year to year) and graduates about 80 majors each year.

The requirements for the different major tracks are as follows.

(1) **Applied Math**. The major requirements in this option are our core requirements:
  (a) Math 256 (Introduction to Differential Equations – 4 credits).
  (b) Math 281-28 (Several Variable Calculus – two terms, 4 credits each term).
  (c) Math 341-342 (Elementary Linear Algebra – two terms, 4 credits each term).
  (d) Math 315 (Elementary Analysis – 4 credits).
  together with the upper division applied math requirement
  (e) At least 4 more upper division courses (16 credits) in applied mathematics.

(2) **Pure Math**. The major requirements for this option repeat the core requirements a-d from above, and substitute for e:
  (e) At least 4 more upper division courses (16 credits) in pure mathematics.

(3) **Design your own**. The major requirements for this option repeat the core requirements a-d from the first option, and substitue for e:
  (e) At least 4 more upper division courses (16 credits) in mathematics to be chosen in consultation with an advisor.

(4) **Secondary Education**.
  (a) Math 341 (first term of Elementary Linear Algebra – 4 credits).
  (b) Math 315 (Elementary Analysis – 4 credits).
  (c) Math 394-395 (Geometry from an Advanced Viewpoint – two terms, 4 credits per term).
  (d) Math 391-393 (Fundamentals of Abstract Algebra – three terms, 4 credits per term).
  (e) Math 461 (Introduction to Mathematical Methods of Statistics, I – 4 credits).
  (f) Math 346 (Number Theory – 4 credits).

(g) CIS 122 (Algorithms and Programming – 4 credits).

In addition, a year long single variable calculus sequence (typically Math 251-253) is an implicit part of the core requirements as that sequence is a prerequisite for Math 315 which is required by all tracks in the major.

2. Educational goals of the major

Because a liberal arts major is in general not a vocational degree (and the math major is no exception), the educational goals are not intended as preparation for a specific job or career.

Educational goals of all tracks of the major are

(1) Familiarity with the ideas and proficiency with the calculational techniques of calculus.
(2) Awareness of the breadth of mathematics.
(3) Ability to engage in the process of mathematical reasoning and proof.
(4) Understanding of some area of undergraduate mathematics in depth.

The secondary education track of the math major is to some extent an exception as that track is specifically designed to help prepare future high school mathematics teachers both in terms of providing a depth of mathematics knowledge to support their teaching, and in terms of providing preparation to pass the appropriate licensure exam in mathematics.

So for students who are preparing to become high school mathematics teachers, we also expect the major to prepare them to take the licensure exam in mathematics.

3. Strategic understanding of the major

We analyze how the major requirements relate to the educational goals listed in section 2.

(1) The first goal is achieved both by requiring students to take a year long course in calculus, and by requiring students to take courses in the core requirements that depend on facility and understanding of single variable calculus. Courses in this category include Math 256, 281, 282 and Math 315 (for students not in the secondary education track) and Math 461 and Math 315 for students who are in the secondary education track.
(2) The second goal is achieved by requiring students to take courses in the core requirements covering both areas in computational/applied math, and in theoretical math. The core requirements also contain courses emphasizing calculus/analysis, courses emphasizing algebra, and courses that introduce key ideas from topology and geometry.
(3) Lower division math courses require mathematical reasoning skills, but not (for the most part) proficiency in mathematical proof. We expect the third goal to be realized when students are taking upper division courses (outside of the secondary education track) and in the anchor algebra and geometry sequences (for students in the secondary eduation track).
(4) Our fourth goal we expect to accomplish through some sequence of courses taken as part of the upper division requirement (for the students who are not in the secondary education track) and through the abstract algebra sequence Math 391-393 required in the secondary education track.

4. Plan for assessment

- Our first two educational goals are assessed structurally within the program and need no further assessment.

  I.e., students who complete the mathematics major must pass courses that require proficiency with calculus in order to succeed. Students cannot pass Math 256, 281, 282 or Math 315 without computational proficiency in calculus.

  Similarly because students must either take our core courses (in three of the major options) or the designated courses for the secondary education major, they are inevitably exposed to a broad area of mathematics as part of their major.

- The assessment activities we plan to initiate cover the third and fourth educational goals. In order to evaluate whether students have learned how to engage in mathematical reasoning and proof, and in order to evaluate whether they have reached some in-depth understanding of an area of mathematics, we will use the following procedure.

  Each year we will choose an "Assessment Subcommittee" of the department's Undergraduate Affairs Committee.

  This committee will select (in consultation with the instructors of the relevant courses, and before these exams are given) a small number of questions from the final exams of the final terms of some of the department's two and three term upper division sequences.

  After these final exams are given, the instructor will make copies of the final examinations for the Assessment Committee. The committee will audit the solutions given to the selected questions for the purpose of assessing whether students are engaging in mathematical reasoning and proof, and for the purpose of assessing whether the answers indicate in-depth understanding of the subject matter of this material. The committee will report its findings to the head of undergraduate studies in mathematics and the mathematics department head.

- In addition, because those of our math majors who plan to pursue high school teaching careers consider the math major to be vocational preparation, we would like data on what percentage of these majors pass the licensure exam for high school mathematics teachers.

  Each year we will poll graduating seniors to find out which students are heading toward a secondary teaching career, and we will poll those students from this group who graduated in the last two years to find out what percentage of these students successfully passed their licensure examination.

5. Feedback from the assessment process

We expect the work of our assessment subcommittee to feed back into our program in at least two ways.

We use information gathered from the assessment process to evaulate precisely what we teach in our upper division sequences, how we teach that material, and how we prepare students for that material in our lower division courses.

We also use that information to evaluate the extent to which the upper division mathematics sequences we teach are appropriate tools for pursuing the educational goals our department has for the mathematics major.

Anecdotally we believe that most of our students taking the CBEST or PRAXIS tests for Oregon licensure are passing. If we discover a significant percentage do not pass, then we will need to further analyze that information to understand in what ways the background we provide is inadequate for those licensure tests.