

### **Undergraduate Mathematics Student Learning Outcomes**

There is no accrediting body for mathematics, but the Mathematical Association of America provides guidelines (CUPM) for undergraduate programs. Furthermore, the Iowa Department of Education has strict requirements which must be met before our graduates are approved to teach. The Department of Education assures the quality of our teaching majors. Performance on the Actuarial exams provides a measure of the quality of our actuarial majors. Our SOA procedures will be presented in the context of the MAA (CUPM) guidelines. The guidelines are currently being revised (and probably always will be). They are designed as guidelines, not a mandate. In brief, they identify seven components of a Mathematics major:

A. Calculus (with differential equations) B. Linear algebra C. Probability and statistics D. Proof-based courses E. An in-depth experience in mathematics F. Applications and connections G. Track courses, departmental requirements and electives

We have four undergraduate math majors; Mathematics, Mathematics (Teaching), Statistics/Actuarial Science, and Applied. All of them begin with the core of three semesters of calculus and one semester of linear algebra.

Our Mathematics major is designed to allow students maximum freedom within the areas of mathematics and does not require probability or statistics. Modern Algebra I is a proof based course which Mathematics majors are required to take. An in-depth experience is provided by sequential upper level courses and also by senior seminar. Applications and connections are not a focus of any course, but will naturally appear in courses.

Our Mathematics (Teaching) major requires a course in probability and statistics, has two proof based courses (geometry and modern algebra), sequential upper level courses to assure an in-depth experience, and a course in connections.

Our Statistics/Actuarial major is essentially a professional major preparing students to work as actuaries, and is continually modified to provide preparation for the actuarial exams as they change. It has significant coursework in probability and statistics, no proof based courses (but proofs are included in several courses), sequential upper level courses and senior seminar for an in-depth experience, and most students take a summer internship which provides experience with applications.

Our applied major is under revision, but will contain probability and statistics, perhaps no proof based courses (but some courses will contain proofs), an in-depth experience, and of course applications.

The primary outcome which we expect from our students is the mastery of the content of the courses.

There are other qualities which we want our students to have which are not a focus of any course. These include:

1) Understanding mathematics in historical and contemporary contexts. (Teaching majors take a history of mathematics course.) 2) Understanding

the interrelationships within mathematics (Teaching majors take a connections course.) 3) understanding the relationships to other disciplines 4) Understand the dichotomy/complementarity of mathematics as an abstract area of study versus an applied discipline. 5) Be aware of the role of technology and be able to appropriately use technology for mathematical problems 6) Be able to work independently including both formulating problems into mathematics and solving the mathematics (This may be covered in senior seminar.) 7) Be able to comprehend and communicate mathematics including making both oral and written presentations. (Communication is covered for teaching majors in methods courses, and may be covered in senior seminar.)

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