From: Liam O'Brien, Department of Mathematics and Statistics
To: Russell Johnson, Academic Affairs Committee
Date: October 4, 2017
Re: Proposed changes to the major in Mathematical Sciences

The major in Mathematical Sciences has been offered by the department for about twenty years. In contrast with the major in Mathematics, this major offers a great deal of flexibility, with few required upper-level courses. When it was created, it had the intention of allowing for

1. Students who wanted a major in mathematics to supplement and support another major. The goal was to allow them to select courses that directly supported their other major.
2. Students who wanted to tailor their major to focus on one of the “mathematical sciences”, by which we meant statistics, computer science, operations research, etc.
3. Students who found the standard major in Mathematics too difficult; in this case as well configurability allowed us to accommodate a wider range of students.

Soon after its inception, the major in Mathematical Sciences became also the major of choice for students who wanted a “more applied” mathematics major. This view of the major was never unanimous within the department, largely because entering a graduate program in Applied Mathematics requires the core courses in the major in Mathematics.

As originally designed, the major asked students to choose a “theme course” that indicated how they intended to tailor their particular version of the Mathematical Sciences major. This was a failure: students simply took one of the listed courses and checked off that box, and advisors found that they had no way to enforce a “theme”. The one theme that became established was Statistics, and a few years ago it was enshrined as an official “concentration” within the Mathematical Sciences major.

The Department of Mathematics and Statistics has long wanted to make adjustments to the design of the major in Mathematical Sciences, with two particular goals in mind. First, we wanted to tighten things just a little bit to counteract its reputation as “the easy major.” Second, we wanted to introduce a capstone experience.
After much discussion, we propose to make small changes to the major requirements in order to immediately implement some beneficial changes while we continue our conversations about our majors. A complete restructuring of our majors may follow in the future, but we feel that these changes will be immediately beneficial.

**Current requirements for the Major in Mathematical Sciences**

The current requirements for the major in Mathematical Sciences are as follows.

Completion of each of the following with a grade of C- or higher: one year of calculus; Mathematics 253, 262, 274; Computer Science 151 or 152; one course (to establish an overall theme for the major) selected from Mathematics 311, 332, 372, 381, Computer Science 231; four additional three- or four-credit courses selected from mathematics or statistics courses numbered 200 or above (excluding 484). With written permission of the advisor, one of these courses may be replaced by a course with significant mathematical content from another department.

The department recommends that students complete Mathematics 274 or 275 before the end of their sophomore year.

For concentrators in Statistics, we simply specify some of the electives:

Completion of each of the following with a grade of C- or higher: one year of calculus; Statistics 212 or 231, and 382; Mathematics 253, 262, 274, 381; Computer Science 151 or 152; Statistics 306 or 321; one additional three- or four-credit course selected from mathematics and statistics courses numbered 300 or above (excluding Mathematics 484 and Statistics 484). Students interested in pursuing a graduate degree in statistics are advised to take Mathematics 338.

The department recommends that students complete Mathematics 274 or 275 before the end of their sophomore year.

**The changes we are proposing**

We are proposing the following changes:

1. Elimination of the “theme course” requirement, which never really achieved its goal. We hope that the requirement of a capstone course will serve the purpose, since all our senior seminars have prerequisites.
2. Clarification of the calculus requirement, replacing “one year” with completion of the second semester course.
3. Replacing the requirement of Computer Science 151 with a more general requirement of a course in Computer Science, mostly in response to the fact that many of our students place out of CS151.
4. Replacing the requirement of Mathematics 262 (which is very important in Physics but not necessarily in other areas of application) with Mathematics 311 (which is important in all kinds of pure and applied mathematics).
5. Removing the possibility of counting a course from another department, which has proved to be an advising nightmare.
6. Adding a capstone experience in the form of a senior seminar “Topics” course. All 400-level courses offered by the department, with the exception of Independent Studies, are senior seminars of this kind.

The new requirements for the major would then be as follows:

Completion of each of the following with a grade of C- or better: Mathematics 122 or 162, 253, 274, 311; one course from Computer Science; four additional three- or four-credit courses selected from mathematics or statistics courses numbered 200 or above; one “Topics” course in Mathematics or Statistics numbered 400 or above (excluding 484). The department recommends that MA274 be completed before the end of their sophomore year.

As of today, there are four possible choices for the senior seminar: “Topics” courses in Real Analysis, Abstract Algebra, Differential Equations, and Mathematical Modeling.

As before, the version for Statistics concentrators simply makes some of the choices; one new course, Topics in Statistics (SC482) would need to be created.

Completion of each of the following with a grade of C- or better: Mathematics 122 or 162, 253, 274, 311, 381; one course from Computer Science; Statistics 212, 321, one additional Statistics course numbered 300 or above (excluding 484), and Statistics 482. The department recommends that MA274 be completed before the end of their sophomore year. Students considering graduate school in statistics are strongly encouraged to take MA338.

We feel that the new requirements will serve to strengthen the major and to make students’ programs more coherent.