Annual Assessment Report
Math Major and Math Minor
2024-2025

LOGISTICS & PROGRAM LEARNING OUTCOMES

Name of program(s) and degree type(s)

The Department of Mathematics and Statistics offers

- A bachelor of science in mathematics
- A minor in mathematics
- A bachelor of science in data science
- A minor in data science (as of Fall, 2025)

Names and contact information of the faculty coordinating the assessment of each program and report.

James D. Wilson (jdwilson4@usfca.edu) – math major and math minor

Daniel Jerison (dcjerison@usfca.edu) – data science major and data science minor (This will be a separate report.)

Mission Statement

There were no changes to our mission statement since last assessment cycle. Our mission statement for the math major and math minor remains:

> *The USF Department of Mathematics & Statistics seeks to deliver a quality mathematics education to our majors and minors, inspiring them to appreciate, understand, and engage with clear and rigorous thinking, both in abstract and concrete settings.*

Program Learning Outcomes

There were no changes made to our PLOs. Math major and math minor PLOs remain:

1. Differentiate and integrate functions of one and several variables;
2. Use differentiation and integration to solve problems in mathematics and other disciplines;
3. Solve and understand linear systems;
4. Give direct proofs, proofs by contradiction, and proofs by induction; formulate definitions and construct counter examples;
5. Read mathematics without supervision; write mathematics with correct style, including typesetting;

6. Apply mathematics to problems in other disciplines; and
7. Use technology to solve mathematical problems.

Curriculum Map for Program Learning Outcomes and Math Courses

	PLO – 1	PLO – 2	PLO – 3	PLO – 4	PLO – 5	PLO – 6	PLO – 7
Math 109	✓	✓			✓		
Math 110	✓	✓			✓		
Math 211	✓	✓			✓		
Math 230			✓	✓	✓	✓	
Math 235				✓	✓		
Math 310				✓	✓	✓	
Math 314				✓	✓	✓	
Math 340	✓	✓	✓			✓	✓
Math 345			✓			✓	✓
Math 350					✓	✓	
Math 355	✓	✓		✓	✓		
Math 367				✓	✓		
Math 370	✓	✓				✓	
Math 371	✓	✓				✓	
Math 372						✓	✓
Math 373						✓	✓
Math 375			✓			✓	✓
Math 380				✓	✓		
Math 422				✓	✓		
Math 435				✓	✓		
Math 453	✓			✓	✓		
Math 482				✓	✓		
Math 485				✓	✓		

Assessment schedule between APRs
We have assessed PLOs 1, 2, 3, 4, 5, and 6 each year since our last Academic Program Review in 2017 through a standardized exit exam. We will continue this plan until it proves to be an unsuccessful measure of assessment. I will also point out that we are having an Academic Program Review this year (2025), and will discuss our PLOs as well as assessment strategies with the independent reviewers.

METHODOLOGY

To assess the aforementioned Program Learning Outcomes, our graduating math majors took the ETS Major Field Test for Mathematics in May 2025. This exam is written by the Educational Testing Service, the same organization that writes the GRE and TOEFL. In the past year (June 2024 – June 2025) this exam was taken by

graduating math majors at different institutions all across the United States. The total number of examinees is usually around 1,000. The exam has 50 multiple-choice questions and covers topics most commonly offered as part of an undergraduate mathematics curriculum. Since math minors take the exact same courses as math majors except for the fact that they stop early, this exam assesses the math minor, as well.

The content breakdown of the exam is as follows:

- **Calculus** (about 30%) Both single-variable and multivariable calculus.
- **Linear & Abstract Algebra** (about 30%) Matrices, linear transformations, eigenvalues, eigenvectors, vector spaces, systems of linear equations, elementary group/ring/field theory, elementary topics from number theory.
- **Additional Topics** (about 40%) Complex analysis, differential equations, discrete mathematics (including graph theory and combinatorics), foundations (including logic, proofs, sets, functions and relations), geometry, point-set topology, probability and statistics, and real analysis.

The exam questions are at three cognitive levels:

- **Routine** (about 55%) These questions cover definitions, questions with no more than a two-step reasoning process, or questions that require a standard technique that is practiced extensively in math courses at most institutions.
- **Non-routine** (about 25%) Includes questions that require an idea that is considered insightful, questions that require several steps of reasoning, and questions that require either the use of several definitions or a new definition that the student would not be expected to know. Some questions may require bringing techniques from two or more areas to bear on one problem.
- **Applied** (about 20%) This includes, for example, questions that are cast in real-world settings.

The relationship between this exam and our Program Learning Outcomes is as follows:

- 30% percent of the exam problems cover calculus knowledge, which corresponds to **Program Learning Outcomes 1 and 2**.
- 30% of the exam problems cover algebra knowledge, which corresponds to **Program Learning Outcomes 3 and 4**.
- 25% of the exam problems are classified as non-routine, requiring several steps of reasoning or a new definition that the student would not be expected to know, which corresponds to **Program Learning Outcomes 4 and 5**.
- 20% of the exam problems are classified as applied, requiring the student to apply math to real-world settings. This corresponds to **Program Learning Outcome 6.**

In addition to this exam, we also gave all of our majors an Exit Survey where we asked a variety of questions about their experience in the major, both in and out of the classroom. The questions were qualitative and open response.

RESULTS & MAJOR FINDINGS

Quantitative assessment results: Exit Exam

Five mathematics majors took the ETS Major Field Test for Mathematics. There was a wide range of scores: between 6th and 95th percentiles when compared to all test takers from 235 undergraduate institutions across the nation. The distribution of scores of our students is shown in the following table. Exam scores can range from 120 —200, and the average score range this year was between 145 and 169.

Individual Performance (2025)		
	TOTAL SCORE	PERCENTILE
Student 1	200	95
Student 2	135	6
Student 3	186	90
Student 4	159	57
Student 5	165	68

Below is the historical data for how USF math majors as a whole have performed on the exam, together with the nationwide average.

USF Performance Over Time		
	Mean	Median
USF 2025	169	165
USF 2024	155	154.5
USF 2023	157.7	151.5
USF 2022	160	154.5
USF 2021	160	163
USF 2020	-	-

USF 2019	172.8	175.5
USF 2018	157	153
USF 2017	159	158
USF 2016	161	154.5

The table below shows how USF math majors performed on the specific question types, which gives us an indication of how we are doing, compared to the national average in each of the PLO categories.

USF Performance by Topic (% of correct answers)					
	Calculus Questions	Algebra Questions	Applied Questions	Routine Questions	Non-routine Questions
National mean	31.1	33.3	33.2	26.2	35.3
USF 2025	46	51	36	52	27
USF 2024	27	42	38	22	27
USF 2023	30	33	37	37	25
USF 2022	-	-	-	-	-
USF 2021	41	32	44	36	27
USF 2020	-	-	-	-	-
USF 2019	48	48	55	52	28
USF 2018	27	35	33	29	38
USF 2017	30	35	38	32	30
USF 2016	30	45	33	38	29

Reflection of Quantitative responses:

Before beginning and discussion, it is important to note that our sample sizes are quite small (only 5 students this year, 6 students last year, and so on). Having said that, the assessment exam showed that our students substantially improved in Algebra, Calculus, and Routine questions. Non-routine questions remained exactly the same as last year, and there was a minor decrease in scores in the Applied question

section. With the exception of “non-routine” questions, our students outperformed (in some areas statistically so) the national average. The significant increases in scores in calculus, algebra, and routine questions from last year highlight our instructors’ dedication and achievement in foundational math courses. A lot of effort is put forth in these courses, including weekly recitation labs as well as weekly math help sessions for students in algebra and calculus-based courses.

When comparing our student performance to the national average, it appears that our students are fairly consistently below the national average in non-routine courses. From our PLO mapping, this would map to student weaknesses generally in upper-division (MATH 400 or higher) courses. There are only 2 such MATH 400+ courses that are required for a mathematics major (Real Analysis and Modern Algebra). Unfortunately, with the size of our major being so small, we are typically unable to offer other MATH 400+ courses because they do not fill. This lack of upper-division offerings may be tied to our students’ ability to compete in these Non-Routine questions.

Qualitative assessment responses: Exit Survey

We sent an Exit Survey to our graduating students (both math and data science). We highlight two particular questions with the student responses.

Question: Tell us something you loved about being a math or data science major at USF. Is there something we're doing that we should definitely keep doing?

- I loved how we pushed the boundaries of what we can learn, and changed the curriculum to match the rapid changes in math and data science. I also enjoyed the personal relationships I was able to cultivate with each professor.
- I loved being able to attend the AWM events, and Math Tea.
- I honestly love my classmates. They’re all super fun and smart.
- I love the professors in the math department, it seems like every professor was exited to help me learn, even if it wasn’t for their class.
- I loved the community. I think the math/DS department and community are the best in the whole school. Everyone I go I hear people from other departments complain about other people or Professors. But, I think everyone in this community is so friendly and encouraging. I couldn’t be more thankful for being apart of a wholesome department/community!
- I really liked having Christine's emails with like all the relevant things going on and things we need to know in the upcoming week. I think that's been really helpful because the CS department emails get a little overwhelming with all these separate emails about things coming through my inbox. I also enjoyed hearing about all the little events although I usually wasn't able to attend.

- I have loved the community and how supportive all of the professors are.
- I really loved the department. I think it is the best department at USF from the professors to the students.

Question: Is there anything about the department or major you think could be improved, or should be changed?

- I think that we should have more extra curricular programs, like study abroad or built in internships.
- I can't really think of any big changes that should be made, other than for the auditing of classes to be more advocated for. I think the students should be made aware of the fact that they can audit classes without having to take them in case they want to take an upper division class they don't qualify for or think they'll pass.
- Yes, I hate the fact that there's only a class for each semester. Classes should be offer both semesters.
- I wish there was a data science study group, maybe with some professor involvement.
- I just heard the university is adding a data science minor that math majors can now take I think in fall of 2025? I would say that was my one suggestion. I would have liked to major in data science as well, but I know it's not allowed.
- I don't think so.

Reflection on the Qualitative Results

We discussed the exit survey results at a faculty meeting in August, 2025. All Math & Stats faculty were present at this meeting. As chair, it seems to me that there are two primary things to note in these comments. The first is that our department is focused on community building - students and faculty have strong relationships, and further students are able to build strong relationships with one another. This is certainly a point of pride of our department, though we have not yet thought of a way to directly assess this through a quantitative means. Secondly, as noted in our Reflection on Quantitative Results, there is a lack of upper division MATH courses / electives. Students commented on it, and our quantitative results further showed a weakness in questions that are non-routine. As a department, we are seeking ways to offer more advanced topics/electives to our students dealing with the constraints of small class size. We are focusing both on increasing recruitment efforts (as needed by the entire university), and also on joining forces with other complementary departments (like Physics) to develop hybrid classes with advanced mathematics concepts and domain-based applications.

We plan to bring these results to our APR reviewers, which will be conducted next week (November 14th and 15th). A central point of our conversation will be to look to how to innovate our Math and Data Science major offerings in a way that enhances the academic and professional experiences of the students and attracts new majors. I look forward to improving the math major/minor experience in the upcoming year.