Annual Assessment Report
Math Major and Math Minor
2023-2024

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.

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

Cornelia Van Cott (cvancott@usfca.edu) – math major and math minor
Daniel O'Connor (doconnor@usfca.edu) – data science major (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
1. counterexamples;
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.

METHODOLOGY

To assess the aforementioned Program Learning Outcomes, our graduating math majors took the ETS Major Field Test for Mathematics in April 2024. This exam is written by the Educational Testing Service, the same organization that writes the GRE and TOEFL. In the past year (June 2023 – June 2024) 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

Six mathematics majors took the ETS Major Field Test for Mathematics. There was a wide range of scores: between 9th and 80th 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.

Individual Performance (2024)		
	TOTAL SCORE	PERCENTILE
Student 1	153	42
Student 2	174	80
Student 3	138	9
Student 4	156	49
Student 5	156	49
Student 6	153	42

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
Nationwide institution aggregate 2017 to 2023	155.2	155
USF 2024	155	154.5
USF 2023	157.7	151.5
USF 2022	160	154.5
USF 2021	160	163
USF 2020[1]	-	-
USF 2019	172.8	175.5
USF 2018	157	153
USF 2017	159	158
USF 2016	161	154.5

[1] We did not administer the exit exam in 2020 due to the pandemic.

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 2024	27	42	38	22	27
USF 2023	30	33	37	37	25
USF 2022[2]	-	-	-	-	-
USF 2021	41	32	44	36	27
USF 2020[3]	-	-	-	-	-
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

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?

- We have a lot of guest speaker and professors are all have industry jobs.
- All my math and data science professors were perfect, USF has really good teachers.
- I absolutely LOVE math tea and colloquium. Please never take those away. If anything, we should strive to make Math Tea a bigger event.
- I loved the professors.
- Daniel Jerison and Cody Carroll are brilliant minds and educators; it is hard to be both. They are my favorite part of my time here and they made massive impacts on my life…
- I honestly love the class sizes and how I was really able to meet my teachers on a personal level as well as my fellow classmates.

[2] ETS does not make available data about individual topics for cohorts of size smaller than 5, so the 2022 cohort information is not included here.

[3] We did not administer the exit exam in 2020 due to the pandemic.

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

- I think maybe the Advising could improve. Even as an active member of the department, I think I only had my advisor check up on me once or twice over my 4 years. I really felt like I was alone in making sure I was up to date on credits and such...
- I think that the advisors/department heads could do a better job at helping students with their 4-year plan
- I wish more people were interested in this major so there would be more class options but I also love how small the department is.

Response to the assessment results

We discussed the exit survey results at a faculty meeting on August 16, 2024. All Math & Stats faculty were present at this meeting. We talked specifically about the need to improve our advising of majors, as mentioned in the survey feedback above. Faculty agreed we can improve. As chair, I sent out the list of advisees to faculty advisors during the semester and reminded the advisors to reach out to their advisees before registration. As faculty, we also discussed the student feedback concerning the small number of majors. We are focusing on recruitment right now, and we are growing bit by bit.

We look forward to improving the math major/minor experience in the upcoming year.