UNIVERSITY OF SAN FRANCISCO | College of Arts and Sciences

Department of Mathematics & Statistics
Mathematics major and minor

ASSESSMENT REPORT
ACADEMIC YEAR 2021-2022

LOGISTICS & PROGRAM LEARNING OUTCOMES

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

The Department of Mathematics and Statistics offers a bachelor's degree in Mathematics and a bachelor's degree in Data Science.

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

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3. Mathematics Major and Minor Mission Statement

There were no changes to our mission statement since last assessment cycle. Our mission statement 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.

4. Mathematics Major and Minor Program Learning Outcomes

There were no changes made to our PLOs.

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 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.

Curricular Map

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				✓	✓		

5. 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

6. Description of the methodology used to assess the PLO(s)

To assess the aforementioned Program Learning Outcomes, our graduating math majors took the **ETS Major Field Test for Mathematics** in April 2022. This exam is written by the Educational Testing Service, the same organization that writes the GRE and TOEFL. In the past year (June 2021 – June 2022) 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.

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**.

RESULTS & MAJOR FINDINGS

7. Description of results and significant findings from the data or assessment process

This year we had 10 mathematics majors who took the ETS Major Field Test for Mathematics, known in our department as the **Mathematics Senior Exit Exam**. There was a wide range of scores: between 18th and 98th percentiles when compared to all test takers from undergraduate institutions across the nation. The distribution of scores of our students is shown in the following table. Exam scores range from 120—200.

Percentile range	Score range	Num of USF students
75—99th	165—200	3
50—74th	156—164	1
25—49th	144—155	4
<25th	120—143	2

Data collected by ETS from domestic institutions with 5 or more students participating in the exam. USF was in the 62.4 percentile in 2023 among these 230 institutions.

	Mean score	Median
Nationwide institution aggregate 2017 to 2023	**155.2**	**155.0**
USF 2023	**157.7**	**151.5**
USF 2022	160	154.5
USF 2021	160	163
USF 2019	172.8	175.5
USF 2018	157	153
USF 2017	159	158
USF 2016	161	154.5

Below is a summary of assessment indicators provided by the ETS, which includes comparative national data.

The 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. We did not administer the exit exam during 2020 due to the pandemic. The students who took the exam in 2022 performed similarly to our students in the past.

	Calculus Questions	Algebra Questions	Applied Questions	Routine Questions	Non-routine Questions
National mean	**31.1**	**33.3**	**35.2**	**33.1**	**26.2**
USF 2023	**30**	**33**	**37**	**37**	**25**
USF 2021	41	32	44	36	27
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

BONUS: EXIT SURVEY

Last spring, we sent an Exit Survey to our graduating students, and 70% responded. The questions were qualitative and open response, so I will summarize the things that stood out to me.

First, answers questions about social aspects of the department, a sense of belonging, and about faculty availability and interaction were uniformly answered favorably. Our students love us, and they *really* love Math Tea… like, a lot. 😊

> I loved how welcoming and supportive the department is, both from faculty and the students. Math Tea is a big aspect of that for sure and please never stop doing it.
>
> Thank you to all the faculty and Christine for everything you do and have done for the students and the department. You all have done an amazing job creating a great atmosphere in the department and curating well-structured programs.
>
> I went to math tea frequently and feel very bonded to the students I went to conferences and had group projects with.

The second thing that stood out to me was that in response to a question about food/housing insecurity, and money troubles in general, more than half said that they'd had struggled financially. Some sought help from the university and were told that no money was available.

> Yes. I struggled paying for books, for tuition, for food, for rent. I lost my job that was my main source of income at one point and had to move places due to toxic and unhealthy roommates. I tried seeking support from the university and they were completely useless and unhelpful as they apparently did not have any emergency funds available for me.
>
> Oh I struggled financially for the last two years while at USF. For a while I was behind on my rent for housing which was very stressful and has stayed stressful up to the end of my graduation, it has required me to try to balance two part time jobs while doing full time classes only to survive in sf. … I wish I had gotten support if I had only known it was available.
>
> … several of my classmates did [struggle] and when they asked for help from the university they were told there were no funds to help them.

There were two comments that included suggestions that we should address. The first:

> There's a lot of help for bsds students to get jobs after graduation but much less for math majors who aren't going to grad school.

We definitely need to be better at this. I'll bring it to the next department meeting.

The second, in response to a question about community and belonging:

> Made a lot of cs friends that I plan to still communicate with (I think a lot of this is due to me occupying the CS labs; ***math dept doesn't really have a space where we can all just work together every day***,

I hope that as we will be able to rectify the bold in the future as the space in Harney and the former blood bank are reorganized.

[I'm sorry this is so late… Thank you for reading.]