

# Annual Academic Assessment Report

## MATHBA and MATHBS

### 2022-2023

Across the many programs within the Department of Mathematical Sciences (BA/BS, MS, PhD) there are common learning objectives recognized by the faculty. While the program requirements show differences in the skills and tools employed within the various options, the learning objectives are stated broadly to apply to each.

- Critical and analytical thinking
- Effective communication of abstract and technical information
- Logical reasoning
- Mastery of computational tools for analyzing data and/or mathematical structure
- Problem solving
- Understanding of algorithms and processes

The overall number of graduating math majors has stayed roughly the same over the last seven years (approximately 29), but the ratio of students in the MATHBA versus the MATHBS has changed. This change is most likely related to trends in the profession of secondary education as traditionally most of the students in the MATHBA program are interested in careers in math education. The data below is from the Office of Strategic Analytics & Insights.

	2017	2018	2019	2020	2021	2022	2023
MATHBA	17	12	14	5	6	10	5
MATHBS	14	15	22	22	19	21	20
Total	31	27	36	27	25	31	25

### Analysis of Assessment of Student Learning Outcomes

The Department of Mathematical Sciences employs four main tools for assessing the student learning outcomes of the undergraduate majors in our department.

- A. Course work
- B. Senior Writing Requirement
- C. Exit Interview
- D. Mathematics Field Test

A. Course Work: Students complete a rigorous program of courses that is routinely monitored and updated by the department's Undergraduate Committee. Courses include assignments that assess the previously mentioned learning outcomes by means of written work (both computational and theoretical) and presentations (both formative and summative). The assignments involve a mix of individual work and work in groups.

B. Senior Writing Requirement: Each student is required to write a research/analytical paper in the Mathematics Major Seminar (MATH 4933) that fulfills the Fulbright Writing Requirement. The student creates a ten minute presentation based on this work which is presented to the class. An honors thesis and defense can substitute for this paper and presentation. The student selects a topic reflecting their own interests, which is approved by the course instructor. The student’s work on the paper and presentation goes through stages of instructor and peer review to ensure quality and clarity. Both the written paper and the presentation are assessed using an instructor crafted rubric that measures the student’s mathematical knowledge, depth of understanding, and ability to communicate this material. This pair of assignments satisfies General Education Learning Outcomes 1.2 and 6.1.

Sample topics from the previous five years are given to show the breadth of interest among majors:

- Torsion subgroups of elliptic curves over  $\mathbb{Q}$
- Teaching Probability Using the Mathematics in Settlers of Catan
- Addressing Bias and Accuracy in Survey Statistics: An Introduction to Sample Weights
- Analysis of N versus NP
- Ranking Algorithms in Sports

C. Exit Interview: Students in the Mathematics Major Seminar (MATH 4933) complete an “Exit Interview Survey” that measures their satisfaction with our program, gives them a way to suggest improvements, and allows us to record their immediate plans upon graduation. The principal audience in MATH 4933 was students that graduated in Spring 2023 or will be graduating in Fall 2023. However, some students that plan to graduate Spring 2024 also took this course if they will be student teaching in Spring 2024.

In Spring 2023, there were 27 responses to the Exit Interview survey.

The first five items are scored on a 1–5 stars scale with 1 star being poor and 5 stars being excellent. These items assess the student’s view and impression of the faculty and department as a whole. The average ratings from the previous three years are tabulated below.

Item	Average Rating		
	Spring 2021	Spring 2022	Spring 2023
Quality of instruction from faculty in the department	4.45	4.15	4.26
Concern of department faculty toward math majors	4.33	3.95	4.33
Sense of community among math majors and math faculty	3.75	3.5	4.07

Quality of advising from mathematics faculty mentor	4.11*	4.33**	4.26***
Overall assessment of the Department of Mathematical Sciences	4.24	4.05	4.22
Number of Student Responses	33	20	27

\* - 6 students did not know who their faculty mentor was

\*\* - 5 students did not know who their faculty mentor was

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These numbers are quite strong and show that the students' overall assessment of our program is high. Places where there is room for improvement are building community and communicating to our majors who their faculty mentor is.

The next set of three questions are scored on a 1–5 Likert scale with 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. These items assess the student's view and impression of the major. The average ratings from the previous three years are tabulated below.

Item	Average Rating		
	Spring 2021	Spring 2022	Spring 2023
The courses required for the major were challenging	2.42	2.5	2.78
The program prepared me well for my career plans	2.7	3.4	3.26
I would recommend becoming a math major at the University of Arkansas to others	2.85	3.25	3.22
Number of Student Responses	33	20	27

These numbers show that most of our majors find our courses challenging. However, they also show that we need to work to align our courses better with their career goals. Even though the number of students that would recommend being a major in our department to others is lower than we would like, only 2 of the 27 students in Spring 2023 answered “No” to the question, “Are you glad you chose to be a math major?”

Among the courses mentioned by students that they would like to see are statistics courses (especially among MATHBS students with Option 3: Stats), courses on mathematical biology, and courses that contain mathematical modeling in business and economics.

Eleven of the 27 students in Spring 2023 responded that they plan to go on graduate school in math or another subject. Only two of the 27 students mentioned teaching in secondary education. Eight of the 27 students had a job lined up in industry and the rest (6 students) either did not have post-graduation plans or did not share them with us.

D. Mathematics Field Test: The Mathematics Field Test (MFT) is taken by students at more than 200 colleges across the United States as a measurement of “the critical knowledge and understanding obtained by students in an academic major.” Our students take this assessment in lieu of a final exam in the Mathematics Major Seminar (MATH 4933).

Average (mean) scores from the previous three years appear in the table below broken down by degree program (MATHBA and MATHBS). The number in parentheses indicates the number of students taking the test in that group. A perfect score is 200.

	<b>Spring 2021</b>	<b>Spring 2022</b>	<b>Spring 2023</b>
US Average	157.5	157.5	157.4
MATHBA	148.4 (13)	150 (5)	147 (5)
MATHBS	162.7 (20)	166.1 (15)	163.5 (20)
Combined BA/BS	157.1 (33)	162.1 (20)	160.7 (25)

The number of students receiving a perfect score has increased from 1 in Spring 2021, to 2 in Spring 2022, to four in Spring 2023. This data shows that our graduates are performing better than the national average. We remark that some of the students in the MATHBA program are taking the MFT at the end of their junior year as opposed to their senior year as they will be student teaching in spring of their senior year and not on campus. This could account for the lower score in the MATHBA program.

#### Changes To Degree Planned or Made Based on Assessment

We have no immediate plans to change the degree based on this assessment, however the department has been looking into the creation of a degree plan and more courses for students interested in statistics and applications of mathematics. This is in line with the findings mentioned above.

#### Changes To the Assessment Process Planned or Made

We plan to include an alumni survey in our annual assessment.