



**Program: Mathematics**

**Assessed by: Dr. Kyle Calderhead, Dr. David Hahn**

**Date: 2015-2016**

**Mission Statement:**

The mission of the mathematics program is to provide students with a mathematical education which prepares them to understand, communicate, and apply mathematics. As a result, our graduates will be able to continue their mathematical education in graduate school, become effective secondary school mathematics teachers, or apply their mathematical knowledge and thinking ability in service or industry.

**Program Goals:**

**Goal 1:** Students will understand a spectrum of mathematical concepts.

**Goal 2:** Students will effectively communicate mathematics.

**Goal 3:** Students will demonstrate an ability to apply mathematical thinking to solve problems.

<b>Program Intended Learning Outcomes (PILO)</b>	<b>Means of Program Assessment &amp; Criteria for Success</b>	<b>Summary of Data Collected</b>	<b>Use of Results</b>
<p>1a: Students will demonstrate a knowledge base of mathematics consistent with the Mathematical Association of America (MAA) standards.</p>	<p><b>ETS Major Field Test in Mathematics:</b> All senior mathematics majors take this standardized test in the fall semester of their senior year. 80% of scores at or above 138.7 (one standard deviation from the mean) will demonstrate a knowledge base.</p> <p><b>Ohio Assessment for Educators Test in Mathematics:</b> All majors seeking education licensure take this test for teaching licensure qualification. The test is 150 multiple-choice questions designed to test the ability to understand and work with five main categories: 1. Mathematical Processes and Number Sense, 2. Patterns, Algebra, and Functions, 3. Measurement and Geometry, 4. Trigonometry and Calculus, and 5. Statistics, Probability, and Discrete Mathematics. The State of Ohio requires a minimum score of 220 to receive licensure. This is assessment was only in its second year, having recently replaced the Praxis II. Our initial goal is 100% of students achieving the passing rate as our benchmark to demonstrate a knowledge base.</p>	<p><b>ETS Major Field Test in Mathematics:</b> Seven students took the ETS MFT; the scores were 120, 142, 151, 154, 167, 167, 167.</p> <p>Subject means for this year are as follows (national means in parentheses): Calculus: 28 (30.7) Algebra: 29 (33.1) Routine: 28 (31.1) Non-routine: 22 (26.2) Applied: 40 (34.7)</p> <p><b>OAE Test in Mathematics:</b> There were three students taking the OAE, with scores of 223, 254 and 264. The state mean was 237.5, with a pass rate of 80.3%</p>	<p><b>ETS Major Field Test in Mathematics:</b> Six of the seven students (86%) scored in the target range, including three students (43%) who scored above the national mean.</p> <p>Additionally, all subject scores are at or above one standard deviation from the national mean.</p> <p>This affirms the effectiveness of our curriculum in giving students a sufficient knowledge base in the field.</p> <p><b>OAE Test in Mathematics:</b> All students passed, and furthermore, our average score of 247 was above the state average of 237.5.</p>

<p>1b: Students will be proficient in mathematics needed to be effective secondary school teachers.</p>	<p><b>OAE Test in Mathematics:</b> 100% of students achieving a passing score of 220 for the state of Ohio will indicate proficiency.</p> <p><b>ETS Major Field Test in Mathematics:</b> The mean of our students falling within one standard deviation of the mean of 30.7 on the Calculus subsection will indicate proficiency. Thus, a mean of 23.2 will indicate proficiency.</p>	<p><b>OAE Test in Mathematics:</b> There were three students taking the OAE, with scores of 223, 254 and 264.</p> <p><b>ETS Major Field Test in Mathematics:</b> The calculus subscore mean was 28.</p>	<p><b>Praxis II Math Content Knowledge Test:</b> All students passed, and furthermore, our average score of 247 was above the state average of 237.5. This affirms the value of our curriculum in giving students sufficient knowledge to be effective secondary school teachers.</p> <p><b>ETS Major Field Test in Mathematics:</b> Our mean is above 23.2, and near the national average of 30.7, affirming changes made to re-emphasize calculus later in the curriculum.</p>
<p>2a: Students will demonstrate ability to independently study and verbally communicate mathematics.</p>	<p><b>Presentation rubric:</b> A rubric to assess mathematical presentations. Presentations in MATH 343 and 460 are assessed by all professors in the program.</p> <p>Each category on the rubric is scored out of 5 points, and then weighted. Success will be demonstrated if 70% of students get 4 or 5 points (5 point scale) in 7 out of the 10 categories.</p>	<p><b>MATH 343:</b> six of the seven students (86%) scored in the successful range.</p> <p><b>MATH 460:</b> Presentation data for MATH 460 was unfortunately lost, however, anecdotally, the results were in keeping with those of previous years, and there are no concerns about not reaching the benchmark.</p>	<p><b>MATH 343:</b> These results affirm the effectiveness of the having students do a smaller preliminary presentation early in the semester before presenting their final projects.</p> <p><b>MATH 460:</b> Again anecdotally, changes made to MATH 460 (and previous courses) in the past few years to improve mathematical presentation skills seem to be working effectively, although we are hesitant to draw firm conclusions from anecdotal data.</p>

<p>2b: Students will demonstrate ability to independently study and communicate mathematics in writing.</p>	<p><b>Paper writing rubric:</b> A rubric to assess mathematical papers. Student papers from MATH 343, 352, and Math 460 are assessed by all professors in the program.</p> <p>As in the Presentation Rubric, success will be determined if 70% of students score a 4 or 5 in 8 out of 12 categories for papers written in MATH 460 (Senior level). For papers written for MATH 343 and 352, success will be demonstrated by 70% of students scoring a 4 or 5 in 6 out of 12 categories. Additionally, the department will track individual scores across the courses and expect improvement.</p>	<p><b>MATH 343:</b> Four of the six students (67%) scored in the successful range.</p> <p><b>MATH 352:</b> All six students (100%) scored in the successful range.</p> <p><b>MATH 460:</b> Paper writing data for MATH 460 was unfortunately lost, however, anecdotally, the results were in keeping with those of previous years, and there are no concerns about not reaching the benchmark.</p>	<p><b>MATH 343:</b> The small sample size is problematic in interpreting these results, particularly since one student was in their first semester, and did not have the advantage of having taken foundational English or Communications courses. Still, this suggests an increased focus on fundamentals of mathematical writing in earlier courses may benefit our students.</p> <p><b>MATH 352:</b> Students fared much better in this course, but they were also all sophomores and juniors. Taken in comparison with the results from MATH 343, this indicates that student writing ability in mathematics is improving over time.</p> <p><b>MATH 460:</b> Again anecdotally, changes made to MATH 460 (and previous courses) in the past few years to improve mathematical writing skills seem to be working effectively, although we are hesitant to draw firm conclusions from anecdotal data.</p>
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<p>3a: Students will write proofs effectively.</p>	<p><b>Proof writing rubric:</b> A rubric to assess mathematical proofs. Selected proofs from MATH 352 and 432 are assessed by all professors in the program. Success will be demonstrated if 80% of students score 18 or higher out of 25 points on the rubric. Additionally, the department will track individual scores across the courses and expect improvement.</p>	<p><b>MATH 352:</b> One of the seven students (14%) scored in the successful range.</p> <p><b>MATH 432:</b> All six students (100%) scored in the successful range</p>	<p><b>MATH 352:</b> While a few scores were close, this clearly indicates a need to increase the class time and level of instruction dedicated to proof writing. We will look for opportunities to practice good proof-writing fundamentals at multiple points in the semester.</p> <p><b>MATH 432:</b> As this is a more advanced course, we see that proof writing skills are more developed at this level. We will also try to discern what prompts this improvement and try to duplicate it in other courses.</p>
<p>3b: Students will solve a variety of problems.</p>	<p><b>ETS Major Field Test in Mathematics:</b> The mean of our students on the “routine” section will be above 23.9 and on the “non-routine” section will be above 20.5 (above one standard deviation from each mean).</p> <p><b>OAE Test in Mathematics:</b> The State of Ohio requires a minimum score of 220 to receive licensure. 100% of students scoring at or above the minimum score of 220 will demonstrate ability to solve a variety of problems.</p>	<p><b>ETS Major Field Test in Mathematics:</b> The “routine” subscore mean was 28, and the “non-routine” subscore mean was 22.</p> <p><b>OAE Test in Mathematics:</b> There were three students taking the OAE, with scores of 223, 254 and 264.</p>	<p><b>ETS Major Field Test in Mathematics:</b> While these scores fall in the acceptable range, the “non-routine” score in particular seems as if it could be improved. A long-delayed curriculum revision (due to budget/staffing cuts) would consider these areas in more detail.</p> <p><b>OAE Test in Mathematics:</b> All students were in the passing range, demonstrating problem-solving ability at the appropriate level.</p>