Assessment Committee Report, 2017—2018
Department of Mathematics, University of Oregon

Task. The Assessment Committee's task was to audit problems from final exams given in the Fall or Winter terms, to assess whether the mathematics major is providing students:

1. An ability to engage in the process of mathematical reasoning and proof, and
2. An understanding of some area of undergraduate mathematics in depth.

Course and problem selection. The requirements for the Mathematics Major were revised effective this year. As of this year, all Mathematics Majors are required to take one of the following proof-based sequences emphasizing a deep understanding of an aspect of mathematics:

- Math 316-317, "Fundamentals of Analysis"
- Math 347-348, "Fundamentals of Number Theory"
- Math 391-392, "Fundamentals of Abstract Algebra"

The Chair of the Undergraduate Affairs Committee contacted the instructors of these sequences (specifically, 316, 347, and 392) towards the end of the winter quarter to ask them to share their final exams with the Assessment Committee. At the end of the quarter, he chose one problem on each final exam which required students to write a proof and represented a key mathematical topic from the course. A member of the Assessment Committee then scored the students' solutions to those problems. The Assessment Committee then tabulated the results.

In Math 392, the final exam was replaced by a project and final quiz, and the quiz was structured so that students could choose which problems to solve. So, the Assessment Committee audited a problem from Math 391 instead.

Grading. Problems were graded on the same 5-point scale used in previous years:

0: No progress towards a solution.
1: Some small amount of progress towards a solution.
2: Mostly incorrect, but some nontrivial amount of progress.
3: Significant errors, but mostly correct.
4: One or two very minor errors.
5: Perfect.

The committee member auditing Math 316 noted that for the problem he was grading, the distinction between a score of 2 and a score of 3 hinged on very minor considerations, as many solutions were close to half correct

Problems graded.

Math 316:

Problem 3. Let $f: \mathbb{R} \to \mathbb{R}$, $f(x) = 2x^2 + 3$. Using the ϵ-δ definition of continuity, prove that f is continuous everywhere.

Math 347:

Problem 7. Let n be a positive integer. Prove that n is a square if and only if each exponent in its prime-power factorization is even.

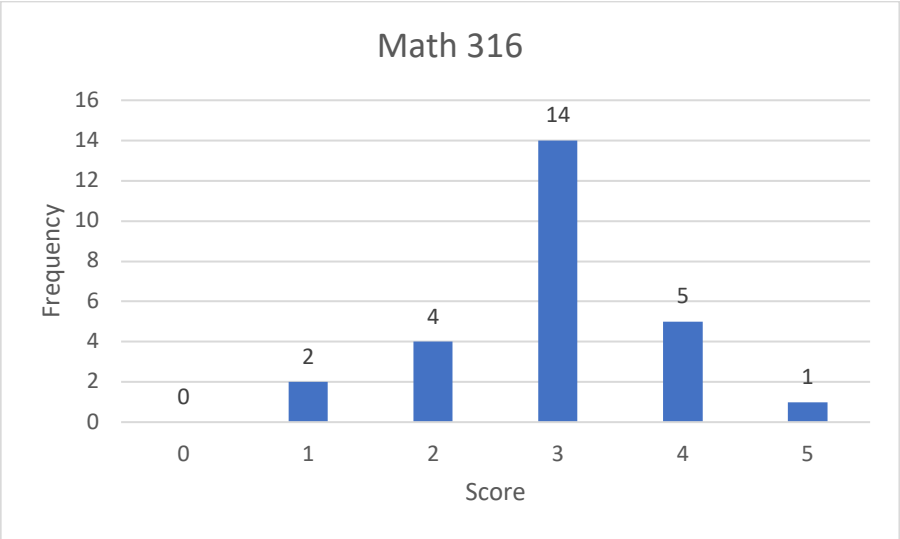
Math 391:

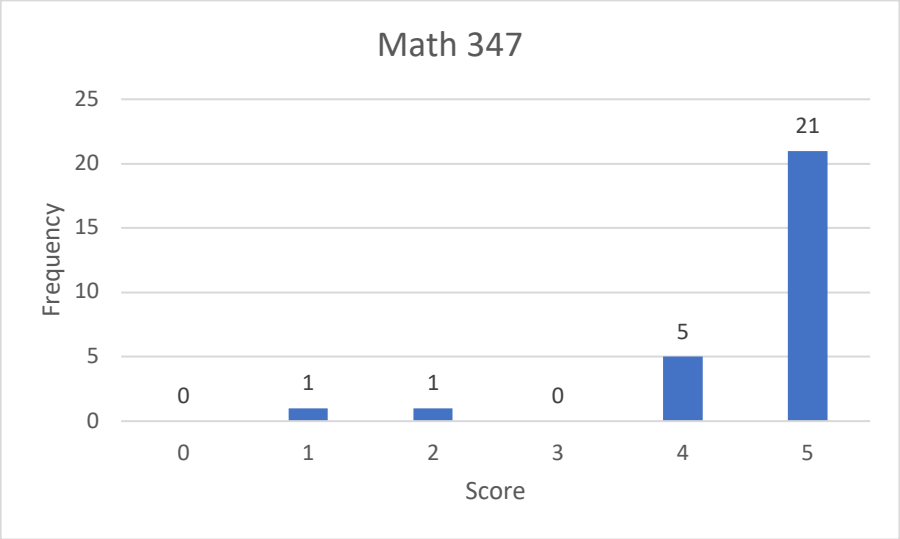
Problem 3(b). Let A and B be commutative rings with unity. Let $f: A \to B$ be a ring homomorphism. Let $S \subset B$ be a prime ideal. Define $f^{-1}(S)$ by

$$f^{-1}(S) = \{a \in A \mid f(a) \in S\}$$

Prove that $f^{-1}(S)$ is a prime ideal of A.

Results.


Math 316
Frequency
16
14
12
10
8
6
4
2
0
0
2
4
14
5
1
0
1
2
3
4
5
Score


Math 347
Frequency
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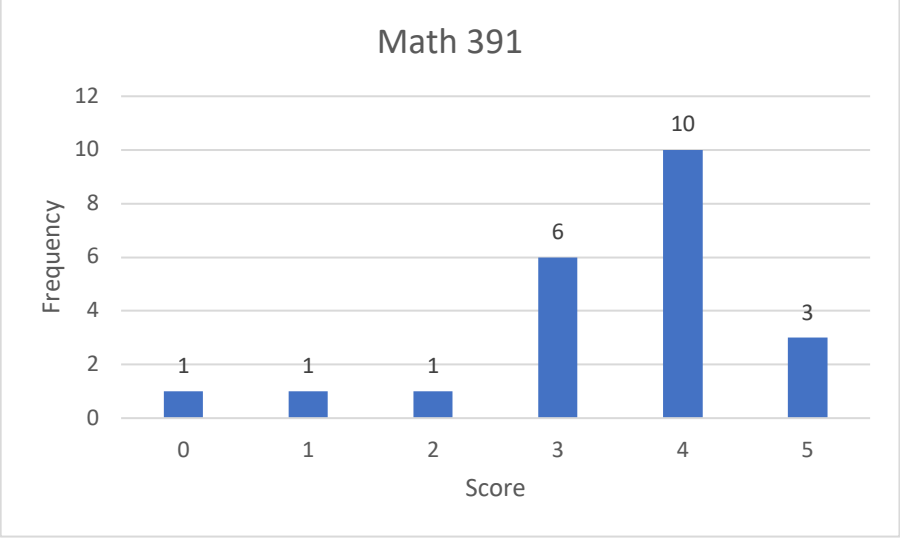
20
15
10
5
0
0
1
1
0
5
21
0
1
2
3
4
5
Score


Math 391
Frequency
12
10
8
6
4
2
0
1
1
1
6
10
3
0
1
2
3
4
5
Score

Conclusions / Recommendations.

Because of the change in courses being assessed, variation in graders, and the variation in problems across courses, it is not clear what conclusions can be drawn from this data. To help reach more useful findings in the future, the committee recommends:

1. Maintaining a library of previously-assessed problems, so that the committee can try to grade consistently with previous graders.
2. Auditing the same classes for the next several years, and attempting to audit similar problems to these, to allow longitudinal comparisons.
3. Adding a mechanism to assess other mathematical reasoning skills, beyond proof-writing.

This report was submitted by:

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Math Department Work Related to Undergraduate Curriculum

Prepared by Daniel Dugger
June 2018

This is a survey of various things the Mathematics department has been working on during 2017–18 related to undergraduate curriculum.

- The new Math Major went into effect Fall 2017. This year saw Math Labs piloted by Dugger, Steinberg, and Merchant (two each), two 316–317 (Fundamentals of Analysis) sequences piloted by Xu and Elias, and 347–348 (Fundamentals of Number Theory) piloted by Akhtari. Micah Warren piloted Math 320, entitled "Theory of Differential Equations". Development and refinement of these courses is expected to continue over the next several years.

- This year we offered three undergraduate topics courses: Yashar Ahmadian taught Introduction to Neural Computation, David Levin taught a course on Statistical Learning, and David Steinberg taught an introductory course on knot theory. Also, Peter Ralph designed and taught a version of Math 425 (technically offered as Math 410) that involved more programming skills and was centered around the statistical software R rather than Excel.

- This was the last year for Math 70 and Math 95. The department successfully proposed a new course Math 101 to take their place, and this has now gotten university approval for next year. Dev Sinha, Tricia Bevans, and Tammy Nezol were all involved in piloting versions of this new course during 2017-18, and Kristen Henderson and Tammy Nezol will take the lead in a multi-person summer development effort to get this course ready for the fall launch.

- As a companion to the previous item, after a successful campaign from the Math Department the university has adopted (as of May 1) the software package ALEKS for math placement and remediation. ALEKS is web-based adaptive learning software, which identifies areas in which students are weak and provides students with extra practice and remedial tools in that area. For the first time in many years we will start enforcing prerequisites for all undergraduate courses; this is a change for at least Math 111, 112, 231, 246, and 251, where for a long time we weren't enforcing prerequisites because of lack of confidence in our placement exam. It is difficult to predict the effect this will have on Fall course enrollments, and we expect a certain amount of drama next Fall as we adapt to this new system. Mike Price has taken the lead on everything related to ALEKS adoption.