University of Guam
College of Natural and Applied Sciences (CNAS)
CNAS Assessment Committee

I. MATHEMATICS SUMMARY OF ASSESSMENT ACTIVITIES

Activity	Description of Activity	Date of Implementation	Date for Completion	Update
1. Spring 2007 WASC Poster Presentation of Assessment Plans	Program Learning Objective Assessment Plan	Spring 2007	Fall 2008	Submitted poster to CNAS Assessment Committee January 2007 for WASC Poster Session; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
	General Education Learning Objective Assessment Plan	AY 2007-2008	Fall 2008	Submitted poster to CNAS Assessment Committee January 2007 for WASC Poster Session; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
	Developmental Mathematics Learning Objective Assessment Plan	AY 2007-2008	Fall 2008	Submitted poster to CNAS Assessment Committee January 2007 for WASC Poster Session; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
2. Degree Program Review Report	PR Closing the Loop Report; Date Covered by Review: 1999-2004	Fall 2008	Fall 2008	Forwarded Program Review Closing the Loop Report to university EET-AQ Committee September 2008; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
3. Math Degree Program SLOs	Finalize Degree Program SLOs	Fall 2007	Spring 2008	See 2008-2009 UOG Catalog; Go back to the SLOs/CMs icon in this website for details.
4. Insertion of SLOs in Course Outlines and Syllabi, Curricular Mappings	Insertion of defined SLOs in Course Outlines	Spring 2008	Sept. 2008	Approved by CNAS-AAC and CNAS Dean; Go back to the Course Outlines icon in this website for details.
	Insertion of defined SLOs in Course Syllabi (proposed course syllabus template only)	Fall 2008	Dec. 2008	Go back to the Course Syllabi icon in this website for details.
	Curricular Mappings	Spring 2008	Fall 2008	Go back to the SLOs/CMs icon in this website for details.
5. CNAS Assessment Math Subcommittee on Math Assessment Activities	MATH Faculty Presentation of MATH Updated Assessment Plans/Reports/Activities to CNAS Faculty	Fall 2007	Spring 2008	Updated Assessment Plans/Reports/Activities for MATH presented to CNAS Faculty March 2008.
	MATH Assessment Exemplar Report to University EET-AQ Committee	Fall 2008	Fall 2008	Submitted by Drs Grazyna Badowski and Henry Taijeron to CNAS Assessment Committee September 2008 and forwarded to university EET-AQ Committee; See Section II below for details.
	Math Assessment Update and Report for AY 2007–2008	AY2007-2008	Summer 2008	Dr. Grishin submitted tentative AY 2007-2008 math assessment update report to CNAS Assessment Committee summer 2008; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
	Program Capstone Evaluation Assessment Study using MA411	Fall 2006	Fall 2008	Dr. Szekely submitted in fall 2008 report titled “Capstone Assessment through Abstract Algebra” to CNAS Assessment Committee; See Section III below for details.
	Program Capstone Evaluation Assessment Study using MA411	Fall 2006	Fall 2008	Dr. Trance submitted in fall 2008 report titled “A Report on the Assessment by Student Performance in MA411 (Introduction to Abstract Algebra)” to CNAS Assessment Committee; See Section III below for details.
	Summary of Program Capstone Evaluation Assessment Studies (MA411 and MA422)	Fall 2006	Fall 2008	Drs. Szekely and Trance submitted in fall 2008 report titled “Capstone Assessment through Abstract Algebra” to CNAS Assessment Committee; See Section III below for details.
	Program Capstone Evaluation Assessment Study using MA422	Fall 2006	Spring 2007	Dr. Trance submitted in spring 2007 report titled “A REPORT ON: THE PROGRAM ASSESSMENT TEST GIVEN TO: SENIOR STUDENTS IN MA422” to CNAS Assessment Committee; See Section III below for details.
	Program Capstone Evaluation Assessment Study using MA422	Fall 2006	Fall 2008	Dr. Nagahashi submitted in fall 2008 report titled “Spring 2008 Program Assessment Test for Math Majors in MATH 422” to CNAS Assessment Committee; See Section III below for details.

II. IDENTIFICATION OF MATHEMATICS ASSESSMENT EXEMPLARS

ASSESSMENT ACTIVITY	SUMMARY OF OUTCOMES AND CHANGES
1. Exit Test conducted in MA085 in Fall, 2006	Assessment results showed weak retention of the material covered and inadequate preparation of the students for the MA161/165 courses. Changes: introduced level I and II exit tests in MA085 to give students opportunity to review material, started MA088, Intermediate Algebra Class for science majors to provide students better preparation before taking MA161/165; MA088 is now being proposed as MA115.
2. Pre- and Post-Test assessments were conducted in MA165 in the Spring 2007	Results showed that students have very weak algebra skills coming in the class and they do not improve them in the end. Also students have weak problem solving skills. Changes: again the assessment results confirmed the need for Intermediate Algebra Class, MA088 to be required before taking MA165. Introduced workshop component modeled on Emerging Scholars Program (ESP) started by Uri Treisman at Berkeley. In the workshops, students work in cooperative groups on challenging problems assisted by both an instructor and an undergraduate student assistant.
3. MA085/MA110 assessments: a. Class-level assessments using Pre-test done with 2-3 math faculty initiated by Prof. Chen showed that students placed in MA110 via math placement test performed better than those who exited MA085 (Same results in Study stated in 4 below); b. Significant % of students taking MA085 who were surveyed indicated that they would like a "lecture-type" class instead of self-paced; c. Other assessment studies in math and concerns from faculty not only math but from other disciplines plus also from students contributed to outcomes and changes here.	The offering of MA084a-b, lecture-type format in teaching developmental math; Exit exams now being conducted in the Developmental Math Program;
4. Study on "Student Success/Failure Rates in Mathematics for Fall 2004, Spring 2005, Fall 2005 and Spring 2006" showed that about 68% of students placed in MA161a via our math placement test passed with C's or better, while only 48% who exited MA110(prerequisite for MA161a) passed with C's or better. Similarly, this study showed that about 82% of students placed in MA165 via our math placement test passed with C's or better, while only 47% who exited MA110 (prerequisite for MA165) passed with C's or better. Other assessment studies in math and NS also contributed to outcomes and changes here.	MA088 (Being proposed as MA115) now being offered as the prerequisite for MA161a/MA165.
5. The study in 4 was motivated during the spring 2005 semester by the Registrar's report that a significant % of students who enrolled in MA085 for the first time exited MA085 within one semester.	Changed math placement cutoff(s) score: Math Placement into MA110 or higher changed from $\geq$ 17 out of 25 correct answers down to $\geq$ 14 out of 25 correct answers.
6. Assessment studies and the study in 4, showed concerns in the success/failure rates of students especially students exiting our math prerequisite courses as compared to students being placed in our math courses.	The "ESP Method" of teaching is currently being conducted in MA161a/M165 (The ESP method is based on the "Workshop" concept developed by Dr. Uri Treisman at UC Berkeley, and now is run at many universities where the truly exceptional academic success of students in these courses is shown and well documented.
7. Math Faculty's recommendations on WASC-required assessments: a. MA422/MA411 now being used as capstone courses for program-level assessments; b. Math GE conducted spring 2008 using MA110; c. Developmental Math assessment using MA085 conducted spring 2008.	Math Faculty's reported results: a. "Closing the Loop" report to be completed fall 2008; b. GE MA110 results submitted to university-wide GERC; c. Exit exam now required by students before exiting developmental math program
8. Because of student difficulties in the required BI 412-Biometrics, Math with biology faculty conducted pre-test of students at start of course to assess preparedness (Conducted by Biology and Math Faculties).	Results showed that a statistics course tailored to biology would better prepare students for BI412-than the current MA161a prerequisite. Results were used to support a successful grant application and development of the course is underway by Prof. Tower Chen. Course will be piloted in Spring 2009.

III. DETAILED SUIMMARY OF AY 2007-2008 ASSESSMENT STUDY REPORTS SUBMITTED BY MATH FACULTY

A. Assessment Plans and Recommendations

ASSESSMENT ACTIVITY	ASSESSMENT RESULTS AND RECOMMENDATIONS
1. Program Capstone Evaluation Assessment using MA411. Program learning objective selected: ***Demonstrate critical thinking, problem solving skills and ability to use mathematical methods by identifying, evaluating and classifying, analyzing, synthesizing, data and abstract ideas in various contexts and situations.*** ***In particular, Problem solving techniques and presentation skills were assessed in MA411.***	Dr. Szekely submitted in fall 2008 report titled "Capstone Assessment through Abstract Algebra" to CNAS Assessment Committee. Findings: The findings indicate good general presentation skills of students, but point out weaknesses in *relating abstract content with presentable material*. Typically, a high percentage of students has *trouble to answer questions* of abstract nature related to the topic of their presentation. As a remedy, students should be encouraged to "talk mathematics" by using exact language in mathematical problem solving *from their freshman years throughout their studies*. Also, presentation as a meaningful assignment should be employed in most, if not all, mathematics courses in order to enhance students' ability to use exact mathematical language in a critically attentive environment. *Preliminary results* of this assessment were presented at the CNAS assessment meeting at November 30th, 2007.
2. Program Capstone Evaluation Assessment Study using MA411. Program learning objective selected: Same objective as in 1.	Dr. Trance submitted in fall 2008 report titled "A Report on the Assessment by Student Presentation in MA411 (Introduction to Abstract Algebra)" to CNAS Assessment Committee. Findings: This method of assessing the attainment of a program objective primarily aims to see how much mathematical maturity the students have gained in going through the different majors courses prior to their final semester in the program as indicated by their firm grasp of the concepts and clear perception of how theorems may be linked together in a logical sequence in order to form a solid proof of another theorem. Among the four presenters only one showed enough mathematical maturity to give an insightful and fluid flow of arguments indicating a good understanding of what she was sharing with her classmates. One student had very little add-on to what was presented in the book and the others, too, projected quite a limited understanding of the material assigned to them. As far as presentation skill is concerned, two of the student presenters made good use of visual aids which contributed a lot in making the abstract concepts appear relevant to the physical world. The value of these findings should be seen in the light of other assessment results.
3. Summary of Program Capstone Evaluation Assessment Studies done in 1 and 2 above. Program learning objective selected: Same objective as in 1.	Drs. Szekely and Trance submitted in fall 2008 report titled "Capstone Assessment through Abstract Algebra" to CNAS Assessment Committee. Findings: As mentioned, a high percentage of students had *trouble to answer questions* of abstract nature related to the topic of their presentation. Based on this finding we make a recommendation: students should be encouraged to "talk mathematics" by using exact language in mathematical problem solving *from their freshman years throughout their studies*. As a good practice, we may encourage students to come to the board frequently and *present their solutions* to homework, quiz or test assignments in front of their classmates in a way that is convincing to both the instructor and their peers. They should also *take and answer questions* from their fellow students so that, in the long range, they develop good command of the knowledge they convey. In general, presentation as a meaningful assignment should be employed in most, if not all, mathematics courses in order to enhance students' ability to use exact mathematical language in a critically attentive environment.
4. Program Capstone Evaluation Assessment Study using MA422. Program learning objective selected: Same objective as in 1.	Dr. Trance submitted in spring 2007 report titled "A REPORT ON: THE PROGRAM ASSESSMENT TEST GIVEN TO: SENIOR STUDENTS IN MA422" to CNAS Assessment Committee. Recommendations: 1. Based on the way the first problem in the Program Assessment Test (PAT) was solved, it is recommended that the formulation of the problems be improved so as to direct the students to use purely mathematical methods in their solutions. 2. It is also recommended to determine the best time for administering the PAT. The schedule should be such that the students will have enough time to review lessons learned in previous courses and still have the interest to get a high rating in the test. 3. A proper incentive to motivate the students to do their best in the PAT should be determined. 4. The result of the PAT should be interpreted in relation to the results of other forms of assessment implemented by the department. 5. A single result is insufficient to serve as basis for introducing changes in the B.S. Mathematics program. Additional data and other relevant factors should be considered for this purpose.
5. Program Capstone Evaluation Assessment study using MA422. Program learning objective selected: Same objective as in 1.	Dr. Nagahashi submitted in fall 2008 report titled "Spring 2008 Program Assessment Test for Math Majors in MATH 422" to CNAS Assessment Committee. Findings; There were three in-class exams and a final exam given in MATH 421 during Fall 2007 semester (six out of seven students took MATH 421). Also three exams were given in class of MATH 422 during Spring 2008. Although students showed certain levels of understandings for these exams, no students could get Problem 5, which focuses on the main issues of MATH 421/422. On the other hand most of the students got the correct answer for Problem 3, which they had a review session right before the exam, and also which is a more computational type of problem. This contrast shows their weakness for the long-term memory, and also the weakness of the skills in reading, writing, and ascertaining the validity of proofs. Hence these aspects should be more stressed in MATH 421/422, or even in MATH 302 and MATH 411.

B. Summary of Assessment Results

1. MA411 Assessment Study Results Using Capstone Rubrics

MATH CAPSTONE RUBRICS FOR PRESENTATION

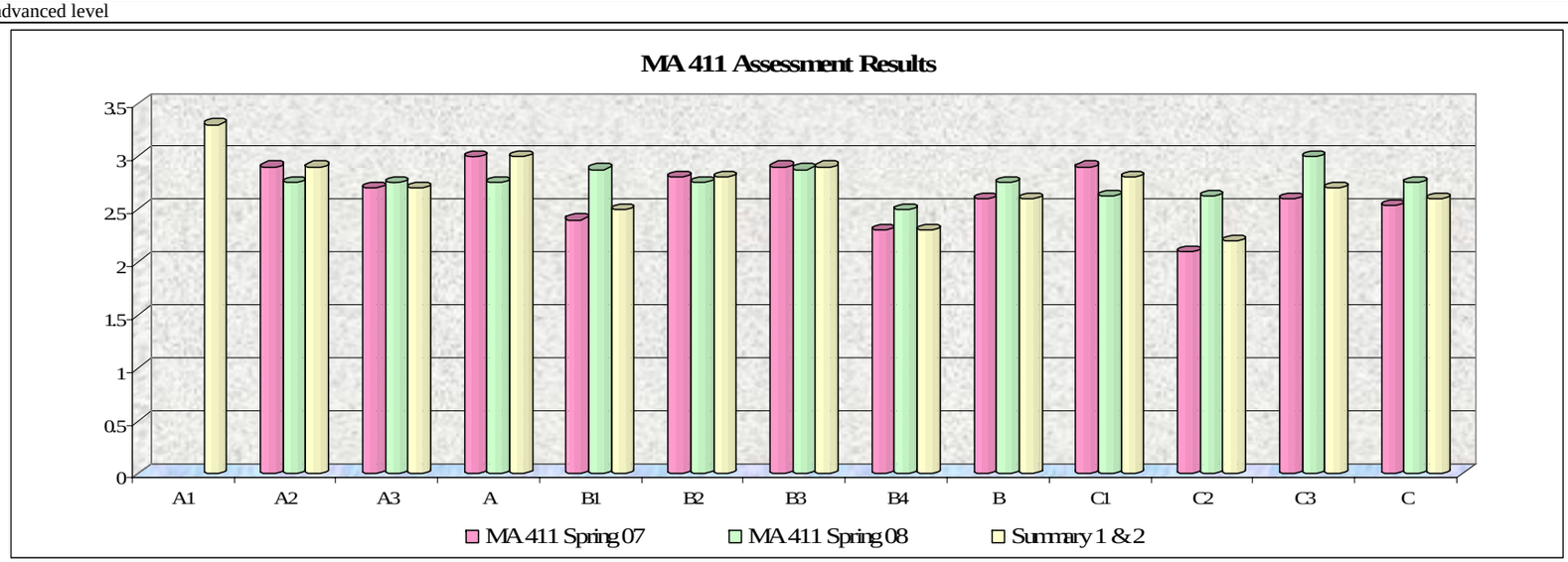
NAME OF EVALUATOR:		**Advanced:** Concise, correct w/all info needed for understanding.	**Proficient:** Correct statements, all important info included.	**Basic:** Correct statements, but some important aspect is missing.	**Unacceptable:** Incorrect statements, unintelligible sentences.
Group	Items of Measurement				
A. General Presentation Skills	A1. The topic of the presentation was stated clearly				
	A2. The presentation was neat, at the level of the Audience				
	A3. The presenter maintained good rapport throughout the presentation				
B. Presentation Skills Specific to Math	B1. The presenter used exact mathematical language				
	B2. Definitions were reviewed and/or explained as Needed				
	B3. The statements were formulated correctly				
	B4. The proof was presented in a way that gave insight				
C. Overall Performance	C1. Previous results, lemmas etc. were mentioned and explained (if any), the result(s) were placed into context				
	C2. The question(s) were answered clearly and correctly (if any)				
	C3. The presentation was convincing and reflected a good understanding the topic				

Other comments:

ASSESSMENT RESULTS USING CAPSTONE PRESENTATION RUBRICS

Capstone Course Study, Semester	No. of Students	General Presentation Skills				Presentation Skills Specific to Math					Overall Performance			
		Mean for Item A1	Mean for Item A2	Mean for Item A3	Overall Mean for A	Mean for Item B1	Mean for Item B2	Mean for Item B3	Mean for Item B4	Overall Mean for B	Mean for Item C1	Mean for Item C2	Mean for Item C3	Overall Mean for C
1. MA411, Spring 07	10	3.3	2.9	2.7	3	2.4	2.8	2.9	2.3	2.6	2.9	2.1	2.6	2.53
2. MA411, Spring 08	4		2.75	2.75	2.75	2.875	2.75	2.875	2.5	2.75	2.625	2.625	3	2.75
Summary 1 & 2	14	3.3	2.9	2.7	3.0	2.5	2.8	2.9	2.3	2.6	2.8	2.2	2.7	2.6

Scoring Rubrics: 1 is unacceptable ... 4 is advanced level



2. MA422 Assessment Study Results Using Capstone Rubrics

MA422 Assessment Study Results Using Capstone Rubrics

Assessment Rubrics for MA422 (Spring 2008)				
Number of Students participating in Assessment Study (Spring 2008)	Demonstration of Understanding Concepts in	Concept Selected for Program Assessment Test (PAT)	Problem # (10 points per problem)	Average Score
7	Linear Algebra (MA341)	Eigenvalues, eigenvectors and applications	1	2.86
	Foundations of Higher Math and Abstract Algebra (MA302 and MA411)	Equivalence/Congruence classes and the first Isomorphism Theorem	2	2.29
	Multivariable Calculus (MA205)	Double Integrals and/or Triple Integrals	3a	8.33
			3b	8
	Analysis (MA421/MA422)	Limits of Sequences and Functions	4a	3.5
			4b	3.2
	Analysis (MA421/MA422)	Sup/Inf, Continuity, differentiability, and integrability	5a	0.8
			5b	0.5