Assessment – Third Year Review 2010 – 2012
Department of Mathematical Sciences
April 2012

Assessment contact

Anne Brown (prepared report) and Yu Song

Attach annual reports prepared since the last third year review

Reports from 2010 and 2011 are attached.

Attach an updated departmental assessment plan

Recently revised plan is attached.

Attach a curriculum map showing program learning goals mapped to course offerings, (if not already a part of the departmental assessment plan.)

New curriculum map is attached

Describe any changes to the program's educational goals since the last Third Year Review, and the rationale for those changes.

Our overall goals have been made more explicit to make it easier to assess them.

Describe any assessment techniques used for measuring the Educational Goals that have been added or discontinued since the last Third Year Review, and the rationale for those changes.

Faculty members will now have specific responsibilities for providing assessment information concerning student performance on the indicators identified by the department in the courses they teach. This change is intended to provide more consistent information on student performance relative to the program goals.

Attach any assessment instruments that have been used during the past three years, and the data collected, (or, summarized data, if that is more appropriate.)

A survey of current students was carried out in Fall 2010; results are attached.

What analysis has been done with this data? What conclusions has your department drawn?

The department is encouraged by the positive response to the goals of our program while acknowledging some of the difficulties that are cited by the students, including the necessity to offer certain courses once every two years rather than every year. We discussed this issue at length and agreed on the need to make changes in the scheduling of statistics courses, as well as in other bottleneck courses that slow down student progress through the program.

What changes have been made to the program as a result? (Curriculum, classes offered, classes discontinued, scheduling, advising, faculty education etc. . .)

Some changes in offerings have been tried during the past two years, particularly more frequent scheduling of upper level courses, when possible. This has met with mixed success due to uneven enrollment patterns.

How did assessment data and analysis support these changes?

We learned more about the problems students see with scheduling and also, surprisingly, that more students now prefer daytime to evening courses.

What changes does the department plan to make in the coming years to the program and to assessment techniques, and why?

The indicators in each course will be further refined as we use them explicitly in assessment. Rather than simply indicating whether an indicator is addressed in a particular course, we will determine the level at which it is addressed: introduced, reinforced, or mastery expected. This can be complicated because the need to offer courses in alternate years means that students who are taking those courses will not all be at the same level.

We will continue to try to develop a more robust methodology for assessing the effectiveness of our majors courses. This is a very complex task in mathematics as there are sophisticated content goals as well as process goals in each course.

The alumni survey will be put entirely online and the link to complete it anonymously will be sent by email to recent alumni this spring. We hope that this will increase the response rate, which was very low the last time the survey was attempted.

How were faculty, students, administration, alumni and other groups involved in assessment?

All faculty who teach majors courses were involved in the development and application of the curriculum map. Current students were surveyed.

The Department of Mathematical Sciences meets annually to analyze the assessment information collected. Changes to the department's degree programs, including curriculum and scheduling of courses, are considered in light of the accumulated assessment data. Further, the assessment plan itself is discussed and, if necessary, revised at this meeting.

How were assessment data and results shared with faculty, students, administration and alumni?

In addition to submitting this report to the Campus Assessment Committee and the Dean of the College of Liberal Arts and Sciences, copies of the assessment plan, survey data, and reports have been placed on the departmental web page.

Does your academic program have courses which fulfill General Education requirements? What general education goals does the course address?

The Department of Mathematical Sciences have several courses which fulfill the Languages of Quantity requirement, and one course that fulfills the Natural World Common Core requirement. The general education goals addressed are specifically stated in the campus General Education requirements.

courses: K300, K310, M111, M118, M119, M125 & M126, M115, M215, M216

The following goals of general education (see IUSB Bulletin) that are addressed in these courses include the following. Students in courses in the mathematical sciences learn to

- Retrieve, evaluate, and use information effectively
- Write clearly and correctly, and analyze written texts in the mathematical sciences
- Understand, construct and analyze quantitative arguments
- Understand, construct and analyze arguments presented in verbal and visual form
- Understand the power and purpose of a scientific view of the natural world

More specifically, in courses in the mathematical sciences, students construct conceptual knowledge of mathematics, and learn general processes and procedures that apply conceptual knowledge to solve a variety of problems in the mathematical sciences, the health sciences, the natural sciences, the social sciences and business. Techniques of reasoning include methods of symbolic manipulation, visual and graphical methods, as well as written and oral communication of mathematical ideas.

How do you assess whether these goals have been met?

Attention to meeting the specified general education goals is an intrinsic part of the courses and the goals are assessed through combinations written homework, quizzes and tests, projects and group work.

Faculty in the department are currently developing a plan for assessing learning in general in the Language of Quantities courses. An initial model (developed for Math-M118) is attached. The Common Core course Math-N390 is assessed in the same way that all other majors courses are assessed (via the indicators on the curriculum map.)

In one paragraph, please summarize the most important impacts of assessment on student learning in the program.

Assessment of student learning is done very thoroughly at the classroom level in the Department of Mathematical Sciences, with attention to standard discipline-specific content and process objectives. This is done through written work that includes graded homework, projects, and exams. With this essential groundwork in place, it is useful to step back and discuss the larger picture of student learning, from a programmatic view. This reflection and analysis has lead to improvements in our program in the areas of scheduling, strengthening of the prerequisites for all courses, agreement on some common policies across courses and a general improvement in coherence across the curriculum.

Attachments to the 3rd Year Review

- Annual Report 2010
- Annual Report 2011
- Recently revised Departmental Assessment Plan
- New curriculum map
- Student survey used in 2010
- Results from 2010 student survey
- Quantitative Literacy Proposal

Assessment Report **May 2010**

a. **Program Name** – Department of Mathematical Sciences
b. **Report prepared by** – Anne Brown
c. **Who is the current assessment contact for your program?** Anne Brown and Yu Song.
d. **Should assessment information be sent to anyone else in your department?** No.

1. **What are the program's educational goals?**
·The major goal of our program is to give students seeking degrees in mathematics a broad understanding of the field of mathematics.
·Students should have the ability to read and understand technical mathematical writing, including proofs, in such areas as algebra and analysis.
·Students should have the ability to communicate mathematical ideas, both in written and verbal form, to others.
·Students should be able to model complex problem situations in equivalent mathematical form and, once a solution is found, be able to translate the solution into the original problem context.
·Students should be able to use appropriate technology to explore and solve mathematical problems.
·Students should be able to apply mathematical knowledge in non-academic contexts.

2. What assessment techniques did the program use?

The main instrument of assessment are the student portfolios, which contain representative student work for all 400 level Mathematical Sciences courses. Representative work for each course is chosen by the instructor and may include such items as final examinations, homework assignments, projects, papers, etc. Independent student research projects may also be included in the relevant area portfolios.

We also track student achievement on the professional actuarial exams, the Putnam Exam, the Indiana Section Mathematics Competition, and the Mathematical Contest in Modeling. In addition, we collect GRE scores when available and keep records of student success in gaining admission to graduate school, including whether they are given financial support.

Also, an informal faculty inventory is part of the annual departmental teaching retreat.

3. What has your program done with assessment information this year? (i.e. communicated results to faculty, staff, alumni and students, made changes in the curriculum, made changes in the budget, added new courses. . .)

a. We have consolidated offerings in probability and statistics to better serve

students. Now M463/M466 and M260/M261 will be offered every year, and the offering of M365 is suspended. This will allow applied math and actuarial majors to take M463/M466 at an appropriate point in their program. In addition, mathematics education majors will now taken M260/M261 which gives more thorough coverage at a better pace for these students.

b. We have improved academic advising by reviewing faculty assignments and also by developing 4 year generic plans for students pursuing each of the three departmental majors.

4. Does your academic program have courses which fulfill General Education requirements? What general education goals does the course address? How do you assess whether these goals have been met?

courses: K300, K310, M111, M118, M119, M125 & M126, M115, M215, M216

The following goals of general education (see page 34 in the 2009-2010 IUSB Bulletin) that are addressed in these courses include the following. Students in courses in the mathematical sciences learn to

·Retrieve, evaluate, and use information effectively
·Write clearly and correctly, and analyze written texts in the mathematical sciences
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·Understand the power and purpose of a scientific view of the natural world

More specifically, in courses in the mathematical sciences, students construct conceptual knowledge of mathematics, and learn general processes and procedures that apply conceptual knowledge to solve a variety of problems in the mathematical sciences, the health sciences, the natural sciences, the social sciences and business. Techniques of reasoning include methods of symbolic manipulation, visual and graphical methods, as well as written and oral communication of mathematical ideas. Attention to meeting the specified general education goals are an intrinsic part of the courses and are assessed through combinations of written homework, quizzes and tests, projects and group work.

5. After reflecting on assessment activities in your unit, as a result of assessment what are two issues you would like to address?

· In the fall of 2010, the assessment plan will be revised. We expect to transition from student portfolios to area portfolios. The areas will be Algebra, Analysis, Applied Mathematics, and Probability/Statistics. A rubric for evaluating the portfolios will be developed for faculty use.

· In addition, we plan to explore the idea of developing a procedure for longitudinal analysis of the collected assessment data in order to better track achievement levels.

Undergraduate Mathematics Assessment Annual Report 2011

Assessment Report **May 2011**

a. Program Name - Department of Mathematical Sciences
b. Report prepared by - Anne Brown
c. Who is the current assessment contact for your program? Anne Brown and Yu Song.
d. Should assessment information be sent to anyone else in your department? No.

1. What are the program's educational goals?

·The major goal of our program is to give students seeking degrees in mathematics a broad understanding of the field of mathematics.
·Students should have the ability to read and understand technical mathematical writing, including proofs, in such areas as algebra and analysis.
·Students should have the ability to communicate mathematical ideas, both in written and verbal form, to others.
·Students should be able to model complex problem situations in equivalent mathematical form and, once a solution is found, be able to translate the solution into the original problem context.
·Students should be able to use appropriate technology to explore and solve mathematical problems.
·Students should be able to apply mathematical knowledge in non-academic contexts.

Note: the above educational goals are currently being revised. One fundamental change is that the word "mathematics" will be replaced with the phrase "mathematical sciences" to acknowledge that the department's educational goals span the fields of classical pure mathematics, applied mathematics, probability and statistics. This is more than just a change in terminology, as the revised goals and indicators will reflect.

2. What assessment techniques did the program use?

The main instrument of assessment has been the portfolios, which contain representative student work for all 400 level Mathematical Sciences courses. Representative work for each course is chosen by the instructor and may include such items as final examinations, homework assignments, projects, papers, etc. Independent student research projects may also be included in the relevant area portfolios.

We also track student achievement on the professional actuarial exams, the Putnam Exam, the Indiana Section Mathematics Competition, and the Mathematical Contest in Modeling. In addition, we collect GRE scores when available and keep records of student success in gaining admission to graduate school, including whether they are given financial support.

A survey of all students in mathematical sciences courses at the 200 level and above was carried out during the fall semester of 2010.

Also, an informal faculty inventory is part of the annual departmental teaching retreat, as well as through continuing discussion in the departmental curriculum committee and department faculty meetings.

3. What has your program done with assessment information this year? (e.g. communicated results to faculty, staff, alumni and students, made changes in the curriculum, made changes in the budget, added new courses. . .)

a. We communicated the results of the student survey to faculty and considered changes in scheduling that would better meet student needs. In response to student requests, we scheduled the course Math-M435 Differential Geometry for Fall 2011.

b. Through student advising, we identified a need for a Common Core Natural World course in mathematics at the 300 level. Math-N390, Mathematics as a Human Endeavor has been approved by the Senate Curriculum Committee and is now in the final stages of remonstrance. If approved, it will replace Math-M380, History of Mathematics in our offerings.

4. Does your academic program have courses which fulfill General Education requirements? What general education goals does the course address? How do you assess whether these goals have been met?

courses: K300, K310, M111, M118, M119, M125 & M126, M115, M215, M216

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More specifically, in courses in the mathematical sciences, students construct conceptual knowledge of mathematics, and learn general processes and procedures that apply conceptual knowledge to solve a variety of problems in the mathematical sciences, the health sciences, the natural sciences, the social sciences and business. Techniques of reasoning include methods of symbolic manipulation, visual and graphical methods, as well as written and oral communication of mathematical ideas.

Attention to meeting the specified general education goals are an intrinsic part of the courses and are assessed through combinations of written homework, quizzes and tests, projects and group work. We are implementing a new procedure with the cooperation of course coordinators for monitoring and analyzing grade distributions and success rates in these courses.

5. After reflecting on assessment activities in your unit, as a result of assessment what are two issues you would like to address?

* We are in the process of revising the department assessment plan this year, developing a more complete and detailed set of goals and indicators, as well as a plan for long term assessment of progress in meeting the goals.

* We will continue to review the curriculum for our three bachelors degree programs to match offerings to student needs. In particular, due to a faculty discussion of student difficulties with the transition to the proof-based courses, we may change the nature of the course that is used as a pre-requisite.

Department of Mathematical Sciences
Degree Program Assessment Plan
Revised March 2012 (tentative)

Our major courses of study lead to a Bachelors of Science in Applied Mathematics, a Bachelors of Science in Actuarial Science, or a Bachelors of Arts in Mathematics.

I. Overall goals

The overall purpose of our program is to develop in students seeking degrees in the mathematical sciences the ability to

- read and understand technical writing, including proofs, in a range of areas in the mathematical sciences
- communicate ideas in the mathematical sciences, both in written and verbal form
- model complex problem situations in equivalent mathematical form and, once a solution is found, to be able to translate the solution into the original problem context.
- use appropriate technology to explore and solve problems in the mathematical sciences.
- apply their knowledge of the mathematical sciences in non-academic contexts.

II. Specific goals with indicators

In the bachelor's degree programs in the Mathematical Sciences at IU South Bend, students develop capabilities as mathematical thinkers and problem solvers while learning specific mathematical content in the areas of calculus, linear and abstract algebra, discrete mathematics, geometry, analysis, probability and statistics. The characteristic activities in the mathematical sciences, each of which increases in complexity throughout the programs of study, are listed below with indicators. Students demonstrate their growing capabilities as they participate successfully in these activities. This framework is informed by the standards of quality in curriculum provided by the major professional organizations in the mathematical sciences (including mathematics, probability and statistics, and mathematics education.)

In the courses of study provided by the Department of Mathematical Sciences:

<u>Students participate in problem solving activities and investigations in which they</u>

- use the tools of the mathematical sciences to model physical, social and mathematical phenomena
- use previously learned concepts and skills typical to the mathematical sciences in new ways
- design their own studies, collect data, and construct and interpret data representations
- use symbolic, visual, numerical representations to organize, present and manipulate mathematical, probabilistic and/or statistical information

Students engage in formal mathematical reasoning and proof making, probabilistic reasoning, and statistical reasoning and inference, through activities in which they

- read, analyze, and interpret rigorously presented arguments
- make and investigate conjectures
- select and use standard methods of proof in formulating their own rigorous arguments
- develop detailed accounts of their own correct probabilistic reasoning
- use the formal methods of statistical inference to estimate population parameters, test conjectured relationships among variables, and analyze data

Students employ appropriate technology for computation, visualization and simulation in solving problems and conducting investigations including

- statistical packages and/or spreadsheets
- graphing calculators, graphing software and/or dynamic geometry software
- computational software such as Mathematica, Maple, etc.

Students communicate explanations and arguments common in the mathematical sciences

- with precise and unambiguous use of the language of the mathematical sciences
- in a logical and organized fashion, with a complete and coherent discussion
- using mathematical word processing software such as MathType and/or TeX
- in oral presentations (in addition to traditional written presentations)
- for general as well as technical audiences

These indicators are intended to describe all assessable indicators in all major courses in the mathematical sciences taken but not all courses will necessarily address every indicator.

III. Methodology

The Department of Mathematical Sciences uses several methods to assess its degree programs. Area portfolios containing representative work from all 400 level Mathematics courses are maintained. Representative work that may be submitted include final examinations, homework assignments, projects, papers, etc. Student research projects are also included in the portfolios. Two surveys are also used in degree program assessment. Every third year, a survey is taken of current students taking our major level courses. Periodically, recent alumni are also surveyed.

Specific assessment of the success of bachelor's degree programs in the mathematical sciences is based on the following performance-based evidence:

- a curriculum map that shows which of the indicators are addressed in which majors course is maintained and updated by all faculty members who teach these courses
- course-based assessment, both individual and in the aggregate: satisfactory grades are interpreted as successful participation in the indicators identified for this course.
- to sharpen course-based assessment, the instructor of a major course at the 400 level will provide work samples as evidence of student performance relate to the indicators addressed in the course, and any recommendations based on those observations.

- student achievement on standardized exams, such as actuarial exams and the GRE
- student achievement on competitive exams, such as the Putnam, the national modeling exam, and the contest exam sponsored by the Indiana section of the MAA
- annual rate of graduate school admissions and the extent of support awarded
- annual employment status within the field of recent graduates

IV. Process

The Department of Mathematical Sciences meets annually, usually in its last meeting of the spring semester, to analyze the assessment information collected. Changes to the department's degree programs, including curriculum and scheduling of courses, are considered in light of the accumulated assessment data. Further, the assessment plan itself is discussed and, if necessary, revised at this meeting.

V. Participation

All full-time members of the department participate in the collection, analysis and discussion of assessment data, as well as in the revision of the assessment plan. On the student and alumni surveys, respondents are invited suggest changes to the curriculum or degree programs.

VI. Records

The Department of Mathematical Sciences keeps an archive of portfolios, student surveys, any other assessment data collected, copies of all assessment reports, and copies of its assessment plan on file in the department office. Copies of the assessment plan and reports are placed on the departmental web page.

Curriculum Map - Mathematical Sciences

Goals with indicators	Required and frequently offered courses																
Students participate in problem solving activities and investigations in which they	M215	M216	M260	M261	M301	M311	M325	M343/4	M347	N390	M403/4/5	M413/4/5	M447/8	M451	M463	M466	M471/2
use the tools of the mathematical sciences to model physical, social and mathematical phenomena	x	x	x	x	x	x	x	x	x				x	x	x	x	x
use previously learned concepts and skills typical to the mathematical sciences in new ways	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
design their own studies, collect data, and construct and interpret data representations				x				x					x	x		x	x
use symbolic, visual, numerical representations to organize, present and manipulate mathematical, probabilistic and/or statistical information	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Students engage in formal mathematical reasoning and proof making, probabilistic reasoning, and statistical reasoning and inference, through activities in which they	M215	M216	M260	M261	M301	M311	M325	M343/4	M347	N390	M403/4/5	M413	M447/8	M451	M463	M466	M471/2
read, analyze, and interpret rigorously presented arguments	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
make and investigate conjectures					x				x							x	x
select and use standard methods of proof in formulating their own rigorous arguments	x	x	x	x	x		x	x	x	x	x	x			x	x	x
develop detailed accounts of their own correct probabilistic reasoning			x	x									x	x	x	x	
use the formal methods of statistical inference to estimate population parameters, test conjectured relationships among variables, and analyze data				x									x	x		x	

Goals with indicators	Required and frequently offered courses																
Students employ appropriate technology for computation, visualization and simulation in solving problems and conducting investigations including	M215	M216	M260	M261	M301	M311	M325	M343/4	M347	N390	M403/4/5	M413/4/5	M447/8	M451	M463	M466	M471/2
statistical packages and/or spreadsheets			x	x									x	x	x	x	
graphing calculators, graphing software and/or dynamic geometry software	x	x	x	x	x	x		x					x	x	x	x	x
computational software such as Mathematica, Maple, etc.	x	x			x	x		x					x				x
Students communicate explanations and arguments common in the mathematical sciences	M215	M216	M260	M261	M301	M311	M325	M343/4	M347	N390	M403/4/5	M413/4/5	M447/8	M451	M463	M466	M471/2
with precise and unambiguous use of the language of the mathematical sciences	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
in a logical and organized fashion, with a complete and coherent discussion	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
using mathematical word processing software such as MathType and/or TeX									x				x	x			
in oral presentations	x	x		x		x		x	x	x		x	x	x		x	x
for general as well as technical audiences	x	x				x		x		x		x	x	x			x

Mathematics Student Survey 2010-2011

(To Students: Please fill out this survey at most once per school year.)

A. What is your major?	C. What are your career plans?
B. Which mathematics course(s) are you taking this semester?	

D. Please circle the appropriate response in each case.

<u>The courses I have taken in mathematics at IUSB enable me to</u>

1. read and understand mathematical writing.

strongly agree | agree | neutral | disagree | strongly disagree | no opinion

2. communicate mathematical ideas, both in written and oral form.

strongly agree | agree | neutral | disagree | strongly disagree | no opinion

3. model problems in mathematical form, solve the problems, and translate the solution back to the context of the original problem.

strongly agree | agree | neutral | disagree | strongly disagree | no opinion

4. use appropriate technology to explore and solve mathematical problems.

strongly agree | agree | neutral | disagree | strongly disagree | no opinion

E. What are the best aspects of your experience with the Mathematics program at IUSB?

F. Do you have any suggestions for improving the Mathematics program at IUSB? For example, are there any new courses and/or topics that you would like to see offered?

G. If you plan to take upper level 300 & 400 level math courses, do you prefer a.) Daytime or b.) Evening? If evening, please list course names, if possible:

Results of Student Survey, 2010-2011

A.

	Major	Minor
None	4	
Undec	11	
Act.Sci	11	
Math	9	
App.Math	9	
MSApplMath	7	
MathEd	25	
MSED	1	
CS	20	
Gen.St.	1	
Biol	12	
Bus	3	1
PreDent	1	
PreMed	2	
Chem	11	
Physics	25	
Econ	3	
Engl	2	
Jap	1	
Pre-Eng	5	
Pharm	2	
Pol.Sci	1	
Acctng	2	
Radiog	1	

B.

Course	*Number*
M126	1
M215	55
M216	22
M260	18
M301	17
M311	12
M343	24
M403	20
M413	5
M415	1
M447	15
M451	14
M477	1
M463	8
M574	7
M577	6

D. *Students feel they are taught to:*

1. read and write mathematical writing

strongly agree	*agree*	*neutral*	*disagree*	*strongly disagree*	*no opinion*
51	79	22	3	1	1

2. communicate mathematical ideas

strongly agree	*agree*	*neutral*	*disagree*	*strongly disagree*	*no opinion*
36	89	23	6	1	1

3. model & solve problems, and state solution in original context

strongly agree	*agree*	*neutral*	*disagree*	*strongly disagree*	*no opinion*
39	82	27	4	2	1

4. use appropriate technology in exploring & solving problems

strongly agree	*agree*	*neutral*	*disagree*	*strongly disagree*	*no opinion*
0	77	33	7	3	2

F. Suggestions for improvement:

Stop alternating years	9
Better mentoring and advising	1
course(s) for third actuarial exam	3
course(s) for GRE prep	1
intro course for modern algebra	1
differential geometry	4
number theory	2
history of math	1
game theory	1
PDE	1
seminar class in statistics	1
improve placement exam	1
increase 300&400 offerings in summer (M311, etc.)	1
avoid conflicts with CS courses	1
slow down in calculus	1
more tutors	1
upper level tutors	1
better supervision of tutors	3
more tutoring space	3
more technology use in classes	6
more high level offerings at more times	7
less proofs	1
interdisciplinary math/bus or math/phys	4

G. Preferred times:

Daytime	Nighttime
75	20

Suggested evening classes:

M471	1
M261	1
M447	1
M344	1
M311	2
M403	1

Quantitative Literacy Proposal

Submitted to the Department of Mathematical Sciences.

This proposal is a package containing:

1) Quantitative Assessment Rubric which was passed by the Department in December 2011.

2) Quantitative Literacy Assessment: Implementation Procedure.

3) Quantitative Literacy Assessment: Prototype Problems.

Respectfully, the Quantitative Literacy Committee of M118 course.

M. Darnel, M. Shafii, J. Pankow, D. Wolf, & C. Wedrychowicz.

March 19, 2012

Quantitative Assessment Rubric
Approved by The Mathematical Sciences

Learning Objectives	Proficient	Sufficient	Developing	Undeveloped
1. Comprehend, critically analyze word problems, and convert into mathematics	Correctly identify all variables, all constants, and set up necessary relationships between them	Identify variables and constants; correctly state nearly all necessary relationships	Identify some variables and constants; display some knowledge of relationships	Variables and constants not recognized as such; incorrect relationships between variables and constants
2. Interpret and use visual mathematical models	Correctly construct graphs, charts, and tables; make correct inferences from graphs, tables, and/or charts	Can construct usable graphs, charts, or tables; gather some correct information from graphs, charts, and/or tables	Incomplete construction of charts, graphs, and tables; gather some information from charts, graphs, or tables	No recognition of variables, constants, or relationships from charts, graphs, or tables
3. Apply new mathematical skills	Correctly identify and implement techniques for correct computation of solution	Can set up correct formulas and substitute correctly with few computational errors	Knowledge of formulas and correct techniques implied by work but not clearly demonstrated; mistakes in computations	Little awareness of correct techniques for solution; computations missing or incorrect
4. Interpret and draw conclusions	Correctly interpret and identify solution; demonstrate knowledge of context	Adequate identification and understanding of the meaning of the solution	Some results correctly recognized; unreasonable answers recognized as such; inability to interpret results	No knowledge of meaning of answers; unable to recognize unreasonable result

Quantitative Literacy Assessment

Implementation Procedure

A) A number of instructors of the course M118 agree to participate in the Quantitative Literacy Processes.

B) An instructor selects some problems (enough to evaluate each objective) similar to the Departmental Quantitative Prototype Problem (QPPS) to construct an evaluation instrument (test).

C) The instructor gives this test to her/his class. The instructor can use the problems as part of a regular examination.

D) The instructor grades the paper and labels each student's performance to be

"Proficient", "Sufficient", "Developing", or "Undeveloped"

in each rubric objective.

E) The instructor tallies the above results (in one copy of the rubric).

Note: This tallied rubric shows the total number of students of the class participated in the evaluation and the number of performances in each objective level.

F) The Department collects these *without the instructor's name*; summarizes the results in one rubric & determine the percentages of objectives' results.

Note: This summarized rubric shows level percentages of the students' Quantitative Literacy Performance for each objective.

G) The individual tallied rubrics and the summarized rubric will be submitted to Linda Chen of Academic Affairs for her evaluation.

Department of Mathematical Sciences

Quantitative Literacy Assessment

Prototype Problems

These problems are examples that could be used for the Quantitative Literacy Assessment for students of M118 Finite Mathematics course.