

Eastern New Mexico University

Mathematics Core Competencies Assessment

Area II Courses: Other College-Level Mathematics Competencies

Eastern New Mexico University: Math 113, Spring 2009

This assessment was completed in 2 phases.

Phase 1: During the last week of class Math 113 students were asked to answer the following questions.

Math 113 Students,

Taking into consideration every chapter that we have discussed this semester:

- Chapter 3, Fair Division
- Chapter 4, Apportionment
- Chapter 5, Euler Circuits
- Chapter 6, The Traveling Salesman Problem
- Chapter 7, The Mathematics of Networks
- Chapter 10, The Mathematics of Population Growth
- Chapter 9, Spiral Growth in Nature

Please answer the following questions to the best of your ability. Give particular examples to explain your response.

Please indicate a chapter or chapters that Competency ___ was addressed. Give an example of a problem that fulfilled the requirements of this competency. If you do not feel this was addressed, respond with not applicable or N/A.

(This question was asked for each competency and results tabulated. A separate file with the form the students filled out and results is available.)

There were 35 students in attendance.

Phase 2: Based on the students' opinions, questions on the last exam were chosen to specifically evaluate the students' performance. The last exam was specific to linear and exponential growth models. It also had a few items dealing with the Fibonacci sequence. In order to assess certain competencies, extra credit questions (not dealing with the major topic of the exam) were added. Because the students' opinions of the entire course were considered in the assessment, these items could not be assessed at the time they were being studied. These questions also address retention of key ideas in the course.

Students will display, analyze, and interpret data.

Students should:

1a. Discriminate among different types of data displays for the most effective presentation.

1b. Draw conclusions from the data represented.

1c. Analyze the implication of the conclusion to real life situations.

1b. Consider the graph below. Is it possible to cross each bridge only once and return to your starting place? (A graph with 6 vertices and 14 edges was provided.)
Why or why not?

Target: Student answered correctly and with appropriate justification.

Acceptable: Student answered correctly, but with either no explanation or invalid justification.

Unacceptable: no response or incorrect response.

Target: 10

Acceptable: 11

Unacceptable: 14

1c. The vertices in the graph above represent islands and the arcs represent real bridges. A photographer wishes to take pictures of each bridge (both sides). It costs \$2 to cross a bridge. What is his minimum cost?

Target: Student answered correctly.

Acceptable: Student's response is correct, based on his assessment of the previous question (1b).

Unacceptable: No response or incorrect response based on previous answer.

Target: 8

Acceptable: 2

Unacceptable: 25

Implications of results:

Students interpreted the statement of this competency to mean graphs in the topologic sense (vertices and arcs). The instructor interpreted this to mean statistical data displays, topics that would be discussed in Math 114.

1b, 1c These two competencies would be better assessed earlier in the semester, at the time that the course focused on these graphic methods. Since both were optional problems, many students did not attempt them.

The validity of a mathematical idea/method should be extended to more than the current topic. Other applications of the same graphing techniques should be offered in future semesters.

2. Students will demonstrate knowledge of problem-solving strategies.

Students should:

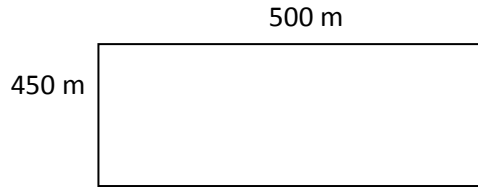
2a. For a given problem, gather and organize relevant information.

2b. Choose an effective strategy to solve the problem.

2c. Express and reflect on the reasonableness of the solution to the problem.

Three partners own a business jointly. By mutual agreement they decide to split up. The assets include the property shown below, along with a desk, a sofa, and a computer.

a) What method(s) might be used divide this piece of land?



b) What method(s) might be used to divide the office items (desk, sofa, and computer)?

c) Explain why your answers should lead to a “fair” division of the property.

2b. Target: Both questions a and b above were answered correctly.

Acceptable: One of the questions was answered correctly.

Unacceptable: no response or incorrect response to both a and b.

Target: 10 Acceptable: 10 Unacceptable: 15

2c. Target: Sound reasoning for the concept of “fair share”.

Acceptable: Student cites “fair share”, but provides no explanation.

Unacceptable: no response or incorrect response.

Target: 7 Acceptable: 8 Unacceptable: 20

Implications of results:

2b. In future semesters, emphasis might be placed on development of student strategies, as well as those offered by the text. Often, the two coincide. It should be pointed out to students that the methods they devise are as sound as those offered in the course. Common sense and thoughtful solutions are as necessary to problem solving as more complicated algebraic techniques.

2c. As much emphasis should be placed on the logic of the solution as on the solution itself. Additional questions about the validity of a solution in other circumstances could be posed.

3. Students will construct valid mathematical explanations.

Students should:

Use mathematics to model and explain real life problems.

1. Interpret the following expression in terms of an investment, interest rate, frequency with which interest is compounded, and length of time.

$$2655\left(1 + \frac{.04}{4}\right)^{60}$$

Use your calculator to evaluate the expression.

2. If Bill Black wants to have \$15,000, nine years from now, how much should he invest today at 6% annual interest compounded monthly?

Target: student answered both questions correctly.

Acceptable: student answered one of the questions correctly.

Unacceptable: no response or incorrect answers to both questions above.

Target: 25 Acceptable: 8 Unacceptable: 2

Implications of results:

Students are more involved with everyday finances and applications than with those they may or may not encounter in the future.

4. Students will display an understanding of the development of mathematics.

Students should: Recognize that math has evolved over centuries and that our current body of knowledge has been built upon contributions of many people and cultures over time.

Name a mathematician whose work/ideas are still used to solve problems today. Please include an example of a problem or a job description that would use his ideas.

Target: student named both a mathematician that we had discussed and the correct application.

Acceptable: Student named only a person we had studied.

Unacceptable: item was unanswered or incorrect.

Target: 18 Acceptable: 6 Unacceptable: 11

Implications of results:

Currently, students are required to write three 2-page papers during the semester. They are given a choice of biographies or current application topics. They submit them to me, but in the future, should be shared with other students. This could be done in class with short presentations or posted on Blackboard.