EMU's QR Course(s)

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EMU has a General Education requirement of a QR course. About a dozen courses across the university have been vetted for QR, but if the student's math placement isn't high enough, that student must also take Math 110, Mathematical Reasoning. The QR student learning outcomes are:

Students will learn to solve real-life problems using a mathematical modeling process. They will learn to:

1. Build an appropriate model.
    1. Estimate an answer to the problem.
    2. Identify important components of the model.
    3. Collect or generate appropriate data.
    4. Analyze the situation using arithmetic, geometric, algebraic, and probabilistic or statistical methods.
2. Use the model to solve the problem.
    1. Propose a solution.
    2. Evaluate the reasonableness of the solution.
3. Communicate the results of their analysis.
    1. Share the findings in oral or written reports using appropriate mathematical language.
    2. Write summaries to explain how they reached their conclusions.
    3. Communicate quantitative relationships using symbols, equations, graphs, and tables.
4. Evaluate the model.
    1. Draw other inferences from the model.
    2. Identify the assumptions of the model.
    3. Discuss the limitations of the model.

Math 110 catalog description: An introduction to quantitative reasoning, with the aim of developing the capacity to comprehend and analyze the quantitative information that is prevalent in modern society. Topics include mathematical modeling, basic probability and statistics, and practical applications.

Prerequisites: Placement or at least C in Math 098 (Pre-College Introductory Algebra Concepts) or Math 098b, or at least D- in any of Math 104 (Intermediate Algebra), 105 (College Algebra), 107 (Trig), etc.

Textbook: varies by instructor, but many use an EMU-written textbook (see next page)

Outcomes specific to Math 110 (not other EMU QR courses):

A. Carry out the steps of a mathematical modeling process.
B. Apply a variety of mathematical models to problem situations.
C. Analyze data using descriptive statistics.
D. Calculate and interpret discrete probabilities.
E. Use the normal distribution.
F. Apply statistical criteria such as significance tests, correlation and confidence intervals.
G. Explain the meaning of statistical criteria such as significance tests, correlation and confidence intervals.
H. Present a written or oral report outlining a problem situation, a proposed mathematical model, and a solution, together with a discussion of both the assumptions upon which the model is based and the limitations of the model.
I. Analyze data using a spreadsheet program.
J. Use a spreadsheet program to produce tables and graphs, and include them in a written report.

Many of our instructors use a textbook written at EMU for Math 110. We have it printed at a local print shop, then students pay about $50 for it, then supply their own 3-ring binder. We encourage other schools to consider adopting it. We can customize it for your needs (include new material, or exclude parts you don't want).

This is a Mathematics for the Liberal Arts book with a focus on mathematical modeling, both as a problem-solving method and as an organizing principle of the book. It assumes competence with arithmetic and elementary algebra, and aims to use the mathematics students already know to help solve problems that are more realistic than the typical Algebra I word problem. Topics include: modeling as an approach to problem solving, elements of quantitative literacy, direct proportion models, linear models, non-linear models (including financial models), probability models, descriptive statistics and the normal distribution, and sampling as a brief introduction to statistical inference. Includes an introduction to modeling with spreadsheets.

Abbreviated Table of contents from the EMU-written textbook (old version, 2008)

Two EMU professors have also written an in-class role-playing game where students use QL skills to debate Social Security and national Unemployment/ Disability/ Health Insurance, set in Congress in 1935. Contact aross15@emich.edu for more info, and see https://sites.google.com/site/reactingscience/games