MTH 105 Math in Society

Course Description:
Math in Society is a rigorous mathematics course designed for students in Liberal Arts and Humanities majors. The course provides a solid foundation in quantitative reasoning, symbolic reasoning, and problem solving techniques needed to be a productive, contributing citizen in the 21st century.

Course Outcomes: Skills and abilities that result from the course.
- ✓ [MR] Mathematical Reasoning: Students will read a complex problem requiring quantitative and/or symbolic analysis, use flexibility in selecting a solution strategy, and impose an appropriate mathematical structure or mathematical procedure in solving the problem.
- ✓ [MH] Mathematical Habits of Thought: Students will determine the reasonableness and implications of mathematical solutions, and will recognize the limitations of the methods used in context.
- ✓ [MDM] Mathematical Decision-Making: Students will apply mathematical processes and solutions in making personal and societal choices.
- ✓ [MC] Mathematical Communication: Student will use appropriate representations to effectively communicate, orally and in writing, quantitative results and mathematical processes.
- ✓ [MS] Mathematical Symbols, Techniques & Computation: Students will demonstrate proficiency in the skills supporting mathematical understanding.

Major Course Topics:
These are the three major topics along with the required supporting topics for each. The major topics are listed in the order in which they should be taught. Reasoning logically and problem solving are skills that should permeate throughout the entire course.
1. Logical Reasoning and Problem Solving --- (10 – 20% of course)
    - ✓ Describing and Critiquing Arguments
    - ✓ Understanding the Language of Logic
    - ✓ Recognizing Common Logical Fallacies
    - ✓ Learning Strategies of Problem Solving (non-algebraic, showing another way)
2. Probability and Statistics --- (30% of course)
    - ✓ Counting --- Multiplication Property
    - ✓ Measures of Central Tendencies and Spread
    - ✓ Calculating and Interpreting Basic Probabilities
    - ✓ Interpreting Graphical Displays/Histograms
    - ✓ Margin of Error/Polls
    - ✓ Expected Value

- ✓ Interpreting Distributions
- ✓ Misuse of Data

3. Financial Literacy --- (20% of course)
   - ✓ Percent Sales and Income Tax
   - ✓ Simple and Compound Interest
   - ✓ Annuities
   - ✓ Loans and Credit Cards

4. Additional Math Topics --- (30% of course)

   Additional topics that might be addressed include, but are <u>not</u> limited to:

✓ Graph Theory	✓ Voting Theory
✓ Gaming	✓ Fermi Approximations
✓ Game Theory	✓ Infinities
✓ **Modeling Growth**	✓ Symmetry/Tessellations
✓ Apportionments	✓ Cryptography
✓ Fractals	✓ Binary Operations
✓ **Applied Trigonometry**	✓ **Historical Numbers**
✓ **Golden Mean**	✓ Proportional Reasoning
✓ Math in Art	✓ Scheduling
✓ Math in Music	✓ Logistic Models
✓ Sequence and Series	

While the major topics overlap in many ways with content addressed in courses in statistics and business mathematics, the focus in MTH 105 is on the "big ideas" in these areas. That is, the aspects of logic, statistics, and finance which are essential knowledge for an educated citizenry. The course should not have extensive emphasis on procedures and details. The intent is to define a rigorous liberal arts quantitative course that provides an important piece of a well-rounded general education, namely, building a student's ability to reason quantitatively. The list of major topics is meant to address this aim through a consistent focus while still leaving time, about 30% of the course, for additional math topics that can be relevant to a wide range of liberal arts and humanities areas. An instructor could choose to apply the time allotted for the Additional Math Topics area to delve deeper into one, or all of the Major Course Topics.

<u>Prerequisite Skills for MTH 105, Math in Society</u>

In order for students to be successful in a rigorous college, transfer-level quantitative reasoning course it is essential that they have a firm foundation in basic number sense, the ability to reason algebraically, and the ability to read and interpret graphs. The following list of skills is intended to help frame our concept of a transfer-level quantitative reasoning course and to provide students and instructors with an understanding of the expectations we have for students who enroll in such a course. This list represents skills students should have entering this MTH 105 course, not a list of skills corresponding to a specific math course. It is important

to realize that students are not expected necessarily to achieve a high level of proficiency in all of these skills prior to entering MTH 105 as many of these skills will continue to be developed in this college, transfer-level course.

The MTH 105, Math in Society, description of skills and outcomes presumes that students entering the course should have developed a skill set through a college developmental math sequence or from math courses taken in high school. These skills include the following: **Note**: While many of these skills provide foundational support for more than one major course topic area in MTH 105, the coding abbreviations in parentheses, where noted, suggest a primary link between a particular skill and one of the three major course topic areas listed for the course: LR = logical reasoning; FL = financial literacy; and PS= probability and statistics.

Number Sense
- Use standard order of operations to evaluate expressions (including fractions and exponents)
- Calculate with, and convert between, decimals, fractions, and percents (FL)
- Interpret and use scientific notation
- Use various strategies to perform estimations (products, ratios, relative sizes) (FL)
- Use, and convert between, units
- Increase or decrease a given value by a given percentage (FL)
- Calculate the relative change (percent) between two quantities (PS)

Algebraic Reasoning and Modeling
- Use variables to represent quantities (LR)
- Solve linear equations and proportions (FL)
- Create and use linear models in a variety of authentic settings (FL)
- Interpret slope as a rate or ratio as appropriate for the given context (FL)
- Simplify and evaluate algebraic expressions using rules of exponents, including negative exponents, and combining like terms. (FL)
- Recognize and describe the relationship between variables expressed in an algebraic equation or graphical representation (intuitive notion of a function)
- Use, and convert between, different representations of relationships (verbal, algebraic, numerical, graphical) (LR)
- Understand order of operations (LR)
- Be able to use Polya's problem solving principles (or at least have modeled and solved some application problems) (LR)

Graphical Sense
- Create and use simple graphs: lines, bar charts, pie charts, and histograms (PS)
- Read and interpret graphs, charts, and tables (PS)