MOHAWK VALLEY COMMUNITY COLLEGE

ROME AND UTICA, NEW YORK

COURSE OUTLINE

MA108

CONCEPTS IN MATHEMATICS

Reviewed, Revised as Needed, and/or Found Acceptable 5/97 – 5/07

Reviewed, Revised 12/07 - 5/12

Reviewed and Found Acceptable 5/13

Reviewed and Revise 5/14

Reviewed and Found Acceptable 8/16

Reviewed and Revised 2/17COURSE OUTLINE

TITLE: Concepts in Mathematics

CATALOG NO.: MA108

CREDIT HOURS: 3

LAB HOURS: 0

PREREQUISITES: An appropriate high school GPA, or

 placement test score, or MA089 Arithmetic.

CATALOG DESCRIPTION:

This course is a survey of mathematics for students in those programs that do not require a mathematics sequence. It provides an appreciation of mathematical ideas in historical and modern settings. Topics include problem solving, logic, geometry, statistics, and consumer mathematics.

GENERAL STUDENT OUTCOMES:

At a level appropriate for students whose mathematical background includes the ability to perform arithmetic operations on signed numbers, fractions, decimals, and percents, and to solve linear equations in a single variable, students successfully completing the course will be able to:

1. Demonstrate an understanding of methods of reasoning and problems solving as applied to particular topics in the course
2. Demonstrate awareness of the nature and history of mathematical thought

SUNY Learning Outcomes

1. The student will develop well-reasoned arguments.
2. The student will identify, analyze, and evaluate arguments as they occur in their own and other’s work.
3. The student will demonstrate the ability to interpret and draw inferences from mathematical models such as formulas, graphs, tables, and schematics.
4. The student will demonstrate the ability to represent mathematical information symbolically, visually, numerically, and verbally.
5. The student will demonstrate the ability to employ quantitative methods such as arithmetic, algebra, geometry, or statistics to solve problems.
6. The student will demonstrate the ability to estimate and check mathematical results for reasonableness.

**MAJOR TOPICS:**

**1. PROBLEM SOLVING and LOGIC**

Inductive reasoning; pattern recognition; estimation; using charts, tables, sketches, and graphs; “guess, test, and revise” strategy.

Student Outcomes:

* 1. Identify and extend patterns in sequences of numbers or figures.

1.2 Estimate results of calculations.

1.3 Obtain information from graphs, sketches, and charts.

1.4 Solve applied problems, and determine whether a proposed solution is reasonable.

1.5 Identify contributions and achievements of various mathematicians.

1.6 Perform unit conversions in the context of problem solving

**2. CONSUMER MATHEMATICS**

Simple and compound interest; installment loans, and finance charges; annual percentage rates; annuities, and mortgages.

Student Outcomes:

2.1 Solve applied problems involving percent increase and decrease.

2.2 Calculate simple interest and compound interest.

2.3 Determine final amounts on deposit and interest earned on accounts involving compound interest.

2.4 Determine present value of investments involving compound interest.

2.5 Determine the amount of deposit to achieve a given value in an annuity.

2.6 Determine the initial amount needed for a payout annuity.

2.7 Find the monthly payment for a loan.

2.8 Find the amount of a loan given the monthly payment.

2.9 Find the total amount of interest paid on a mortgage.

**3. GEOMETRY**

Lines, angles, polygons, and solids; fractals and geometric processes that create them; geometric representation of complex numbers.

Student Outcomes:

3.1 Calculate areas and volumes using basic formulas

3.2 Calculate perimeters and areas from direct measurements with a ruler and protractor.

3.2 Recognize and describe self-similarity

3.3 Use an initiator and a generator to construct fractal sequences

**4. STATISTICS**

Tables and graphs; population, sample, sampling methods, and bias, measures of central tendency; measures of variation; percentiles; z-scores; normal distribution.

Student Outcomes:

4.1 Construct a frequency distribution for a set of data.

4.2 Draw representations of a set of data; possibly including stem-and-leaf, histogram, circle graph, box-and-whiskers.

4.3 Identify deceptions in visual displays of data.

4.4 Identify sampling methods

4.5 Identify ways that statistical results may not be sound.

4.6 Calculate mean and median for a set of raw data.

4.7 Calculate range and standard deviation for a set of raw data.

4.8 Compare data from two different scales by converting the data values to z-scores.

4.9 Find percentages of normally distributed data falling in various ranges.

TEACHING GUIDE

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**Optional topics**

The instructor will use the remaining time on two or more of the following topics, available in the Lippman book:

**Further Development of Fractals and Geometry of Complex Numbers**

**Symbolic Logic and Truth Tables**

**Voting Theory**

**Sets**

**Probability**

**Supplement of Names of Mathematicians:**

Pythagoras – Pythagorean Theorem

Polya – Four-Step problem solving process

Sierpinski - Discovered many examples of topological spaces with unexpected properties

Mandelbrot – Defined a fractal set, and did innovative work with computer graphics in mathematics.

Euler – Laid the foundations of Graph Theory.

Gauss – Developed an exponential function that was the foundation for the normal or “Gaussian” curve.

Venn – Use of overlapping circles to represent set relations led the modern use of “Venn” diagrams.