I. **OVERVIEW**
   The following information will appear in the 2009 - 2010 catalog

   **MATH-105 Structure of Mathematics 1**
   4 Units
   
   **Prerequisite:** Satisfactory completion of MATH 90 or equivalent placement by MJC assessment process.

   Structure of arithmetic for prospective elementary school teachers. The definitions, operations, and properties of sets, counting numbers, integers, rational and irrational numbers; numeration systems; number theory, logic. Field trips are not required. Course is applicable to the associate degree. General Education:
   CSU-GE - B4

II. **LEARNING CONTEXT**
   Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**

   a. Sets
      i. Set operations
      ii. Venn diagrams

   b. Problem Solving
      i. Principles
      ii. Strategies
      iii. Applications

   c. Numeration Systems
      i. Historical Numeration Systems
      ii. Non-decimal Positional Systems

   d. Whole Numbers
      i. Models for Arithmetic Operations
      ii. Algorithms for Arithmetic Operations

   e. Integers
i. Models for Integers
ii. Algorithms for Integers

f. Rational Numbers
   i. Models for Rationals
   ii. Algorithms for Arithmetic with Rationals

g. Real Number System
   i. Introduction to Irrational Numbers
   ii. Decimals
   iii. Percent

h. Number Theory
   i. Divisibility
   ii. Clock Arithmetic
   iii. Ratio and Proportion
   iv. GCD and LCM

i. Methods of Calculations
   i. Techniques of Mental Arithmetic
   ii. Calculator Related Concerns
   iii. Pencil and Paper Techniques

B. ENROLLMENT RESTRICTIONS

1. Prerequisites
   Satisfactory completion of MATH 90 or equivalent placement by MJC assessment process.

2. Requisite Skills
   Before entering the course, the student will be able to:
   a. Graph lines and find the equation of a line, given sufficient information.
   b. Effectively use function notation to describe mathematical relationships.
   c. Determine the domain and range of a given function.
   d. Given a relation between two variables, determine if the relation is a function.
   e. Graph linear, quadratic, absolute value, and simple cubic functions using transformations.
f. Solve systems of linear equations in two or three variables by choosing the most effective method for the given problem.

g. Solve linear, quadratic, absolute value, and rational inequalities.

h. Solve quadratic equations with real and complex solutions by completing the square and using the quadratic formula.

i. Graph quadratic functions by determining and using the vertex and stretching constant.

j. Add, subtract, multiply, and divide complex numbers.

k. Convert radicals to rational exponents and vice versa.

l. Add, subtract, multiply, divide, or compose two given functions.

m. Find the inverse of a given function.

n. Graph exponential and logarithmic functions using transformations.

o. Solve exponential and logarithmic equations.

p. Simplify expressions using the properties of logarithms.

q. Identify the equations for and sketch the graphs of conic sections.

r. List a requisite number of terms of a given arithmetic, geometric, or recursive sequence.

s. Determine the general term of a given arithmetic or geometric sequence.

t. Determine the sum of a fixed number of terms of an arithmetic or geometric series, and determine the sum of an infinite geometric series when it exists.

u. Solve problems involving permutations, combinations, and probability.

C. HOURS AND UNITS

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<thead>
<tr>
<th>INST METHOD</th>
<th>TERM HOURS</th>
<th>UNITS</th>
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<tr>
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D. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Lecture/discussion

2. Demonstrations of problem solving by instructor and/or students

3. Exercise sets which develop mathematical skills and provide practice in applying those skills

4. (optional) Field trips, projects, and readings from professional journals to inform students of current issues in elementary mathematics education

5. Problem-solving exercises require students to analyze problems and either select appropriate previously learned solution methods or create their own method.

6. Class discussions require students to analyze and compare different teaching strategies and
philosophies.

E. ASSIGNMENTS (TYPICAL)

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**
   
   *Time spent on coursework in addition to hours of instruction (lecture hours)*

   Homework assignments should be assigned on a daily or weekly basis. Exercises from the textbook can be used for these assignments, to be supplemented as desired. Each hour of class time should produce almost 2 hours of homework.

   Several exams should occur during the semester, apportioned as appropriate. Each exam should require several hours of preparation from the student.

   A comprehensive final exam should be held during the scheduled time. This exam should require several hours of preparation from the student.

2. **EVIDENCE OF CRITICAL THINKING**
   
   *Assignments require the appropriate level of critical thinking*

   a. Use the grid method to illustrate the product of \( \frac{3}{4} \) and \( \frac{1}{2} \).

   b. Use Polya's problem solving principles to solve the following problem. At a benefit concert, 600 tickets were sold and $1500 was raised. If there were $2 and $5 tickets, how many of each type was sold?

   c. Use mats, strips, and units to find the sum of \( 131_{\text{four}} \) and \( 123_{\text{four}} \).

   d. Find the product of 261 and 5,639 using the lattice algorithm.

F. **TEXTS AND OTHER READINGS (TYPICAL)**


2. **Other**: Mathematics Framework for California Public Schools, Published 2005, California Department of Education

3. **Other**: Principles and Standard for School Mathematics, Published 2000, National Council of Teachers of Mathematics

III. **DESIRED LEARNING**

A. **COURSE GOAL**

   *As a result of satisfactory completion of this course, the student should be prepared to:*

   Explain mathematical concepts to elementary school children. They should also be prepared to succeed in MATH 106.

B. **STUDENT LEARNING GOALS**

   *Mastery of the following learning goals will enable the student to achieve the overall course goal.*

   1. **Required Learning Goals**

      *Upon satisfactory completion of this course, the student will be able to:*

      a. define the vocabulary of the structure of number systems.
b. compare and contrast other numeration systems with the Hindu-Arabic base 10 place value system.

c. outline the relationships of the major subsets of the real number system.

d. name and describe the properties of the real number system.

e. apply the operations of the real number system to selected problems.

f. select appropriate problem solving strategies and use the strategies to solve problems.

g. use various algorithms for calculations and evaluate the effectiveness of each.

h. develop positive attitudes toward mathematics and mathematics teaching.

i. identify resources available to elementary mathematics teachers.

j. use mental arithmetic, paper and pencil calculations, and calculators as appropriate.

k. select appropriate problem solving strategies and use them to solve problems.

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

1. Homework

2. Tests given regularly throughout the semester

3. (Optional) Projects and Reports

B. SUMMATIVE ASSESSMENT

1. Final examination

2. (Optional) Projects and Reports