

Principles of Mathematics I

Course Design

2003-2004

Course Information

Organization:	Eastern Arizona College
Division:	Mathematics
Course Number:	MAT 130
Title:	Principles of Mathematics I
Credits:	3
Developed by:	Ralph Selensky
Lecture/Lab Ratio:	3 lecture; 0 lab
Transfer Status:	ASU general elective, U of A departmental elective, NAU Mat 150
Activity/Enrichment Course:	No
CIP Code:	27.0101
Assessment Mode:	Pre/Post Test (20 questions/20 points)
Semester Taught:	Offered Every Fall Semester
Gen. Ed. Area:	None
Separate Lab:	No
Awareness Course:	No
Intensive Writing Course:	No
Prerequisites:	1. MAT 140 or MAT 154 with a grade of "C" or higher
Educational Value:	To provide student with a better understanding of the fundamental concepts of mathematics that are generally taught in an elementary school. To expose student to a variety of mathematical ideas and methods for teaching elementary mathematics.
Description:	Mathematical principles and processes underlying mathematics instruction in grades K-8; problem solving, number theory, systems of whole numbers, integers, rational numbers, and real numbers, ratios, decimals, and percents.
Textbooks:	Sonnabend. Mathematics for Elementary School Teachers. second. Saunders College Publishing, 1997.
Supplies:	

Competencies and Performance Standards

1. Investigate mathematical reasoning.		
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Important</i> <i>Difficulty-- Medium</i>
<p>Criteria--Criteria - Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner can discuss inductive and deductive reasoning. • learner can apply inductive and deductive reasoning. • learner can discuss Polya's four steps in problem solving. • learner can apply a variety of problem solving strategies. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Discuss inductive and deductive reasoning. Apply inductive and deductive reasoning. Discuss Polya's four steps in problem solving. Apply a variety of problem solving strategies.
2. Understand sets and set notation.		
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Important</i> <i>Difficulty-- Medium</i>
<p>Criteria--Criteria - Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner understands the basic terminology and notation of sets. • learner can define the set operations intersection, union, and cartesian product. • learner can determine the intersection, union, and cartesian product of given sets. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Understand the basic terminology and notation of sets. Define the set operations intersection, union, and cartesian product. Determine the intersection, union, and cartesian product of given sets.

3. Understand the set of Whole Numbers.			
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Essential</i>	<i>Difficulty-- Medium</i>
<p>Criteria--Criteria - Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner can compare and contrast the following numeration systems: tally, Egyptian, Babylonian, Roman, Hindu-Arabic. • learner can demonstrate two models for place value. • learner can define the following operations on whole numbers: addition, subtraction, multiplication, division. • learner can illustrate addition as a union of sets, and as measures on a number line. • learner can illustrate the take away and comparison meanings of subtraction using sets and measures on a number line. • learner can illustrate the various meanings of multiplication using sets and measures. • learner can illustrate the various meanings of division using sets and measures. • learner understands and can apply the properties of whole number operations. • learner understands and can demonstrate a variety of algorithms for whole number operations. • learner can discuss strategies for mental computation and estimation of whole number operations. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Compare and contrast the following numeration systems: tally, Egyptian, Babylonian, Roman, Hindu-Arabic. Demonstrate two models for place value. Define the following operations on whole numbers: addition, subtraction, multiplication, division. Illustrate addition as a union of sets, and as measures on a number line. Illustrate the take away and comparison meanings of subtraction using sets and measures on a number line. Illustrate the various meanings of multiplication using sets and measures. Illustrate the various meanings of division using sets and measures. Understand and apply the properties of whole number operations. Understand and demonstrate a variety of algorithms for whole number operations. Discuss strategies for mental computation and estimation of whole number operations. 	

4. Understand number theory.			
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Important</i>	<i>Difficulty-- Medium</i>
<p>Criteria--Criteria - Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner understands and can apply divisibility theorems. • learner can demonstrate the divisibility tests for 2,3,4,5,6,7,8,9,10. • learner can determine whether a number is prime or composite. • learner can determine all the factors of a given number. • learner can write the prime factorization of a given number. • learner can determine the greatest common factor and the least common multiple of two numbers. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Understand and apply divisibility theorems. Demonstrate the divisibility tests for 2,3,4,5,6,7,8,9,10. Determine whether a number is prime or composite. Determine all the factors of a given number. Write the prime factorization of a given number. Determine the greatest common factor and the least common multiple of two numbers. 	
5. Understand the set of Integers.			
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Essential</i>	<i>Difficulty-- Medium</i>
<p>Criteria--Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner can explain the rules for addition and subtraction of integers using a variety of applications. • learner can illustrate the rules for addition and subtraction of integers using a number line and colored counters. • learner can explain the rules for multiplication and division of integers by establishing a pattern, and using a variety of applications. • learner can extend the properties of Whole Numbers to the Integers. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Explain the rules for addition and subtraction of integers using a variety of applications. Illustrate the rules for addition and subtraction of integers using a number line and colored counters. Explain the rules for multiplication and division of integers by establishing a pattern, and using a variety of applications. Extend the properties of Whole Numbers to the Integers. 	

6. Understand the set of Rational Numbers.			
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Essential</i>	<i>Difficulty-- Medium</i>
<p>Criteria--Criteria - Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner can demonstrate four meanings of an elementary fraction. • learner can use two methods for verifying the equivalence of two fractions. • learner can explain the rules for adding and subtracting fractions. • learner can use fraction bars to illustrate the rules for adding and subtracting fractions. • learner can explain the rules for multiplying and dividing fractions. • learner can illustrate the rules for multiplying and dividing fractions using a variety of methods. • learner can extend the properties of the Integers to the Rational Numbers. • learner can discuss strategies for mental computation and estimation of Rational Number operations. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Demonstrate four meanings of an elementary fraction. Use two methods for verifying the equivalence of two fractions. Explain the rules for adding and subtracting fractions. Use fraction bars to illustrate the rules for adding and subtracting fractions. Explain the rules for multiplying and dividing fractions. Illustrate the rules for multiplying and dividing fractions using a variety of methods. Extend the properties of the Integers to the Rational Numbers. Discuss strategies for mental computation and estimation of Rational Number operations. 	
7. Understand the Real Number System.			
<i>Domain-- Cognitive</i>	<i>Level-- Application</i>	<i>Importance-- Important</i>	<i>Difficulty-- Medium</i>
<p>Criteria--Performance will be satisfactory when:</p> <ul style="list-style-type: none"> • learner can explain the meaning of decimal numbers using place value models. • learner can explain the rules for adding, subtracting, multiplying, and dividing decimal numbers. • learner can solve problems using ratios and proportions. • learner can convert between percents, fractions and decimals. • learner can solve percent problems. • learner can identify the major subsets of the Real Numbers. • learner can discuss the properties of Real Number operations. 	<p>Conditions-- Competence will be demonstrated:</p> <ul style="list-style-type: none"> • on assigned activities. • on written exams. • on a two hour cumulative exam. 	<p>Learning Objectives:</p> <ol style="list-style-type: none"> Explain the meaning of decimal numbers using place value models. Explain the rules for adding, subtracting, multiplying, and dividing decimal numbers. Solve problems using ratios and proportions. Convert between percents, fractions and decimals. Solve percent problems. Identify the major subsets of the Real Numbers. Discuss the properties of Real Number operations. 	

Types of Instruction

Classroom Presentation

Grading Policy

Evaluation Methods:

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written exams must represent at least 50% of the course grade.
2. Final exam must represent at least 20% of the course grade.
3. The Post Test is to be embedded in the final exam and must represent at least 10% of the course grade.
4. Other activities may represent at most 30% of the course grade.

Grading Scale:

Grade	Requirement
A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	Below 60%

Learning Plans

Learning Plan 1-- MAT 130 Principles of Mathematics I

Overview: Instructors are encouraged to be creative and to use both a variety of learning activities, and a variety of assessment activities. Suggested activities are listed below.

- Competency:** 1. Investigate mathematical reasoning.
- Competency:** 2. Understand sets and set notation.
- Competency:** 3. Understand the set of Whole Numbers.
- Competency:** 4. Understand number theory.
- Competency:** 5. Understand the set of Integers.
- Competency:** 6. Understand the set of Rational Numbers.
- Competency:** 7. Understand the Real Number System.

Learning Activities:

- _____ 1. Listen to a lecture and take notes
- _____ 2. Participate in a class discussion
- _____ 3. Read the assigned section in the text
- _____ 4. Demonstrate a procedure for others
- _____ 5. Work on assigned problems individually
- _____ 6. Collaborate with others on assigned problems
- _____ 7. Correct mistakes on homework and exams
- _____ 8. Complete a computer lab activity

- Performance Assessment Activities:**
- _____ 1. Complete assigned activities
 - _____ 2. Complete written exams
 - _____ 3. Complete a final exam