Principles of Mathematics I

Course Design
2018-2019

Course Information

Division: Mathematics
Course Number: MAT 156
Title: Principles of Mathematics I
Credits: 3
Developed by: Ray Orr
Lecture/Lab Ratio: 3 Lecture/0 Lab
Transfer Status: ASU NAU UA

<table>
<thead>
<tr>
<th>Activity Course</th>
<th>ASU</th>
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<th>UA</th>
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<td>MTE 280</td>
<td>MAT 150</td>
<td>MATH Departmental Elective</td>
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CIP Code: 27.0101
Assessment Mode: Final Exam (25 Questions/100 Points)
Semester Taught: Spring
GE Category: None
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites
MAT 140 or higher with a grade of "C" or higher or placement test score as established by District policy

Educational Value
Provide prospective elementary school teachers a deep understanding of key concepts and principles of mathematics so they will be able to help their students do likewise.

Description
Mathematical principles and processes underlying mathematics instruction in grades K-8; numbers and the base-ten system, problem solving, fractions, decimals, addition, subtraction, multiplication, division, ratios, proportions, and number theory.

Supplies
Calculator
Competencies and Performance Standards

1. Explain numbers and the base-ten system.
   **Learning objectives**
   *What you will learn as you master the competency:*
   a. Discuss counting numbers, whole numbers, and the cardinality of a set.
   b. Explain and use the base-ten system to represent numbers as bundled objects.
   c. Discuss integers and decimal numbers.
   d. Compare numbers in the base-ten system.
   e. Explain and apply the process for rounding numbers.
   f. Use a different base system to count.

   **Performance Standards**
   *You will demonstrate your competence:*
   o on assigned activities
   o on written exams
   o on a two hour cumulative exam

   *Your performance will be successful when:*
   o learner can discuss different sets of numbers
   o learner can explain and use the base-ten system
   o learner can plot numbers on a number line
   o learner can round numbers to a certain place value

2. Explain fractions.
   **Learning objectives**
   *What you will learn as you master the competency:*
   a. Identify the parts of a fraction.
   b. Explain the meaning of the numerator and the denominator.
   c. Convert between fractions and decimals.
   d. Plot fractions and equivalent fractions on a number line.
   e. Explain how to find equivalent fractions and how to reduce fractions.
   f. Compare fractions using multiple methods.
   g. Solve percent problems.

   **You will demonstrate your competence:**
   o on assigned activities
   o on written exams
   o on a two hour cumulative exam

   **Your performance will be successful when:**
   o learner can explain what the numerator and the denominator of a fraction mean
   o learner can find equivalent fractions and reduce fractions
   o learner can determine which fraction is larger or smaller by more than one method
   o learner can solve percent problems
3. Explain addition and subtraction.

*Learning objectives*

*What you will learn as you master the competency:*

a. Identify the parts of an addition and subtraction problem.

b. Explain the relationship between addition and subtraction.

c. Solve addition and subtraction problems using a number line or a math drawing.

d. Apply the commutative and associative properties of addition.

e. Use multiple strategies to do mental addition and subtraction.

f. Use and explain the standard addition and subtraction algorithms.

g. Explain the process to add and subtract fractions.

h. Explain the process to add and subtract signed numbers.

*Performance Standards*

*You will demonstrate your competence:*

- on assigned activities
- on written exams
- on a two hour cumulative exam

*Your performance will be successful when:*

- learner can identify the parts of addition and subtraction problems

4. Explain multiplication.

*Learning objectives*

*What you will learn as you master the competency:*

a. Identify when multiplication is the correct operation to use.

b. Identify the parts of a multiplication problem.

c. Explain and apply the commutative and associative properties of multiplication.

d. Explain and apply the distributive property.

e. Use and explain the standard algorithm for multiplication.

f. Use the array model to demonstrate multiplication.

*Performance Standards*

*You will demonstrate your competence:*

- on assigned activities
- on written exams
- on a two hour cumulative exam

*Your performance will be successful when:*

- learner can identify when multiplication is the appropriate operation to use
5. Explain division.

Learning objectives

What you will learn as you master the competency:

a. Identify and explain the two interpretations of division.
b. Explain why division by zero is undefined.
c. Explain why the process of reciprocate and multiply works for division of fractions.
d. Explain why the standard algorithm works for division.
e. Explain why the process for division of decimal numbers works.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two hour cumulative exam

Your performance will be successful when:

- learner can explain why division by zero is undefined
- learner can explain why reciprocal and multiply works for division of fractions
- learner can explain the process for division of decimal numbers and why it works
- learner can recognize and explain the two interpretations of division

6. Explain ratio and proportion.

Learning objectives

What you will learn as you master the competency:

a. Explain the meaning of a ratio and ratio notation.
b. Recognize and explain proportional relationships.
c. Use different methods to solve proportions including strip diagrams.
d. Explain why cross multiplication works.
e. Explain the difference between direct and inverse proportional relationships.
f. Solve percent problems using proportions.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a two hour cumulative exam

Your performance will be successful when:

- learner can explain the meaning of a ratio
- learner can solve proportions by different methods, including strip diagrams
learner can explain direct and inverse proportion relationships
learner can solve percent problems using proportions

7. **Explain basic number theory.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Explain the difference between factors and multiples.
b. Explain the characteristics of even and odd multiple ways.
c. Use and explain divisibility test for 2, 3, 4, 5, 6, 8, 9, and 10.
d. Explain the characteristics of prime and composite counting numbers.
e. Find greatest common factor and least common multiple by the slide method.
f. Find greatest common factor and least common multiple using prime factors.
g. Explain the difference between rational and irrational numbers.

*Performance Standards*

*You will demonstrate your competence:*

- on assigned activities
- on written exams
- on a two hour cumulative exam

*Your performance will be successful when:*

- learner can explain the difference between factors and multiples
- learner can explain the characteristics of even and odd
- learner can use and explain divisibility test for 2, 3, 4, 5, 6, 8, 9, and 10
- learner can explain the characteristics of prime and composite counting numbers
- learner can find the greatest common factor and least common multiple by the slide method
- learner can find greatest common factor and least common multiple using prime factors
- learner can explain the difference between rational and irrational numbers

*Types of Instruction*

Classroom Presentation

*Grading Information*

*Grading Rationale*

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

1. Written exams must represent at least 60% of the final course grade.
2. Final exam must represent at least 20% of the final course grade.
3. Other activities may represent at most 20% of the final course grade.
Grading Scale

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