Mathematics Department
Course Outline

Ma 508 Professionalized Subject Matter in Arithmetic

Course Description: This course offers a study of procedures in arithmetic. Attention is given to concepts in manipulative and problem solving areas. Various services for diagnostic and remedial measures are introduced and evaluated.

Goals of the Course

1. To provide the student with mathematical skills needed in the study of algebra.

2. To provide the student with an algebraic, numerical and graphical approach to problem solving.

3. To investigate and evaluate diagnostic tools used for student evaluation.

4. To provide the student with knowledge of technological resources available for this level of student.

5. To expose the student to a variety of problem solving techniques.

Instructional Procedures

1. Classroom Lecture.
2. Group Projects.
3. Calculator and Computer Projects.
4. Class Project or Presentation.

<u>Course Content</u>

1. Whole Numbers
    A. Place Value and Names for Numbers
    B. Properties and Facts of Addition
    C. Addition with Whole Numbers and Perimeter
    D. Rounding Numbers, Estimating Answers, and Displaying Information
    E. Subtraction with Whole Numbers
    F. Properties and Facts of Multiplication
    G. The Distributive Property and Multiplication with Whole Numbers
    H. Division with Whole Numbers
    I. Exponents and Order of Operations
    J. Area and Volume

2. Introduction to Algebra
    A. Positive and Negative Numbers
    B. Addition with Negative Numbers
    C. Subtraction with Negative Numbers
    D. Multiplication with Negative Numbers
    E. Division with Negative Numbers
    F. Simplifying Algebraic Expressions
    G. Multiplication Properties of Exponents
    H. Adding and Subtracting Polynomials
    I. Multiplying Polynomials: An Introduction

3. Fractions and Mixed Numbers
    A. The Meaning and Properties of Fractions
    B. Prime Numbers, Factors, and Reducing to Lowest Terms
    C. Multiplication with Fractions, and the Area of a Triangle
    D. Divisions with Fractions
    E. Addition and Subtraction of Fractions
    F. Mixed Number Notation
    G. Multiplication and Division with Mixed Numbers
    H. Addition and Subtraction with Mixed Numbers
    I. Combinations of Operation, and Complex Fractions

4. Solving Equations
    A. Distributive Property and Algebraic Expressions
    B. Addition Property of Equality
    C. Multiplication Property of Equality

    D. Linear Equations in One Variable
    E. Applications
    F. Evaluating Formulas
    G. Paired Data and Equations in Two Variables
    H. Rectangular coordinate System
    I. Graphing Straight Lines

5. Decimals
    A. Decimal Notation and Place Value
    B. Addition and Subtraction with Decimals
    C. Multiplication with Decimals, Circumference and Area of a circle
    D. Division with Decimals
    E. Fractions and Decimals, and the Volume of a Sphere
    F. Equations containing Decimals
    G. Square Roots and the Pythagorean Theorem
    H. Simplifying Square Roots
    I. Adding and Subtracting Square Roots

6. Ratio, Proportion and Unit Analysis
    A. Ratios
    B. Unit Analysis 1: Length
    C. Unit Analysis 2: Area and Volume
    D. Weight
    E. Converting between the Two Measurement System
    F. Proportions

7. Percent
    A. Percents, Decimals, and Fractions
    B. Basic Percent Problems
    C. General Applications of Percent
    D. Sales Tax and Commission
    E. Percent Increase or Decrease and Discount
    F. Interest

Evaluation Measures Determining Students' Grades

1. Two hourly exams   50%
2. Final Exam   25%
3. Projects   25%

Bibliography

A. Required Text

Carpenter, Thomas P., Elizabeth Fennema, Megan Loef Franke, Linda Levi and, Susan Empson, <u>Children's Mathematics: Cognitively Guided Instruction</u>, Heinemann Publishers, Portsmouth, NH, 1999.

Fosnot, Catherine Twomey, and Maarten Dolk, <u>Young Mathematicians at Work: Constructing Multiplication and Division</u>, Heinemann Publishers, Portsmouth, NH, 2001.

Fosnot, Catherine Twomey, and Maarten Dolk, <u>Young Mathematicians at Work: Constructing Fractions, Decimals, and Percents</u>, Heinemann Publishers, Portsmouth, NH, 2002.

Required Calculator: TI83 or equivalent graphing calculator.

B. Additional Required Readings

<u>Curriculum and Evaluation Standards for School Mathematics</u>, National Council of Teachers of Mathematics, NCTM, Washington DC, 1989.

<u>New Jersey Core Curriculum Standards</u>, NJ Department of Education, Trenton, NJ, 1996.

C. Supporting Bibliography

Bach, Daniel, and Patricia Leitner, <u>PreAlgrebra: Mathematics for a Variable World</u>, Houghton Mifflin Publishers, New York, New York, 1995.

Bennett, Jeffrey, and William Briggs, <u>Using and Understanding Mathematics: A Quantitative Reasoning Approach</u>, Addison Wesley Publishers, Reading, MA, 1999.

Lial, Margaret, Stanley Salzman, Dianne Hestwood, and Charles Miller, <u>Basic College Mathematics: Fifth Edition</u>, Addison Wesley Publishers, Reading, MA, 1998

McKeague, Charles, <u>Prealgebra: Third Edition</u>, PWS Publishing Company,

New York, New York, 1998.

Shankland, Regina, and Sara Williams, <u>Excursions in Real World Mathematics: An Interactive Approach: Second Edition</u>, Harcourt Brace Publishers, New York, New York, 1999.

Sobel, Max, and Evan Maletsky, <u>Teaching Mathematics: A Sourcebook of Aids, Activities, and Strategies: Third Edition</u>, Allyn & Bacon Publishing Company, New York, New York, 1999.

Van Dyke, James, James Rogers, and Holli Adams, <u>Fundamentals of Mathematics: Seventh Edition</u>, Saunders College Publishers, New York, New York, 1999.

Whimbey, Arthur, and Jack Lochhead, <u>Developing Mathematical Skills</u>, McGraw Hill Publishers, New York, New York, 1997.

D. Relevant Periodical Resources

Mathematics Teacher, National Council of Teachers of Mathematics, Washington, DC.

Mathematics in the Middle School, National Council of Teachers of Mathematics, Washington, DC.

Teaching Children Mathematics, National Council of Teachers of Mathematics, Washington, DC.

Mathematics Magazine, Mathematics Association of America, Washington, DC.

E. Relevant Software

<u>TI-83 Graphing Calculator Guidebook</u>, Texas Instruments

Best, George, <u>Best Grapher 4.0</u>, Houghton Mifflin Publisher, New York, New York, 1998.

<u>Converge</u>, Version 4.5, Soft Warehouse Inc., Honolulu, Hawaii, 1995.

Derive: A Mathematical Assistant, Version 2.56, Soft Warehouse Inc., Honolulu, Hawaii, 1992.

Geometers Sketchpad, Key Curriculum Press, Menlo Park, CA, 1995.

Hubbard, Elaine, and Ronald Robinson, The Computer Tutor for Elementary and Intermediate Algebra, Houghton Mifflin Publishers, New York, New York, 1997.