

NUMBER SENSE, ALGEBRA, AND GEOMETRY FOR MIDDLE SCHOOL EDUCATION

MTCH 2020

Course Description:

The course covers the following major concepts: standard algorithms for Arithmetic with rational numbers, proportional reasoning, number theory topics in K-8, beginning Algebra concepts, and beginning Geometry. **3 credits**

Prerequisites:

EDUC 2020 with a C or better and College of Education major and MATH 1950 with a C or better.

Overview of Content and Purpose of the Course:

This course represents a collection of topics, developed specifically for Secondary Education or Middle Grades Education majors, not covered in other math courses or methods courses.

Anticipated Audience/Demand:

This course is designed to meet the needs of those students who will be Middle School classroom teachers, including those secondary teachers who are certified 7-12.

Major Topics:

Number Sense

1. Addition and Subtraction

- a.** Properties of Addition, Mental Mathematics
- b.** Addition/Subtraction of Fractions
- c.** Addition/Subtraction of Signed Numbers

2. Multiplication

- a.** Properties of Multiplication; Area/Volume
- b.** Distributive Property/Mental Mathematics
- c.** Why Common Algorithms of Multiplication Work
- d.** Multiplication of Fractions

- e. Multiplication of Decimals
- f. Multiplication of Signed Numbers
- g. Powers/Scientific Notation

3. Division

- a. Interpretations of Division
- b. Why Common Algorithms of Division Work
- c. Fraction Division from Quotative Perspective
- d. Fraction Division from Partitive Perspective

4. Ratio/Proportions/Percentages

- a. Meaning of Ratio, Rate, and Proportion
- b. Solving Proportions
- c. Connecting Ratios and Fractions
- d. Uses of Proportions
- e. Percent Increase/Decrease

Number Theory

- 1. Factors/Multiples
- 2. Greatest Common Factor; Least Common Multiple
- 3. Divisibility Tests
- 4. Rational and Irrational Numbers

Algebra

- 1. Solving Algebraic Story Problems with Diagrams and Algebra
- 2. Sequences
- 3. Series
- 4. Functions
- 5. Linear Functions

Geometry

1. Angles
2. Circles and Spheres
3. Moving and Additivity Principle about Area
4. Area of Parallelograms and Other Polygons
5. Cavalieri's Principle about Shearing and Area
6. Area and Circumference of Circles
7. Approximating Area of Irregular shapes
8. Polyhedra and other Solid Shapes
9. Patterns and Surface Area
10. Volume of Solid Shapes
11. Transformations
12. Symmetry
13. Congruence
14. Similarity

Methods:

This course is to be taught in a manner that has increased emphases on images, ideas, reasons, goals, and relationships. The focus is to be on the big ideas, to realize that mathematics is not about getting answers to questions, but rather about developing insight into relationships and structures. Students will be engaged in complex problems to encourage deep understanding, instead of less meaningful memorization of the procedures for solving them. Online interactive activities will be used to enhance instruction and provide additional ways of understanding the concepts.

Student Role:

Students must attend class, participate in class discussion, and complete outside projects/activities. Students will be required to do extensive writing related to mathematical understanding. To demonstrate mastery of a concept, students must be able to organize ideas and concepts in a meaningful way. Explanations of work must be complete, conceptual, and

coherent. Assignments will contain both questions and activities. Some assignments will be completed individually and others within small groups.

Textbook:

Beckmann, Sybilla. *Mathematics for Elementary Teachers, 3rd ed.*, Massachusetts: Pearson Education, 2010.

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