

Course Goals: Math 102 Arithmetic Structures

Catalog description: This course focuses on the arithmetic and algebraic content of Pre-K–8 mathematics and appropriate teaching methods and is designed specifically to address requirements for teachers and pre-service teachers seeking MC-EA licensure. Instruction will be guided by the Common Core State Standards for Mathematics and the NCTM Principles and Standards for School Mathematics. Emphasis is on problem solving, critical thinking, and communication. This course does NOT satisfy the college general education requirement in math. Prerequisite: MATH 101 with a grade of C or above.

Student will demonstrate each of the following abilities.

- Regarding professional standards:
 - State each of the six NCTM Principles and the ten Standards.
 - Identify, with justification, principles and standards addressed within specific examples of lesson plans.
 - Identify, with justification, the grade band/s (corresponding with NCTM *Principles and Standards for School Mathematics* and the *Common Core State Standards for Mathematics*) in which a given problem might occur.
 - Analyze a unit from a mathematics curriculum that is currently in use in area school districts.

- Regarding professional standards and formal pedagogy:
 - Articulate basic structure of a lesson plan and explore a specific type (*E.g.* Review-Teach-Practice, Investigate/Problem-Based, or Direct Instruction)
 - Articulate learning objectives using the language of Bloom’s taxonomy.
 - Construct (original or based on materials explored within the course) classroom activities around a variety of different types of goals: concept introduction, exploration, reinforcement and generalization.

- Within arithmetic concepts and skills:
 - Represent or model numbers in multiple ways (e.g. number line, geometric representation, as a fraction, or proportion).
 - Represent or model operations on numbers in multiple ways.
 - Evaluate various representations for effectiveness in the context of problem solving.
 - Identify the CGI problem types, articulate common learner strategies and create original examples.
 - Evaluate solutions to arithmetic problems for correctness, validity, efficiency and potential for extension/development
 - Compose and decompose numbers by place-value (for 10 as well as for other bases), as a product of primes, as equivalent fractions.
 - Use and justify a variety of different algorithms for performing basic arithmetic operations on integers, fractions, and decimal numbers; and evaluate alternative algorithms for correctness, efficiency and extendibility.
 - Construct (original or based on materials explored within the course) activities that practice and reinforce basic arithmetic skills.
 - Identify common arithmetic errors/misconceptions. Articulate preventative measures that teachers may take as well as responsive guidance that might be given to learners.

- Within algebraic concepts and skills:
- Articulate the definitions of and relationships between common sets of numbers: whole, integers, rationals, and reals.
 - Demonstrate knowledge of field axioms and identify axioms used in context.
 - Give a correct, clear, complete explanation of why one cannot divide by zero.
 - Articulate the distinction between the following concepts: minus, opposite, and negative.
 - Recognize and describe the progression of algebraic reasoning in the Pre-K-8 mathematics curriculum.
 - Distinguish between an unknown and a variable, and between an equation and an expression; explain the significance of each of these.

Students must pass a **Math 102 – Basic Skills Gateway** exam in order to earn a grade of C or higher in the course. The gateway consist of 20 basic skills problems (+, −, ×, ÷, % with fractions and decimals); students will have 20 minutes to complete the exam and will not be permitted to use a calculator. Passing requires 18 or more correct answers. The Math 102 – Basic Skills Gateway may be taken up to five times during the semester.

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