Mathematics 67-110 (4 credits)
Number Systems – a course for future elementary teachers

Prerequisite: A minimum grade of C in Math 103 (or equivalent) or higher placement.

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Class Meetings: Class meets MTWR for a face-to-face hour each day.

Office Hours: Monday: 3:00 – 4:00, Wednesday: 11:30 – 12:30, and Thursday 12:00 – 1:00. Please don't let yourself fall behind. I am happy to meet with you. Let me know any time if you would like an appointment.

Textbook: *Big Ideas in Numbers & Operations* by John Beam, Jason Belnap, Eric Kuennen, Amy Parrott, Carol Seaman and Jen Szydlik. This text is available at the University Bookstore.

Learning Objectives: This course is designed to give you an **experience** in thinking mathematically. This means that you will solve problems, make conjectures, make arguments, evaluate the claims of others and communicate your findings and ideas. The content of the course includes important ideas from the elementary school curriculum as described by the Common Core State Standards for Mathematics, and by the National Council of Teachers of Mathematics. It will include content that you will someday teach in your own classrooms, and also material that is designed to deepen your own understanding of mathematics and the practice of mathematics.

Upon successful completion of the course, you are expected to have the ability to:

- Create and use a variety of problem solving strategies. These include direct modeling of the physical situation; and generating and organizing data, and observing numeric and geometric patterns.

- Understand fundamentals of logical reasoning and distinguish between and use, both inductive and deductive reasoning.

- Learn that mathematicians make mathematical arguments to explain *why* a conjecture is true (and not just *how* the problem was solved). Come to understand, through logic and structure - as opposed to another authority - when a solution is correct and complete.

- Communicate the problem solving process and the resulting mathematics both orally and in writing using the language of mathematicians.

- Listen, evaluate and respond effectively to the mathematical ideas of peers.

- Build connections among, and work with, a variety of representations.

- Understand children's mathematical models and how these relate to the mathematical work of teaching.

- Experience the beauty and power of mathematics.

- Understand place value and models for arithmetic.

- Analyze standard and non-standard arithmetical algorithms.

- Understand connections between arithmetical structure and algebra.

- Know and apply the Fundamental Theorem of Arithmetic.

- Use prime factorization to make sense of divisibility, GCF, and LCM.

- Understand and use powerful models for fractions and fraction operations.

- Understand and use powerful models for integers and integer operations.

- Explore the relationships among natural numbers, integers, rational numbers and real number systems.

Course Outline:

- Unit 1: On Being a Mathematician: (2.5 weeks) problem solving and the language of mathematics.

- Unit 2: Arithmetic Thinking (4 weeks): sets, operations, place value, algorithms, the integers, and children's thinking in arithmetic.

- Unit 3: Number Theory (2.5 weeks): divisibility, the Fundamental Theorem of Arithmetic, LCM and GCF, and theorems about factors.

- Unit 4: Rational Numbers (3 weeks): fraction operations and models and decimal operations and models.

- Until 5: Ratios, Rates and Proportions (2 weeks): Lots of proportional reasoning.

Format: This class may be unlike any mathematics class you have ever taken before. Most class time will be spent solving interesting problems in small groups and discussing problem solving ideas and solutions as a class. Sometimes you will be asked to write up those ideas and solutions for me. Sometimes we will just discuss them. But **always** you are expected to think about the problems and communicate your ideas with others. This format gives you the opportunity to practice skills you will need to be a teacher: listening and making sense of another people's mathematical ideas; explaining your ideas to others (both orally and in writing); understanding that people think about problems in many ways; and learning to help others understand mathematical ideas.

Assessment: Your grade in this course will be based on:

- Attendance and participation (5%) It is very important that you are here to participate in solving the problems and contributing to the class discussion. You may miss two classes without penalty (for illness, prior commitments, religious observance, work or anything else you feel is important), **and after that you will lose one percentage point of your course grade for each day missed (up to 5%).**

- Written work (20%) This category will include problem write-ups[*], short papers, quizzes and homework sets from the text.

- Three exams (25% each) Exams will be given in class. The dates of the exams are: Friday March 6, Friday April 10, and Friday May 15.

The grading scale will be as follows (after rounding to the nearest percent):

A	93 - 100% of the course points
A-	90 - 92%
B+	87 - 89%
B	83 - 86%
B-	80 - 82%
C+	77 - 79%
C	73 - 76%
C-	70 - 72%
D	60 - 69%
F	0 - 59%

*Guidelines for Problem Write-ups: Write-ups should be typed or written in ink and include four sections:

1) (3 pts) an explanation of the question or problem: (Convince me you understand the question and define ambiguous terms or notation.)

2) (6 pts) a description of your problem-solving *strategies*: (What did you do to work on the problem? Be specific. Include any data, tables, or sketches as appropriate)

3) (8 pts) the solution: (what is the answer to the questions?), and

4) (8 pts) a justification of the solution: (*Why* does your solution make sense mathematically? Argue that it is complete - that there are no other solutions – and prove it is correct.)

The Legal Stuff:

- You are expected to behave with integrity and honor. Here is the official UWO policy regarding academic misconduct: https://www.uwosh.edu/deanofstudents/university-policies-procedures/academic-misconduct

- It is the policy and practice of UW Oshkosh to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your inclusion, please notify me as soon as possible. You are also welcome to contact Services for Students with Disabilities at 920-424-3100 or dean1@uwosh.edu. For more information, visit the Services for Students with Disabilities website at http://www.uwosh.edu/deanofstudents/disability-services.

- Students are advised to see the following URL for disclosures about essential consumer protection items required by the Students Right to Know Act of 1990: https://uwosh.edu/financialaid/consumer-information/