

MATH 164 | Foundations of Arithmetic

Winter 2019

General Information

Class Time: M – F, 1:00PM – 1:50PM

Location: Samuelson Math Ed Lab 115

Instructor: Dr. Emilie Hancock

Office: Samuelson 218C

Office Hours: M – F, 2:00PM – 3:00PM and by appointment (in person or virtually)

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Course Description

Reflecting Washington State [mathematics K-12 learning standards](#), the National Council of Teachers of Mathematics ([NCTM principles and standards](#)), and the State of Washington Professional Educator Standards Board ([PESB endorsement standards](#)) for Number and Operations, this course emphasizes the development of the real number system in conjunction with the four arithmetic operations (+, −, ×, ÷). Elementary mathematics content is rediscovered through problem solving¹ in an inquiry-based learning² context to support the development of mathematical [processes](#) and [practices](#).

Major content topics of the course include number sets and their properties; investigation of place value in different bases; meaning and interpretations of four arithmetic operations; standard and alternative algorithms of operations; and investigation of operations on various subsets of real numbers using concrete and abstract models. Exploration of these topics will follow the outline:

Unit 1: Place Value and the Base-Ten Number System

Unit 2: Meaning and Interpretation of Four Arithmetic Operations

Unit 3: Meaning and Representation of Fractions

Unit 4: Four Arithmetic Operations using Fractions

Mathematical problem solving permeates this course. We will focus more explicitly on mathematical problem-solving strategies through weekly ‘Portfolio Problem’ sessions.

Required Materials

Supplies: 3-ring binder for handouts and notes; labeled tabs to separate binder sections by unit; colored pencils; basic, simple function calculator (cell phone calculators are not allowed).

Canvas Access: I will update the course site on Canvas frequently with announcements, assignments, handouts, and due dates. Check Canvas daily.

Online Manipulatives: In class we will use various manipulatives. The following links provide some of these manipulatives virtually. You can use them to practice ideas from class and help with assignments.

- *National Library of Virtual Manipulatives:* <http://nlvm.usu.edu/en/nav/vlibrary.html>
- *Pattern Blocks:* <http://www.mathplayground.com/patternblocks.html>
- *Cuisenaire Rods:* <https://nrich.maths.org/12222>

Suggested Texts (Not Required):

[Mathematics for Elementary Teachers with Activities](#) by Sybilla Beckmann, ISBN: 9780321825728

[Explorations in Elementary Mathematical Concepts](#) by Willard and Shiver, ISBN: 9781465251190

¹ Stein, M. K., Boaler, J., & Silver, E. A. 2003. Teaching Mathematics through Problem Solving. In Schoen, H. L., & Charles, R. I. (Eds.) *Teaching mathematics through problem solving: Grades 6-12* (pp.245-256). Reston, VA: National Council of Teachers of Mathematics.

² Ernst, D. C., Hodge, A., & Yoshinobu, S. 2017. Inquiry-based learning. *Notices of the AMS*, 64(6), p. 570-574.

Learning Objectives

Upon successful completion of this course, you will be able to:

- Understand and explain the connections and distinctions among whole numbers, integers, rational numbers, and real numbers.
- Understand and explain the key mathematical structures and ideas underlying procedures used for operating on various subsets of real numbers.
- Persevere in solving mathematical problems involving number and operations using a variety of strategies, and reflect on this process.
- Provide alternative mathematical solutions, evaluate the reasonableness of these solutions, and identify connections among solutions to problems in the area of number and operations.
- Make mathematical conjectures and investigate the reasonableness of these conjectures.
- Develop and evaluate mathematical arguments related to number and operations.
- Select appropriate tools for computation, whether mental computation, estimation, paper and pencil techniques, or technology based approaches.
- Clearly and precisely communicate mathematical ideas about numbers and operations using appropriate mathematical language.
- Make connections between mathematical ideas to build mathematical knowledge and solve problems regarding numbers and operations.
- Represent operations on various subsets of real numbers using a variety of concrete and abstract models.
- Utilize representations as tools to mediate mathematical thinking and problem solving in a dual process of decontextualizing and contextualizing problem situations, such as organizing and communicating mathematical ideas, or modeling and interpreting mathematical phenomena.

This course directly addresses the State of Washington Professional Educator Standards Board ([PESB](#)) [Endorsement Standards](#) 9.D.1, 9.D.2, 9.D.4A (Early Childhood Education), 1.D.1, 1.D.2, 1.D.4A, 1.D.5, 1.D.6A (Elementary Education), 2.0 (Middle Level Mathematics), 2A, 2B (Mathematics).

Grading Scale

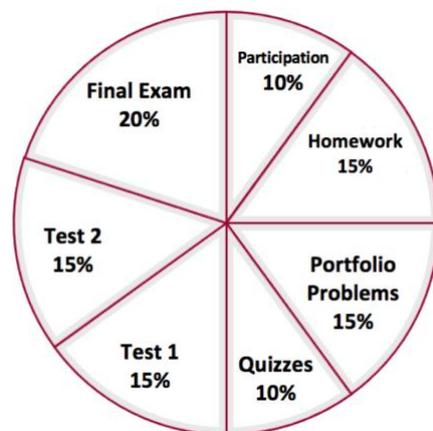
Final letter grades will be determined based on your weighted percent grade, rounded to the nearest whole percent.

Letter Grade	F	D	D+	C-	C	C+	B-	B	B+	A-	A
Percent	0-59	60-66	67-69	70-72	73-76	77-79	80-82	83-86	87-89	90-92	93-100

Method of Evaluation

Overall grades will be determined as a weighted average:

10%	Participation
15%	Homework
15%	Portfolio Problems
10%	Quizzes
15%	Test 1 (Units 1 and 2)
15%	Test 2 (Units 3 and 4)
20%	Cumulative Final Exam



Brief Descriptions of Evaluation Components

Participation (10%): As a member of a peer learning community, a high degree of professionalism and participation in class is expected. CWU expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events.

I measure class participation based on the following criteria:

- Arrive to class on time and stay for the entire class.
- Be present. Focus on learning by being an active participant. Limit side activities and put away cell phones. (If you are anticipating an emergency phone call, just let me know in advance.)
- Come to class prepared. You may need to finish up activities in between classes.
- Bring a positive and energetic attitude every day.
- Respect everyone, treat each other with dignity, and encourage all to participate.
- Participate in group work by asking questions, communicating your understanding to your groupmates, and completing the handouts.
- Present your ideas to the class and ask questions when other students present.

Attendance will be taken every day³. Groups will periodically assess individual contributions.

Homework (15%): The main purpose of homework is for you to practice explaining mathematical reasoning related to important course concepts. Show your work and explain yourself using appropriate mathematical language and representations. Homework is the responsibility of each individual, but you are encouraged to work with others.

Homework will be assigned after each major unit objective and submitted through Canvas. Late homework will not receive credit.

Portfolio Problems (15%): Each week we will work on a problem notably more “problematic” than usual coursework, where the key mathematical ideas of the problem are directly related to the current unit. Portfolio Problems will help you (1) deepen your mathematical content knowledge of the current unit, (2) develop your problem-solving skills, and (3) increase awareness of your problem-solving process. After working together in class, you will continue investigating at home and submit a write-up documenting your solution attempt and thinking process. Late assignments will not be accepted.

Quizzes (10%): No notes allowed and no make-ups unless you have an excused absence³. Quizzes will cover material since the last quiz or test. Quiz corrections may be submitted until the next quiz or test.

Tests 1 and 2 (15% each): No notes allowed and no make-ups unless you have an excused absence³. Any missed exam which is not excused will be a zero and will certainly affect your grade in the course. Make-up exams will be a different exam though covering the same material.

Cumulative Final Exam (20%): No notes allowed. There will be no early final exam or make-ups, so make travel arrangements accordingly. The final is scheduled for **Tuesday, March 12th, 12PM-2PM**.

Academic Honesty

Consult university policies ([CWUP 5-90-040\(22\)](#), [CWUR 2-90-040\(22\)](#), and [Student Conduct Code](#)) for student conduct in the classroom, cheating, plagiarism, and other academic expectations. CWU's policies and recommendations for academic misconduct will be followed, leading to disciplinary action up to and including failing the course.

³ Excused absences will not lower your overall grade in this class. Excused absences are those that are both valid and verifiable, i.e. illness, bereavement, and school-related activities. Documentation is required. Excused absences do not include holiday travel.

Disability Support Services

Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations.

Location and Contact Information: Hogue Hall 126, 509.963.2214, DS@cwu.edu

Changes

The instructor reserves the right to amend, adjust, or otherwise modify the syllabus at any time during the course.

