

# MATH 164 | Foundations of Arithmetic

Winter 2019

## General Information

**Class Time:** M – F, 11:00am – 11:50am

**Location:** Samuelson Math Ed Lab 115

## Instructor: Dr. Emilie Hancock

Please address me as either Emilie or Dr. Hancock.

**Office:** Samuelson 218C

**Phone:** 509.963.2402

**Office Hours:** MWF 10-11am, MTWR 12-1pm,  
or by appointment (F2F or virtual)

**Email:** emilie.hancock@cwu.edu

## 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 solving<sup>1</sup> in an inquiry-based learning<sup>2</sup> 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

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<sup>1</sup> 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.

<sup>2</sup> 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 (Elementary Education), 2.0 (Middle Level Mathematics), 2A, 2B (Mathematics).

### Grading Scale

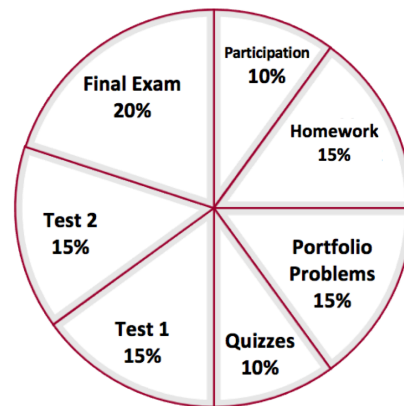
Final letter grades will be determined based on your weighted percent grade, rounded to the nearest whole percent.

| 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% Attendance and Professionalism
- 15% Homework
- 15% Portfolio Problems
- 10% Mastery Quizzes
- 15% Test 1 (Units 1 and 2)
- 15% Test 2 (Units 3 and 4)
- 20% Cumulative Final Exam



## Brief Descriptions of Evaluation Components

### Attendance and Professionalism (10%)

Each class period is worth 2 participation points. Your final grade in this evaluation category is calculated using:

$$\frac{\text{Number of points you accumulated throughout the quarter}}{2 \times (\text{Number of class sessions})}$$

#### *Professionalism*

As a member of a peer learning community, a high degree of professionalism is necessary. CWU expects every member of the university community to contribute to an inclusive and respectful classroom culture. Groups will periodically assess individual contributions.

I measure professionalism 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.
- Use a 3-ring binder to organize and promptly access class handouts, assignments, and notes.

A lack of professional participation will result in a loss of participation points for the day. Severe or repeated lapses in professional judgment may result in disciplinary action up to and including failing the course.

#### *Attendance*

Regular attendance is essential for successful completion of this course.

- Each absence will lower your overall score in the 'Attendance and Professionalism' evaluation component by 10%.
- More than 4 absences from this class may result in an automatic course grade of F for the quarter.

#### *Is my absence excused?*

Excused absences will not lower your overall grade in this class and are determined on a case-by-case basis. 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, work, or non-emergency travel delays.

#### *What if I miss class?*

- Communicate with me as soon as possible
- Get information about what happened in class, either from me or a peer
- Assignment deadlines will not be adjusted if your absence is unexcused
- If appropriate, send me supporting documentation for an excused absence

### 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 and submitted through Canvas. Late homework will not receive credit.

### Portfolio Problems (15%)

We will periodically work on problems notably more “problematic” than usual coursework, where the key mathematical ideas of the problem are directly related to course content. Portfolio Problems will help you (1) deepen your mathematical content knowledge of the current unit, (2) develop your problem-solving skills, and (3) increase your 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.

### Mastery Quizzes (10%)

No notes allowed and no make-ups unless you have an excused absence. 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 absence. Any missed exam which is not excused will be a zero and will certainly affect your grade in the course.

### 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 **Friday, June 7<sup>th</sup>, 8am-10am**.

### 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.

### 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: Hogue Hall 126, 509.963.2214, [DS@cwu.edu](mailto:DS@cwu.edu)

### Changes

I reserve the right to amend, adjust, or otherwise modify the syllabus at any time during the course.

