COURSE NAME: Foundations of Elementary Mathematics

COURSE NUMBER: MTH 212

COURSE CREDITS: 4 credits

COURSE PREREQUISITES: MTH 211 [C-]

CATALOG DESCRIPTION: Math 212 is the second of a three-term sequence of classes designed to help prepare prospective elementary and middle school teachers. Topics covered include: Fractions, decimals, percent, ratio and proportion, integers, rational numbers, real numbers, probability and statistics.

COURSE CONTENT: This course presents mathematical content needed for teaching at the elementary and middle school levels. It focuses intensively on problem solving throughout while covering the following topics:

- Fraction Addition, Subtraction, Multiplication, and Division
- Decimals, Ratio, Proportion, and Percent
- Integers and Integer Operations
- Rational and Real Numbers
- Introduction to Statistics
- Elementary Concepts in Probability

COURSE-SPECIFIC MEASURABLE STUDENT LEARNING OUTCOMES:
A successful student in Math 212 will be able to:

1. Use and explain a variety of models, including number line models, in solving problems involving fractions.

2. Explain how and why the standard algorithms for addition, subtraction, multiplication and division of fractions and decimals work.

3. Convert between fraction, decimal and percent representations of a number and explain why all fractions have either terminating or repeating decimal representations.

4. Use ratios and proportions to solve problems and use and explain a variety of models such as a grid, proportion or equation to solve problems involving percent.

5. Use the strategies “Working Backwards” and “Solve an Equation” to solve word problems.

6. State, and identify in practice, properties of operations such as closure, commutativity, associativity, distributivity, identity, inverse for the set of fractions, integers, rational numbers, real numbers. Determine which of these properties hold for which number systems and operations.

7. Describe the set relationships between the sets of natural numbers, whole numbers, fractions, integers, rational numbers, irrational numbers, real numbers and complex numbers. Sort numbers according to which of these sets they belong to.

8. Model addition, subtraction, multiplication and division of integers using a set model (eg red and black chips).

9. Apply the definition of integer exponents and demonstrate, via patterns, why this definition is consistent with the definition of whole number exponents.
10. State the density properties for rational and real numbers. Demonstrate this by being able to find a rational number and an irrational number between any two (different) given numbers. Construct segments of irrational length using a geoboard and the Pythagorean Theorem.

11. State, describe and use the four steps for statistical problem solving to design and carry out a survey including formulating a question, collecting data, organizing and displaying the data and analyzing some of its statistical features.

12. Compute mean, median, mode, range, variance and standard deviation for numerical data and use these statistics to make comparisons between two or more sets of data.

13. For a given set of data, choose and construct an appropriate graph or plot to picture the data (dot plot, stem and leaf plot, histogram, bar graph, line graph, circle graph, pictograph, or scatterplot) and Use a given graph to make observations about a set of data.

14. Explain the difference between experimental probability and theoretical probability and, for a given experiment, list the outcomes in a sample space and an event using an outcome tree diagram and/or making an organized list in set format.

15. Construct a probability tree diagram for "drawing with replacement" and "drawing without replacement" and discuss the differences between these two types of experiments. Use the Fundamental Counting Property, Pascal's triangle, and probability tree diagrams to determine the probability of an event.

16. Explain the concept of expected value in a probability setting and compute the expected of an experiment given the probabilities of disjoint events making up the sample space.

CLASS GOALS AND FORMAT: This is a mathematics content course intended to deepen and strengthen the mathematical background of prospective elementary school teachers. The course is designed to help students to improve their mathematical communication skills, ability, and comfort level with solving all types of problems. Although a variety of teaching techniques will be modeled in the classroom, this course will not specifically focus on how mathematical concepts are taught or learned.

As a teacher, you will need to understand mathematical concepts deeply enough to be able to read and correctly interpret your district or schools curriculum materials, the Common Core State Standards for Mathematics (CCSSM), and materials related to these and other sets of standards. You will need to be able to answer children’s questions, correct their misperceptions and appreciate their alternate ways of approaching and understanding the concepts that you will be teaching. You will need to have an appreciation of the trajectory of mathematical learning that they will encounter. Not only do you need to fully understand the material you will present, you need to also understand how what the students learned previously, and how they learned it, will affect their ability to understand what you are teaching. In addition, you need to have a clear and deep understanding of how what you do in your classroom will impact your students in the future.

Each day in class will consist of short lectures and in-depth in-class activities in a professional workshop format. Regular attendance, preparation for class, and active participation are required components of the course. You will be expected to arrive on time prepared to work actively, co-operatively, and enthusiastically in small groups on a daily basis. Your peers will be relying on you to offer your ideas and provide feedback. You need to be prepared to discuss and reflect on your reading and homework assignments demonstrating critical, analytical and reflective processes. This aspect of our course is key to mastering the Baccalaureate Core learning outcome: “Critique the applicability of a mathematical approach or the validity of a mathematical conclusion”, as it requires you to actively engage in this type of mathematical work in class every day. You will be graded on your class participation each day.
**EVALUATION OF STUDENT PERFORMANCE:** Your grade for this course will be determined by your scores in the following areas: exams, in-class activities, homework, and reflective writing. The points will be distributed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exams (2 @ 100 points)</td>
<td>200</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150</td>
</tr>
<tr>
<td>In-Class Work (16 @ 5 pts)</td>
<td>80</td>
</tr>
<tr>
<td>Homework checks (9 @ 5 pts)</td>
<td>45</td>
</tr>
<tr>
<td>Quizzes (best 6 of 7 at 15 pts each)</td>
<td>90</td>
</tr>
<tr>
<td>Reflective writing</td>
<td>35</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>600</td>
</tr>
</tbody>
</table>

**Grading Scale:**

- A: 540 - 600
- B: 480 - 539
- C: 420 - 479
- D: 360 - 419
- F: Below 360

**IMPORTANT NOTE:** *In addition to* the point totals shown above, in order to receive a grade of C or above you also must have earned at least 65% of the possible exam points (227 points). To receive a D or above you must also have earned at least 55% of the possible exam points (193 points).

**Examinations:** There will be two Midterm Exams (100 points each) and a cumulative Final Exam (worth 150 points). The exams are primarily write-out in format and are designed in part to help your instructor assess your ability to understand, identify and use appropriate mathematical models.

**Reading and Homework assignments:** The assignments list daily readings, exercises and problems from the text, and, on occasion, additional activities handed out in class or posted on Canvas. Homework assignments are designed to help you to understand the key concepts that have been or will be explored in greater depth in class. They will frequently require you to work toward mastering the two Baccalaureate Core Learning outcomes: “Identify situations that can be modeled mathematically” and “Calculate and/or estimate the relevant variables and relations in a mathematical setting.” You are expected to be prepared with each day’s assignment done at the beginning of class. Homework will not be corrected; however, your progress on this will be assessed via homework checks and quizzes.

**Homework Checks:** On one day each week (see calendar) the TAs will be checking your homework that is due that day. They will be looking for effort shown on every problem, and complete solutions (not just the final answer). If you are going to be absent from class on a homework check day, you may have a friend turn your homework in at the beginning of class and you will then earn full credit. Otherwise, if you are absent, you can receive half credit for the missed homework check by having a TA look at it on the day you return to class. If you miss more than one homework check day in a row, you will need to discuss late credit with me. No other late homework credit will be given.

**Quizzes:** There will be seven homework quizzes. Your top six of these seven scores will be counted towards your grade. For this reason, absolutely no makeup quizzes will be given. If you miss a quiz for any reason, including illness, a “0” is recorded for that quiz, and one such score will be the one that is not counted in your final grade. Since a primary objective in giving homework quizzes is to inspire you to do homework, you may use any notes you have taken in class or homework you have done as resource materials during the quiz. Quiz problems typically closely resemble assigned homework or class work from the previous few days, and, like the assigned homework problems.

**Writing Assignments:** There will be several reflective writing assignments over the course of the term, approximately one per week. These will typically be short reflections on selected readings, your experiences and our work together. A scoring rubric will be handed out in class and posted.
on Canvas. Writing assignments must be typed and are expected to be completely professional in appearance.

**LEARNING RESOURCES (required):**

- 3-ring binder with dividers, pencils, erasers, colored pencils or markers
- calculator for homework.

**Policy on calculators and other electronics:** Only basic calculators will be allowed during class work and tests. Basic calculators will be provided for use during all class and test periods. These are the type of calculators that will be available for your future students to use in the elementary classroom and it is important that you are able to do all calculator work needed during this course using only this type of calculator. Unless you get special permission from me in advance (usually only for disability accommodation), do not use laptops, tablets, phones, or other similar electronic devices in class, even for taking notes. The material we'll be covering is not conducive to electronic note-taking, and electronic note-taking in general seems to be less effective than handwritten (Mueller and Oppenheimer 2014).

**STUDENTS WITH DISABILITIES:** Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

**ACADEMIC DISHONESTY:** Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- Cheating: use or attempted use of unauthorized materials, information or study aids;
- Fabrication: falsification or invention of any information;
- Tampering: altering or interfering with evaluation instruments and documents;
- Plagiarism: representing the words or ideas of another person as one’s own;
- Assisting: helping another commit an act of academic dishonesty.

If evidence of academic dishonesty comes to my attention I will, after following the University documentation procedures, impose a grade of “F” in the course for the involved student(s). For more information about academic integrity and OSU policies and procedures in this area, visit the Student Conduct website: [http://studentlife.oregonstate.edu/studentconduct/offenses-0](http://studentlife.oregonstate.edu/studentconduct/offenses-0)

**EXPECTATIONS OF STUDENT CONDUCT:** You are expected to turn off your cell phone or put it on vibrate and put it away when you arrive for class. If you are texting during class, then you are not participating in your group work and will lose 2 of your participation points per time that you are reminded to put your cell phone away. You are expected to conduct yourself in a professional manner in this class. It is assumed that you will be respectful in your conversations with your classmates, with your TAs and with me. If you have a concern about an aspect of the course, please come to my office to discuss your concern. Students exhibiting disrespectful behavior will be referred to the Office of Student Conduct.
There are many resources available to help you with the study of mathematics. Make a note of my office hours. I will be glad to help you whenever I can - just ask! Make a note of your TA's office hours. He/she will also be glad to work with you.

I strongly recommend that you form the habit of studying together in small groups. There are many locations on campus for study groups to meet and work, for example the library or the Mathematics Learning Center. Many students find that working with other students is an effective way of doing homework, but be sure you are working together towards understanding the solution, not just "getting the answer". Often another student can explain things in terms that an instructor cannot. If you find you are doing most of the explaining in your group, remember that you often can learn concepts best by explaining them to someone else. The most successful mathematics students form study groups early and keep them throughout the term.

Walk-in tutoring (free of charge) is available in the Mathematics Learning Center (Kidd 108) and in the Library. Below is a list of hours for the Mathematics Learning Center. It is at times difficult for the tutors in the center to help with this course, since it is so different from the "usual" math classes. The TA's who help in these classes will be holding their own office hours and they should be your first choice for help in the MLC. We will be providing you with their office schedule soon.

<table>
<thead>
<tr>
<th>Mathematics Learning Center</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where:</strong> Kidder 108</td>
</tr>
<tr>
<td><strong>Hours:</strong> MTWR 9:00 AM - 5:00 PM</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Where:</strong> Library (CLC)</td>
</tr>
<tr>
<td><strong>Hours:</strong> SuMTWR 6:00 PM - 10:00 PM</td>
</tr>
</tbody>
</table>