

The logo for Southern Oregon University Mathematics. It features the letters 'SO' in a red box above a 'U' in a red box, followed by the text 'Southern OREGON UNIVERSITY' in black, with 'Southern' in red and 'OREGON' in black. Below this, the word 'MATHEMATICS' is written in a large, bold, black font.

SO Southern OREGON UNIVERSITY MATHEMATICS

Learning Objectives for a Mathematics Education Minor

As you complete a Mathematics Education Minor, it is important to keep in mind that teachers' mathematical knowledge has been shown to be significantly related to student achievement gains. In taking our series of mathematics education coursework, you will have ample opportunity to reflect on your own K-12 mathematics experience, as well as deepen your own thinking and understanding of K-12 mathematical concepts. You will be completing our Fundamental of Elementary Mathematics Series (Math 211, 212, and 213) that will provide a core foundation for K-12 mathematics. You will then have the opportunity to choose five courses from our Math 481 Topics in Middle and High School Mathematics Series. These courses are specifically designed to deepen teacher content knowledge of K-12 mathematical concepts. By completing both of these series, you will have a strong foundation which is characteristic of highly effective teachers with a specialized understanding of K-12 mathematical concepts.

What You Will Learn In Your Courses

Math 211

What strategies can you use when faced with a math problem? How do you explain the procedures used to compute with whole numbers, and are there alternative algorithms you were never taught? Problem solving and whole number operations form the foundation for all the rest of the K-12 math curriculum, as well as the rest of this sequence of courses intended for future teachers.

Math 212

In learning to divide by a fraction, some of you were taught "Don't stop to question why, just invert and multiply!" There are reasons for every valid computational procedure, and a good teacher understands them, can explain them, and knows the critical questions to ask to further deepen students' understanding. Math 212 focuses on fractional parts of the whole and real-life situations in which they arise.

Math 213

The Greek philosopher Plato's academy gates were inscribed with the words "Let no one ignorant of geometry enter here." This may seem like a severe entrance requirement, but it applies to the teaching of mathematics. Geometry is an important branch of mathematics, one that must be deeply understood by anyone teaching math in grades K-12, and it is the focus of Math 213.

Math 481: Topics in Middle and High School Mathematics

- **Arithmetic and Algebraic Structures.** What is the connection between arithmetic and algebraic thinking? Why is algebraic thinking so powerful? Making the transition from concrete to abstract reasoning is an important milestone in your study of mathematics. Starting with concrete models, you will deepen your ability to recognize numeric patterns and to generalize those patterns. Various conceptualizations of algebra, including a structural component, are used to explore the algebra of real numbers and their underlying structures. Finally, you will take a brief look at the abstract algebraic structure known as a group.
- **Concepts of Calculus.** Have you thought about why we call dividing by zero undefined and how this concept is further developed in mathematics? You will investigate this through the concept of a limit in this course. Regardless of whether you have studied calculus, you will deepen your understanding of familiar elementary concepts by investigating how they culminate and are continued in the study of calculus. Through hands-on group activities, guided discussions and explorations, you will investigate functions, graphs, rates of change, derivatives, and integrals. The focus of this course is on understanding concepts, not on the use of formulas or computations.
- **Informal Geometry.** The Greek philosopher Plato's academy gates were inscribed with the words "Let no one ignorant of geometry enter here." You will have opportunities to deepen your thinking of geometric concepts and can rest assured that this is not your proof oriented high school geometry class. Based on a series of hands-on activities, explorations, and guided discussions you will explore various geometric shapes and relationships. This course includes exciting topics such as the "Golden Mean," Platonic solids, tilings, and the Fibonacci numbers.
- **Math and History: Connections.** Have you ever wondered what mathematicians studied centuries ago? Well, they discovered and investigated critical mathematical concepts that are the foundation of our study of mathematics today. By taking time to explore mathematical concepts as the Babylonians, Egyptians, Greeks, and other mathematicians did, you will gain an in-depth understanding of seemingly familiar concepts from a new perspective.
- **Measurement.** What is measurement and how do you decide on which attributes to measure? If you saw an animal off in the distance, could you determine its size given very little information? How could you measure the Earth's circumference taking very few measurements? Explore these types of concepts as you deepen your understanding of measurement.
- **Problem Solving.** George Poyla, our father of problem solving, said, "A problem is not a problem for you if you can solve it in twenty-four hours." True problem solving involves ongoing in-depth investigation of concepts. Teachers need to teach this kind of problem solving but they also need to model it in their own thinking. This course allows you to develop a plethora of problem solving strategies and will challenge your thinking to its depths.
- **Experimental Probability and Statistics.** Statistics and probability are everywhere around us and students are constantly inundated with situations where they have to apply their knowledge of statistics and probability. How can teachers have a deeper understanding of statistics and probability so that they can develop interesting age appropriate investigations for students to deepen their thinking? This course will provide you with ample opportunities to "model with mathematics" a deep understanding of critical statistical and probability concepts.
- **Curriculum: Conceptual Depth in the K-12 Math Curriculum.** "Teacher is this right?" How do you respond to this type of question whether it's asked by a second grader, middle school student, or a high school student? Teachers need a different kind of content knowledge in order to respond in a way that will allow a student to deepen their understanding of the mathematical concepts involved. Conceptual depth in the K-12 mathematics curriculum allows you to explore concepts spanning kindergarten through twelfth grade looking at a variety of strategies to develop your own thinking.