



SOU | **Southern OREGON**
UNIVERSITY
MATHEMATICS

Learning Objectives for a Mathematics Major

SOU and the Math Department want you to have a fulfilling successful learning experience. We want to help you develop the skills, knowledge and attitudes of a truly educated liberal arts student. Your foundation for this education is the core curriculum – those general education courses that you will be taking in your first years here. The requirements for a math major enhance and deepen these learning outcomes.

You will build a base for all subsequent math courses by taking

- A sequence of four calculus courses (Math 251, Math 252, Math 253, and Math 281)
- An introduction to statistics course (Math 243)
- A linear algebra course (Math 261) and
- A computer science course choosing among Math 271, Computer Science 256 or 257, Chemistry 371, Physics 380, or Engineering 373.

You will also take a course we call Mathematical Perspectives (Math 290) to learn about the field of mathematics – its history, how to get a graduate degree, and the types of work mathematicians do. You will practice expository writing in this class.

After you gain a foundation, we will be working with you to develop a breadth and depth of mathematical knowledge. We want you to be skilled at providing effective rationale and coherent mathematical arguments, in other words, proving theorems.

- In Number Structures (Math 311) you will learn the many different approaches to proving mathematical facts and learn to write using mathematical language while working in groups formed of your fellow students.
- In Topics in Foundations and Geometry (Math 411) you will build on these skills and you will learn to present your reasoning to the entire class.
- We will be also assessing your proving abilities in
 - Topics in Analysis (Math 431) and
 - In Topics in Abstract Algebra (Math 441).

Of course you will be using your newly-acquired proof skills in all of your subsequent classes.

We want our graduates to be able to analyze data and model real-world problems using technology as appropriate. After building a base with

- Differential Equations (Math 321) and
- Probability (Math 361),

you will increase your skills by taking one topic from

- Topics in Applied Mathematics (Math 421) – Complex Variables, Optimization, Partial Differential Equations, Mathematical Modeling, Numerical Linear Algebra or Signal Analysis and Processing

or if you are interested in teaching mathematics, you can take two topics from

- Topics in Middle School and High School Mathematics (Math 481) including Arithmetic and Algebraic Structures, Concepts of Calculus, Informal Geometry, Math and History, Measurement, Problem Solving, Experimental Probability and Statistics and Curriculum.

You will also take one of the

- Topics in Probability and Statistics (Math 461) – Multivariate Analysis, Regression Analysis, Financial Mathematics, Actuarial Mathematics or Analysis of Variance.

Note that the 400 level topics course cycle through the topics and you may not to get to take your first choices.

To be sure you have a breadth of mathematical knowledge,

- In the mathematics area of analysis you will take
 - Introduction to Real Analysis (Math 331) and
 - One of the Topics in Analysis (Math 431) – Integration, Metric spaces or Infinite Series.
- In the mathematics area of abstract algebra you will take
 - Introduction to Algebraic Systems (Math 341) and
 - One of the two advanced topics in Topics in Abstract Algebra (Math 441) – Rings or Groups.

Note that the 400 level topics course cycle through the topics and you may not to get to take your first choice.

In many of your courses we will be working with you on how to learn independently and how to communicate effectively. Your capstone project developed as part of

- Our Senior Colloquium (Math 490 – a two term sequence)

is where you will learn a particular mathematical topic independently under the guidance of a faculty mentor and then effectively communicate what you have learned with an extensive paper and a public presentation. This is how you will show us that you have the skills, knowledge and attitudes of a true

mathematics major. We hope that, by the end of your time with us, you will have an education that you can be proud of.

Here are examples of what you may learn in your SOU math classes.

Math 105	If you fold a piece of paper in half fifty times, would it be higher than the moon?
Math 211	What would numbers look like if we only had eight fingers? What are the different ways to solve math problems?
Math 212	How many different ways are there to explain how adding fractions works? What chance do you have to win the lottery?
Math 213	Which has a larger volume a cylinder with height 11" and circumference 8.5" or the other way around? You can cover a floor with square tiles. Do any other shapes work?
Math 244	How do you use mathematics to out-predict so-called experts? How do age, size, and location affect the cost of a house?
Math 251	How do you make the cheapest cereal box to hold a fixed volume?
Math 252	How much cable is needed to suspend the Golden Gate bridge?
Math 253	What does $1 + \frac{1}{2} + \frac{1}{4} + \dots$ add up to? What does $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$ add up to?
Math 281	What is the shortest path up a mountain?
Math 361	How can mathematics help you understand the stock market or other financial markets? In World War II how did the Allies figure out the number of German tanks from a sample of serial numbers?
Math 461	Regression Analysis: How likely is a person to get a disease? Variance: How do you analyze the results of an experiment with many variable? Actuarial Mathematics: How do you use the computer program R to simulate house insurance models? Financial Mathematics: How can EXCEL and Visual Basic help you understand the stock market? How are insurance premium rates determined?
Math 481	History: What do ancient counting systems look like? Geometry: Can you fill a rectangular with one continuous curve?