

Learning Goals
Department of Mathematics, Computer Science, and Statistics
April 2006

Introduction

Our department includes the three distinct disciplines of mathematics, computer science, and statistics. Many of our most important learning goals, however, are shared across all three disciplines. In this document, we first list the learning goals that are shared by all three disciplines, then add those learning goals that are more unique to each of the disciplines. Finally, since we teach a large number of students who are not majors or minors in our department, we include learning goals specifically for non-majors.

Learning goals for all majors, combined majors, and minors in the department:

Understanding and Appreciation of Theory

- Know how to think analytically and logically
- Be able to construct a valid argument
- Understand the logical structure of the discipline
- Appreciate the importance and beauty of the discipline

Solid Analytical and Computational Skills

- Have a solid foundation in the knowledge, techniques, and concepts of the discipline
- Have strong computational skills embedded within deep conceptual understanding

Proficiency in Communication

- Be able to read independently and to understand results within the discipline
- Be proficient writers in the discipline, both in writing formal proofs and in writing interpretations and explanations of results
- Be an effective oral presenter
- Be able to use technology effectively in the presentation of results

Problem Solving Ability and Understanding of Applications

- Be diligent and proficient problem-solvers
- Understand what technology can and cannot do and be able to use technology effectively in problem solving
- Have an understanding of some of the significant applications of the discipline to other fields

Student Agency

- Be willing to attack a difficult problem in multiple ways and over an extended period of time
- Be able to effectively work cooperatively with others on problems within the discipline
- Be able to effectively work independently on problems within the discipline
- Develop curiosity and a questioning mind
- Develop maturity and responsibility for one's own learning

Additional learning goals unique to each discipline

Majors, Combined Majors, and Minors in Mathematics:

- Have a working knowledge of the sets, spaces, functions, and operations that are central to mathematics
- Develop fluency to articulate mathematical ideas using the symbolic language of mathematics
- Be able to mathematically model a real situation and to analyze the results appropriately
- Recognize the breadth of sub-disciplines within the mathematical sciences and have a sense of how they interrelate

Majors, Combined Majors, and Minors in Computer Science:

- Have understanding of multiple programming paradigms
- Develop a basic understanding of concurrent systems
- Be able to design and construct non-trivial software systems including the use of modern tools, specification, and testing
- Apply problem solving techniques to develop algorithmic solutions
- Have strong debugging skills
- Appreciate the mathematical underpinnings of computer science

Minors in Applied Statistics:

- Understand the basic principles underlying statistical inference
- Be able to apply statistical techniques to address real questions with data
- Appreciate the importance of proper data collection
- Be competent at working with univariate and multivariate models using quantitative and categorical data
- Be able to use statistical software to select appropriate models, estimate model parameters, generate graphical displays, check diagnostic conditions, and perform inferences

Learning goals for non-majors in departmental courses:

All students who take a course in our department should be able to:

- Investigate and answer significant questions using mathematics, computer science, or statistics, and be able to clearly interpret the results
- Develop proficiency and understanding of the mathematical, computer science, or statistical ideas taught in our courses sufficient to apply the methods and ideas effectively in other courses and other situations
- Appreciate both the beauty and the importance of the discipline