

Department of Mathematics and Computer Science Writing in the Mathematics Major

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Statement of Educational Goals for Majors

The primary goal of the majors offered by the department is to graduate students who think like mathematicians and computer scientists.

For the mathematics major, this thought process includes an appreciation for the elegance of mathematics, an understanding of the applications of mathematics to other disciplines, and competence with current mathematical software, including an understanding of the limitations of current technology. For the computer science major, this includes a cautious skepticism of numerical results, a passion for creating applications for a wide range of computer users, and an appreciation for the mathematical foundations in software engineering. For both mathematics and computer science, two significant components of the thought process are the ability to apply old tools to new problems and the willingness to “beat your head against the wall” when a solution is not immediately obvious.

As faculty in a liberal arts environment, we feel it is important that students can read and comprehend mathematics and computer science and can communicate technical material both orally and in writing to a variety of audiences, lay and expert alike.

Writing in the Mathematics Major

Mathematical writing is a primary tool to help students develop the clarity of thought and reasoning abilities that are fundamental to success in the mathematics program. This development is a four-year process, and therefore, a strong emphasis is placed on writing throughout the curriculum. An important component of all writing is understanding the intended audience. In most assignments, the focus is placed on writing so that another student at the same level of mathematical development can follow and understand the explanation. Several different types of writing are used.

- **Formal mathematical proofs**

The major purpose is to help students understand that formal, rigorous arguments not only expose subtleties and nuances not readily apparent, but also reveal the beauty of mathematics. This is definitely a learned skill, and each proof often requires several iterations before it is complete. Several faculty give students the opportunity to rewrite their proofs if there are fundamental problems with the first version.

The writing of proofs is the primary focus of Discrete Mathematics, which is a requirement for the major and is a prerequisite for most of our 300-level courses. All 300-level courses require some proof writing, with Abstract Algebra and Real Analysis requiring a substantial amount.

- **Writing projects**

These range from papers written in a student’s first year in Calculus I and Calculus II to formal papers in 300-level courses. In 100- and 200- level courses, some faculty assign group writing projects that are written as letters from fictional characters asking the students for help, and some 300-level courses include semester long projects that build on material throughout the term. In addition, some upper division courses also include expository papers with less emphasis on mathematical content, such as book reviews of popular books about mathematics. The capstone experience in the Senior Seminar will also require a substantial writing project.

One emphasis of all of these papers is that the students should give complete and thorough justification for their conclusions that is appropriate for the level of the course. For example, papers in Real Analysis are held to a more rigorous standard than those in Calculus I.

- **Shorter writing assignments**

All classes in the major require weekly, or almost weekly, homework assignments. While correct computations and calculations do matter, great emphasis is placed on giving complete, precise justification for the conclusions. By practicing this type of thorough explanation in writing from their first mathematics course at Wheaton, students develop a stronger mathematical intuition during their four years here.

Some faculty also give assignments that ask students to respond to specific questions on the reading via email before the class meeting. These questions are usually not computational, but instead ask the students to express the major ideas or a specific concept in their own words. This helps the students determine which topics they understand well and which need more clarification during the class time.