

HS Mathematics Department Rationale for Prerequisites

In previous years, students have been permitted to take two courses simultaneously where one course serves as prerequisite to the other. As a department and administration, we have decided that enrolling in consecutive courses concurrently is not the optimal way to learn, practice, or apply mathematics. We based this decision on observations from previous years, as well as in preparation for our transition to the Common Core Math Standards.

In previous years, there were several instances where students needed to apply material learned in the prior; however, at that point in the year, the content had not yet been introduced or formally developed in the prerequisite course. This creates gaps in future understanding and undermines the conceptual foundation of mathematics. A few instances of course offerings are Algebra I/Geometry and AFT/Precalculus described below.

When students enroll in Algebra I and Geometry concurrently, many issues can arise:

- In Geometry, students apply the Quadratic Formula and factoring techniques to solve quadratic equations in the context of circles. These algebraic methods are formally introduced in Algebra I, a prerequisite for Geometry. A student enrolled in both courses concurrently cannot apply material they should have previously learned.
- A major focus of Geometry is the concept of formal proof. Students extend their understanding of proof in this class from manipulating equations in Algebra I to geometric contexts. Without Algebra I as a foundation, students cannot make this extension to logical reasoning that prevails through the Geometry course.
- Students apply coordinate geometry formulas and definitions (slope, midpoint, distance, radical simplification, etc.) learned in Algebra I throughout the year in Geometry. Without sufficient practice in these skills, students cannot apply them accurately and meaningfully in new geometric contexts.
- Students are expected to be proficient at algebraic manipulation of geometric formulas in Geometry. Algebraic structure and manipulation are major focuses of Algebra I and require sufficient practice for mastery.

Similarly, another common option that students have taken in the past is simultaneously enrolling in AFT and Precalculus. AFT serves as a prerequisite for Precalculus (or their honors equivalents). This creates issues such as:

- Students in AFT learn fundamental definitions through repeated practice and have exposure to applying these definitions and theorems. For example, polynomial functions and their characteristics are developed fully in AFT. These ideas are required to further study rational functions in Precalculus. Taking the two courses concurrently requires some students to apply polynomial concepts in Precalculus before they are even formally learned in AFT.
- Another unifying mathematical concept between the two courses is the development of trigonometry. Students learn basic trigonometric definitions and use them to create graphs and other mathematical relationships in AFT. These are

built upon to develop, verify, and apply trigonometric identities in Precalculus. Again, students taking the two courses concurrently are required to apply assumed ideas when they have possibly not been developed in the previous course.

- Logarithms and exponential functions are extended through their properties of graphs in AFT. These ideas are applied in Precalculus in more advanced contexts such as mathematical modeling. Students that have not fully explored and developed these ideas cannot properly apply them to these novel contexts in Precalculus.

In addition, the *Common Core State Standards of Mathematics* focuses on eliminating redundancy among courses. In this respect, standards are meaningfully presented in an intentional sequence between courses such that a concept is learned and mastered for future application in subsequent courses. The current progression of Common Core courses makes it even more difficult to succeed by doubling up in courses where one is a prerequisite for another.

We still have options for students to accelerate through the mathematics curriculum:

- Students can flex out of a course by taking the Flex Credit exam, which are offered in December and June. We recommend students earn at least an 80% on this exam to move on to the next course.
- Students may opt for the board-approved acceleration policy. In this case, a team consisting of the guidance counselor, math teacher, parent, and administrator determines if accelerating beyond a course is reasonable. Typically, this involves the student taking a placement test, which is typically the Flex Credit test for a given subject.
- UAHS has developed a two-period daily course for students who wish to accelerate to Calculus. This course is purposefully placed in the junior year, where students' schedules permit a two-period course as a result of not having a social studies requirement. At this point, students may schedule the two-period daily AFT/Precalculus course, which covers two years of material in one year. Once the transition to CCSSM occurs, students will be able to combine Algebra II and Precalculus in the same manner. This course is intentionally designed for students to learn and apply concepts in an educationally sound sequence.

To summarize, students have many opportunities to succeed and excel in the mathematics curriculum at the high school without doubling up courses. Besides the options cited above, students could deepen their understanding of mathematical rigor by taking the honors course sequence as well as taking challenging elective courses including AP Statistics or AP Computer Science. Mathematics courses are carefully designed and aligned to maximize students' development in mathematical understanding. This same reasoning holds true for all courses designed in a sequence. We would not allow students to be concurrently scheduled into Spanish II/III at the same time. Nor would we allow students to concurrently be enrolled in English 10/11. Based on these reasons, we know that strongly implementing the prerequisites as described in the program of studies is the most educationally sound plan for a student's mathematical learning.