



AP<sup>®</sup>

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# AP<sup>®</sup> Precalculus

AP PRECALCULUS WAS CREATED TO PREPARE  
A WIDE RANGE OF STUDENTS TO SUCCEED  
IN MATH THEY'LL ENCOUNTER IN COLLEGE



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## The Problem

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Every year, tens of thousands of American students are derailed by a common obstacle: **inadequate preparation for college math.**



The Mathematical Association of America has described Americans' struggle with math as **"the most significant barrier"** to completing both STEM and non-STEM degrees.<sup>1</sup>



While many students enter college as STEM majors, a massive **40% of these students switch to a non-STEM major or fall short of a degree** after failing common gateway courses, particularly calculus.<sup>2</sup>



"The evidence is clear that **calculus functions as a critical gatekeeper for U.S. students seeking to enter STEM majors and careers,**" according to researchers from Just Equations, a California-based public policy institute. "Calculus' reputation as a weed-out course is well deserved."<sup>3</sup>



Looking across all majors, 40% of college students lack sufficient math in high school to enroll in college-level math courses so must spend time and money on remedial math courses that do not count toward their degrees. **Nearly half of these students fail to fulfill the math requirement.**<sup>4</sup>

1. Saxe, K. & Braddy, L. (2015). "A Common Vision for Undergraduate Mathematical Sciences Programs in 2025," Mathematical Association of America (MAA). Retrieved from: [maa.org/sites/default/files/pdf/CommonVisionFinal.pdf](http://maa.org/sites/default/files/pdf/CommonVisionFinal.pdf)

2. Drew, C. (2011). "Why Science Majors Change Their Minds (It's Just So Darn Hard)," *The New York Times*, November 6. Retrieved from: [nytimes.com/2011/11/06/education/edlife/why-science-majors-change-their-mind-its-just-so-darn-hard.html?pagewanted=all](http://nytimes.com/2011/11/06/education/edlife/why-science-majors-change-their-mind-its-just-so-darn-hard.html?pagewanted=all)

3. Charting A New Course: Investigating Barriers on the Calculus Pathway to STEM. (2021). Retrieved from: [justequations.org/wp-content/uploads/Learning-Lab-Calculus-Report-Layout-ADA.pdf](http://justequations.org/wp-content/uploads/Learning-Lab-Calculus-Report-Layout-ADA.pdf)

4. Chen, X. (2016). Remedial Coursetaking at U.S. Public 2- and 4-Year Institutions: Scope, Experiences, and Outcomes (NCES 2016-405). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved [2022] from: [nces.ed.gov/pubsearch](http://nces.ed.gov/pubsearch)

# How will AP Precalculus make a difference?

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- AP Precalculus provides students with **140 hours of contact time with their instructor**; in comparison, students who wait and take precalculus in college will typically receive 48 hours of contact.
- **AP Precalculus meets students where they are**, in the familiar environment of a high school classroom, and provides free online practice and videos that can be tailored to individual students' needs for additional help.
- **Many students are galvanized by the opportunity to earn college credit**, devoting more time and effort to the sort of practice and focus that math proficiency demands.
- The AP Precalculus Exam is developed and scored by college professors, rather than by a student's own teacher, **setting an unimpeachable standard across a wide range of classrooms**.
- **AP students tend to see their teachers as their coaches and allies**, dedicated to helping them learn what is necessary for college credit.



**“AP Precalculus is a well-balanced and meaningful course that will be beneficial for every student regardless of their intended future plans. The content captures the modeling of our dynamic, changing world, which can ignite a passion and appreciation for the pursuit of many areas related to mathematics.”**

JULIE HARRISON, SPELMAN COLLEGE, DEVELOPMENT COMMITTEE MEMBER

**“AP Precalculus will open the door for many students to advanced course studies in mathematics and will bring a college-level course to students who may not have access to other AP math classes. It will level the playing field for underrepresented students, and all students who have completed an algebra 2 course (or equivalent class) will be able to succeed in this course.”**

BRENDAN MURPHY, JOHN BAPST  
MEMORIAL HIGH SCHOOL,  
DEVELOPMENT COMMITTEE  
MEMBER

## AP Precalculus will serve three different types of high school students

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### 1 AP Precalculus will prepare students who start algebra 1 in 9th grade for a successful transition into a STEM major in college.

Half of American students begin algebra 1 in 9th grade. Accordingly, most of these students interested in STEM majors and careers will first encounter calculus in college. If they're not ready for calculus, they will need to take precalculus in college first.

These students deserve solid preparation for STEM majors and careers. Providing them with an AP credit opportunity for precalculus will motivate many students to persist in four years of high school math and will significantly boost student readiness for the subsequent math classes they will need to major in STEM.

### 2 AP Precalculus will help students who take algebra 1 before 9th grade prepare for AP Calculus.

Half of American students take algebra 1 prior to 9th grade. While many of these students aspire to take calculus in high school, many are not ready. Students who take AP Precalculus before their senior year will be much better prepared for success in AP Calculus and for any subsequent math they may need in college.

### 3 AP Precalculus will help students fulfill their college math requirement when their majors and careers do not require calculus.

Students interested in non-STEM majors will often be able to use a qualifying AP Precalculus Exam score to fulfill a college math requirement. These students can then focus their valuable time and college budget on the courses most central to their majors and careers, avoiding the need to repeat content already mastered in AP Precalculus. Offering a college-level precalculus course in high school will afford a wide range of high school students a new and valuable way to improve math readiness and on-time college graduation.





## Mathematics Pathways

This table shows math pathways available to students based on their algebra 1 school year.

| Year 1                 | Year 2  | Year 3   | Year 4  | Year 5+   |
|------------------------|---|--|---|---|
| Algebra 1              | Geometry  | Algebra 2  | <b>AP Precalculus*</b>                                    | AP Calculus AB*<br>AP Calculus BC* <sup>^</sup><br>AP Statistics* |
|                        |   |  | AP Statistics   | AP Calculus AB<br>AP Calculus BC<br><b>AP Precalculus</b>         |
|                        |   |  | AP Calculus AB  | AP Calculus BC<br>AP Statistics                                   |
|                        | Algebra 2   | Geometry   | <b>AP Precalculus*</b><br>AP Calculus AB<br>AP Statistics | AP Calculus AB*<br>AP Calculus BC* <sup>^</sup><br>AP Statistics* |
| Geometry and Algebra 2 | <b>AP Precalculus*</b><br>AP Statistics<br>AP Calculus AB | AP Calculus AB*<br>AP Calculus BC* <sup>^</sup><br>AP Statistics | AP Calculus AB<br>AP Calculus BC<br>AP Statistics*        |   |

(Note: for integrated mathematics curricula that weave algebra 1, geometry, and algebra 2 into a united three-year sequence, the Year 4 and Year 5+ pathways are available depending on when the student begins the three-year integrated curriculum and follows the Pre-AP course sequence rows.)

\* Represents an anticipated sequence for most students on this pathway.

<sup>^</sup> It is anticipated that a higher percentage of students may pursue AP Calculus BC having had AP Precalculus due to topic coverage not found in some precalculus courses.

The Pre-AP Course Sequence is Pre-AP Algebra 1, Pre-AP Geometry with Statistics, Pre-AP Algebra 2.

**“The AP Precalculus course content leverages research on learning calculus that calls for precalculus to include a focus on students conceptualizing quantities’ values and considering how they are related and vary together. Including a focus on exploring how quantities change together allows students to understand and define growth patterns described in applied problems using function formulas and graphs.”**

MARILYN CARLSON, ARIZONA  
STATE UNIVERSITY, DEVELOPMENT  
COMMITTEE MEMBER

## The Course

The Advanced Placement® Program convened college faculty to build a precalculus course that invites a diverse group of students to prepare for college mathematics, encourages more students to complete four years of mathematics in high school, and improves student readiness to succeed in STEM courses and majors in college.

In AP Precalculus, students explore everyday situations and phenomena using mathematical tools and lenses. Through regular practice, students build deep mastery of modeling and functions, and they examine scenarios through multiple representations. They will learn how to observe, explore, and build mathematical meaning from dynamic systems, an important practice for thriving in an ever-changing world.

**AP Precalculus prepares students for other college-level mathematics and science courses.** The framework delineates content and skills common to college precalculus courses that are foundational for careers in mathematics, physics, biology, health science, social science, and data science.

### What will students experience in AP Precalculus?



#### MODELING REAL-WORLD DATA

Students will apply the mathematical tools they acquire in real-world modeling situations. By examining scenarios, conditions, and data sets and determining and validating an appropriate function model, they gain a deeper understanding of the nature and behavior of each function type.



#### EXPLORING MULTIPLE REPRESENTATIONS

Students will examine functions through multiple representations. They will gain a deeper understanding of functions by examining them graphically, numerically, verbally, and analytically.



#### MASTERING SYMBOLIC MANIPULATION

Students will develop rigorous symbolic manipulation skills needed for future mathematics courses. They learn that a single mathematical object can have different analytical representations depending on the function type or coordinate system, and that the different analytical representations reveal different attributes of the mathematical object.



#### HARNESSING A DYNAMIC WORLD

Students will engage in function building that reflects not a static view of things but one that embodies how things change. Every function representation characterizes the way in which values of one variable simultaneously change as the values in another variable change. This understanding of functions and their graphs as embodying dynamic covariation of quantities prepares students to tame an ever-changing world.



## Credit and Placement

Precalculus fulfills a math requirement at a diverse range of colleges and universities, including the majority of public institutions. However, most highly selective colleges do not treat precalculus as a college-level course, and thus college credit for AP Precalculus will not be available at such institutions; instead, AP Precalculus will provide students attending such colleges with superb preparation for AP Calculus in high school or college calculus when they matriculate. AP Precalculus Exam scores can also be used by colleges for math and science course placement among newly enrolling students.

## Supporting teachers

Teachers can enroll in an AP Summer Institute (APSI) for Precalculus, a four-day professional learning experience that equips teachers with a deep understanding of the course framework, exam, and instructional supports. Additional one-day professional learning workshops will also be available. APSI scholarships will be available to teachers who qualify.

## Recruiting students

Educators have an influential voice in students' decisions about AP courses and college aspirations. AP Precalculus is for any student seeking a rigorous third- or fourth-year mathematics course following completion of algebra 2. This course prepares students for calculus and prepares students to succeed in both STEM and non-STEM majors. AP Precalculus helps students interested in STEM majors develop an exceptionally strong foundation for calculus, the launchpad for most STEM majors. Students interested in non-STEM majors that do not require calculus can use AP Precalculus as a capstone math course, earning college credits that clear the way to focus in college on courses most relevant to their major and career. Moreover, AP Precalculus will have given such students the language and ideas surrounding the deep study of functions—used in the visual arts and music—or the ability to model complex systems that social and behavioral science students can use to examine the complexity of human individual and group interactions.

Given the benefits of AP Precalculus, teachers, counselors, and administrators should do everything possible to ensure the demographic representation in the AP Precalculus course mirrors their school's population, eliminating all barriers that discourage students traditionally underrepresented in advanced math courses from participating.



### AP CLASSROOM

AP students and teachers receive access to **AP Classroom**, free digital instructional resources, and through-course supports that include instructional videos, formative assessments, and personalized feedback reports.



To learn more about AP Precalculus:  
**[apcentral.collegeboard.org/courses/  
ap-precalculus](https://apcentral.collegeboard.org/courses/ap-precalculus)**