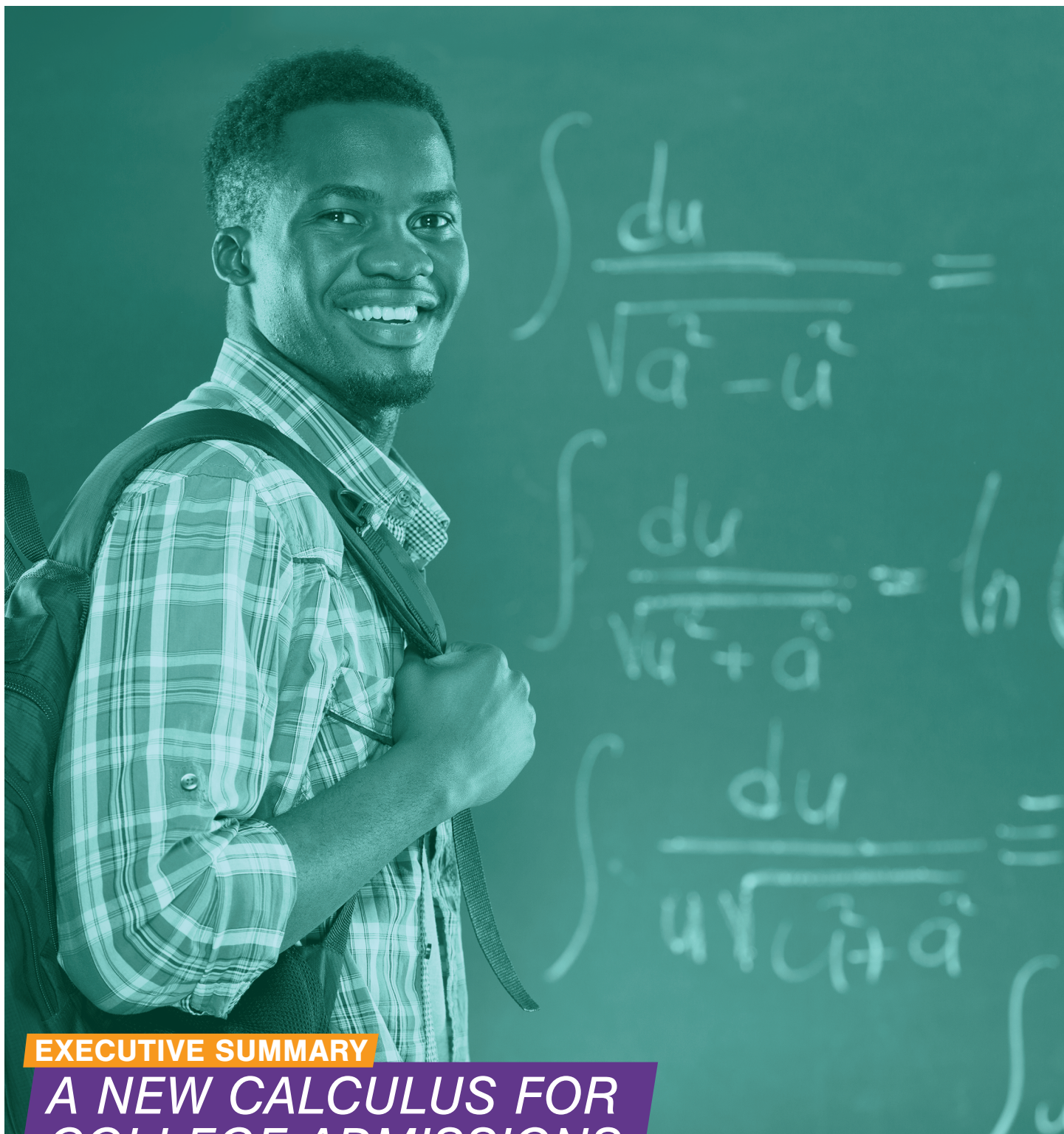




EXECUTIVE SUMMARY

A NEW CALCULUS FOR COLLEGE ADMISSIONS

HOW POLICY, PRACTICE, AND PERCEPTIONS OF HIGH SCHOOL MATH EDUCATION LIMIT EQUITABLE ACCESS TO COLLEGE

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NACAC

“In moving away from test scores, calculus will be the next frontier for battles of access and equity in higher education.”

– public university admissions director



In the world of competitive college admissions, conventional wisdom says that applicants with calculus on their transcripts have an advantage. This assumption drives the race to calculus, in which some students accelerate through traditional math sequences beginning in middle school in order to make it to calculus by 12th grade.

However, leading math organizations have cautioned against this pattern for years. Not all students have the opportunity to accelerate through mathematics. Many who do accelerate miss out on foundational math learning and encounter problems later. For example, most students who successfully complete high school calculus still end up taking calculus or even a lower-level math course again when they get to college.

The emphasis on calculus—a course that has changed little in 50 years—can crowd out statistics and data science, subjects that are more relevant to most students’ academic and career aspirations. Math professional associations and state education systems are promoting a broader, more up-to-date definition of quantitative reasoning. In addition to traditional options such as college algebra, precalculus, and calculus, many if not most students attending public universities can fulfill their math requirement with new courses aligned with their major. These include statistics, quantitative reasoning, mathematical modeling, and data

science—options that are more reflective of how math is used in today’s data-rich, computer-powered world.

Reflecting these changes, high schools are also beginning to offer new rigorous and relevant course options in addition to the traditional sequence. To take hold, however, the new math options must be regarded by families and high schools as rigorous, college-prep options on par with calculus. Until those courses are recognized by admissions officers and rewarded in the college admissions process, especially by the elite private institutions whose practices have outside influence over the field, they will remain in the shadow of calculus.

A New Calculus for College Admissions explores the disconnect between the innovations in math education and traditional college admission processes. It also highlights early reforms to admissions being pursued in some states and steps that colleges can take to realign admissions policies, practices, and perceptions with the changing role of math in education. Its findings are based on a survey of admissions professionals conducted in partnership with the National Association for College Admission Counseling. The report’s goal is to stimulate new thinking on the part of college administrators, faculty, admissions officers, and K–12 leaders about the contours and content of college math preparation in the 21st century.

KEY FINDINGS INCLUDE:

Calculus is rarely required for university admission, outside of specific majors.

Most colleges require three or four years of high school math for admission, often including the traditional sequence of Algebra I, geometry, and Algebra II. But completing minimum requirements does not guarantee entry, especially at more competitive institutions. Most survey respondents noted that calculus is not necessary for all applicants.

- Only 5 percent of respondents—all at private institutions—said their college explicitly requires calculus, but most said applicants who did not have access to calculus at their high school would not be penalized.
- Calculus was more common as a requirement for those who seek admission to study engineering, physical science, math, technology, or business. About one-fifth of respondents said their institutions had these.
- About half of all high schools offer calculus, but only 38 percent of those with predominantly Black or Latinx enrollment offer the course.

Though not required, calculus is favored by many admissions offices as a sign of rigor.

Math is only one of numerous variables evaluated during admissions reviews, yet, for many admissions officers, calculus on a transcript carries prestige and a presumption of intelligence. The perception that it is valued leads more students to take the course. At Wesleyan University, for example, 79 percent of



the fall 2021 entering class had completed math through calculus, about four times the most recently documented national calculus attainment rate. Our survey of admissions professionals revealed the premium that many still place on calculus:

- When asked to name which advanced high school math courses carry the most weight for admissions, respondents' top three choices were AP Calculus (75 percent), regular calculus (73 percent), and precalculus (50 percent)—all ahead of AP Statistics (38 percent).
- An overwhelming number of respondents (79 percent) agreed with the statement, “Students who have taken calculus are more likely to succeed in college.”

High school calculus doesn't guarantee advanced math standing in college.

Estimates are that fewer than 20 percent of students who took AP Calculus in high school go straight to Calculus II in college. Another 30 percent take Calculus I, a repeat of the AP course. The other half of students take Precalculus or remedial algebra courses, non-calculus pathway courses such as statistics, or no math at all.

Some universities weigh other advanced math courses equally to calculus.

Some public institutions, notably the University of California, have made clear that AP Statistics is not only accepted for admission but receives equal weight to other advanced math courses. In 2020, the UC system went further, revising its admission policy to include data science among courses that would be accepted toward the required three or recommended four years of math. Stanford University's admission team has taken similar steps, prescribing “any” rigorous preparation in fundamental math skills and listing calculus, statistics, and data science as courses it “welcomes.” Another selective private university includes cautions against a calculus bias in its training for admissions readers.

High school students often receive mixed messages about whether to take calculus.

On the college recruitment circuit, admissions officers invariably encounter questions about calculus. According to survey responses, students who



Calculus may be the next frontier in discussions about equity in college admissions.

The idea of updating math requirements is out there but far from widespread. It's time for those with authority over college admissions to reconsider policies, practices, and training that allow preferences for calculus in the admissions process to persist—preferences that can skew the composition of the student body and, as some math faculty argue, interfere with successful math learning. This begins with building awareness of new pathways and deepening conversations on campuses and at the regional or state level about aligning admissions requirements with 21st-century math. Strategies that higher education leaders, national associations, state agencies, and other funders can pursue include:

- **Increasing knowledge and understanding of new high school and college math options through research and dissemination.**
- **Fostering intersegmental, interdisciplinary, and cross-functional dialogues to inform development of new policies.** Participants should include math faculty, faculty from disciplines that use mathematics, high school teachers and administrators, high school counselors, and other college-access specialists.
- **Addressing bias and misperceptions about math pathways** through training for college admissions officers and high school counselors.

Armed with greater awareness about 21st-century math in a technology-enhanced and data-rich world, high schools and colleges can further open the door for expanding math pathways—expanding opportunity for students as a result.



speak to multiple admissions officers may receive a confusing mix of answers: Take the most rigorous math courses. But don't let your GPA suffer. Calculus is recommended but not required. Therefore, as institutions strive to deliver a nuanced message, students may end up feeling confused or simply decide to err on the safe side and take calculus. Admissions officers who encourage courses other than calculus also note that applicants and high school counselors are slow to give up calculus and the competitive edge they believe it imparts.

The expertise needed to support admissions changes exists on many university campuses.

Admissions professionals noted that they are not math experts and could use more information from faculty with subject-matter expertise. Changes to university admissions policies on mathematics may be on the horizon, but more leadership is needed. Prestigious universities both public and private have outsize influence over perceptions of rigor and quality, so changes they make can help shift admissions perceptions and practices far beyond their own applicant pool. Faculty from social sciences, psychology, and other disciplines that teach or utilize statistics or other new areas of quantitative reasoning have a role to play in updating admissions policies. So do forward-looking math departments and scholars of math education.



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