50CAN

MATHWAYS

Every Kid is a Math Kid

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AUGUST 2025

When it comes to math in American schools, we have a lot of problems.

It's not just that, of the country's 8th graders, only 28% are proficient in math on the National Assessment of Educational Progress, commonly known as the Nation's Report Card. It's also that, as **one expert noted**, "math achievement has fallen so far in 11 years that what would once have been an unremarkable score now leads the nation." Even the prestigious Harvard University has launched **a new math course** aimed at "rectifying a lack of foundational algebra skills" among incoming students. On an **international math test** in 2023, the U.S. ranked 22nd out of 44 countries, and 8th grade scores have fallen 27 points since 2019. On the whole this is tragic but it is still only half of the story.

American students are also underprepared for a future labor market in which advanced math is necessary for many of the fastest-growing jobs. Data science is "**a professional discipline in which people gather, analyze and interpret data sets to solve complex, real-life problems using statistical and computational methods**" and is a highly-marketable skill set. Of **the 30 fastest-growing occupations** by 2033, at least twelve require significant amounts of math and other skills under the data science and analytics umbrella (including, of course, the fourth-fastest growing occupation of all: data scientists). Industrial machinery mechanics, market research analysts, and actuaries are three jobs that regularly use math and have **significant projected growth** by 2030. Almost **one in four U.S. job postings** ask for at least some "data science" skills (such as **business metrics, data security, and data collection**), even while over 60 percent of companies struggle to find candidates with those skills. Data skills are increasingly critical to compete in sectors like **manufacturing, agriculture, or utilities** (think servicing a gas line). Addressing the math challenge we currently face, like its companion challenge in student literacy, is crucial to preparing students for a world that requires more math, data science skills, and data literacy to be a fully-participating citizen.

Solving the problem isn't simple, however. For instance, not enough high school students even take the kinds of math courses that will prepare them to demonstrate these skills and qualify for these jobs. Some students don't take advanced math, like statistics or calculus, because they never get that

far before graduation, while others don't take it because they don't believe it's relevant to their future lives. And many students take math courses that don't use high-quality curriculum.

Rural schools, which serve almost ten million students, often struggle to hire advanced math teachers or don't have enough students to merit creating an entire class for these subjects. High-poverty schools are more likely to **not offer advanced math**, and teachers in those schools are more likely to report spending more instructional time addressing **math topics below grade level**. As many as half of all high schools in the US **don't even offer calculus**. Some students take advanced math but don't pass whichever course they chose, while others will pass what they believe are advanced math courses which have been watered down or where grades are inflated.

At 50CAN we believe the math problem is a serious one, and we have developed a framework with our executive directors and partners featuring three strategic pillars to address it across our state campaigns: Start, Strengthen, and Show.

Start is how we give all students a strong foundation for math in grades K-8, including improving how math is taught and supporting students who need additional help, and how we address teacher training and assignment in math subjects. **Strengthen** is how we improve advanced math pathways and choices in middle and high school, and how we ensure that math courses ladder up to career and college readiness. Finally, **Show** is how we measure the success of the efforts in Start and Strengthen so we know more students have access to both high-quality math coursework and great educators with the skills to teach it.

In this policy brief, we also pair problems with concrete policy solutions that will help states set students up to acquire the math skills and knowledge they need to thrive and live with confidence on their own and in the workplace.

START at the Beginning

Like reading, math fluency is built over time and depends on students mastering critical skills early and sequentially. Children have to know how to add and subtract before they can grasp long division; one must be able to solve for the *variable x* in a basic algebraic equation before solving for the length of a side in a right triangle. America's math problem doesn't start in high school–that's just when it presents itself most acutely. Our solutions can't start there either.

On the 2024 4th grade NAEP math assessment, the percent of students scoring proficient rose slightly from 2022, but still lagged behind pre-pandemic results. Averages only tell part of the story, and in this case mask significant declines in math mastery for the lowest-achieving students. Students scoring in the 25th percentile or below showed precipitous drops in achievement compared to pre-pandemic levels, a trend that continued in the 2024 NAEP.

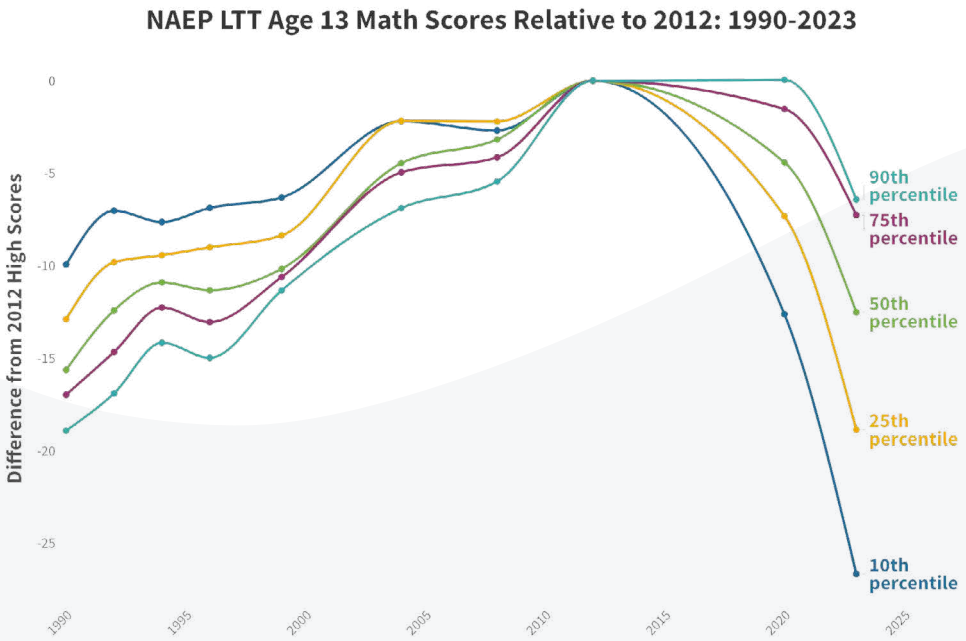


Chart courtesy of Nat Malkus, AEIdeas

If we don't ensure today's elementary students have strong math foundations, how will they succeed in advanced math in secondary school? One **study found** that when students know at least 80 percent of required concepts and skills from previous grades, they are likely to reach proficiency in Algebra. But almost half the students in the national sample start their algebra course with only one-third of those required skills.

Early math achievement is so important that research shows it is predictive not only of later math achievement but also later reading achievement–in one study, kindergarten math proficiency predicted both fifth-grade math and reading proficiency. More than half of high school students who ever identified as "a math person" began feeling that way in elementary school. Strong elementary math foundations, in other words, matter for academic success both directly and indirectly.

Only 47 percent of U.S. school districts selected a high-quality elementary math curriculum in 2023-24, according to one survey, and just 42 percent chose one of high-quality for middle school. There's no reason that students shouldn't be taught with high-quality instructional materials when many different options exist. According to a recent report by the National Council on Teacher Quality (NCTQ), 24 states do not even offer recommendations on which curricula districts should use, or provide a default model of high quality for adoption. Only four states require districts to select high-quality math curricular materials.

Foundational Math

FOUNDATIONAL MATH

Problem 1:

Not enough elementary students acquire sufficiently strong foundational math skills, which will ultimately become an obstacle to completing any advanced math course.

Policy Solution 1A:

States should conduct a math standards audit to ensure the K-12 math standards sufficiently detail the specific skills that will set students up for success throughout K-12 math, including into advanced math pathways. Utah's math standards revision process is a strong example.

Policy Solution 1B:

All districts should use a high-quality math curriculum for both elementary and middle grades. States should create a list of approved math curricula from which districts can choose, and incentivize them to do so.

Policy Solution 1C:

K-8 teachers need more professional learning in numeracy skills. States should require that all current K-8 math teachers complete an approved professional learning course. Louisiana's Numeracy Professional Learning ***suite of courses*** *is one strong example.*

Policy Solution 1D:

Elementary students in grades K-3, at a minimum, should be given math fluency screeners at least twice each year. Students performing below grade level should have access to tutoring; results of the screeners should be shared with parents. Tutoring could be provided during the school day by the school, or funds could be provided to families to procure tutoring outside of school, as Louisiana has done with the ***Steve Carter tutoring program****, which provides $1,500 to families whose children are not proficient.*

Taking Algebra

TAKING ALGEBRA

Problem 2:

As students get closer to the pivotal Algebra I course, identifying those who need support becomes even more critical. Educators, parents, and students need information more often, and earlier, than annual assessments in middle school.

Policy Solution 2:

States should implement an Algebra-readiness screener starting in 7th grade. If students are not on-track to access Algebra I in 9th grade based on screeners in 7th and 8th grade, they should have access to high-impact math tutoring.

STRENGTHEN Math Pathways

For decades, students applying to competitive colleges and universities have taken calculus in high school, which serves as a proxy for an aptitude for advanced math and an ability to tackle more complex subjects. To get more students in advanced math courses in a world increasingly shaped by technology and artificial intelligence, we need to both ensure all students have access to the traditional advanced math challenges of calculus, and broaden the types of advanced, rigorous math available in high school. Colleges and universities must also be willing to consider non-calculus advanced math options that are on par with calculus in their admissions practices. High schools expanding their course offerings should also allow students to take both calculus and statistics in high school, both of which are foundational to data science.

This work is underway. Several states have shifted their math course sequence to allow for multiple pathways–or mathways–that include other forms of advanced math, including rigorous statistics, instead of just calculus.

The standard high school math course sequence typically requires students to take Algebra I by ninth grade, followed by one year of Geometry and one year of Algebra II before accessing more advanced math. In the 2020-2021 school year, **only 27 percent** of all ninth and tenth grade students nationally were enrolled in Algebra I. Another 20 percent took Algebra I in the eighth grade, **but already fewer than half of all students will even have the option to access advanced math**.

A 2019 study of high school transcripts showed that 85 percent of graduates did finish Algebra I and Algebra II by 12th grade. A dishearteningly low 16 percent of students had taken calculus with another 17 percent completing a course in probability and statistics. These numbers shrink even further when we consider family income. In schools where 75 percent of students are low-income, only 9 percent of students completed calculus. In the most affluent schools, where fewer than one-quarter of students are low-income, 25 percent complete calculus.

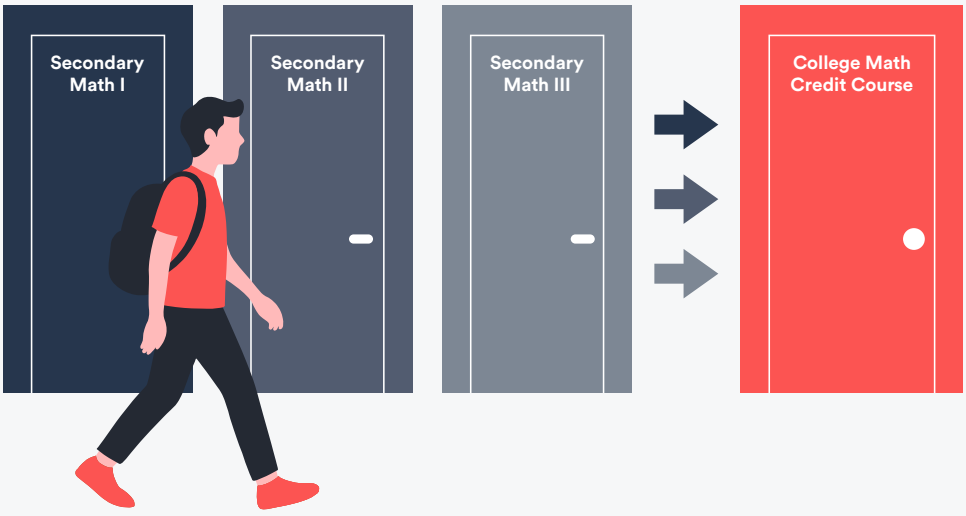
One reason for this is that many high schools still don't offer advanced math. A **2016 review** of high school course offerings, the most recent available, found that only 50 percent of high schools offered calculus. Among schools serving significant populations of minority students, just 38 percent offered calculus. Even as we broaden the types of advanced math offered in high school, we have to ensure students in all types of schools, in all types of

communities, have access to these math opportunities whether in their school or elsewhere.

Broadening the advanced math opportunities in schools should be done in a way that helps the most advanced students go as far as their talents can take them while also ensuring that students needing extra help get that support early enough so they don't fall behind. Done right, we should see the average amount of advanced math covered in high school increase, while at the same time foundational math skills rise for all students.

Our urgency in pursuing these reforms should be driven by an understanding that advanced math courses are increasingly helpful, and in some cases necessary, for a wide variety of jobs. From being a **power plant operator to elevator repair tech to first-line supervisor of mechanics**. All of these positions don't require a college degree but use math or data intensive skills.

A decade ago, **Utah** launched new **high school math pathways**. The state now requires all high schools to offer three foundational courses (Secondary Math I, Secondary Math II, and Secondary Math III), though accelerated versions of each course are also available. After the second course, students may branch into alternative selections like introductory statistics, computer programming, or accounting. If a student completes the third foundational course, they can choose one of four final courses that both meet graduation requirements and provide a college math credit. These include quantitative reasoning, statistics, college algebra and trigonometry, and calculus. Utah's approach not only provides multiple pathways to different types of advanced math but also bridges high school and post-secondary education.



Ten years into Utah's math pathways, the state's enrollment and completion rates in advanced math don't look much different than the rest of the country. About **18% of Utah students** were enrolled in calculus or another AP/IB advanced math course, not so different from the 16% of students nationally who take calculus. Where Utah has made significant progress is in the foundational courses, with 87 percent of students taking Secondary Math I (Algebra I) in ninth grade plus an additional seven percent of students taking that course in middle school. In other words, where national data suggest only about half of students are taking Algebra I by ninth grade, Utah has more than 90 percent of students reaching this critical math course much **earlier**. In a **2023 national poll**, 93 percent of parents agreed that "when students succeed in math, they are more likely to succeed later in life." But students must be given the opportunity to succeed by having access to appropriately challenging math as soon as they are ready for it. On this issue, Utah is paving the way for other states to follow.

Utah also developed more ways for students to earn college credit as they fulfill high school math requirements, including with expanded dual enrollment opportunities. "What we saw happen in Utah that was really exciting," explained Lindsey Henderson, former secondary math specialist for the Utah State Board of Education and now the math policy director for the national education policy organization ExcelinEd, "was that as more students and families learned about the dual enrollment courses that matched their students' area of interest, more students started taking a fourth year of math in high school." In other words, though Utah only requires three years of math to graduate, the expanded pathways and increased transparency for families about those pathway options led more students to take more math.

In January 2025, **Maryland** announced their own new approach to math pathways. The traditional three-course sequence of Algebra I, Geometry, and Algebra II will be condensed into two years of Integrated Algebra (in which geometry is integrated into the algebra curriculum). Following those years, schools and districts are required to **provide access** to at least four different advanced math pathways: Quantitative Reasoning, Data and Data Analytics, Algebraic Foundations of Calculus, and Statistics and Probability. Maryland's hypothesis is that, by getting students into pathways of their own choosing earlier in high school, while also making more choices available to them, more students will enroll and succeed in more challenging math courses. The success of Maryland's ambitious new plan may well hinge on the success of implementing additional supports in earlier grades. As established earlier, many students get to high school unprepared for this

level of coursework. In Maryland, under this new plan, students in grades 3-7 will also have the chance to qualify for math acceleration at least once each year, so more students who are ready for the next challenge have the opportunity to go further in math faster. Students in grades 3-7 will also benefit from new systems of support that districts must develop to ensure more students are achieving on grade level in math.

Alabama offers another model that seeks to accomplish many of the same goals. In 2019, the state published a new **course of study in mathematics** that created a new framework for math across all grades. With the passing of the **2022 Alabama Numeracy Act**, the state began to systematically invest in overhauling elementary math instruction as it implemented the diverse math pathways it established in 2019. Alabama now requires Geometry with Data Analysis as the first course a student takes in high school, regardless of whether they have yet completed Algebra I. As the Alabama Department of Education explains, "this arrangement allows all students, no matter what pathway they followed in the middle grades to enter Geometry in grade 9, providing them with a common mathematics experience at the beginning of high school." To support students who might struggle with math, Alabama says school systems should offer "lab courses" to be taken alongside the required math courses. Corinn O'Brien, vice-president of policy at A+ Education Partnership in Alabama, shared that "it has taken years of hard work, but it's starting to pay off. You visit schools now, and math just feels different." O'Brien says the work is far from finished, but that "Alabama is on the right track."

The following table shows how a typical student and an accelerated student would progress in math in Alabama, Maryland, and Utah.

	Alabama Standard	Alabama Accelerated	Maryland Standard	Maryland Accelerated	Utah Standard	Utah Accelerated
Grade 8	8th Grade Math	Algebra I with Probability	8th Grade Math	Integrated Algebra I	8th Grade Math	Secondary Math I
Grade 9	Geometry with Data Analysis	Geometry with Data Analysis	Integrated Algebra I	Integrated Algebra II	Secondary Math I	Secondary Math II
Grade 10	Algebra I with Probability	Algebra II with Statistics	Integrated Algebra II	Choose pathway: Quant Reasoning *or* Data Analytics or Calculus *or* Statistics	Secondary Math II	Secondary Math III
Grade 11	Algebra II with Statistics	Precalculus *or* Mathematical Modeling *or* Finite Math	Choose pathway: Quant Reasoning *or* Data Analytics or Calculus *or* Statistics	Continue selected pathway	Choose pathway: Secondary Math III *or* Access and Advancement Framework courses	Choose pathway: Access and Advancement Framework courses
Grade 12	Precalculus *or* Mathematical Modeling *or* Finite Math	AP Calculus *or* AP Statistics	Continue selected pathway	Continue selected pathway *or* choose a new pathway	Continue advanced pathway *or* choose a new pathway	Continue selected pathway

For students who plan to enter the workforce after high school, districts and schools should work to demonstrate the relevance or importance of math skills to the jobs available in their communities. This work must be locally-focused, as the jobs available with a high school diploma in Alabama may not be the same jobs available to those candidates in Oregon.

Automatic Enrollment

AUTOMATIC ENROLLMENT

Problem 3:

*Some students with the aptitude to move ahead in math aren't given the opportunity to do so. For example, in 2017, **ten percent of eighth-grade students** in the second-highest math course had received scores making them eligible for the highest-level math course but were not given the opportunity to enroll.*

Policy Solution 3:

Launch an automatic enrollment policy that places students who score in the highest tier in the previous year's math assessment in the highest possible math class. Within five years of passing "auto-enrollment" legislation in North Carolina, for example, only 2 percent of eligible students weren't in the highest math course. Virginia and Texas have also now passed auto-enrollment laws targeting middle school math; Illinois and Washington state have such laws for high school math.

Mastering Algebra

MASTERING ALGEBRA

Problem 4:

Not enough students are reaching advanced math courses because they are stumbling on foundational courses like Algebra I.

Policy Solution 4:

*Passing Algebra I in 9th-grade is a significant landmark on the path to high school graduation. The inverse is also, unfortunately, significant: students who fail Algebra I in the 9th grade are even more likely to never earn their diploma. Between well-respected Algebra I tutoring programs and other research efforts on **summer school Algebra I credit recovery**, states should ensure that every Algebra student has access to academic support, in the form of tutoring if needed, during the school*

year, and a high-quality summer school option for the summer following 9th grade, if necessary.

Advanced Options

Problem 5:

Some high schools still don't offer any advanced math, and many more have limited advanced math options.

Policy Solution 5:

All students should have access to advanced math courses including Calculus and Statistics. If a school doesn't offer these courses, students should still have an option for a math pathway that leads to an advanced math course in 12th grade that could be taken online, at a local community college, or elsewhere, paid for by the school or district.

Building Pathways

Problem 6:

Limited math pathways, including calculus as the primary advanced math option, are in turn limiting the number of students with the ability and desire to access advanced math.

Policy Solution 6:

Alabama, Maryland, and Utah provide examples of strong approaches to building math pathways. They also demonstrate that there's no one way to provide more access to advanced math. States should analyze these examples and consider the pathways that will work given the culture and structure of their state's education system. States should also consider working with higher education institutions to increase flexibility around entrance requirements to enable and encourage the pursuit of new math pathways.

Labor Markets

LABOR MARKETS

Problem 7:

Limited math pathways mean that students aren't acquiring math skills necessary to participate in the labor market, especially for those students who go directly from high school to the workforce.

Policy Solution 7:

*Work with state labor departments and chambers of commerce to identify occupations with projected growth and provide transparent information to high school students about the math courses and skills that will help them acquire those jobs and succeed in them. In Florida, the state Chamber of Commerce **found a significant gap** between curriculum and math skills that employers are demanding. In Kentucky, the **U.S. Chamber of Commerce Foundation** and the Kentucky Chamber Workforce Center collaborated to build a stronger pipeline of registered nurses, amongst 27 other industry collaboratives in the state.*

SHOW the Impact

It's no longer sufficient to pass a course. With rampant grade inflation, we need external measures that let a student prove their mastery of material. This is especially true when mastery can lead to jobs or college credit.

A 2023 **analysis of ACT** scores and high school grades found that while high school grades across English, math, social studies, and science have all become inflated, math grades have gone up the most. Across a 12-year window, the average math GPA increased from 3.02 to 3.32, with a clearly widening gap between grade and ACT performance for students at the low-end of the ACT scale. In other words, lower-performing students are also receiving more grade inflation. There's also evidence that high school grades do a poor job of **predicting academic success** in college.

An objective measure of student success could close the gap on grade inflation, and the AP Calculus and AP Statistics exams could be the best choice, in that they are established assessments of the very skills and

knowledge we want more students to obtain. While they are imperfect measures since many students continue to lack access to these courses, they remain the most common way that American high school students pursue advanced math. The **AP Calculus exam results** suggest that more students are mastering calculus, with the percentage of students earning a 3 or above increasing from 59% in 2014 to 64% in 2024. However, the total number of students taking the exam decreased by 5 percent in that time frame. Despite this, and importantly, the College Board **has not changed the proficiency bar** for AP Calculus scores during this time.

National averages assume there is minimal variation between AP Calculus classrooms. In other words, they assume that AP Calculus in Furr High School in Houston, Texas is exactly the same as AP Calculus at Walt Whitman High School in Bethesda, Maryland. If that's true, we might ask why **84 percent** of Whitman students who took the 2023 AP Calculus exam scored a passing grade of 3 or higher, while zero percent of Furr students passed the test in the same year? We might wonder whether Whitman has a better calculus teacher than Furr, or whether the Furr class actually covered all the material. It might not surprise anyone to learn that fewer than five percent of Whitman students come from low-income households, but **more than 95 percent** of Furr students do.

But this extreme difference in passing rates isn't unique to these two schools. Across all of the Houston Independent School District, in fact, **only 37 percent** of AP Calculus takers score a 3 or higher. Meanwhile, in Montgomery County Public Schools, where Whitman sits, 70 percent of students passed the AP Calculus exam. Ultimately, if students aren't mastering the material, it matters little whether they took the course. When a majority of students aren't passing the year-end exam, it's worth questioning what is happening in the classroom.

AP Statistics is an exam that is rapidly growing in popularity. Between 2014 and 2024, participation in the AP Statistics exam grew by 37 percent, with the total number of participants almost catching up to those of AP Calculus. About 60 percent of students score a 3 or above on this exam, and there's been a small increase in passing rates. In 2014, 60 percent of students scored a 3 or above but in 2024, that number rose to 62 percent.

But 500,000 students taking an AP Calculus or AP Statistics exam in a given year tells us very little about the math proficiency of **the 7 million** 11th and 12th grade students who might be enrolled in these courses. It is clear more can still be done.

As some states continue to evolve school accountability systems, there could be an opportunity to include advanced math enrollment and AP course participation into them. In Virginia's **new high school accountability system**, for example, 25 percent of the score comes from the "3E Readiness Framework" which looks at whether students are graduating ready for enrollment, employment, and/or enlistment. Virginia says schools will earn points for "students that meet defined expectations across enrollment, i.e., dual credit or credit-bearing coursework," which should include AP courses that lead to college credit if sufficient test scores are achieved.

Demonstrating mastery doesn't just matter for high school accountability or college applications. Parents also have a vested interest in both understanding the pathways open to their student, and in knowing whether their student is acquiring advanced math knowledge and skills. Showing the impact of advanced math coursework, therefore, has to include explicit measures of transparency for parents.

Transparency

TRANSPARENCY

Problem 8:

A lack of transparency means that parents, and the general public, don't know whether schools are successfully teaching advanced math courses.

Policy Solution 8:

Districts should make public how many students take and pass (score 3+) AP Calculus and AP Statistics exams at each school, including data on demographic subgroup participation.

Accountability

ACCOUNTABILITY

Problem 9:

State and district leaders need a way to hold schools accountable for whether students are accessing and succeeding in advanced math.

Policy Solution 9:

High school accountability systems, where they exist, should consider math proficiency, perhaps with a standalone math assessment like the Integrated Algebra assessment Maryland will roll out in the 2028-2029 school year. They should also take into account the number of students enrolled in advanced math, and the number passing assessments like AP or IB assessments, with a particular focus on schools serving low-income students who improve on this measure. States should allow flexibility for other types of assessments that evaluate advanced math skills.

Information for Parents

INFORMATION FOR PARENTS

Problem 10:

Parents and students often don't have full information about math options, and the types of math courses needed for postsecondary education or long-term career opportunities.

Policy Solution 10:

Provide information to parents in 8th, 9th, and 10th grade about math pathways, and which courses best prepare students for various postsecondary and career options. Provide test scores and other objective evaluative data to parents about how their student has fared in math courses, and how parents and schools might support each student in more challenging math courses.

Conclusion

Just as math can be an intimidating subject for students, it can also be an intimidating policy area for lawmakers. Yet states like Utah, Maryland, and Alabama show there are multiple ways to make concrete progress in improving students' math skills and better preparing them for the jobs of the future.

One clear lesson from these state proof points is that we won't get many more students to and through advanced math without better math foundations. The work should start early, with clear messaging to teachers, parents, and students about the requisite math skills required to move to the next level, and ample supports to help the maximum number of students reach advanced math by high school.

Finally, states should care about knowing whether these new efforts work just as parents care about whether their student is succeeding, or not, in school. Measuring outcomes, whether through test scores, accountability systems, long-term post-secondary outcomes, or even longer-term economic data, is integral and must be built into the system from day one.

Math isn't the only issue facing K-12 education, but it's a critical one that deserves to be in the spotlight. Gone must be the days when students say "I'm just not a math person." By learning from each other and focusing on policies that expand both opportunities and support, states can ensure that every student has an opportunity to become a math person in school and beyond.

Appendix

Alabama State Pathways

Alabama Course of Study Mathematics

Examples of Pathways. The rows of the following table provide examples of pathways which students may experience across Grades 7-12. Note that students should be enrolled in a mathematics course every year of middle and high school.

<table>
<tr><th>Grade 7</th><th>Grade 8</th><th>Grade 9</th><th>Grade 10</th><th>Grade 11</th><th>Grade 12</th></tr>
<tr><td>Grade 7 Mathematics</td><td>Grade 8 Mathematics</td><td>Geometry with Data Analysis</td><td>Algebra I with Probability</td><td>Algebra II with Statistics</td><td>Specialized course</td></tr>
<tr><td rowspan="2">Grade 7 Mathematics OR Accelerated Grade 7 Mathematics</td><td rowspan="2">Grade 8 Mathematics</td><td rowspan="2">Geometry with Data Analysis AND Algebra I with Probability (concurrently)</td><td rowspan="2">Algebra II with Statistics</td><td>Precalculus</td><td>AP Calculus OR Additional specialized course</td></tr>
<tr><td>Mathematical Modeling OR Applications of Finite Mathematics</td><td>Precalculus OR Other additional specialized course</td></tr>
<tr><td rowspan="2">Accelerated Grade 7 Mathematics</td><td rowspan="2">Accelerated Grade 8 Mathematics</td><td rowspan="2">Geometry with Data Analysis</td><td rowspan="2">Algebra II with Statistics</td><td>Precalculus</td><td>AP Calculus OR Additional specialized course</td></tr>
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</table>

See Appendix E for an exhaustive list of course pathways. In addition, see the figure in Appendix B which shows how each pathway connects with postsecondary options.

Chart provided by Alabama State Department of Education, Alabama Course of Study: Mathematics

Chart 2: Pathways through K-12 Mathematics to Postsecondary

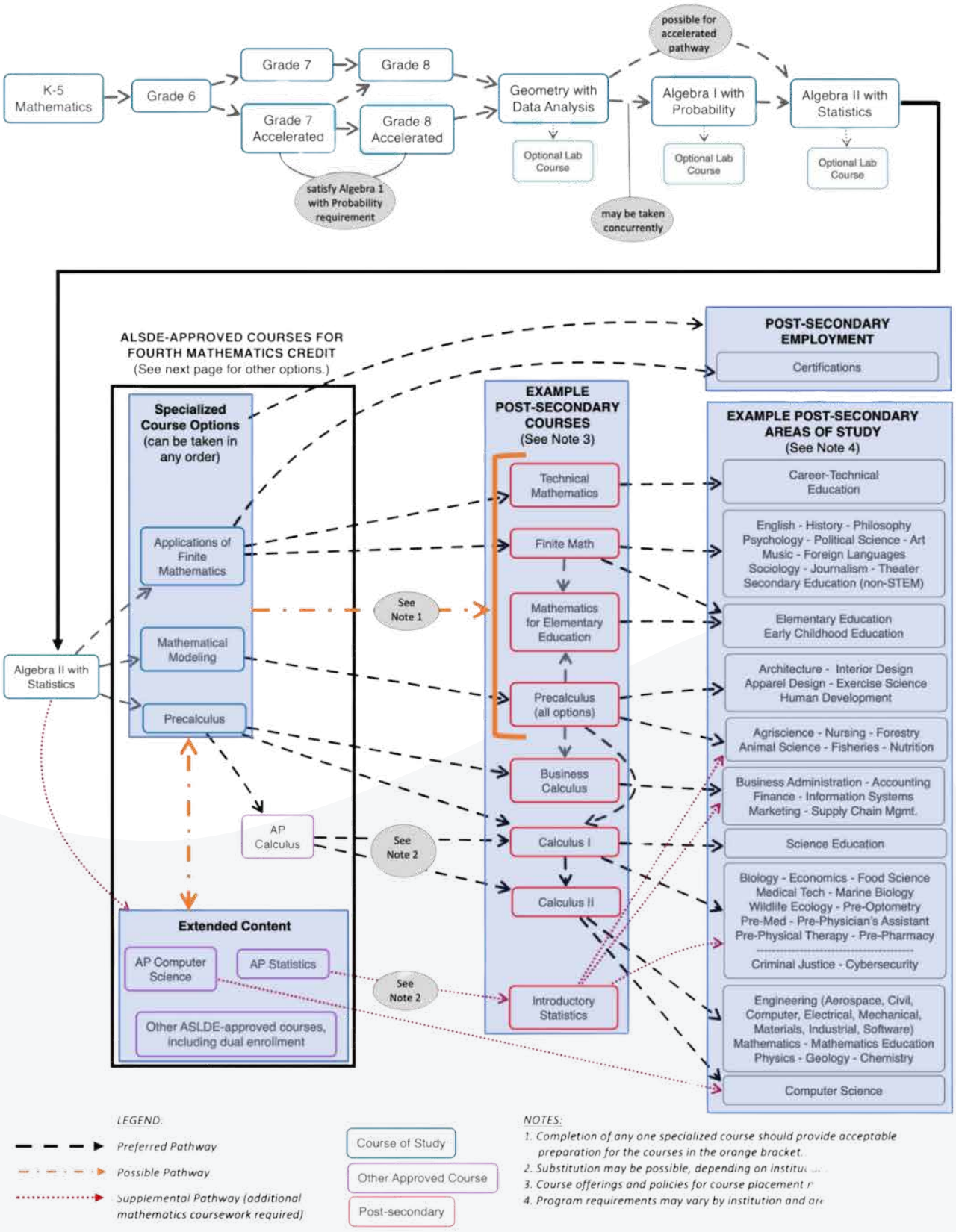


Chart provided by Alabama State Department of Education, Alabama Course of Study: Mathematics

Maryland State Pathways

Draft PreK-12 Mathematics Policy January 2025

Integrated Algebra refers to intentional integration of algebra, geometry, and statistics to showcase their interconnected nature for a cohesive and deeper understanding of mathematics. With this approach, students are provided opportunities to use different areas of math (algebra, statistics, geometry) as a lens through which they develop a more holistic understanding of concepts traditionally taught in isolation. For example, students can explore concepts like quadratic relationships not only through the lens of algebra but also by analyzing their graphical representations in geometry and modeling real-world data in statistics.

The pathway to college and career numeracy develops within four interconnected content domains as students progress from early elementary to secondary mathematics learning experiences. Each domain reflects a developmental progression from fundamental concepts in early grades to advanced skills in high school, and provides students with a multidimensional understanding of numerical and algebraic relationships, spatial awareness and geometric modeling capabilities, proficient data literacy and critical statistical reasoning skills:

1. **Number and Operational Sense** - Early numeracy development begins with foundational skills in counting, place value, and basic operations which provide the foundation for proportional reasoning. As students progress through their understanding of whole numbers, fractions, decimals, ratios, and percentages, they build fluency in interpreting and manipulating numerical information. This developmental trajectory enables students to recognize and make use of structure, attend to precision, and reason flexibly about numerical relationships, including proportionality.

2. **Algebraic Reasoning** - The progression of algebraic thinking starts with identifying and analyzing patterns to create mathematical models. Students advance from early pattern recognition to exploring functions (e.g., linear, exponential, and quadratic) and developing symbolic representations to model mathematical phenomena. As they deepen their algebraic thinking, they learn to algebraically express regularity in repeated reasoning, construct viable arguments, and critique the algebraic reasoning of others as they solve authentic problems in collaborative spaces.

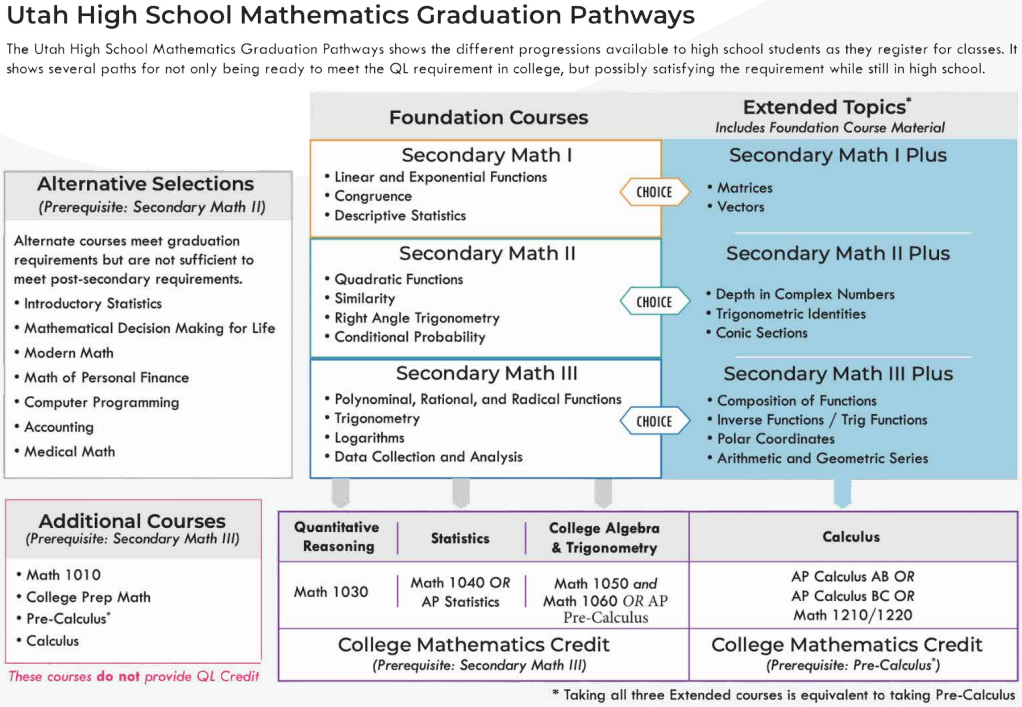
3. **Geometric Reasoning** - Development in geometrical reasoning begins with recognizing shapes, symmetry, and measurement concepts. Over time, students expand their spatial awareness to include transformations, trigonometry, and spatial modeling. As they progress, students engage in conjecture, reasoning inductively and deductively, and verifying their conclusions. They learn to use multiple representations to analyze and reason about spatial phenomena and apply these skills to solve both abstract and practical problems.

4. **Reasoning with Data and Statistics** - The ability to reason with data and statistics develops as students move from organizing and interpreting information to engaging with variability, probability, and uncertainty. As they progress, they develop statistical models, analyze patterns, and question data sources critically. This growth includes using tools and technology to synthesize information and communicate findings effectively. By the time they reach advanced levels, students are prepared to apply data-driven decision making in complex, real-world contexts.

Utah State Pathways

Beginning in the MIDDLE: Mathematics Pathways

Utah High School Mathematics Graduation Pathways



Provided by the Utah State Department of Education, High School Mathematics Graduation Pathways

How to Get Involved

Sign up for our mailing list and follow us on social media:

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