



The Algebra II Variable: State Policies for Graduation Requirements, Assessments, and Alignment to Postsecondary Expectations

Over the last decade, most states have defined college- and career-ready standards in mathematics to include content at the Algebra II level, but the expectations for students to meet those standards vary widely. Some states require students to complete Algebra II, some do not. Some assess that requirement, some do not. Some expectations around Algebra II align to postsecondary entrance expectations, and some do not. In many cases, policies within a state seem to contradict themselves, as assessments often do not align with course requirements or standards. What may appear to be uniform is actually quite variable.

In this brief we explore inconsistencies that exist both within and between states, and we urge reflection on the need for stakeholders to clarify the purpose and role of Algebra II. Specifically, we provide an overview of state-level mathematics policies across the United States with respect to Algebra II course requirements, state assessments, and alignment to postsecondary expectations as we examine the following:

- **Graduation Requirements:** Which mathematics courses/experiences do states expect of students before they graduate from high school?
- **Assessment:** How do states assess students' mathematics proficiency and how does Algebra II fit in with those assessment requirements?
- **Alignment to Postsecondary Expectations:** How do states' high school graduation requirements and assessments align to in-state postsecondary education institutions?

I. State High School Graduation Requirements

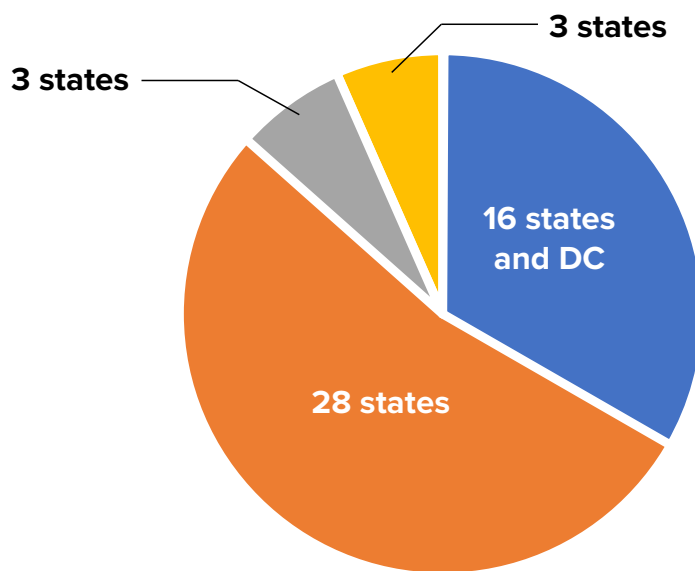
High school mathematics graduation requirements vary throughout the United States. In all states, the state sets the graduation “floor” – districts can supplement with additional courses or experiences as they deem appropriate. States differ in the number of mathematics courses required and in the content of those

required courses. States also differ in terms of the number of graduation options available to students; some offer a single diploma option while others offer several options. The analysis that follows will focus on the graduation requirements that students – absent any action on their part – are expected to complete. In other words, these are the “default” expectations for students.

Years of Mathematics Required by States

There is a lack of consistency when it comes to the number of years of mathematics coursework students must take to receive the default diploma. As shown in Figure 1, sixteen states and the District of Columbia require students to take four credits of mathematics for graduation. Twenty-eight states require three credits of mathematics. Three states require students to take two credits of mathematics, and three states do not specify a particular number.

FIGURE 1: NUMBER OF REQUIRED MATHEMATICS CREDITS

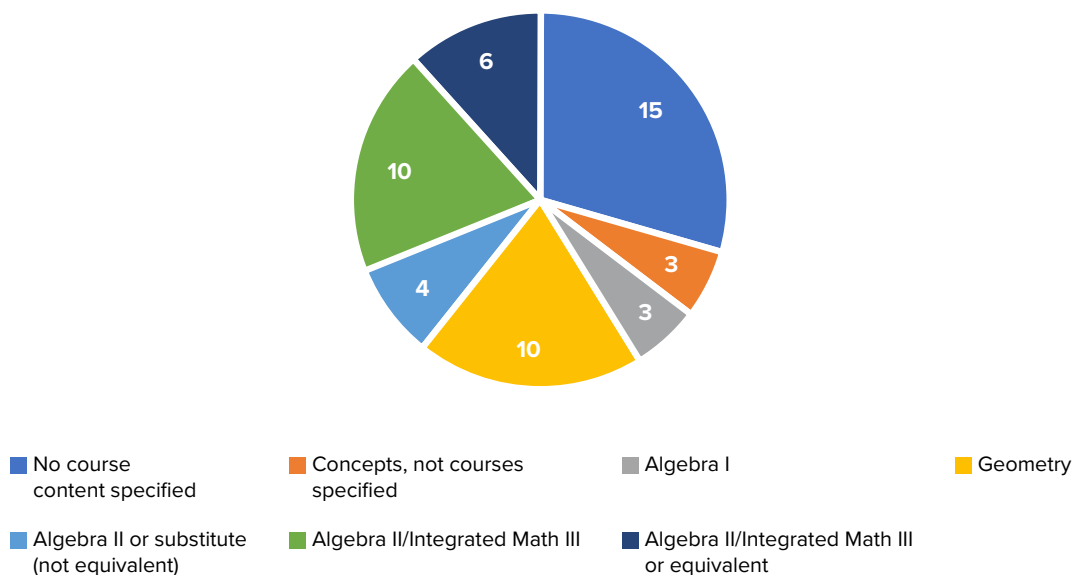


■ Four credits
 ■ Three credits
 ■ Two credits
 ■ No state course requirements for mathematics

Content of Mathematics Required by States

Significant variation emerges across states when we look at course requirements in terms of content. As detailed in Figure 2 below, fifteen states require some number of mathematics courses be taken, but do not specify which courses. An additional three states require mathematical concepts be learned but do not go so far as to specify the courses. Three states require students take no less than Algebra I before they graduate. Ten states require that students take no less than Geometry before they graduate. Finally, twenty states require students to take Algebra II or Integrated Math III.

FIGURE 2: HIGHEST LEVEL MATHEMATICS COURSE SPECIFIED BY STATES



It is worth noting that while no state specifically requires students complete a probability and statistics or data analysis course prior to graduation, eleven states do specifically reference these courses as options for students to count toward mathematics requirements. Six states' graduation requirements reference computer science as counting toward mathematics requirements.

II. State High School Assessment Requirements

Across the country, high school assessment requirements are also different from state to state, from when students take the assessment(s) to what the assessments measure. We classified the statewide mathematics assessments students were required to take in 2018-19 into ten different types, as shown in Table 1.¹

¹ For details on each state's requirements for the 2018-19 school year, how these assessments matter (or don't matter) for students, and how each state is holding schools accountable for student performance on high school assessments, see Achieve's Statewide Assessments in High School: <https://highschool.achieve.org/statewide-assessments-high-school-data-explorer> and the related policy brief: <https://www.achieve.org/high-school-student-assessment-experience-2019>.

TABLE 1: STATES' REQUIRED MATHEMATICS HIGH SCHOOL ASSESSMENTS: 2018-19

Assessment	Number of States*	States
State-developed assessment(s)	26	Alaska, Arizona**, Florida, Georgia, Indiana, Iowa, Kansas, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, Nevada, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Utah***, Virginia, and Wyoming
Smarter Balanced	7	California, Hawaii, Idaho, Oregon, South Dakota, Vermont and Washington
PARCC	2	District of Columbia and Maryland
ACT Aspire	2	Arkansas and Wisconsin
Pre ACT	2	Alabama and North Carolina
ACT	13	Alabama, Hawaii, Kentucky, Louisiana, Mississippi, Montana, Nebraska, Nevada, North Carolina, North Dakota, Utah, Wisconsin, and Wyoming
PSAT 8/9	2	Illinois and Michigan
PSAT 10	5	Colorado, Delaware, Illinois, Michigan, and Rhode Island
SAT	9	Colorado, Connecticut, Delaware, Illinois, Maine, Michigan, New Hampshire, Rhode Island, and West Virginia
ACT or SAT (district/ student choice)	3	Ohio, Oklahoma, and Tennessee

*Categories are not mutually exclusive.

**Beginning with SY2018-2019, LEAs are permitted to administer an assessment from a menu of high school assessments in lieu of the AzMerit.

*** Utah's assessment is 50% ACT Aspire/50% Utah-developed items.

End of Course Assessments

The high school mathematics assessments states administer vary in design. Many use a comprehensive (i.e., end of grade) assessment (or assessments) administered to all students in a cohort at the same time regardless of the courses the student has taken in high school. The ACT, ACT Aspire/ PreACT, PSAT, SAT, and Smarter Balanced are all comprehensive assessments. Nineteen states use an end-of-course (EOC) assessment (or assessments), such as an Algebra I EOC, that students take upon completion of the requisite coursework regardless of which grade they are in, as shown in Table 2.

TABLE 2: END OF COURSE ASSESSMENTS ACROSS STATES

Algebra I/Int Math I	Geometry/Int Math II	Algebra II/Int Math III
18 states AZ, FL, GA, LA, MD, MS, MO, NV, NJ, NM, NY, NC, OH, PA, SC, TN, TX, and VA	14 states AZ, DC, FL, GA, LA, MD, MO, NV, NJ, NM, NY, OH, TN, and VA	10 states AZ, MD, MO, NJ, NM, NY, NC, TN, TX, and VA

Of the nineteen states that administer an EOC assessment (or assessments)²:

- Four states administer a single high school mathematics EOC assessment. Of these, three states (MS, PA, SC) assess students with an Algebra I/Integrated Math I assessment; the District of Columbia assesses students with a Geometry/Integrated Math II assessment.
- Fifteen states administer more than one mathematics EOC assessment but differ in what content they assess:
 - Eight states have developed Algebra I or Integrated Math I, Geometry or Integrated Math II, and Algebra II or Integrated Math III assessments. Of these:
 - One state, Tennessee, assesses all students with an Algebra I, Geometry and an Algebra II test.
 - Seven states (AZ, MD, MO, NJ, NM, NY, VA) allow students to opt out of or do not require students to take an Algebra II course (and the corresponding EOC assessment).
 - One state, North Carolina, assess all students with a Math I and a Math III assessment.
 - One state, Texas, assesses all students with an Algebra I assessment and has developed but does not require students to take an Algebra II course (and the corresponding EOC assessment).
 - Five states (FL, GA, LA, NV, OH) assess all students in Algebra I/Integrated Math I and Geometry/Integrated Math II.

Course and Assessment Mismatches

Despite all states adopting Algebra II-level standards for students, state mathematics expectations (as expressed through course and assessment requirements) for all students are very different. Only six states expect students to take an Algebra II/Integrated Math III course and also assess their state's standards for that course: MN, NM, NC, SD, TN, and WA³. Beyond this, five types of disconnects between courses and assessments emerge:

1. **Coursework outpaces assessment:** Some states expect students to take an Algebra II/Integrated Math III course, but do not administer assessments tied to these courses (AR, DC, GA, IN, MS, OH).
2. **Assessment outpaces coursework:** Some states assess all students on advanced mathematics content (e.g., using the Smarter Balanced mathematics comprehensive assessment) without

² Some of these states also administer the ACT or SAT.

³ Within this group of states, only MN, NC, and TN require Algebra II/Integrated Math III. NM, SD, and WA expect students to take this course but allow students to modify the requirement.

requiring them to have the underlying coursework. Though these states will administer to all students assessments capable of generating a CCR score, states that do not require aligned coursework (e.g., Algebra II or Integrated Math III) will be testing some students on content for which they have not received instruction, or administering the assessments earlier in a student's high school career (CA, HI, ID (grade 10), OR (grade 10), VT (grade 9)).

3. **Assessment misaligned to coursework:** Some states expect students to take an Algebra II/Integrated Math III course but use a college admissions assessment in high school not designed to specifically assess the full range of mathematics content that is reflected in state content standards (AL, DE, KY, MI, NE, OK, UT, WV).⁴
4. **Assessment not directly aligned to standards:** Some states neither require all students to have the underlying coursework through Algebra II/Integrated Math III nor administer the assessment that ties to it (e.g., the highest-level mathematics end-of-course exam administered all students is Geometry or Algebra I, or a grade 9 or 10 comprehensive assessment).
5. **Assessment offered but not required:** Some states have developed end-of-course assessments in Algebra II/Integrated Math III, however, states do not expect students to take this assessment nor an Algebra II/Integrated Math III course (MD, MO, NJ, NY, TX, VA).

In Table 3, we examine the intersection of states' course and assessment requirements in mathematics to get a sense of when students' mathematics progress and proficiency is last monitored in a high school student's career.

⁴ For more on this disconnect see Achieve's What Gets Tested Gets Taught: <https://www.achieve.org/college-admissions-tests-accountability>.

TABLE 3: MATHEMATICS COURSE REQUIREMENTS AND MOST ADVANCED ASSESSMENT

State	Algebra II/Int Math III Course Expectation For 2019 Graduates	Most Advanced Mathematics Assessment For All Students	Grade Assessed
Alabama	Yes*	ACT	11
Alaska	No	Performance Evaluation for Alaska's Schools (PEAKS)	9
Arizona	Yes*	AzMERIT Algebra 2 EOC	EOC
Arkansas	Yes*	ACT Aspire	10
California	No	Smarter Balanced	11
Colorado	No	SAT	11
Connecticut	No	SAT	11
DC	Yes	PARCC Geometry/Int Math II EOC	EOC
Delaware	Yes	SAT	11
Florida	No	Florida Standards Assessment (FSA) Geometry EOC	EOC
Georgia	Yes	Georgia Milestones Analytic Geometry or Geometry EOC	EOC
Hawaii	No	Smarter Balanced	11
Idaho	No	Smarter Balanced	10
Illinois	No	SAT	11
Indiana	Yes*	ISTEP+ 10	10
Iowa	No	Iowa Statewide Assessment of Student Progress (ISASP)	11
Kansas	No	Kansas Assessment Program	10
Kentucky	Yes	SAT	11
Louisiana	No	LEAP 2025 Geometry EOC	EOC
Maine	No	SAT	11
Maryland**	No	PARCC Geometry EOC	EOC
Massachusetts	No	Massachusetts Comprehensive Assessment System (MCAS)	10
Michigan	Yes	SAT	11
Minnesota	Yes	Minnesota Comprehensive Assessments (MCA)	11
Mississippi	Yes	Mississippi Academic Assessment Program (MAAP) - Algebra I EOC	EOC
Missouri**	No	Missouri Assessment Program (MAP) Algebra I EOC	EOC
Montana	No	ACT	11
Nebraska	Yes	ACT	11
Nevada	No	Math II Emphasis on Geometry/Int Mathematics II EOC	EOC
New Hampshire	No	SAT	11
New Jersey**	No	Geometry EOC	EOC
New Mexico	Yes*	Algebra II/Int Mathematics III EOC	EOC
New York**	No	Regents Algebra I Exam	EOC
North Carolina	Yes	North Carolina READY EOC in Math 3	EOC
North Dakota	No	North Dakota State Assessment (NDSA)	10
Ohio	Yes	Geometry/Int Math II EOC	EOC
Oklahoma	Yes*	SAT (Districts may assess students with ACT)	11
Oregon	No	Smarter Balanced	11
Pennsylvania	No	Keystone Exam Algebra I EOC	EOC
Rhode Island	No	SAT	11
South Carolina	No	End of Course Examination Program (EOCEP) in Algebra I	EOC
South Dakota	Yes*	Smarter Balanced	11
Tennessee	Yes	Algebra II/Int Math III EOC	EOC
Texas**	No	STAAR Algebra I EOC	EOC
Utah	Yes*	ACT	11
Vermont	No	Smarter Balanced	9
Virginia**	No	Algebra I, Geometry, or Algebra II Standards of Learning‡	EOC
Washington	Yes*	Smarter Balanced	10
West Virginia	Yes	SAT	11
Wisconsin	No	ACT	11
Wyoming	No	ACT	11

Note: In addition to the above assessments, Hawaii, Louisiana, Mississippi, and Nevada assess all students using the ACT. All students in Ohio and Tennessee must take the ACT or SAT prior to graduation.

*All students in these states are automatically enrolled in a mathematics course sequence that includes Algebra II, but with parental permission a student may modify (i.e., lessen) the Algebra II/Int Math III requirement. Students in these states who modify the mathematics requirement will not be assessed using the Algebra II/Int Math III EOC.

**Maryland, Missouri, New Jersey, New York, Texas and Virginia have Algebra II EOCs available; however, Algebra II coursework/content is not required for all students to graduate.

‡Students must pass one mathematics Standards of Learning test to fulfill their mathematics graduation requirement.

III. Alignment to Postsecondary Expectations

Finally, we compared the mathematics students are expected to learn in high school to what is needed for admission to public, four-year colleges that serve some of the largest populations of first-time, in-state students. In 29 states, completing the graduation option a student automatically starts in will mean students do not complete the right courses for entry into either of the two in-state universities included in the analysis. This mismatch places the burden on students and families to choose a different program of study beyond what is signaled as required to graduate from high school. In the remaining 21 states, completing the state's default high school mathematics graduation requirements meets the postsecondary admissions requirements of at least one of the two in-state universities we analyzed.⁵

Key disconnects: Number of courses, specificity, and advanced coursework requirements

In nearly all cases where high schools expect something different of students than the higher education institutions, the higher education institutions require more advanced coursework and/or are more specific about the coursework students must complete, or the higher education institutions required more total units of mathematics.

- Our analysis found that in fifteen states, K–12 requires fewer credits/years/units of mathematics to graduate from high school than the higher education institution requires for admissions (example A in Table 4 below).
- In nineteen states, K–12 is less specific than the higher education institution or K–12 requires a subset of the courses required by the higher education institution (examples B and C below).
- Finally, in a number of states, the K–12 system specifies courses that students may count toward their mathematics credits, but the higher education institution does not consider these courses as qualifying for mathematics credit (example D in Table 4).

⁵ See Achieve's "Mathematics and Science Requirements Data Explorer: Comparing K–12 Exit and Postsecondary Admissions Requirements" for additional details: <https://highschool.achieve.org/postsecondary-explorer>.

TABLE 4: COMMON DISCONNECTS BETWEEN K–12 EXIT AND HIGHER EDUCATION ENTRANCE EXPECTATIONS: MATHEMATICS

	K–12 Requirement	Higher Education Institution Requirement
A	Three units	Four units
B	Three units	Three years, including one year each of algebra, geometry, and advanced algebra
C	Three units, including Algebra I, Geometry, and a mathematics basic elective	Three units, including Geometry and Algebra II
D	Three units, including Algebra I, Geometry, and one unit from Applied Mathematics, Business Mathematics, Trigonometry, Fundamentals of Calculus, Probability and Statistics, Discrete Mathematics, or courses in mathematical problem solving and reasoning	Three units, at least two courses must be taken in grades 10-12: Applied Math I, Applied Math II, Algebra I, Algebra II, Geometry, Analytic Geometry, Calculus, Statistics, Trigonometry

How do states' mathematics assessments signal students' readiness for postsecondary coursework?

When high school assessments open doors to postsecondary opportunities, students and their families view them as relevant to their futures. Done well, these assessments signal to students the level of performance necessary for postsecondary success. This type of signal also provides more opportunities for districts and schools to offer additional guidance and support to students who have yet to achieve a college- or career-ready level of performance in their final year(s) of high school. Students and their families also receive better information earlier and identify resources to take action.

The number of states that have adopted statewide policies that use high school assessments to place students into credit-bearing (non-remedial) coursework in postsecondary institutions has more than doubled since 2013. According to Achieve's research, seventeen states now administer statewide English language arts/literacy and mathematics assessments in high school that may be used by higher education to make judgments about placing students in first-year credit-bearing courses, or that meet admissions minimums.⁶

- In 2019, seven states administered high school end-of-grade or end-of-course assessments developed by K–12 and higher education leaders and have a statewide postsecondary policy for placing students into first year, credit-bearing courses based on these assessments: CA, HI, MN, OR, SD, TX, WA. This is compared to three states in 2013: CA, FL, GA.
- In 2019, ten states administered ACT or SAT to all students and have a statewide postsecondary policy for placing students into first year, credit-bearing courses: CO, IL, ME, WV (SAT); KY, LA, NV (ACT); OH, OK, TN (ACT or SAT). This is compared to three states in 2013: HI, KY, LA.

⁶The analysis is focused on states that administer an assessment statewide that is used for placement. Some states have statewide placement policies for assessments such as the ACT or SAT, but do not assess all students in high school using this assessment. These states are not included in this analysis.

Conclusion

In the midst of these alignment issues, postsecondary institutions are increasingly creating new mathematics pathways that emphasize statistics and quantitative literacy over an in-depth study in higher-level algebra.⁷ The mathematics expectations are changing to better meet the needs of students.

It's time for state departments of education, districts, and higher education providers to work together to rethink not only the role of Algebra II but to also create a system in which high school mathematics standards, course content, course pathways, graduation requirements, and assessments are coherently aligned with each other and with postsecondary program requirements.

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About Launch Years

Launch Years is an initiative led by the Charles A. Dana Center at The University of Texas at Austin—in collaboration with Community College Research Center, Achieve, Education Strategy Group, and the Association of Public and Land-grant Universities—focused on addressing systemic barriers that prevent students from succeeding in mathematics and progressing to postsecondary and career success. Leveraging work within states, the initiative seeks to modernize math in high school through relevant and rigorous math courses as well as policies and practices leading to more equitable outcomes for all students.

Learn more at: utdanacenter.org/launch-years.



⁷ Coe, T., & Strom, A. (2019). Who Moved the Mathematics?: The Need for IMPACT. *MathAMATYC Educator*, 10(2), 52-59.