

Question: You asked about what other states are doing to make the senior year in high school more relevant with full class schedules and coursework necessary to enter postsecondary education prepared for credit-bearing coursework.

You also asked if there is a “best practice” regarding the number of credits a student should have to graduate, and, in order for a student to be college/career ready, if are there specific subjects that need mandatory numbers of credits.

Our Response: States are taking several approaches to ensure 12th graders have full class schedules and are taking the courses needed to enter postsecondary education prepared for credit-bearing coursework. These approaches include:

- Requiring high school seniors to be enrolled in courses for a minimum portion of the school day.
- Requiring students to complete four units of math for high school graduation.
- Requiring students to be enrolled in a math course each year of high school, or during the senior year of high school.

The section that follows identifies states that have any of these provisions in place. It also provides an overview of research on course credits correlated with student success in postsecondary education.

Requiring seniors to be enrolled in courses for minimum portion of school day

At least three states (below) specify in statute or regulation that high school students (or seniors specifically) must be enrolled in a minimum number of hours or courses during the school day.

One consideration for such policies: While requiring seniors to be enrolled in a minimum number of courses or instructional hours during the school day may keep students in school and engaged in coursework, efforts should be made to ensure that courses are rigorous and provide meaningful preparation for students’ next step in life – postsecondary education, the workforce or military. Approaches such as dual enrollment, high-quality remedial coursework in reading, writing, and math, and structured work-based learning opportunities such as job shadowing, internships, mentorships, etc. may offer this meaningful preparation.

State	Provision	Citation
AR	“A unit of credit shall be defined as the credit given for a course which meets for a minimum of 120 clock hours. A minimum average six-hour day or minimum thirty (30) hour week is required.”	Ark. Admin. Code 005.15.2-14.03
DE	“During the senior year the student shall maintain a credit load each semester that earns the student at least a majority of credits that could be taken that semester. ... a student participating in a dual enrollment course or dual credit course ... shall be considered to be	14 Del. Admin. Code

State	Provision	Citation
	meeting the majority of credits, as long as a credit in Mathematics is earned during the senior year.”	505.4.1.4
OK	“As a condition of receiving accreditation from the State Board of Education, all students in grades nine through twelve shall enroll in a minimum of six periods, or the equivalent in block scheduling or other scheduling structure that allows for instruction in sets of competencies, of rigorous academic and/or rigorous vocational courses each day, which may include arts, vocal and instrumental music, speech classes, and physical education classes.”	70 Okl. St. Ann. § 11-103.6(H)

Requiring students to complete four units of math for high school graduation

The section that follows identifies states that require completion of four Carnegie units (four years) of math for the standard high school diploma. Note that some states not listed below have advanced diploma options or endorsements that require four units of math, but do not require four units of math for the standard diploma.

Note:

- State-set graduation requirements for the standard diploma are minimum requirements, and that districts may adopt credit requirements that exceed the state-level graduation requirements.
- Most states allow students to substitute the highest level math course for a less rigorous alternative based on an agreement among the student, student’s parent, and a counselor or other school staff member. Additional information on such policies available upon request.
- Many states allow students to substitute a career/technical education (CTE) course with appropriate math content for a traditional math course. Increasingly, states are allowing students to fulfill a math credit with a computer science course, often AP Computer Science or another rigorous course taken concurrently with or after Algebra II. Additional information on such policies available upon request.
- Table includes states with plans to transition to 4 units of math with a future graduating class. Unless otherwise noted, these states currently require fewer than 4 units of math for high school graduation.

* = or equivalent

State	Policy identifies math courses students must complete	Citation
AL	Class of 2016: Students complete requirements for either the Alabama High School Diploma with Advanced Academic Endorsement (first-choice diploma) or Alabama High School Diploma. The Alabama High School Diploma with Advanced Academic Endorsement requires Algebra I*, Geometry*, Algebra II with Trigonometry*, and 4 th course. Alabama High School Diploma requires Algebra I*, Geometry*, and 2 additional courses. Eff. Class of 2017: Algebra I*, Geometry*, Algebra II* or Algebra II with Trigonometry*, and 4 th course chosen from Alabama Course of Study: Mathematics or Career and Technical Education/Advanced Placement (AP)/International Baccalaureate (IB)/postsecondary equivalent courses .	Ala. Admin. Code r. 290-3-1-.02 (8)(a)
AZ	Algebra I, Geometry, Algebra II (or its equivalent) and an additional course with significant math content as determined by district governing boards or charter schools.	A.A.C. R7-2-302.02
AR	Algebra I or Algebra A & B (Grades 7-8 or 8-9), Geometry or Investigating Geometry or Geometry A & B (Grades 8-9 or 9-10), Algebra II, 4 th course chosen from Transitions to College Math, Pre-Calculus, Calculus, Trigonometry, Statistics, Computer Math, Algebra III, or an AP math. (Option 2: Computer Science plus 3 courses above, including Algebra	Ark. Admin. Code 005.15.2-14.02

State	Policy identifies math courses students must complete	Citation
	II)	
CT	Eff. Class of 2021: Algebra I, Geometry and Algebra II or Probability and Statistics	C.G.S.A. § 10-221a
DE	Algebra I*, Geometry*, and Algebra II* or Integrated Mathematics III	14 Del. Admin. Code 505 4.1.1
DC	Algebra 1, Geometry, and Algebra II	D.C. Mun. Regs. Subt. 5-E, § 2203.3
FL	Algebra I, Geometry	West's F.S.A. § 1003.4282(3)(b)
GA	Mathematics I or GPS Algebra*, Mathematics II or GPS Geometry*, Mathematics III or GPS Advanced Algebra*, and 4 th course chosen from the list of GPS/ CCGPS /AP/IB/dual enrollment designated courses.	Ga Comp. R. & Regs. 160-4-2-.48(5)(ii)(II)
LA	Algebra I, Applied Algebra I, or Algebra I-Pt. 2; Geometry or Applied Geometry; Algebra II, 4 th course chosen from list of courses identified in regulation. ¹	La. Admin Code. tit. 28, pt. CXV, § 2318 (C)(2)(b)(iv)
MI	Algebra I, Geometry, and Algebra II, or an integrated sequence of this course content that consists of 3 credits, and an additional mathematics credit, such as trigonometry, statistics, precalculus, calculus, applied math, accounting, business math, a retake of algebra II, or a course in financial literacy ... A pupil may complete algebra II over 2 years with 2 credits awarded or over 1.5 years with 1.5 credits awarded.	M.C.L.A. 380.1278a (1)(a)(i)
MS	Algebra I or Integrated Math I	Mississippi Public School Accountability Standards 2015, Appendix A-2
NM	One unit must be equivalent to or higher than Algebra II	N. M. S. A. § 22-13-1.1(J)(2)
NC	<p>One of the following:</p> <ul style="list-style-type: none"> Math I, II, III and a fourth math course aligned with the student's post high school plans Algebra I, Geometry, Algebra II and a fourth math course aligned with the student's post high school plans Integrated Mathematics I, II, and III and a fourth math course aligned with the student's post high school plans. <p>Eff. Class of 2018: Either Math I, II, III and a fourth mathematics course to be aligned with the student's post high school plans; OR Math I and Math II plus two additional courses identified on the NC DPI Math options chart.</p>	North Carolina State Board of Education Policy Manual, GCS-N-004
OH	Algebra II*. However, students entering 9 th grade for the first time on or after July 1, 2015 (Class of 2019) who are pursuing a career-technical instructional track must not be required to take Algebra II, and instead may complete a career-based pathway math course as an alternative.	R.C. § 3313.603 (C)(3), (D)(5)(b)

¹ Financial Mathematics, Math Essentials, Advanced Math—Pre-Calculus, Advanced Math—Functions and Statistics, Pre-Calculus, Calculus, Probability and Statistics, Discrete Mathematics, AP Calculus BC, or a locally initiated elective approved by BESE as a math substitute.

State	Policy identifies math courses students must complete	Citation
	Eff. Class of 2018: Algebra II no longer required. Students must complete 1 unit chosen from Probability and statistics; Computer programming; applied mathematics or quantitative reasoning; or any other course approved by the department using standards established by the superintendent	
RI	Three math courses and one math-related course	L-6-3.1
SC	Not specified in policy	S.C. Code of Regulations R. 43-234(I)(A)
TN	Algebra I*, Geometry*, and Algebra II*, and 4 th course chosen from courses above Algebra I.	Tenn. Comp. R. & Regs. 0520-01-03-.06(1)(b)(1)(a)
TX	Classes of 2016 and 2017 may choose between course requirements for the Foundation High School Program or one of three other diploma options: Minimum, Standard/Recommended, or Advanced/Distinguished. Effective Class of 2018, Foundation High School Program becomes default high school curriculum, and students are encouraged to complete one or more endorsements in addition to the Foundation Program requirements. Foundation High School Program includes 3 units math; some endorsement requirements include an additional unit of math. Standard/Recommended curriculum option includes Algebra I, Algebra II, and Geometry, and 4 th course chosen from a number of courses set forth in 19 TAC § 74.73(b)(2) .	19 TAC § 74.73(b)(2)
WV	Math I or Algebra I Math II or Geometry Math III STEM, or Math III LA or Math III TR or Algebra II Math IV – Trigonometry/Pre-calculus or Math IV TR or Transition Mathematics for Seniors* or any other fourth course option (see Chart V) An AP Mathematics course may be substituted for an equivalent course or any fourth course option.	W. Va. Code St. R. § 126-42-5.4.a, Chart IV

Requiring students to be enrolled in a math course each year of high school, or during the senior year

Seven states specify that a student must be enrolled in a math course during the senior year of high school. This is to ensure that students who earn a math credit toward high school graduation in grade 8 or earlier are engaged in math coursework the senior year, and, it is hoped, less likely to place into remedial coursework upon college entry.

The table below provides specifics of these states' policies.

State	Provision	Citation
DE	"A credit in Mathematics shall be earned during the senior year."	14 Del. Admin. Code 505, 4.1.4
ID	"[One of the three required units of math] must be taken in the last year of high school in which the student intends to graduate. ... Students who have completed [3 units] of math prior to the fall of their last year of high school, including at least two (2) semesters of an Advanced Placement or dual credit calculus or higher level course, are exempt from taking math during their last year of high school. High School math credits	IDAPA 08.02.03.105 .01(d)(ii)

State	Provision	Citation
	completed in middle school shall count for the purposes of this section.”	
KY	“A mathematics course or its equivalent as determined by the district shall be taken each year of high school to ensure readiness for postsecondary education or the workforce...”	704 Ky. Admin. Regs. 3:305, Section 2(3)(a)
MD	“Beginning with students entering the 9th grade class of 2014-2015 school year, each student shall enroll in a mathematics course in each year of high school that the student attends, up to a maximum of 4 years of attendance, unless in the 5th or 6th year a mathematics course is needed to meet a graduation requirement.”	COMAR 13A.03.02.03(A)
MI	“Each pupil must successfully complete at least 1 mathematics course during his or her final year of high school enrollment.”	M.C.L.A. 380.1278a(1)(a)(i)
NH	“Students shall engage with and apply English and mathematics graduation competencies during every year they are enrolled in high school even if graduation competencies for English and mathematics have been demonstrated. Such engagement may occur through integration of these graduation competencies in courses focused on content areas other than English or mathematics. Such engagement shall support students to be college and career ready in mathematics and English/language arts.”	N.H. Code Admin. R. 306.27(j)
TN	“All students will be enrolled in a math class each year.”	Tenn. Comp. R. & Regs. 0520-01-03-.06(1)(b)(1)(a)

Below are some state alternatives to requiring students to complete math during the senior year of high school:

Arkansas requires that all students take a math course in grade 11 *or* grade 12. (Ark. Admin. Code 005.15.2-14.01)

Indiana recommends but does not require that students complete 2 semesters of math during the student's last year in high school. “A student who takes mathematics in the senior year is better prepared for mathematics placement exams upon entering a postsecondary education program, an apprenticeship program, or the military. A student who takes mathematics in the senior year is:

- (i) less likely to require remedial mathematics courses following high school; and
- (ii) more likely to complete a postsecondary program.” (511 IAC 6-7.1-5 (c)(4)(B))

In the development of Personalized Student Learning Plans, New Jersey recommends district boards to actively encourage all students who have otherwise met the requirements for high school graduation to include in their programs of study one unit each of math, lab science, social studies, and world languages during each year of enrollment, to prepare students for entrance into postsecondary programs or 21st century careers. N.J.A.C. 6A:8–5.1(b)

Texas regulation provides, “All students who wish to complete the Recommended High School Program are encouraged to study each of the four foundation curriculum areas (English language arts, mathematics, science, and social studies) every year in high school.” 19 TAC § 74.73(c)

Utah does not require all students to be enrolled in a math course each year of high school, but does require a “senior student with a special circumstance” (senior who has not demonstrated college-readiness in math via AP, IB, ACT/SAT or other specified assessments or by earning a “C” or higher in a math concurrent enrollment course) to take a full year mathematics course during the student's senior year of high school. (U.A.C. R277-700-9)

West Virginia requires, “Students who do not meet the college- and career-readiness benchmarks (established in conjunction with the WV HEPC) for English language arts and/or mathematics prior to their senior year must enroll in Transition English Language Arts for Seniors and/or Transition Mathematics for Seniors even if they already have the required number of credits in that area.” W. Va. Code St. R. § 126-42-5.4.f.6

Research on Correlation of High School Coursetaking and Postsecondary Enrollment/Preparation/Success

In terms of “best practice” as to the number of credits or specific subjects that a student should complete to be college-ready, a significant body of research identifies a correlation between high school coursetaking and students’ postsecondary outcomes. For instance, studies published by the U.S. Department of Education in [1999](#) and [2006](#) found that the rigor of a student’s high school coursework was the greatest predictor of a student’s likelihood of graduating high school, matriculating in a baccalaureate-awarding institution, and graduating with a four-year degree within a reasonable time. The high school curriculum most closely correlated with these outcomes included 4 years of English, 3 years of math in an Algebra I, geometry, and Algebra II sequence, 3 years of lab science, and 3 years of social studies. Of all the high school curricular components, math coursetaking had the greatest predictive ability of a student’s later academic success.

A [2012 study](#) echoed these findings on the impact of math coursetaking. The study found Math achievement to be a good predictor of whether students in P-12 stay on track toward 2- or 4-year college education.

ACT analysis of test-takers subsequent postsecondary outcomes has led to development of ACT College Readiness Benchmarks. As [defined by ACT](#), “a student who meets the ACT College Readiness Benchmark on any of the four ACT subject-area tests has a 50 percent chance of obtaining a B or higher, or about a 75 percent chance of obtaining a C or higher, in corresponding credit-bearing first-year college courses in that subject.” ACT has [identified a core curriculum](#) (4 years of English, and 3 years each of math, science, and social studies) correlated with a student’s likelihood of achieving ACT’s College Readiness Benchmarks, enrolling and staying in college, and achieving higher first-year college GPAs than their peers who did not complete this curriculum. Students taking the high school core curriculum were also less likely to place into remedial coursework upon postsecondary matriculation. These results held constant regardless of test-takers’ gender, family income or race/ethnicity.

ACT likewise found that students taking the recommended core curriculum were also more likely to ready for workforce training programs.

Similarly, another [2012 study](#) comparing high school students’ coursetaking and postsecondary matriculation and outcomes reported the following findings:

- There are significant differences in outcomes for those who take rigorous courses, and these effects are often larger for disadvantaged youth and students attending disadvantaged schools.
- Students who take at least one rigorous course are significantly more likely to graduate high school and go to a 4-year college. Also noted is a statistically significant increase in college credits earned, a college grade point average, and the likelihood of earning a bachelor’s degree.
- In math, students who take a rigorous course early in high school produce a statistically significant increase on 10th grade math test scores.
- The difference in outcomes associated with moving from taking no rigorous course to one rigorous course is larger than moving from one to more than one rigorous course.
- There are diminishing returns to taking more rigorous courses for students who are already taking rigorous courses. The largest gains appear to be for more marginal students.

- The effects of rigorous courses on graduation and college going are remarkably similar across the five subjects explored.
- Once students are enrolled in an advanced class, most of the relationships between course-taking and outcomes are the same across demographic groups.

However, some research points to inequities in students' likelihood of completing rigorous coursework. For example, a [2011 study](#) found that while 8th grade algebra enrollment had increased over the past two decades, There has been consistently lower enrollment in 8th and 9th grade algebra among Black and Hispanic students, low-income students and those whose parents have fewer years of education, including those students who are prepared to take algebra based on their achievement scores. (Encouragingly, this study found universal algebra policies resulted in large increases in algebra enrollment, with enrollment for minority students and students from lower socioeconomic groups increasing the most.)

One [2013 study](#) found that students in low-income schools were comparatively far less likely to take advanced math coursework. A [2012 study](#) examining high school course-taking patterns in math from 1982 to 2004 found that while racial and class disparities in geometry, algebra II, and trigonometry completion had narrowed significantly, low-income students and students of color were still less likely than their peers to complete calculus. The [2012 study](#) noted in the previous paragraph likewise found that Black and "poor" students were the least likely to take advanced courses (those students are less than half as likely to take a Level-3 course than their White and non-poor peers); male students are less likely to take advanced courses than females; and high ability students are far more likely to take an advanced course than slightly above average students. Additionally, the number of students taking advanced courses is significantly higher in low poverty or high ability schools than in high poverty or low ability schools.

This is significant, as both research by the U.S. Department of Education and ACT find that the greatest gains in college-readiness occur with completion of coursework *beyond* Algebra II.

Common sense also suggests that improving alignment between high school graduation requirements and course admissions requirements to four-year postsecondary institutions will send a clear signal to students and parents on the high school courses students need to take to be eligible for admission to four-year institutions.