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APPENDIXES

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Regional Educational Laboratory Appalachia

At SRI International

Algebra I and College Preparatory Diploma Outcomes among Virginia Students Who Completed Algebra I in Grades 7–9

See https://go.usa.gov/xGMxh for the full report.

Appendix A. Methods

This appendix details the data sources, study population, and analysis methods used in the study.

Data sources

The study used administrative data from the Virginia Longitudinal Data System, which contains information on all Virginia public school students in grades K–12, including their demographic characteristics and program participation, state assessment results, and courses taken (table A1). The data in the system were collected, analyzed, and reported as part of state and federal accountability requirements and were subject to robust validation checks and audits. The combination of these factors is typically associated with increased data quality (Jonas et al., 2014), including completeness, thereby reducing error. No data were missing on any variables used in the analysis for any students in the study population.

Table A1. Research questions and variables from the Virginia Longitudinal Data System used in the analysis

Research question	Key variables from the Virginia Longitudinal Data System					
	Proficiency level on the grade 5 math state assessment[a]	Economically disadvantaged status	English learner status	Grade level in which Algebra I was completed	Proficiency level on the Algebra I state assessment	High school diploma type[b]
1. What percentages of the overall study population, economically disadvantaged students, and English learner students at each grade 5 math proficiency level completed Algebra I in grades 7, 8, and 9 in Virginia?	X	X	X	X		
2. Among students who scored at the advanced proficient level in grade 5 math, what percentages of the overall study population, economically disadvantaged students, and English learner students passed the Algebra I state assessment, and what percentages earned a college preparatory diploma?	X	X	X	X	X	X
3. Among students who scored at the proficient level in grade 5 math, what percentages of the overall study population, economically disadvantaged students, and English learner students passed the Algebra I state assessment, and what percentages earned a college preparatory diploma?	X	X	X	X	X	X

Note: For definitions of variables in the Virginia Longitudinal Data System, see https://vlds.virginia.gov/insights.
a. Proficiency levels are advanced proficient, proficient, or below proficient.
b. High school diploma types are the Advanced Studies diploma, which is considered a college preparatory diploma, or other diploma types.
Source: Virginia Longitudinal Data System.

Study population

This section describes the inclusion criteria that resulted in the final study population, provides the characteristics of the population, and explains how the study team determined the grade level in which students completed Algebra I.

Inclusion criteria. The study focused on the cohort of Virginia students who were in grade 5 in the 2009/10 school year and who graduated from high school in four years (by August 2017) because those students were directly affected by two changes that took effect in the 2011/12 school year. First, high school graduation requirements changed. For students who started grade 9 in 2011/12, high school graduation requirements were more rigorous and included additional math and other core and elective courses. Second, the math state assessment changed for grades 3–8, Algebra I, Algebra II, and geometry. The revised assessments tested more challenging math content at each grade level in keeping with the new Standards of Learning introduced in Virginia in 2009.

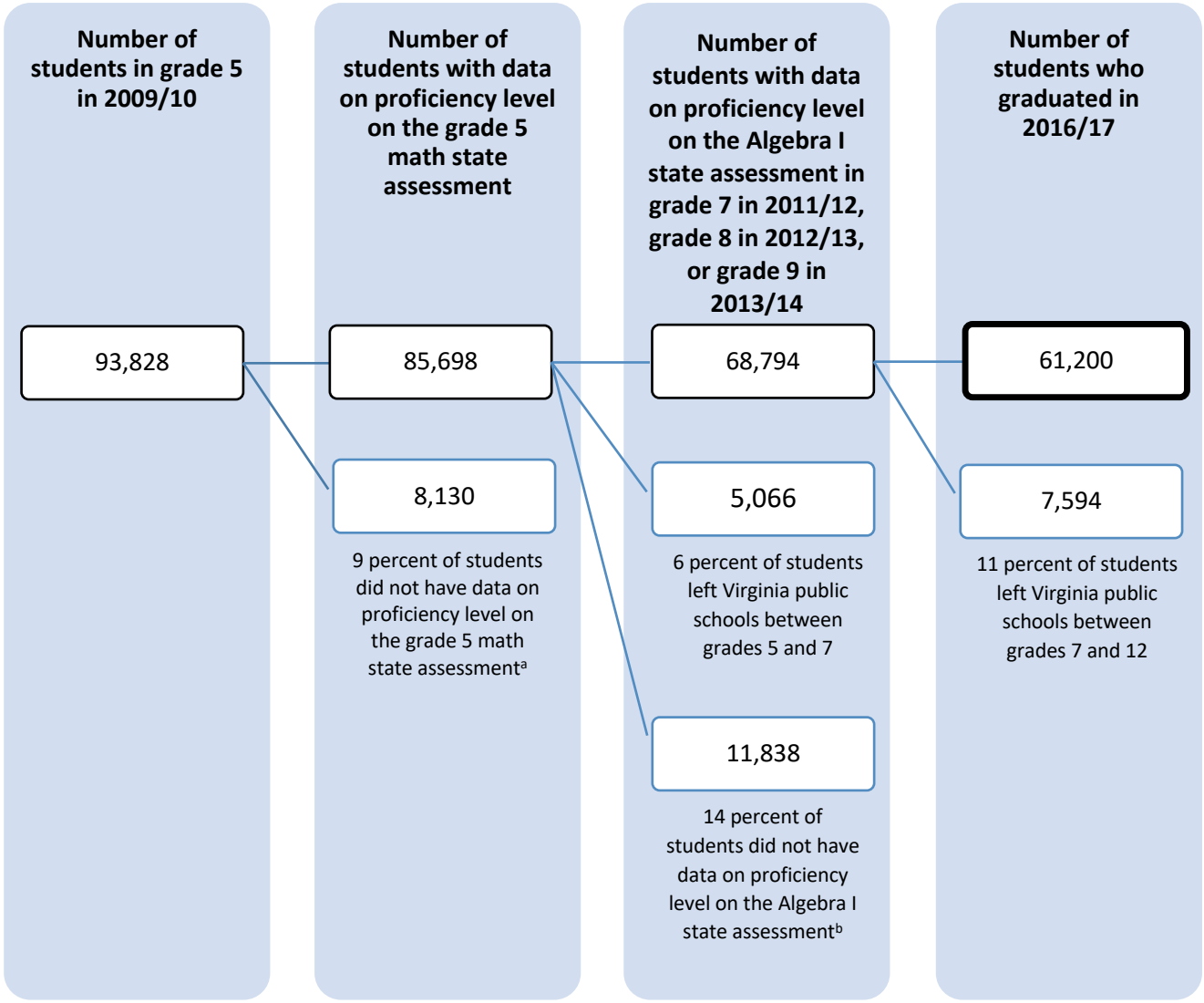
The study team applied the following criteria to identify students for inclusion in the overall study population (figure A1):

- In Virginia public schools in grade 5 in 2009/10.
- Took the Virginia state math assessment in grade 5 in the 2009/10 school year.
- Took the Algebra I state assessment for the first time in grade 7 in 2011/12, in grade 8 in 2012/13, or in grade 9 in 2013/14.
- Graduated from a Virginia public school in 2016/17.

Applying these criteria resulted in a population of 61,200 students. The population excludes students who were in grade 5 in the 2009/10 school year and did not have a proficiency level on the state math assessment, students who took the state Algebra I assessment for the first time before grade 7 or after grade 9, students who enrolled in private school or were homeschooled,[1] students who transferred out of state or died between grade 5 and graduation, students who did not follow an on-time grade progression, and students who did not graduate in 2016/17.

[1] The Virginia Department of Education does not collect data at the individual level for these students, and records are not available in the Virginia Longitudinal Data System.

Figure A1. Applying the study inclusion criteria led to a population of 61,200 students in the study, 2009/10–2016/17



a. Students who did not have data on proficiency level on the grade 5 math state assessment were those who took an alternate test, skipped grades, were held back, or had other reasons for not taking the standard state assessment.
b. Students who did not have data on proficiency level on the Algebra I state assessment scores were those who completed Algebra I in grade 6 or 10, took an alternate test, skipped grades, were held back, or did not otherwise follow the typical grade progression (for example, students who took the Algebra I state assessment in grade 8 in 2010/11 or 2012/13).
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10 –2016/17.

Characteristics of the overall study population. Of the 61,200 students in the overall study population, 56 percent were White, 22 percent were Black, and 9 percent were Hispanic (table A2). About 10 percent received special education services, and 22 percent were eligible for gifted education services. About 62 percent scored at the advanced proficient level in grade 5 math, and 37 percent scored at the advanced proficient level in grade 5 English language arts.

About 36 percent of the overall study population were economically disadvantaged students. Of these, 38 percent were Black, 33 percent were White, 18 percent were Hispanic, and 4 percent were Asian (see table A2). About 49 percent scored at the advanced proficient level in grade 5 math, and 22 percent scored at the advanced proficient level in grade 5 English language arts.

About 5 percent of the overall study population were English learner students. Of these, 63 percent were Hispanic, 18 percent were Asian, 7 percent were Black, and 6 percent were White (see table A2). About 33 percent scored at the advanced proficient level in grade 5 math, and 10 percent scored at the advanced proficient level in grade 5 English language arts.

Table A2. Characteristics of the overall study population, economically disadvantaged students, and English learner students, 2009/10

Characteristic	Overall study population (*n* = 61,200)	Economically disadvantaged students (*n* = 22,196)	English learner students (*n* = 3,108)
Overall study population	100	36	5
Male	50	49	55
American Indian/Alaska Native	<1	<1	<1
Asian	5	4	18
Black	22	38	7
Hispanic	9	18	63
White	56	33	6
Other race/ethnicity	8	8	6
In special education	10	13	20
Gifted/talented	22	12	12
Economically disadvantaged	36	100	75
English learner	5	11	100
Proficiency level on the grade 5 math state assessment			
Advanced proficient	62	49	33
Proficient	30	38	40
Below proficient	8	13	27
Proficiency level on the grade 5 English language arts state assessment			
Advanced proficient	37	22	10
Proficient	53	60	44
Below proficient	10	18	46

Note: Characteristics are based on data in students' grade 5 records in 2009/10.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10.

Determining grade level of Algebra I completion. The study team sorted each student in the overall study population into one of three mutually exclusive categories: students who completed Algebra I for the first time in grade 7, students who completed Algebra I for the first time in grade 8, and students who completed Algebra I for the first time in grade 9.

The grade level in which students completed Algebra I was proxied by the grade level in which students took the Algebra I state assessment for the first time.[2] Virginia requires students to take the state assessment aligned with the highest math course completed each year. This means that all students who complete an Algebra I course must take the Algebra I state assessment in the same year. Some students take Algebra I and the state assessment multiple times over multiple grade levels in order to earn the verified credit needed for high school graduation.[3]

[2] Students in Virginia must pass the Algebra I state assessment to graduate from high school. This can result in students attempting the assessment multiple times to earn a verified credit for high school graduation.

[3] A verified credit is a credit for which a student both completed the course requirements and passed the associated Standards of Learning exam. (For more information, see Virginia Department of Education, n.d.)

For example, a student might complete an Algebra I course in grade 7, take and fail the Algebra I state assessment in grade 7, complete Algebra I again in grade 8, and pass the assessment in grade 8. That student would be classified as having completed Algebra I in grade 7. State assessment data were used because they are of higher quality than course and transcript records (Jonas et al., 2014).

In Virginia, course completion rather than course enrollment triggers the requirement to take a state assessment. In some schools, students may begin an Algebra I course in one year, such as grade 7, and complete it in the next year, grade 8. In such cases, the students first completed the course and took the Algebra I assessment in grade 8 and were therefore categorized as completing Algebra I in grade 8.

About 16 percent of students in the overall study population completed Algebra I for the first time in grade 7, 42 percent completed Algebra I for the first time in grade 8, and 42 percent completed Algebra I in the first time in grade 9 (table A3).

Table A3. Characteristics of students in the overall study population, by grade level in which they completed Algebra I, 2009/10–2013/14

Characteristic	Overall study population (*n* = 61,200)	Completed Algebra I in grade 7 (*n* = 9,613)	Completed Algebra I in grade 8 (*n* = 25,887)	Completed Algebra I in grade 9 (*n* = 25,700)
Overall study population	100	16	42	42
Male	50	51	48	51
American Indian/Alaska Native	<1	<1	<1	<1
Asian	5	10	6	3
Black	22	19	17	27
Hispanic	9	4	9	12
White	56	59	60	50
Other race/ethnicity	8	8	7	8
In special education	10	3	6	18
Gifted/talented	22	49	29	4
Economically disadvantaged	36	24	29	48
English learner	5	2	4	8
Proficiency level on the grade 5 math state assessment				
Advanced proficient	62	93	75	38
Proficient	30	7	23	46
Below proficient	8	<1	3	16
Proficiency level on the grade 5 English language arts state assessment				
Advanced proficient	37	66	45	18
Proficient	53	33	51	63
Below proficient	10	1	5	19

Note: Characteristics are based data in students' grade 5 records in 2009/10.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10.

Analysis methods

The study team calculated descriptive statistics and produced cross-tabulations with tabular displays that indicate the percentage of students and sample size per cell. These results were calculated for the overall study population (61,200 students), for economically disadvantaged students (22,196 students), and for English learner students

(3,108 students). These three groups are not mutually exclusive. The overall study population includes economically disadvantaged students and English learner students, some economically disadvantaged students are also English learner students, and some English learner students are also economically disadvantaged students.

For each analytic group the study team disaggregated data by grade 5 math proficiency level (advanced proficient, proficient, and below proficient[4]) and when students completed Algebra I (grade 7, 8, or 9). The study team disaggregated data by students' math proficiency level in grade 5 for two reasons. First, the Virginia Standards for Mathematics for grade 5 emphasize pre-algebraic thinking and skills such as ratios, multistep equations, and proportional reasoning that are needed for algebraic reasoning and understanding (Empson et al., 2011; Silver & Stein, 1996; Smith & Stein, 1998). Students who are not proficient in algebraic reasoning may not succeed in Algebra I and may continue to struggle in advanced math in high school (Bandeira de Mello et al., 2018; Brown et al., 2018).

Second, many of Virginia's school divisions[5] use grade 5 math proficiency level to inform decisions on secondary school math course placement. Math coursetaking progressions (also called pathways) are a division-level policy, and divisions can choose different curricular materials (and implementation), pedagogy, and use of technology and personalized learning, as well as different math courses, including a variety of advanced courses. Because the state requires Algebra I in order to graduate high school, all school divisions offer a course called Algebra I, and after completing this course, all students take the Algebra I state assessment. While there is no statewide policy on how students are placed into Algebra I courses, many school divisions, including the divisions partnered with the Regional Educational Laboratory Appalachia, use the grade 5 state math assessment as one source of information when placing students in a math coursetaking progression. The school divisions use grade 5 math proficiency level to decide which math course students take in grade 6, which then determines whether students take Algebra I in grade 7, 8, or 9 (table A4). For example, students who scored at the advanced proficient level in grade 5 math might bypass grade 6 math and take grade 7 math in grade 6; that coursetaking progression would lead them to take Algebra I in grade 7.

Table A4. Possible math coursetaking pathways in Virginia, grades 5–9

Grade level of student taking the course	Pathway to complete Algebra I in grade 7	Pathway to complete Algebra I in grade 8	Pathway to complete Algebra I in grade 9
5	Grade 5 math	Grade 5 math	Grade 5 math
6	Grade 7 math	Grade 6 math	Grade 6 math
7	(Intensified) Algebra I	Grade 8 math	Grade 7 math
8	(Intensified) Geometry I	Algebra I	Grade 8 math
9	(Intensified) Algebra II	Geometry I	Algebra I

Source: Based on authors' review of programs of study from 10 school divisions across the state and interviews with six school divisions partnered with the Regional Educational Laboratory Appalachia.

The percentage of students who passed Algebra I was calculated as the number of students who passed the Algebra I state assessment divided by the number of students who completed Algebra I in the relevant grade level (grade 7, 8, or 9). This was calculated separately for students who scored at each grade 5 math proficiency level. For example, 37,898 students scored at the advanced proficient level in grade 5 math, and 8,928 of those students

[4] Scaled scores for Virginia's state assessments range from 0 to 600. Scores of 0–399 are classified as below proficient, scores of 400–499 are classified as proficient, and scores of 500–600 are classified as advanced proficient. Scores of 400–600 (proficient and advanced proficient) are considered passing scores.

[5] School divisions are the local education agencies that administer Virginia public schools and are similar to school districts in other states.

completed Algebra I in grade 7. Of those 8,928 students who scored at the advanced proficient level in grade 5 math and completed Algebra I in grade 7, 90 percent (8,070 / 8,928) passed Algebra I.

The percentage of students who earned a college preparatory diploma (called an Advanced Studies diploma in Virginia) was calculated as the number of students who earned a college preparatory diploma divided by the number of students who completed Algebra I in the relevant grade level (grade 7, 8, or 9). This was also calculated separately for students who scored at each grade 5 math proficiency level. For example, of the 8,928 students who scored at the advanced proficient level in grade 5 and completed Algebra I in grade 7, 80 percent (7,114 / 8,928) earned a college preparatory diploma.

References

Bandeira de Mello, V., Rahman, T., & Park, B. J. (2018). *Mapping state proficiency standards onto NAEP scales: Results from the 2015 NAEP Reading and Mathematics Assessments* (NCES No. 2018-159). U.S. Department of Education. Retrieved June 2, 2020, from https://nces.ed.gov/nationsreportcard/pubs/studies/2018159.aspx.

Brown, J., Dalton, B., Laird, J., & Ifill, N. (2018). *Paths through mathematics and science: Patterns and relationships in high school course taking* (NCES No. 2018-118). U.S. Department of Education. Retrieved June 2, 2020, from https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2018118.

Empson, S. B., Levi, L., & Carpenter, T. P. (2011). The algebraic nature of fractions: Developing relational thinking in elementary school. In J. Cai & E. J. Knuth (Eds.), *Early algebraization: A global dialogue from multiple perspectives* (pp. 409–428). Springer.

Jonas, D., Goldschmidt, W., & Garland, M. W. (2014). *Researchers guide to using VLDS*. Center for Innovative Technology. Retrieved June 2, 2020, from https://vlds.virginia.gov/insights.

Silver, E. A., & Stein, M. K. (1996). The QUASAR Project: The "revolution of the possible" in mathematics instruction reform in urban middle schools. *Urban Education, 30*(January), 476–521.

Smith, M. S., & Stein, M. K. (1998). Selecting and creating mathematical tasks: From research to practice. *Mathematics Teaching in the Middle School, 3*(5), 344–350.

Virginia Department of Education. (n.d.). *Frequently asked questions about earning a Virginia high school diploma.* Retrieved June 2, 2020, from http://www.doe.virginia.gov/instruction/graduation/faq.shtml.

Appendix B. Supporting analysis

The tables in this appendix provide the numbers of students who completed Algebra I in grades 7–9, the characteristics of those students, and those students' Algebra I and college preparatory diploma outcomes. Data are provided for students in the overall study population, for economically disadvantaged students, and for English learner students and are disaggregated by grade 5 math proficiency level.

Number of students

Table B1 shows the numbers of students in the overall study population who completed Algebra I in grades 7–9 by their grade 5 math proficiency level. Among the 37,898 students in the overall study population who scored at the advanced proficient level in grade 5 math, about one-quarter (8,928) completed Algebra I in grade 7, just over half (19,320) completed Algebra I in grade 8, and one-quarter (9,650) completed Algebra I in grade 9. However, among the 18,391 students in the overall study population who scored at the proficient level in grade 5 math, nearly two-thirds (11,811) completed Algebra I in grade 9. Among the 4,911 students in the overall study population who scored at the below proficient level in grade 5, 86 percent (4,239) completed Algebra I in grade 9.

Table B1. Numbers of students in the overall study population who completed Algebra I in grades 7–9, by grade 5 math proficiency level, 2009/10–2013/14

Grade 5 math proficiency level	Overall study population	Completed Algebra I in grade 7	Completed Algebra I in grade 8	Completed Algebra I in grade 9
Advanced proficient	37,898	8,928	19,320	9,650
Proficient	18,391	664	5,916	11,811
Below proficient	4,911	21	651	4,239
Total number of students	61,200	9,613	25,887	25,700

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.

Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B2 shows the numbers of economically disadvantaged students who completed Algebra I in grades 7–9 by their grade 5 math proficiency level. Among the 10,872 economically disadvantaged students who scored at the advanced proficient level in grade 5 math, only one-fifth (1,983) completed Algebra I in grade 7, fewer than half (4,916) completed Algebra I in grade 8, and over one-third (3,973) completed Algebra I in grade 9.

Table B2. Numbers of economically disadvantaged students who completed Algebra I in grades 7–9, by grade 5 math proficiency level, 2009/10–2013/14

Grade 5 math proficiency level	Overall study population	Completed Algebra I in grade 7	Completed Algebra I in grade 8	Completed Algebra I in grade 9
Advanced proficient	10,872	1,983	4,916	3,973
Proficient	8,408	290	2,300	5,818
Below proficient	2,916	14	357	2,545
Total number of economically disadvantaged students	22,196	2,287	7,573	12,336

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B3 shows the numbers of English learner students who completed Algebra I in grades 7–9 by their grade 5 math proficiency level. The total number of English learner students is only 3,108; after disaggregation, this left very few English learner students in some categories, so interpretations should be made with caution. Among the 1,031 English learner students who scored at the advanced proficient level in grade 5 math, fewer than one-fifth (171) completed Algebra I in grade 7.

Table B3. Numbers of English learner students who completed Algebra I in grades 7–9, by grade 5 math proficiency level, 2009/10–2013/14

Grade 5 math proficiency level	Overall study population	Completed Algebra I in grade 7	Completed Algebra I in grade 8	Completed Algebra I in grade 9
Advanced proficient	1,031	171	429	431
Proficient	1,242	14	380	848
Below proficient	835	2	113	720
Total number of English learner students	3,108	187	922	1,999

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Student characteristics

Table B4 shows the characteristics of students who scored at the advanced proficient level in grade 5 math by the grade level in which they completed Algebra I. Among students who scored at the advanced proficient level in grade 5 math and completed Algebra I in grade 9, larger percentages were Black, Hispanic, in special education, and economically disadvantaged compared with the overall study population.

Table B4. Characteristics of students who scored at the advanced proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2013/14 (percent)

Characteristic	Overall study population (*n* = 37,898)	Completed Algebra I in grade 7 (*n* = 8,928)	Completed Algebra I in grade 8 (*n* = 19,320)	Completed Algebra I in grade 9 (*n* = 9,650)
Male	50	51	48	52
American Indian/Alaska Native	<1	<1	<1	<1
Asian	7	10	7	3
Black	17	18	14	22
Hispanic	8	4	8	11
White	61	60	64	56
Other race/ethnicity	8	8	8	8
In special education	5	2	4	8
Gifted/talented	32	51	35	8
Economically disadvantaged	29	22	25	41
English learner	3	2	2	4

Note: Race/ethnicity categories are mutually exclusive but may not sum to 100 because of rounding. The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B5 shows the characteristics of students who scored at the proficient level in grade 5 math by the grade level in which they completed Algebra I. Among students who scored at the proficient level in grade 5 math and completed Algebra I in grade 9, larger percentages were in special education and economically disadvantaged compared the overall study population.

Table B5. Characteristics of students who scored at the proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2013/14 (percent)

Characteristic	Overall study population (*n* = 18,391)	Completed Algebra I in grade 7 (*n* = 664)	Completed Algebra I in grade 8 (*n* = 5,916)	Completed Algebra I in grade 9 (*n* = 11,811)
Male	48	47	45	50
American Indian/Alaska Native	<1	<1	<1	<1
Asian	4	6	5	3
Black	28	41	26	29
Hispanic	11	5	11	11
White	50	40	51	50
Other race/ethnicity	8	8	7	8
In special education	12	4	9	15
Gifted/talented	7	20	13	3
Economically disadvantaged	46	44	39	49
English learner	7	2	6	7

Note: Race/ethnicity categories are mutually exclusive but may not sum to 100 because of rounding. The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B6 shows the characteristics of students who scored at the below proficient level in grade 5 math by the grade level in which they completed Algebra I. Among the overall population of those students, 47 percent are in special education, 59 percent are economically disadvantaged students, and 17 percent are English learner students.

Table B6. Characteristics of students who scored at the below proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2013/14 (percent)

Characteristic	Overall study population (*n* = 4,911)	Completed Algebra I in grade 7 (*n* = 21)	Completed Algebra I in grade 8 (*n* = 651)	Completed Algebra I in grade 9 (*n* = 4,239)
Male	53	62	50	54
American Indian/Alaska Native	<1	<1	<1	<1
Asian	3	5	5	3
Black	35	81	36	34
Hispanic	17	5	16	16
White	38	5	36	38
Other race/ethnicity	7	5	6	8
In special education	47	38	33	49
Gifted/talented	2	33	6	1
Economically disadvantaged	59	67	55	60
English learner	17	10	17	17

Note: Race/ethnicity categories are mutually exclusive but may not sum to 100 because of rounding. The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.
Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Algebra I and college preparatory diploma outcomes

Table B7 shows Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the advanced proficient level in grade 5 math. The percentage of students in the overall study population who earned a college preparatory diploma was higher for students who completed Algebra I in grade 7 than for students who completed Algebra I in grade 8 or 9. This pattern was also true among economically disadvantaged students and English learner students.

Table B7. Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the advanced proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2016/17

Student group and grade level in which Algebra I was completed	Passed Algebra I	Earned a college preparatory diploma
Overall study population (*n* = 37,898)		
Grade 7 (*n* = 8,928)	90	80
Grade 8 (*n* = 19,320)	89	75
Grade 9 (*n* = 9,650)	76	44
Economically disadvantaged students (*n* = 10,872)		
Grade 7 (*n* = 1,983)	80	62
Grade 8 (*n* = 4,916)	81	60
Grade 9 (*n* = 3,973)	71	33
English learner students (*n* = 1,031)		
Grade 7 (*n* = 171)	93	77
Grade 8 (*n* = 429)	83	66
Grade 9 (*n* = 431)	72	34

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.

Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B8 shows Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the proficient level in grade 5 math. The percentage of those students in the overall study population who earned a college preparatory diploma was higher for students who completed Algebra I in grade 7 or 8 than for students who completed Algebra I in grade 9. This pattern was also true among economically disadvantaged students and English learner students.

Table B8. Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2016/17

Student group and grade level in which Algebra I was completed	Passed Algebra I	Earned a college preparatory diploma
Overall study population (*n* = 18,391)		
Grade 7 (*n* = 664)	59	45
Grade 8 (*n* = 5,916)	65	47
Grade 9 (*n* = 11,811)	57	26
Economically disadvantaged students (*n* = 8,408)		
Grade 7 (*n* = 290)	48	29
Grade 8 (*n* = 2,300)	58	33
Grade 9 (*n* = 5,818)	53	18
English learner students (*n* = 1,242)		
Grade 7 (*n* = 14)	79	64
Grade 8 (*n* = 380)	63	44
Grade 9 (*n* = 848)	57	22

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.

Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.

Table B9 shows Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the below proficient level in grade 5 math. The percentage of those students in the overall study population who earned a college preparatory diploma was higher for students who completed Algebra I in grade 8 than for students who completed Algebra I in grade 7 or 9. This pattern was also true among economically disadvantaged students. Among English learner students the percentage of students who completed Algebra I in grade 7 is limited (fewer than 10 students per cell). Thus, these cells are suppressed.

Table B9. Algebra I pass rates and percentages of students who earned a college preparatory diploma among students who scored at the below proficient level in grade 5 math, by grade level in which they completed Algebra I, 2009/10–2016/17

Student group and grade level in which Algebra I was completed	Passed Algebra I	Earned a college preparatory diploma
Overall study population (*n* = 4,911)		
Grade 7 (*n* = 21)	29	5
Grade 8 (*n* = 651)	36	19
Grade 9 (*n* = 4,239)	34	8
Economically disadvantaged students (*n* = 2,916)		
Grade 7 (*n* = 14)	29	0
Grade 8 (*n* = 357)	28	12
Grade 9 (*n* = 2,545)	31	6
English learner students (*n* = 835)		
Grade 7 (*n* = 2)	—	—
Grade 8 (*n* = 113)	47	21
Grade 9 (*n* = 720)	40	10

— indicates that the data have been suppressed because the cell size was less than 10.

Note: The grade level in which a student completed Algebra I is proxied by the grade level in which the student took the Algebra I state assessment for the first time. The study included three mutually exclusive groups: students who completed Algebra I in grade 7, students who completed Algebra I in grade 8, and students who completed Algebra I in grade 9. In Virginia, Algebra I is required for high school graduation, and students must take the Algebra I state assessment at the end of the same school year in which they complete the course. Students who failed the assessment and retook Algebra I were included in the group for the grade level in which they first completed the course and took the assessment. For example, a student who completed an Algebra I course in grade 7, took and failed the Algebra I state assessment in grade 7, completed Algebra I again in grade 8, and passed the assessment in grade 8 was included in the group that completed Algebra I in grade 7.

Source: Authors' analysis using data from the Virginia Longitudinal Data System, 2009/10–2016/17.