

# Mapping State Proficiency Standards Onto the NAEP Scales

Results From the 2017 NAEP Reading and Mathematics Assessments

**Technical Notes**

# Technical Notes

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## Mapping states' standards onto the NAEP scales

Under the 2001 and 2015 reauthorizations of the Elementary and Secondary Education Act of 1965, states are required to define and report their standards of reading and mathematics for grades 4 and 8. Because each state sets its own standards, students who meet the standards set by one state may not be able to meet the standards set by another state. Comparing the stringency of the standards set by the states is possible because Congress mandated states to participate in the National Assessment of Educational Progress (NAEP). NAEP provides a common scale on which the stringency of the various state criteria for proficiency can be compared.

The NAEP equivalent score—that is, the NAEP score that corresponds to a state's standard—is determined by a direct application of equipercenile mapping. For a given grade and subject, the percentage of students in each NAEP school who met the state assessment standard is matched to the point on the NAEP scale corresponding to that percentage. For example, if 70 percent of the students in grade 4 in a particular school are meeting the state reading achievement standard and 70 percent of the students in the NAEP achievement distribution in that school are at or above 241 on the NAEP scale, then the best estimate using the results from that school is that the state's standard is equivalent to 241 on the NAEP scale. Results are then aggregated over all schools in the state that are participating in NAEP to provide an estimate of the NAEP score that is equivalent to the state's threshold for its standard. By extension, when estimating the NAEP scores equivalent to the standard of a common assessment shared by a group of states, all schools participating in NAEP in those states are included in the estimation.

The classification of NAEP equivalent scores into NAEP achievement levels accounts for the error associated with the estimates. A state is determined to be in a given NAEP achievement level range if its NAEP equivalent score is statistically significantly lower than the cut score of the next highest achievement level. For example, using the grade 4 reading assessment as an illustration, if the NAEP score equivalent to a state standard is 235 points with a standard error of 1 point, the upper limit of the margin of error is 237 ( $235 + 2 \times 1$ ), which is lower than the cut score of the *NAEP Proficient* level (238). Thus, this state is categorized in the *NAEP Basic* level. If, however, the state's score is 235 points with a standard error of 2 points, the upper limit of the margin of error is 239 ( $235 + 2 \times 2$ ), which is larger than the cut score of the *NAEP Proficient* level. This state would be categorized in the *NAEP Proficient* level. NAEP achievement level cut scores for 2017 can be found in **Table 3** in the main report ([NCES 2019-040](#)).

In reporting the mapping results, in addition to the NAEP equivalent scores, two types of error—*standard error* and *relative error*—are presented to describe the sources of variation in the mapping of state proficiency standards. The sources of random variation (measurement error and sampling variation) are accounted for by the *standard error* of the mapping, and the amount of error that is added to the placement of the standard, given the fact that NAEP and the state assessment may not measure exactly the same knowledge and skills, is captured in the *relative error*. This measure is based on the accuracy with which school-level percentages of students meeting the state standard are reproduced by applying the cut score indicated by the linkage to the NAEP results in each school, after taking into account measurement variation in NAEP and NAEP student sampling within each participating school.

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A relative error greater than 0.5 (i.e., when the mapping error accounts for more than half of the total variation) indicates that the error is too large to support useful inferences from the placement of the state standard onto the NAEP scale without additional evidence. In the figures and tables in this report, a triangle indicates that the relative error is greater than 0.5.

Additional details on the mapping methodology can be found in the [NCES 2010-456](#) report.

# Data Tables

This section provides two supporting data tables. **Tables A-1** and **A-2** display the NAEP equivalent scores for each state, and the last three rows show the NAEP equivalent scores for the testing programs when all participating states in each program are considered as one single jurisdiction. A triangle indicates that the relative error is greater than 0.5, and the results should be interpreted with caution.

Data tables with the complete NAEP scale score equivalents can be found at [https://nces.ed.gov/nationsreportcard/studies/statemapping/findings\\_table2.aspx](https://nces.ed.gov/nationsreportcard/studies/statemapping/findings_table2.aspx) for 2007 and at [https://nces.ed.gov/nationsreportcard/studies/statemapping/findings\\_table\\_2015a.aspx](https://nces.ed.gov/nationsreportcard/studies/statemapping/findings_table_2015a.aspx) for 2015.

**Table A-1. NAEP equivalent scores for state grade 4 reading and mathematics standards for proficient performance, by state and testing program: 2017**

State	Testing program	Reading		Mathematics	
		NAEP equivalent score	Standard error	NAEP equivalent score	Standard error
Alabama	ACT	230	1.5	232	1.5
Alaska		228	1.5	240	0.6
Arizona		223	1.2	240	1.0
Arkansas	ACT	222	1.4	231	1.1
California	SBAC	224	1.1	240	0.9
Colorado	PARCC	234	1.6	255	1.1
Connecticut	SBAC	229	1.7	241	1.4
Delaware	SBAC	221	0.9	238	1.9
District of Columbia	PARCC	234	0.8	248	1.3
Florida		226	0.7	236	1.2
Georgia		231	1.5	241	1.0
Hawaii	SBAC	223	0.9	241	1.5
Idaho	SBAC	229	1.6	243	1.0
Illinois	PARCC	236	1.7	255	0.9
Indiana		216	1.3	238	0.8
Iowa		201	1.2	220	1.7
Kansas		228	1.3	251	0.6
Kentucky		227	1.3	243	1.1
Louisiana		220	0.8	238	1.4
Maine		225	1.7	246	1.3
Maryland	PARCC	235	0.9	252	0.7
Massachusetts		238	1.2	250	1.0
Michigan		229	1.1	245	0.9
Minnesota		222	1.1	237	1.1
Mississippi		234	1.0	246	0.7
Missouri		214	1.5	238	1.2
Montana	SBAC	228	1.4	247	0.9

See notes at end of table.

**Table A-1. NAEP equivalent scores for state grade 4 reading and mathematics standards for proficient performance, by state and testing program: 2017—Continued**

State	Testing program	Reading		Mathematics	
		NAEP equivalent score	Standard error	NAEP equivalent score	Standard error
Nebraska		224	1.3	223	1.3
Nevada	SBAC	224	1.4	242	0.9
New Hampshire <sup>1</sup>	SBAC	—	†	—	†
New Jersey	PARCC	229	1.5	249	0.9
New Mexico	PARCC	238	2.0	253	0.9
New York		234	0.9	243	0.7
North Carolina		233	0.6	242	0.7
North Dakota	SBAC	230	0.8	250	0.7
Ohio		217	1.0	223	0.9
Oklahoma		231	1.1	245	0.7
Oregon	SBAC	225	1.3	240	2.0
Pennsylvania		219	1.3	247	1.4
Puerto Rico <sup>2</sup>		—	†	186 ▲	0.8
Rhode Island	PARCC	236	0.8	253	0.7
South Carolina		228	1.9	238	0.8
South Dakota	SBAC	227	1.1	244	0.8
Tennessee		234	1.1	245	0.9
Texas		200	1.3	224	1.6
Utah		238	0.9	245	0.9
Vermont	SBAC	232	1.0	244	0.9
Virginia		201	1.8	221	1.2
Washington	SBAC	222	1.7	240	1.6
West Virginia	SBAC	224	1.5	244	1.1
Wisconsin		229	1.3	249	1.0
Wyoming		219	1.4	244	0.7
ACT		227	0.8	232	0.9
PARCC		234	0.6	253	0.5
SBAC <sup>3</sup>		224	0.7	241	0.7

— Not available.

† Not applicable.

▲ Relative error greater than 0.5.

<sup>1</sup> New Hampshire was not included in the study because the state did not use the same assessment for all students in grade 4 for reading and mathematics.

<sup>2</sup> The NAEP equivalent score of Puerto Rico's reading standard is not available because the NAEP reading assessment was not administered in the jurisdiction.

<sup>3</sup> Connecticut administered the SBAC reading assessment but was not included in the estimation of the NAEP equivalent score of the SBAC reading standard because the state did not use all components of the SBAC reading assessment.

NOTE: Summary tables displaying the relative error are available at <https://nces.ed.gov/nationsreportcard/studies/statemapping/>. ACT refers to ACT Aspire, PARCC refers to Partnership for Assessment of Readiness for College and Careers, and SBAC refers to Smarter Balanced Assessment Consortium.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2017 Reading and Mathematics Assessments; and U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, ED Facts School Year 2016–17.

**Table A-2. NAEP equivalent scores for state grade 8 reading and mathematics standards for proficient performance, by state and testing program: 2017**

State	Testing program	Reading		Mathematics	
		NAEP equivalent score	Standard error	NAEP equivalent score	Standard error
Alabama	ACT	263	0.7	282	1.2
Alaska		271	1.1	304	1.2
Arizona		279	1.2	—	†
Arkansas	ACT	257	1.0	280	1.3
California	SBAC	265	1.7	289	1.2
Colorado	PARCC	276	1.3	—	†
Connecticut	SBAC	272	0.9	293	1.2
Delaware	SBAC	263	1.4	287	1.4
District of Columbia	PARCC	269	1.0	—	†
Florida		264	1.1	—	†
Georgia		274	1.1	—	†
Hawaii	SBAC	267	1.1	288	1.5
Idaho	SBAC	271	1.1	296	0.7
Illinois	PARCC	280	0.9	—	†
Indiana		264	1.4	283	1.8
Iowa		247	1.3	261	0.9
Kansas		290	1.6	310	2.1
Kentucky		260	1.6	277	1.3
Louisiana		264	1.4	—	†
Maine		271	0.9	300	1.4
Maryland	PARCC	280	1.1	—	†
Massachusetts		279	1.9	300	1.2
Michigan		269	1.3	294	1.4
Minnesota		265	1.1	288	2.2
Mississippi		272	0.9	283	1.4
Missouri		260	1.0	—	†
Montana	SBAC	272	1.0	300	0.7
Nebraska		271	0.7	275	1.0
Nevada	SBAC	—	†	—	†
New Hampshire <sup>1</sup>	SBAC	—	†	—	†
New Jersey	PARCC	270	0.9	—	†
New Mexico	PARCC	277	0.9	—	†
New York		272 ▲	1.5	—	†
North Carolina		273	1.2	293	1.6
North Dakota	SBAC	272	1.0	304	1.4

See notes at end of table.

**Table A-2. NAEP equivalent scores for state grade 8 reading and mathematics standards for proficient performance, by state and testing program: 2017—Continued**

State	Testing program	Reading		Mathematics	
		NAEP equivalent score	Standard error	NAEP equivalent score	Standard error
Ohio		270	1.0	—	†
Oklahoma		275	0.8	301	1.2
Oregon	SBAC	266	0.9	292	1.2
Pennsylvania		265	1.6	305	1.8
Puerto Rico <sup>2</sup>		—	†	261 ▲	1.8
Rhode Island	PARCC	280	1.2	—	†
South Carolina		273	1.0	290	1.3
South Dakota	SBAC	270	0.8	295	1.1
Tennessee		283	1.1	—	†
Texas		—	†	—	†
Utah		278	0.9	—	†
Vermont	SBAC	272	1.5	297	1.0
Virginia		245	1.1	—	†
Washington	SBAC	265	1.1	290	1.2
West Virginia	SBAC	266	0.8	291	1.0
Wisconsin		279	1.1	304	1.0
Wyoming		269	0.8	290	1.2
ACT		261	0.5	281	1.1
PARCC <sup>3</sup>		277	0.6	—	†
SBAC <sup>4</sup>		266	0.6	291	0.9

— Not available.

† Not applicable.

▲ Relative error greater than 0.5.

<sup>1</sup> New Hampshire was not included in the study because the state did not use the same assessment for all students in grade 8 for reading and mathematics.

<sup>2</sup> The NAEP equivalent score of Puerto Rico's reading standard is not available because the NAEP reading assessment was not administered in the jurisdiction.

<sup>3</sup> The NAEP equivalent score of the PARCC standards for grade 8 mathematics was not estimated because all states using PARCC did not require all students to take a general mathematics assessment.

<sup>4</sup> Connecticut administered the SBAC reading assessment but was not included in the estimation of the NAEP equivalent score of the SBAC reading standard because the state did not use all components of the SBAC reading assessment.

NOTE: States that did not require all eligible students to take a general grade 8 reading or mathematics assessment were not included in the analysis. Summary tables displaying the relative error are available at <https://nces.ed.gov/nationsreportcard/studies/statemapping/>. ACT refers to ACT Aspire, PARCC refers to Partnership for Assessment of Readiness for College and Careers, and SBAC refers to Smarter Balanced Assessment Consortium.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2017 Reading and Mathematics Assessments; and U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, ED*Facts* School Year 2016–17.

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