

Science Performance Index Calculation Using Scores from NGSS-Aligned Assessments December 2019

Individual student results from the Next Generation Science Standards (NGSS) assessment are reported in terms of scale scores and achievement levels. Results from the Connecticut Alternate Science (CTAS) assessment are reported using raw scores and achievement levels. Achievement levels unique to each test are used as a way of categorizing student performance in a content area. The levels represent broad groupings of performance that are developed based on the judgment of content experts. Operationally, the levels are used as a starting point in discussing a student's test scores; the scale scores (NGSS assessment) and raw scores (CTAS) are more precise measures of a student's achievement on the performance continuum.

For district- and school-level accountability, Connecticut uses student scale scores (NGSS assessment) and raw scores (CTAS), not achievement levels, to calculate the Science performance index. This approach to performance index calculation acknowledges that the assessments were not developed solely to classify students into broad achievement levels. On the contrary, they were developed to provide a more precise measure of student performance. The index calculation is more sensitive to changes in student performance at the subgroup, school, and district levels.

The performance index calculation uses a 0-110 scale. Important considerations in defining the index are that it: (a) provides an aggregate measure of science performance across grades; (b) allows for a more accurate comparison of subgroup, school, and district performance, not only within a year, but also across years; (c) encourages a focus on all students, not just those at the cusp of an achievement level; and (d) ensures that the expected index performance of 75 falls solidly in the desired achievement level (i.e., Level 3).

To meet these requirements, for the NGSS assessment, the individual student index is set to zero if a student obtains a score at or below the "low range" for the student's grade, and 110 if the student obtains a score at or above the "high range." Although the highest index value at the school, district, and subgroup level is 100, assigning scores ranging from 100 to 110 to students who are the highest performing has the effect of rewarding these schools and districts by weighting these scores additionally in the computation of the Science performance index. Further information is provided in Tables 1 and 2, including scores defining the low and high ranges of the scale for the NGSS assessment and CTAS.

The formula used to convert student scale scores from the NGSS assessment to an index value is presented below.

$$\text{Index} = \frac{\text{Scale Score} - \text{Low Range Score}}{\text{Scale Score Range}} * 110$$

The following examples use information from Table 1 to convert student scale scores to index values.

If a Grade 5 student earns a scale score of 525 on the NGSS assessment, the index value for this score is 82.5. The calculation is performed as follows:

$$\text{Index} = \frac{525 - 405}{155} * 110 = 85.2$$

When a Grade 11 student earns a scale score of 1020 on the NGSS assessment (a score below the “low range” score), the listed “low range” score is used in place of the student’s earned score of 1020. The index value for any scale score at or below the “low range” score is 0. The calculation is performed as follows:

$$\text{Index} = \frac{1030 - 1030}{130} * 110 = 0$$

For students earning scores above the listed “high range” score, the high range value is used in the index calculation.

Table 1.

Low Range and High Range Scale Scores and the Scale Score Range by Grade Level for the NGSS Assessment

Grade	Low Range Score	High Range Score	Scale Score Range
5	405	560	155
8	715	860	145
11	1030	1160	130

The index calculation using CTAS raw scores is similar. The individual student index will be set to zero if a student earns the lowest obtainable raw score of 0, and 110 if the student obtains the highest possible raw score, which varies by grade. All CTAS raw score ranges are included in Table 2.

The formula used to convert student raw scores from the CTAS to an index value is presented below.

$$\text{Index} = \frac{\text{Raw Score} - \text{Lowest Possible Raw Score}}{\text{Range}} * 110$$

The following examples use information from Table 2 to convert student raw scores to index values.

If a Grade 5 student earns a raw score of 30 on the CTAS, the index value for this score is 37.5. The calculation is performed as follows:

$$\text{Index} = \frac{30 - 0}{88} * 110 = 37.5$$

If a Grade 8 student earns a raw score of 54 on the CTAS, the index value for this score is 70.7. The calculation is performed as follows:

$$\text{Index} = \frac{54 - 0}{84} * 110 = 70.7$$

Table 2.

Lowest and Highest Possible Raw Scores and the Raw Score Range by Grade Level for CTAS

Grade	Lowest Possible Raw Score	Highest Possible Raw Score	Range
5	0	88	88
8	0	84	84
11	0	84	84