

Idaho NAEP 2013 Mathematics Strand Results for Grades 4 and 8¹

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The National Assessment of Educational Progress (NAEP) mathematics test, which used multiple choice and constructed response items, measured five broad areas of mathematics on the 2013 assessment in grades 4 and 8. Grade level results were reported for total and for each strand by demographic group.

The NAEP mathematics assessment was anchored in five content areas [a.k.a. strands or subscales]. The divisions were not intended to separate mathematics into discrete elements. Rather, they were intended to provide a helpful classification scheme that describes the full spectrum of mathematical content assessed by NAEP. Classification of items into one primary content area is not always clear-cut, but it helps ensure that important mathematical concepts and skills are assessed in a balanced way.

The five NAEP 2013 mathematics strands for grades 4 and 8 were:

- *Number Properties and Operations* – including computation and understanding of number concepts.
- *Measurement* – including use of instruments, application of processes, and concepts of area and volume.
- *Geometry* – including spatial reasoning and applying geometric properties.
- *Data Analysis, Statistics, and Probability* – including graphical displays and statistics.
- *Algebra* – including representations and relationships.

The National Assessment Governing Board provides a complete framework for each assessment. A free PDF or MS Word copy of the NAEP 2013 framework for mathematics can be downloaded from the Board's website. [See: <http://www.nagb.org/publications/frameworks/mathematics/2013-mathematics-framework.html>]

NAEP reported 2013 mathematics results as scale scores and achievement level percentages. Both of these NAEP score formats, however, lack the statistical characteristics needed to make cross-strand comparisons. Each grade-level strand scale has its own mean and standard deviation; a composite of the five mathematics strand scale scores makes up the total mathematics scale score. There is no reason whatsoever to expect that a scale score of 240 on the measurement scale has the same meaning as a 240 on any of the four other mathematics subscales.

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NAGB and the National Center for Education Statistics (NCES) believe that the NAEP achievement levels are useful for reporting trends in the educational achievement of students in the United States. Trends only, not other types of analyses whether across-strands or cross-group-within-strand comparisons. NAEP does not provide achievement level percentages for strands. Moreover, NCLB requires that NAEP achievement levels be used on a trial basis until the Commissioner of Education Statistics [NCES] determines that they are "reasonable, valid, and informative to the public." So far, no Commissioner has made such a determination, and the achievement levels remain in trial status. The achievement levels should continue to be interpreted and used with caution. [See <http://nces.ed.gov/nationsreportcard/achlevdev.asp>]

National percentile ranks (NPR) are derived from a scale score distribution using the means and standard deviations. They are "effect size" statistics. Their interpretation is straightforward. For example, an NPR = 56 means that the average student in the focus group (e.g., a demographic group) scored higher than 56 percent of the students in the reference or norm group. Whether the difference between two NPRs is large or small need not be determined by statistical tests, but can be determined by the experience and expectations of the reader.

The NPRs reported in this paper were transformed scale scores calculated via two step procedure. First, a "z-score" was computed, i.e., the difference between the means of the norm group and the focus group, divided by the standard deviation of the norm group. Then a Microsoft Excel formula transformed the z-score to an NPR, i.e., =TRUNC(100*NORMSDIST(z-score)).

Two mathematics norm groups were identified for this report, one for grade 4 and one for grade 8:

- The grade 4 norm group was *all fourth-grade students in the nation's public schools who participated in the NAEP 2013 mathematics assessment.*
- The grade 8 norm group was *all eighth-grade students in the nation's public schools who participated in the NAEP 2013 mathematics assessment.*

The grade-level norm group was utilized to calculate the NPR for each of the 11 demographic groups on the total mathematics and five strand scores. This comes to 66 NPRs for grade 4 mathematics, and 66 NPRs for grade 8 mathematics.

Table 1. National percentile rank (NPR) for eleven Idaho demographic groups on six strands (i.e., Total, Number Properties & Operations, Measurement, Geometry, Data Analysis, Probability and Statistics, and Algebra) from the NAEP 2013 mathematics assessment in grade 4.

**Idaho NAEP 2013 Mathematics, Grade 4
National Percentile Ranks**

	Total	Numbers	Measure	Geometry	Statistics	Algebra
All	49	48	53	47	46	46
Male	52	52	57	49	48	48
Female	46	45	48	46	47	45
White	54	53	57	52	52	51
Hispanic	29	28	33	29	29	29
NSLP-Yes	39	39	42	39	38	38
NSLP-No	59	58	63	57	57	55
SD-Yes	17	17	22	21	16	15
SD-No	53	52	56	51	51	50
LEP-Yes	13	15	16	12	11	16
LEP-No	51	50	54	49	50	48

NSLP = National School Lunch Program; free/reduced price lunch

SD = student with disability on IEP; excludes 504 students

LEP = limited English proficient, in US schools at least one year

Observations:

It may not be of much interest that Idaho's average fourth-grade student with disability scored higher than 17 percent of the fourth-grade students in the nation's public schools in Total Mathematics on the NAEP 2013 assessment. However

It is likely noteworthy to many that Idaho's average fourth-grade student with disability scored seven (7) points higher in Geometry (22) than in Algebra (15). And that

The best NAEP 2013 mathematics cross-strand performance for all of the 11 Idaho fourth-grade demographic groups was in Measurement.

What else do you see in the mathematics strands?

Table 2. National percentile rank (NPR) for eleven Idaho demographic groups on six strands (i.e., Total, Number Properties & Operations, Measurement, Geometry, Data Analysis, Probability and Statistics, and Algebra) from the NAEP 2013 mathematics assessment in grade 8.

Idaho NAEP 2013 Mathematics, Grade 8
National Percentile Ranks

	Total	Numbers	Measure	Geometry	Statistics	Algebra
All	53	57	54	53	51	50
Male	53	60	55	53	51	50
Female	52	54	53	52	52	50
White	57	64	59	57	55	55
Hispanic	32	29	33	36	36	30
NSLP-Yes	42	43	44	42	41	39
NSLP-No	61	68	62	61	59	58
SD-Yes	13	11	17	12	15	11
SD-No	56	61	57	56	55	53
LEP-Yes	10	8	12	11	10	12
LEP-No	54	59	56	54	53	51

NSLP = National School Lunch Program; free/reduced price lunch

SD = student with disability on IEP; excludes 504 students

LEP = limited English proficient, in US schools at least one year

Observations:

On the NAEP 2013 mathematics test, the average eighth-grade student in Idaho scored higher than 53 percent of the eighth-grade students in the nation's public schools.

Idaho's average eighth-grade male student (60) scored six (6) points higher on Number Properties and Operations than the average female student (54), but there was no difference between male and female performance in Algebra (50).

The best NAEP 2013 mathematics strand performance for Idaho's average student with disability was in Measurement (17), which was six (6) points higher than in Measurement (11) and Algebra (11).

What else do you see in the mathematics strand?

Idaho's NAEP 2013 Mathematics Strand Results For Grades 4 and 8

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Author Note

Bert Stoneberg was Idaho's NAEP State Coordinator from 2002 to 2012. Now retired he keeps busy with independent research and consulting in educational measurement and evaluation. He maintains a website to make his findings public. Visit <http://k12researchidaho.com>

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