How Good Are U.S. Students in Math? Fact and Fiction

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Overarching Questions

1. Are the mathematics skills of U.S. students better, worse, or about the same as students in years past?
2. How do U.S. Students compare to students in other countries?
3. How can I see how my students do in relation to students across my state, the U.S., or the world?
Periodic Mathematics Assessment Programs

- National Assessment of Educational Progress (NAEP) - grades 4, 8, and 12 (U.S. only)
- Trends in International Mathematics and Science Study (TIMSS) - grades 4 and 8
- Program of International Student Assessment (PISA) - 15 year olds
NAEP (National Assessment of Educational Progress)

- U.S. Only
- NAEP is used in many content areas (math, science, reading, art, U.S. history, writing, etc.)
- Administered at grades 4, 8, and 12 in math, reading, and science, but only grades 8 or 12 in other subjects.
- There are 150 to 200 items per grade level. Each student completes 20 to 30 of those items.
NAEP Programs

- **Main NAEP**
  - Primary NAEP assessment
  - Most NAEP results you hear about are from Main NAEP
  - State and national samples
  - Dates to 1990
  - Grades 4 and 8 now administered every two years, grade 12 every 4 years
  - Includes relatively complex “problem solving” items

- **Long-Term Trend NAEP**
  - First administered in 1973
  - National sample only, now administered every 4 years
  - Ages 9, 13, 17
  - Predominantly a basic skills test
  - Used same items and procedures from 1982 to 2004
NAEP Content Strands in Mathematics

- Number sense, Properties, and Operations
- Measurement
- Geometry and Spatial Sense
- Data Analysis, Statistics, and Probability
- Algebra and Functions
NAEP Reporting Results: Scale Scores and Achievement Levels

- **Scale Scores**
  - Can range from 0 to 500 (except grade 12 after 2000)

- **Achievement Levels**
  - Basic, Proficient, and Advanced
  - Setting of achievement levels is controversial (proficient level is challenging)
# NAEP Achievement Level Descriptions

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>Partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade.</td>
</tr>
<tr>
<td>Proficient</td>
<td>Solid academic performance for each grade assessed. Students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Superior performance.</td>
</tr>
</tbody>
</table>
There are 30 people in the music room. There are 74 people in the cafeteria. How many more people are in the cafeteria than the music room?

A) 40  
B) 44  
C) 54  
D) 104
A club needs to sell 625 tickets. If it has already sold 184 tickets to adults and 80 tickets to children, how many more does it need to sell?

Answer: _____________________________
Item Administered at Grades 4, 8, and 12

What is the length of the toothpick in the figure above?

Answer:
NAEP Grade 4 Extended-Constructed-Response Item (item that requires justification of answer)

1. Rico bought 10 cards, which cost $12.20 before tax. How many packages of each type did he buy? Explain how you know that your answer is correct.

2. Rico said that one postcard is cheaper than one greeting card. Show that Rico is correct.

Note: a calculator was available for this item
Points A and B are on a number line. The coordinate of point B is 3 and the coordinate of the midpoint of segment AB is -5. What is the coordinate of point A?

Answer __________
Grade 8 Item

Write the next two numbers in the pattern.

1, 6, 4, 9, 7, 12, 10

Write the rule that you used to find the two numbers you wrote.
Grade 12 Item

In a certain restaurant, a whole pie has been sliced into 8 equal wedges. Only 2 slices of the pie remain. Three people would like an equal portion from the remaining slices of pie. What fraction of the original pie should each person receive?
Overarching Question 1

- How has mathematics performance of U.S. students changed over time at grades 4, 8, and 12?
At grade 4, a gain of 14 points is approximately one grade level. Thus, the gain from 1990 to 2015 is about two grade levels.
At grade 8, a gain of 10 points is approximately one grade level. Thus, the gain from 1990 to 2015 is about two grade levels.
12th-grade NAEP Mathematics Scale Score Trends, 1990-2000
12th-grade NAEP Mathematics Scale Score Trends, 2005-2013
Long-Term Trend NAEP Mathematics Scale Score, 1973-2012

* Significantly different (p < .05) from 2012.
Main NAEP Average Reading Scale Score, Grade 4
Main NAEP Average Reading Scale Score, Grade 8
Question

- Do NAEP results suggest that NCLB (and all the testing that went with that law) were effective in improving mathematics achievement at grades 4 and 8?
Question

- Are we closing the mathematics achievement gaps between race/ethnicity groups?
Black-White Achievement Over Time: Grade 4 Math

The graph shows the scale scores of Black and White students over time in Grade 4 Math. The scores are significantly different (p < .05) from 2015. The Accommodations not permitted line is indicated by a dashed line, and the Accommodations permitted line is indicated by a solid line. The statistically significant differences are marked with an asterisk (*).
Hispanic-White Achievement Over Time: Grade 4 Math

The graph shows the scale score trends for White and Hispanic students over time, with accommodations permitted and not permitted. Statistically significant differences are marked with an asterisk (*). The score difference is indicated at the bottom of the graph.
Black-White Achievement Over Time: Grade 8 Math

*Significantly different (p < .05) from 2015.
Hispanic-White Achievement Over Time: Grade 8 Math

* Significantly different (p < .05) from 2015.
Politics and NAEP

How Indiana Students Fared On The Tests The Whole Country Cares About

NOVEMBER 7, 2013 | 10:01 AM
BY KYLE STOKES

Indiana’s Fourth & Eighth Grade NAEP Scores

U.S. DEPARTMENT OF EDUCATION / GOOGLE DRIVE

Indiana fourth graders’ and eighth graders’ average scale scores on the nation’s benchmark standardized test both increased. The gains in fourth grade were more substantial in Indiana than in eighth grade.

How much has Indiana’s performance on the nation’s benchmark standardized tests changed since their last release in 2011? The answer depends on how much you’re willing to make of just a few points.
TIMSS (Trends in International Mathematics and Science Study)

- Different countries participate each year, so rankings vary depending on which countries participate.

Participation in 2011

- Grades 4 and 8: 34 countries
- Grade 4 only: 18 countries
- Grade 8 only: 11 countries
TIMSS Scoring

- Scoring Scale goes from 0 to 1000, mean is 500
- Students in different schools and classes complete different items
  - each student completed 20 to 30 items
  - about 200 items for Grade 8
  - about 150 items for Grade 4
There are 218 passengers and 191 crew members on a ship. How many people are on the ship altogether?

Answer: ____________
The scale on a map indicates that 1 centimeter on the map represents 4 kilometers on the land. The distance between two towns on the map is 8 centimeters. How many kilometers apart are the two towns?

A 2
B 8
C 16
D 32
In this figure, triangles ABC and DEF are congruent with BC = EF.

What is the measure of angle EGC?
A. 20°
B. 40°
C. 60°
D. 80°
E. 100°
Alice ran a race in 49.86 seconds. Betty ran the same race in 52.30 seconds. How much longer did it take Betty to run the race than Alice?

A. 2.44 seconds
B. 2.54 seconds
C. 3.56 seconds
D. 3.76 seconds
Which of these numbers is closest to 10?

A. 0.10
B. 9.99
C. 10.10
D. 10.90
Overarching Question 2

- How do U.S. Students compare to students in other countries?
- How does U.S. performance now compare to performance in the 1960s when the first international study took place?
Singapore, South Korea and Japan scored higher than the U.S.

Finland, Russia, The Netherlands, and Denmark were statistically equal to the U.S.

The other 31 countries participating at grade 4 scored below the U.S.

76 grade 4 TIMSS items have been released since 1995. U.S. students scored above the international average on 72 of those. Three of the four where U.S. students scored below the international average required knowledge of the metric system.
TIMSS Grade 8 Mathematics: 2011

- Singapore, South Korea, Japan, and the Russian Federation scored significantly higher than the U.S.
- Israel, Finland, Australia, Slovenia, Hungary, and Lithuania were statistically equal to the U.S.
- The other 27 countries participating at grade 8 scored below the U.S.
First and Second International Mathematics Studies

- First International Mathematics Study (FIMS) took place in the mid 1960s
  - U.S. 13-year olds were 11\textsuperscript{th} out of the 12 participating countries (most participating countries were European).

- Second International Mathematics Study (SIMS) took place in the mid 1980s
  - On the various parts of the study, U.S. was as high as 8\textsuperscript{th} and as low as 17\textsuperscript{th} out of 20 (mostly European) countries.
PISA (Program for International Student Assessment)

- **Purpose:** How effectively can students apply their knowledge and skills in *practical situations from the real world*?

- **Sponsored by the Organization for Economic Cooperation and Development (OECD), a group of economically developed nations, predominantly in Europe.**
  - Nations can participate regardless of whether they are members of OECD


- **Students:** age 15

- **Countries:** 67 countries or parts of countries participated in 2009 and 68 countries or parts of countries participated in 2013 (half of these were members of OECD).

- **PISA assesses reading, mathematics, and science.**
The diagram below shows the results on a Science test for two groups, labeled as Group A and Group B. The mean score for Group A is 62.0 and the mean for Group B is 64.5. Students pass this test when their score is 50 or above.

Looking at the diagram, the teacher claims that Group B did better than Group A in this test. The students in Group A don’t agree with their teacher. They try to convince the teacher that Group B may not necessarily have done better.

Give one mathematical argument, using the graph, that the students in Group A could use.
For a homework assignment, students collected information on the decomposition time of several types of litter that people throw away. A student thinks of displaying the results in a bar graph.

- Give one reason why a bar graph is unsuitable for displaying these data.
Connecting Ideas
Now that you know how a bar graph presents data, you can make bar graphs.

Fred surveyed his friends to find out how much time they spent listening to music in the morning and in the evening. The table on the right shows the results of Fred’s survey.

Follow the steps below to make a double bar graph to show the information from the survey.

<table>
<thead>
<tr>
<th>Person</th>
<th>Morning (in minutes)</th>
<th>Evening (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sue</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Phyllis</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Salita</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Martin</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Moe</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Sherry</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

**Step 1** Choose a title.

**Step 2** Choose a scale and mark equal intervals. For this data, the vertical scale should begin at 0 and end at 60.

**Step 3** Label the horizontal axis *People* and the vertical axis *Minutes*.

**Step 4** Draw a bar for each item.

**Step 5** Make a key to show what each bar represents.

**Think and Discuss** How would the graph look if the scale was changed to 20-minute intervals? 5-minute intervals?
Students’ self-concept (PISA, 2000)

- I am just not good at mathematics.
- I get good marks in mathematics.
- I learn mathematics quickly.
- I believe that mathematics is one of my best subjects.
- In my mathematics class, I understand the most difficult work.

<table>
<thead>
<tr>
<th>OECD</th>
<th>CAN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>42%</td>
<td>34%</td>
<td>36%</td>
</tr>
<tr>
<td>57%</td>
<td>63%</td>
<td>72%</td>
</tr>
<tr>
<td>51%</td>
<td>58%</td>
<td>58%</td>
</tr>
<tr>
<td>35%</td>
<td>44%</td>
<td>44%</td>
</tr>
<tr>
<td>33%</td>
<td>43%</td>
<td>44%</td>
</tr>
</tbody>
</table>
Average scores in mathematics literacy ranged from 613 in Shanghai – China to 368 in Peru. The US average score was 481, which is lower than OECD average of 494.

In terms of rank, the US performed significantly below 22 of the 33 other OECD countries.
MATH 2012: Percentage of 15-year-old students performing at PISA proficiency Levels 5 and above, below Level 2

<table>
<thead>
<tr>
<th>Education system</th>
<th>Below level 2</th>
<th>Levels 5 and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD average</td>
<td>23%</td>
<td>13%</td>
</tr>
<tr>
<td>Shanghai-China</td>
<td>4%</td>
<td>55%</td>
</tr>
<tr>
<td>Singapore</td>
<td>0%</td>
<td>40%</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>13%</td>
<td>37%</td>
</tr>
<tr>
<td>Hong Kong-China</td>
<td>9%</td>
<td>34%</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>9%</td>
<td>31%</td>
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<tr>
<td>Liechtenstein</td>
<td>14%</td>
<td>25%</td>
</tr>
<tr>
<td>Macao-China</td>
<td>11%</td>
<td>24%</td>
</tr>
<tr>
<td>Japan</td>
<td>11%</td>
<td>24%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>12%</td>
<td>21%</td>
</tr>
<tr>
<td>Belgium</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Germany</td>
<td>18%</td>
<td>17%</td>
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<tr>
<td>Poland</td>
<td>14%</td>
<td>17%</td>
</tr>
<tr>
<td>Canada</td>
<td>14%</td>
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<tr>
<td>Finland</td>
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<td>New Zealand</td>
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<tr>
<td>Australia</td>
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<tr>
<td>Estonia</td>
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<tr>
<td>Austria</td>
<td>19%</td>
<td>14%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>20%</td>
<td>14%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>14%</td>
<td>13%</td>
</tr>
<tr>
<td>France</td>
<td>22%</td>
<td>13%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>21%</td>
<td>13%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>22%</td>
<td>12%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>24%</td>
<td>11%</td>
</tr>
<tr>
<td>Iceland</td>
<td>21%</td>
<td>11%</td>
</tr>
<tr>
<td>Slovak Republic</td>
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<td>11%</td>
</tr>
<tr>
<td>Ireland</td>
<td>17%</td>
<td>11%</td>
</tr>
<tr>
<td>Portugal</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>Denmark</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td>Italy</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>Norway</td>
<td>22%</td>
<td>9%</td>
</tr>
<tr>
<td>Israel</td>
<td>34%</td>
<td>9%</td>
</tr>
<tr>
<td>Hungary</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>United States</td>
<td>28%</td>
<td>8%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>26%</td>
<td>8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education system</th>
<th>Below level 2</th>
<th>Levels 5 and above</th>
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<tbody>
<tr>
<td>Sweden</td>
<td>27%</td>
<td>8%</td>
</tr>
<tr>
<td>Spain</td>
<td>24%</td>
<td>8%</td>
</tr>
<tr>
<td>Latvia</td>
<td>20%</td>
<td>8%</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>24%</td>
<td>7%</td>
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<tr>
<td>Greece</td>
<td>17%</td>
<td>7%</td>
</tr>
<tr>
<td>Turkey</td>
<td>27%</td>
<td>6%</td>
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<td>Bulgaria</td>
<td>30%</td>
<td>5%</td>
</tr>
<tr>
<td>Greece</td>
<td>17%</td>
<td>4%</td>
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<td>Cyprus</td>
<td>41%</td>
<td>4%</td>
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<tr>
<td>United Arab Emirates</td>
<td>60%</td>
<td>3%</td>
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<td>Romania</td>
<td>57%</td>
<td>3%</td>
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<tr>
<td>Thailand</td>
<td>50%</td>
<td>3%</td>
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<tr>
<td>Qatar</td>
<td>70%</td>
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<td>Chile</td>
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<td>Montenegro, Republic of</td>
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</tr>
<tr>
<td>Kazakhstan</td>
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<tr>
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</tr>
<tr>
<td>Tunisia</td>
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<td>1%</td>
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<tr>
<td>Brazil</td>
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<td>Mexico</td>
<td>55%</td>
<td>1%</td>
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<tr>
<td>Peru</td>
<td>75%</td>
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<tr>
<td>Costa Rica</td>
<td>60%</td>
<td>1%</td>
</tr>
<tr>
<td>Jordan</td>
<td>60%</td>
<td>1%</td>
</tr>
<tr>
<td>Colombia</td>
<td>74%</td>
<td>1%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>75%</td>
<td>1%</td>
</tr>
<tr>
<td>Argentina</td>
<td>66%</td>
<td>#1%</td>
</tr>
</tbody>
</table>

U.S. state education systems

- Massachusetts: 18% (19%)
- Connecticut: 21% (16%)
- Florida: 30% (6%)
Are the Top PISA Performers as Good as They Appear?

- Shanghai was top performer in all three main categories (math, science, reading)
- Shanghai’s population of migrant children is not fully represented in public schools and thus the PISA scores are not representative of the entire population
- Although the PISA assessment is conducted in multiple Chinese provinces, China only releases data from Shanghai and Hong Kong
Creative Problem Solving was only assessed in 2012.

The US ranked 18th out of 44 participating countries and educational systems. This was above the international average. Statistically, the US was in a tie for 11th among all participants and in a tie for 6th among OECD countries.
TICKETS

A train station has an automated ticketing machine. You use the touch screen on the right to buy a ticket. You must make three choices.

- Choose the train network you want (subway or country).
- Choose the type of fare (full or concession).
- Choose a daily ticket or a ticket for a specified number of trips. Daily tickets give you unlimited travel on the day of purchase. If you buy a ticket with a specified number of trips, you can use the trips on different days.

The BUY button appears when you have made these three choices. There is a CANCEL button that can be used at any time BEFORE you press the BUY button.

Question 1: TICKETS CP038Q02
Buy a full fare, country train ticket with two individual trips.
Once you have pressed BUY, you cannot return to the question.
Main Themes of NAEP (Math)

- At grades 4 and 8, there was dramatic improvement in students’ math skills between 1990 and 2007.
- If NCLB was going to positively impact student performance in math, we would have seen that by now. The lack of gain in math scores since 2007 suggest that the global recession halted gain in math but NCLB reforms were also a significant (negative) factor.
- At grade 12, there has been only minimal improvement since the first math NAEP in 1973. This lack of gain is not well understood but is due in part to the fact that more students who are weak in mathematics are completing high school and holding average scores down.
- Although there are black and Hispanic students who do very well in school and on NAEP, there are large gaps in achievement between white and black or Hispanic student populations. These gaps are similar in magnitude to gaps based on income as measured by eligibility for free or reduced price lunch. The extent to which the gaps are narrowing depends on which set of data are being used but even in the best case scenario it will be several decades before gaps based on race/ethnicity close completely.
Main Themes of TIMMS and PISA

- On TIMSS, which assesses knowledge of “school math,” the U.S. scores substantially above the international average at grade 4. At grade 8, the US scores a bit above the international average.

- On PISA, which assesses ability to apply math by 15 year olds, the U.S. is well below the OCED average for industrialized countries. On the PISA Creative Problem Solving Test, the U.S. is above the OECD average of mostly European countries but still substantially below the highest performing Asian countries.

- Taken together, TIMSS and PISA show that at the elementary level, the U.S. does fairly well. However, as students get older the U.S. loses ground, especially with respect to applying mathematics skills in real world settings.
A Note About Assessments

- It seems ironic that most current U.S. assessments are much closer in content and format to TIMSS (where U.S. students do reasonably well) than to PISA (where U.S. students do poorly). If we want our students to do well on PISA, then our state assessments should have more items of the type used on PISA.

- PARCC and Smarter Balanced Assessment claim to be constructing assessments of the Common Core that have substantial emphasis on problem solving and critical thinking. It is not clear whether the new assessments will achieve this goal, in part because it is very difficult to construct reliable assessments of problem solving and critical thinking.
Overarching Question 3

- How can I see how my students do in relation to students across my state, the U.S., or the world?
From the NAEP Website (http://www.nationsreportcard.gov/), click on Data Tools (top center)
Click on “try questions” under Questions Tool
Click on “Questions Tool”
Click on “Search NAEP Questions”, “Try NAEP Questions”, “Select a Preformatted Test”, or “Make a Customized Test”
Select “Search NAEP Questions” to Get Question Details

- Select subject, wait until grade level option appears
- Select grade level(s), wait for selection screen to appear
Select Options to restrict the items you will see, then click on “Get Count” or “Ok”. (ECR and Moderate or High Complexity Items have relatively high cognitive demand.)
Click on “Actions” and “Show Question” or double click on “Description” to see an item.
To see how well students did on an item, select “Performance Data”
To see state-level results for the item, click on “Table” and then “Report Options”.

**Table**

Percentages for mathematics, grade 8 by jurisdiction, year and Draw lines of symmetry (M1701E1): 2013
2013, National

- Incorrect: 35
- Partial 2: 2
- Partial 1: 7
- Correct: 52
- Omitted: 5
- Off task: 0

Percent

# Rounds to zero.

NOTE: Detail may not sum to totals because of rounding. Some apparent differences between estimates may not be statistically significant.

Now select “State” and select the state(s) you wish. Then click on “View Table”
Table showing National, National Public, California, and Indiana data.

<table>
<thead>
<tr>
<th></th>
<th>All students</th>
<th>Year</th>
<th>Jurisdiction</th>
<th>Incorrect</th>
<th>Partial 2</th>
<th>Partial 1</th>
<th>Correct</th>
<th>Omitted</th>
<th>Off task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All students</td>
<td>2013</td>
<td>National</td>
<td>272</td>
<td>35</td>
<td>266</td>
<td>2</td>
<td>279</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>National public</td>
<td>270</td>
<td>35</td>
<td>264</td>
<td>2</td>
<td>278</td>
<td>7</td>
<td>269</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>California</td>
<td>259</td>
<td>48</td>
<td>±</td>
<td>2</td>
<td>±</td>
<td>4</td>
<td>289</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Indiana</td>
<td>272</td>
<td>31</td>
<td>±</td>
<td>2</td>
<td>±</td>
<td>8</td>
<td>264</td>
<td>57</td>
</tr>
</tbody>
</table>

# Rounds to zero.
± Reporting standards not met.

NOTE: The NAEP Mathematics scale ranges from 0 to 500. Detail may not sum to totals because of rounding. Some apparent differences between estimates may not be statistically significant.

To make a “test” for your students, select items and click “Download” or “Publish Test Online”
Many of the analyses reported here were supported by the REESE Program of the National Science Foundation, grant no. 1008438. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.
Activities from NAEP Mathematics. Edited by D. Mohr, C. Walcott, & P. Kloosterman. (To be published by NCTM in late 2016 or early 2017.)

What mathematics do students know and how is that knowledge changing? Evidence from the National Assessment of Educational Progress. Edited by P. Kloosterman, D. Mohr, & C. Walcott (2016). Charlotte, NC: Information Age Publishing.


Web Resources

- **NAEP**
  - nationsreportcard.gov (overall)
  - nationsreportcard.gov/reading_math_2013/#/state-performance (by state)

- **TIMSS**
  - nces.ed.gov/surveys/timss/
  - timss.bc.edu
  - www.iea.nl/timss_2011.html

- **PISA**
  - nces.ed.gov/Surveys/PISA
  - www.oecd.org/pisa/

- **Indiana University Research on NAEP**
  - ceep.indiana.edu/ImplicationsFromNAEP