Chapter 1

International Student Achievement in Mathematics

What Are the Overall Differences in Mathematics Achievement?

Chapter 1 summarizes achievement on the TIMSS mathematics test for each of the participating countries. Comparisons are provided overall and by gender for the upper grade tested (often the eighth grade) and the lower grade tested (often the seventh grade), as well as for 13-year-olds.

Table 1.1 presents the mean (or average) achievement for 41 countries at the eighth grade.[1] The 25 countries shown by decreasing order of mean achievement in the upper part of the table were judged to have met the TIMSS requirements for testing a representative sample of students. Although all countries tried very hard to meet the TIMSS sampling requirements, several encountered resistance from schools and teachers and did not have participation rates of 85% or higher as specified in the TIMSS guidelines (i.e., Australia, Austria, Belgium (French), Bulgaria, the Netherlands, and Scotland). To provide a better curricular match, four countries (i.e., Colombia, Germany, Romania, and Slovenia) elected to test their seventh- and eighth-grade students even though that meant not testing the two grades with the most 13-year-olds and led to their students being somewhat older than those in the other countries. The countries in the remaining two categories encountered various degrees of difficulty in implementing the prescribed methods for sampling classrooms within schools. Because the Philippines did not document clearly its procedures for sampling schools, its achievement results are presented in Appendix C. A full discussion of the sampling procedures and outcomes for each country can be found in Appendix A.

To aid in interpretation, the table also contains the years of formal schooling and average age of the students. Equivalence of chronological age does not necessarily mean that students have received the same number of years of formal schooling or studied the same curriculum. Most notably, students in the three Scandinavian countries, Sweden, Norway, and Denmark, had fewer years of formal schooling than their counterparts in other countries,[2] and those in England, Scotland, New Zealand, and Kuwait had more. Countries with a high percentage of older students may have policies that include retaining students in lower grades.

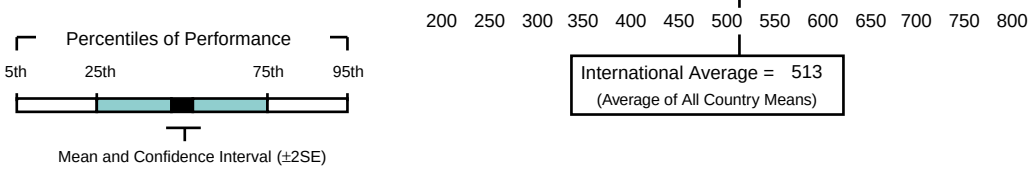
[1] TIMSS used item response theory (IRT) methods to summarize the achievement results for both grades on a scale with a mean of 500 and a standard deviation of 100. Scaling averages students' responses to the subsets of items they took in a way that accounts for differences in the difficulty of those items. It allows students' performance to be summarized on a common metric even though individual students responded to different items in the mathematics test. For more detailed information, see the "IRT Scaling and Data Analysis" section of Appendix A.

[2] Achievement results for the eighth-grade students in Denmark and Sweden, as well as for the eighth-grade students in German-speaking schools in Switzerland are presented in Appendix D.

Table 1.1

Distributions of Mathematics Achievement - Upper Grade (Eighth Grade*)

Country	Mean	Years of Formal Schooling	Average Age	Mathematics Achievement Scale Score
Singapore	643 (4.9)	8	14.5	
Korea	607 (2.4)	8	14.2	
Japan	605 (1.9)	8	14.4	
Hong Kong	588 (6.5)	8	14.2	
† Belgium (Fl)	565 (5.7)	8	14.1	
Czech Republic	564 (4.9)	8	14.4	
Slovak Republic	547 (3.3)	8	14.3	
1 Switzerland	545 (2.8)	7 or 8	14.2	
France	538 (2.9)	8	14.3	
Hungary	537 (3.2)	8	14.3	
Russian Federation	535 (5.3)	7 or 8	14.0	
Ireland	527 (5.1)	8	14.4	
Canada	527 (2.4)	8	14.1	
Sweden	519 (3.0)	7	13.9	
New Zealand	508 (4.5)	8.5 - 9.5	14.0	
†2 England	506 (2.6)	9	14.0	
Norway	503 (2.2)	7	13.9	
† United States	500 (4.6)	8	14.2	
1 Latvia (LSS)	493 (3.1)	8	14.3	
Spain	487 (2.0)	8	14.3	
Iceland	487 (4.5)	8	13.6	
1 Lithuania	477 (3.5)	8	14.3	
Cyprus	474 (1.9)	8	13.7	
Portugal	454 (2.5)	8	14.5	
Iran, Islamic Rep.	428 (2.2)	8	14.6	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):				
Australia	530 (4.0)	8 or 9	14.2	
Austria	539 (3.0)	8	14.3	
Belgium (Fr)	526 (3.4)	8	14.3	
Bulgaria	540 (6.3)	8	14.0	
Netherlands	541 (6.7)	8	14.3	
Scotland	498 (5.5)	9	13.7	
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):				
Colombia	385 (3.4)	8	15.7	
†1 Germany	509 (4.5)	8	14.8	
Romania	482 (4.0)	8	14.6	
Slovenia	541 (3.1)	8	14.8	
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):				
Denmark	502 (2.8)	7	13.9	
Greece	484 (3.1)	8	13.6	
Thailand	522 (5.7)	8	14.3	
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):				
1 Israel	522 (6.2)	8	14.1	
Kuwait	392 (2.5)	9	15.3	
South Africa	354 (4.4)	8	15.4	



*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 1.1

Multiple Comparisons of Mathematics Achievement - Upper Grade (Eighth Grade*)

Instructions: Read ***across*** the row for a country to compare performance with the countries listed in the heading of the chart. The symbols indicate whether the mean achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the two countries. †

Country	Singapore	Korea	Japan	Hong Kong	Belgium (Fl)	Czech Republic	Slovak Republic	Switzerland	Netherlands	Slovenia	Bulgaria	Austria	France	Hungary	Russian Fed.	Australia	Ireland	Canada	Belgium (Fr)	Thailand	Israel	Sweden	Germany	New Zealand	England	Norway	Denmark	United States	Scotland	Latvia (LSS)	Spain	Iceland	Greece	Romania	Lithuania	Cyprus	Portugal	Iran, Islamic Rep.	Kuwait	Colombia	South Africa
Singapore		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	▼		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	▼	●		●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong	▼	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fl)	▼	▼	▼	●		●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	▼	▼	▼	●	●		●	▲	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	●	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Switzerland	▼	▼	▼	▼	●	▼	●		●	●	●	●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	▼	▼	▼	▼	▼	▼	●	●	●		●	●	●	●	●	●	●	▲	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Fed.	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ireland	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fr)	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Thailand	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Israel	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	▼	▼	▼	●	●	●	●	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	▼	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	▼	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Denmark	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	▼	●	●	●	●		●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	▼	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	▼	●	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Latvia (LSS)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	▲	▲	▲	▲	▲	▲	▲
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	▲	▲	▲	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	▼		▲	▲	▲	▲	▲	▲
Portugal	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲
Iran, Islamic Rep.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		●	▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲
South Africa	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Countries are ordered by mean achievement across the heading and down the rows.

▲ Mean achievement significantly higher than comparison country

● No statistically significant difference from comparison country

▼ Mean achievement significantly lower than comparison country

*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.

†Statistically significant at .05 level, adjusted for multiple comparisons.

Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A for details).

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

The results reveal substantial differences in average mathematics achievement between the top- and bottom-performing countries, although most countries had achievement somewhere in the middle ranges. To illustrate the broad range of achievement both across and within countries, Table 1.1 also provides a visual representation of the distribution of student performance within each country. Achievement for each country is shown for the 25th and 75th percentiles as well as for the 5th and 95th percentiles.[3] Each percentile point indicates the percentages of students performing below and above that point on the scale. For example, 25% of the eighth-grade students in each country performed below the 25th percentile for that country, and 75% performed above the 25th percentile.

The range between the 25th and 75th percentiles represents performance by the middle half of the students. In contrast, performance at the 5th and 95th percentiles represents the extremes in both lower and higher achievement. The dark boxes at the midpoints of the distributions show the 95% confidence intervals around the average achievement in each country.[4] These intervals can be compared to the international average of 513, which was derived by averaging across the means for each of the 41 participants shown on the table.[5] A number of countries had mean achievement well above the international average of 513, and others had mean achievement well below that level.

Comparisons also can be made across the means and percentiles. For example, average performance in Singapore was comparable to or even exceeded performance at the 95th percentile in the lower-performing countries such as Portugal, Iran, Kuwait, Colombia, and South Africa. Also, the differences between the extremes in performance were very large within most countries.

Figure 1.1 provides a method for making appropriate comparisons in overall mean achievement between countries.[6] This figure shows whether or not the differences in mean achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, a triangle pointing up indicates significantly higher performance than the country listed across the top, a dot indicates no significant difference in performance, and a triangle pointing down indicates significantly lower performance.

At the eighth grade, Singapore, with all triangles pointing up, had significantly higher mean achievement than other participating countries. Korea, Japan, and Hong Kong also performed very well. Korea and Japan performed similarly to each other and better than all of the other participating countries except Singapore. Besides showing no significant difference from Korea and Japan, Hong Kong also performed about the same as Flemish-speaking Belgium and the Czech Republic. Interestingly, from the top-performing countries on down through the list of participants, the differences in

[3] Tables of the percentile values and standard deviations for all countries are presented in Appendix E.

[4] See the "IRT Scaling and Data Analysis" section of Appendix A for more details about calculating standard errors and confidence intervals for the TIMSS statistics.

[5] Because the Flemish and French educational systems in Belgium participated separately, their results are presented separately in the tables in this report.

[6] The significance tests in Figures 1.1 and 1.2 are based on a Bonferroni procedure for multiple comparisons that holds to 5% the probability of erroneously declaring the mean of one country to be different from another country.

performance from one country to the next were often negligible. For example, in addition to performing similarly to each other and Hong Kong, Belgium-Flemish and the Czech Republic also performed similarly to the Slovak Republic, the Netherlands, and Bulgaria. In turn, the Slovak Republic also performed similarly to Switzerland, Slovenia, Austria, France, Hungary, and the Russian Federation.

Despite the small differences from one country to the next, however, spanning across all the participating TIMSS countries, the performance differences from the top-performing to the bottom-performing countries was very large. Because of this large range in performance, the pattern for a number of countries was one of having lower mean achievement than some countries, about the same mean achievement as some countries, and higher mean achievement than other countries. In contrast, Kuwait and Colombia, which performed similarly to each other, had significantly lower means than all other countries except South Africa.

Table 1.2 and Figure 1.2 present corresponding data for the seventh grade.[7] The cluster of the four highest performing countries is the same as at the eighth grade. Seventh-grade students in Singapore had significantly higher mean achievement than other participating countries, with Korea, Japan, and Hong Kong also performing very well and similarly to each other. For the remaining countries, performance rankings tended to be similar, but not identical, to those found at the eighth grade. For example, at the seventh grade, Flemish-speaking Belgium had higher achievement than the Czech Republic. Flemish-speaking Belgium performed as well as Hong Kong but not as well as Korea and Japan. The Czech Republic, the Netherlands, Bulgaria, Austria, the Slovak Republic, and French-speaking Belgium all performed at about the same level.

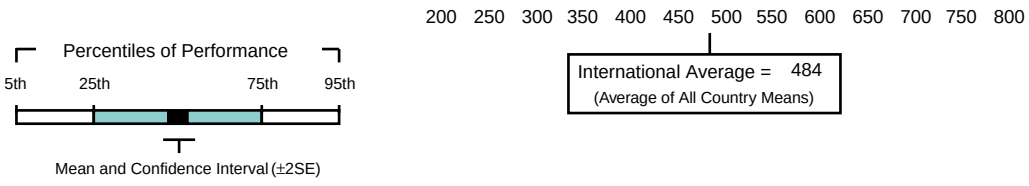
It can be noted that the international average at the eighth grade (513) was nearly 30 points higher than the international average of 484 shown at the seventh grade. Even though equivalent achievement increases cannot be assumed from grade to grade throughout schooling, this 30-point difference does provide a rough indication of grade-by-grade increases in mathematics achievement during the middle school years. By this gauge, the achievement differences across countries at both grades reflect several grade levels in learning between the higher- and lower-performing countries. A similarly large range in performance can be noted within most countries. There needs to be a further note of caution, however, in using growth from grade to grade as an indicator of achievement. The TIMSS scale measures achievement in mathematics judged to be appropriate for seventh- and eighth-grade students around the world. Thus, higher performance does not mean students can do advanced secondary-school mathematics, only that they are more proficient at middle-school mathematics.

[7] Results are presented for 27 countries in the top portion of Table 1.2 because French-speaking Belgium and Scotland met the sampling requirements at this grade. Thirty-nine countries are presented in total because Kuwait and Israel tested only the eighth grade.

Table 1.2

Distributions of Mathematics Achievement - Lower Grade (Seventh Grade*)

Country	Mean	Years of Formal Schooling	Average Age	Mathematics Achievement Scale Score
Singapore	601 (6.3)	7	13.3	
Korea	577 (2.5)	7	13.2	
Japan	571 (1.9)	7	13.4	
Hong Kong	564 (7.8)	7	13.2	
† Belgium (Fl)	558 (3.5)	7	13.0	
Czech Republic	523 (4.9)	7	13.4	
Slovak Republic	508 (3.4)	7	13.3	
† Belgium (Fr)	507 (3.5)	7	13.2	
1 Switzerland	506 (2.3)	6 or 7	13.1	
Hungary	502 (3.7)	7	13.4	
Russian Federation	501 (4.0)	6 or 7	13.0	
Ireland	500 (4.1)	7	13.4	
Canada	494 (2.2)	7	13.1	
France	492 (3.1)	7	13.3	
Sweden	477 (2.5)	6	12.9	
†2 England	476 (3.7)	8	13.1	
† United States	476 (5.5)	7	13.2	
New Zealand	472 (3.8)	7.5 - 8.5	13.0	
† Scotland	463 (3.7)	8	12.7	
1 Latvia (LSS)	462 (2.8)	7	13.3	
Norway	461 (2.8)	6	12.9	
Iceland	459 (2.6)	7	12.6	
Spain	448 (2.2)	7	13.2	
Cyprus	446 (1.9)	7	12.8	
1 Lithuania	428 (3.2)	7	13.4	
Portugal	423 (2.2)	7	13.4	
Iran, Islamic Rep.	401 (2.0)	7	13.6	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):				
Australia	498 (3.8)	7 or 8	13.2	
Austria	509 (3.0)	7	13.3	
Bulgaria	514 (7.5)	7	13.1	
Netherlands	516 (4.1)	7	13.2	
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):				
Colombia	369 (2.7)	7	14.5	
†1 Germany	484 (4.1)	7	13.8	
Romania	454 (3.4)	7	13.7	
Slovenia	498 (3.0)	7	13.8	
Countries With Unapproved Sampling Procedures At The Classroom Level (See Appendix A for Details):				
Denmark	465 (2.1)	6	12.9	
Greece	440 (2.8)	7	12.6	
† South Africa	348 (3.8)	7	13.9	
Thailand	495 (4.8)	7	13.5	



*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 1.2

Multiple Comparisons of Mathematics Achievement - Lower Grade (Seventh Grade*)

Instructions: Read ***across*** the row for a country to compare performance with the countries listed in the heading of the chart. The symbols indicate whether the mean achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the two countries.†

Country	Singapore	Korea	Japan	Hong Kong	Belgium (Fl)	Czech Republic	Netherlands	Bulgaria	Austria	Slovak Republic	Belgium (Fr)	Switzerland	Hungary	Russian Fed.	Ireland	Slovenia	Australia	Thailand	Canada	France	Germany	Sweden	England	United States	New Zealand	Denmark	Scotland	Latvia (LSS)	Norway	Iceland	Romania	Spain	Cyprus	Greece	Lithuania	Portugal	Iran, Islamic Rep.	Colombia	South Africa
Singapore		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	▼		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	▼	●		●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong	▼	●	●		●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fl)	▼	▼	▼	●		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	▼	▼	▼	▼	▼		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼	▼	▼	▼	▼	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	▼	▼	▼	▼	▼	●	●		●	●	●	●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	▼	▼	▼	▼	▼	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fr)	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Switzerland	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Fed.	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ireland	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Thailand	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	▼	●	●	●	●	●	●		●	●	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	▼	●	●	●	●	●	●	●		●	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲
Denmark	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲
Latvia (LSS)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	▲	▲	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	▲	▲	▲	▲	▲
Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼		●	●	▲	▲	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●		●	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	▲	▲	▲	▲
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	▲	▲	▲
Portugal	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●		▲	▲	▲
Iran, Islamic Rep.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲
South Africa	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Countries are ordered by mean achievement across the heading and down the rows.

▲ Mean achievement significantly higher than comparison country

● No statistically significant difference from comparison country

▼ Mean achievement significantly lower than comparison country

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.

†Statistically significant at .05 level, adjusted for multiple comparisons.

Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A for details).

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Increases in Achievement Between the Lower and Upper Grades?

Table 1.3 shows the increases in mean achievement between the two grades tested in each TIMSS country. Countries in the upper portion of the table are shown in decreasing order by the amount of this difference. Increases in mean performance between the two grades ranged from a high of 49 points in Lithuania to a low of 8 points in the Flemish-speaking part of Belgium[8] and 7 points in South Africa.[9] This degree of increase can be compared to the difference of nearly 30 points between the international average of 513 at eighth grade and that of 484 at seventh grade. Despite the larger increases in some countries compared to others, there is no obvious relationship between mean seventh-grade performance and the difference between that and mean eighth-grade performance. That is, countries showing the highest performance at the seventh grade did not necessarily show either the largest or smallest increases in achievement at the eighth grade. Still, in general, countries with high mean performance in the seventh grade also had high mean performance in the eighth grade.

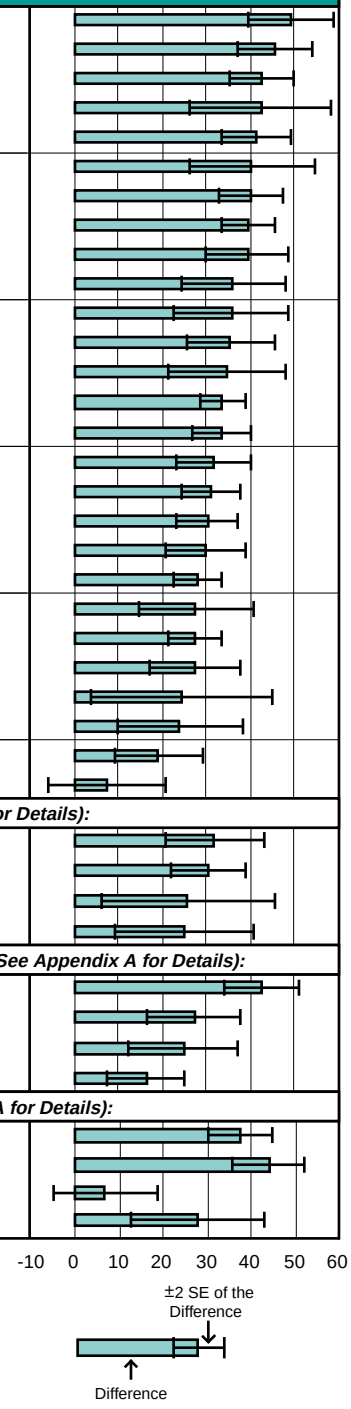
[8] Both the Flemish and French educational systems in Belgium have policies whereby lower-performing sixth-grade students continue their study of the primary school curriculum and then re-enter the system as part of a vocational track in the eighth grade. Since these lower-performing students are not included in the seventh-grade results, but do compose about 10% of the sample at the eighth grade, this contributed to reduced performance differences between the seventh and eighth grades.

[9] In South Africa, there is no structural reason to explain the relatively small difference between seventh- and eighth-grade performance. However, in 1995, its education system was undergoing radical reorganization from 18 racially-divided systems into 9 provincial systems.

Table 1.3

Achievement Differences in Mathematics Between Lower and Upper Grades (Seventh and Eighth Grades*)

Country	Seventh Grade Mean	Eighth Grade Mean	Eighth-Seventh Difference
[1] Lithuania	428 (3.2)	477 (3.5)	49 (4.7)
France	492 (3.1)	538 (2.9)	46 (4.3)
Norway	461 (2.8)	503 (2.2)	43 (3.6)
Singapore	601 (6.3)	643 (4.9)	42 (8.0)
Sweden	477 (2.5)	519 (3.0)	41 (3.9)
Czech Republic	523 (4.9)	564 (4.9)	40 (7.0)
[1] Switzerland	506 (2.3)	545 (2.8)	40 (3.6)
Spain	448 (2.2)	487 (2.0)	39 (3.0)
Slovak Republic	508 (3.4)	547 (3.3)	39 (4.7)
New Zealand	472 (3.8)	508 (4.5)	36 (5.9)
† Scotland	463 (3.7)	498 (5.5)	36 (6.6)
Hungary	502 (3.7)	537 (3.2)	35 (4.9)
Russian Federation	501 (4.0)	535 (5.3)	35 (6.6)
Japan	571 (1.9)	605 (1.9)	34 (2.7)
Canada	494 (2.2)	527 (2.4)	33 (3.3)
[1] Latvia (LSS)	462 (2.8)	493 (3.1)	32 (4.2)
Portugal	423 (2.2)	454 (2.5)	31 (3.3)
Korea	577 (2.5)	607 (2.4)	30 (3.5)
†[2] England	476 (3.7)	506 (2.6)	30 (4.5)
Cyprus	446 (1.9)	474 (1.9)	28 (2.7)
Ireland	500 (4.1)	527 (5.1)	28 (6.6)
Iran, Islamic Rep.	401 (2.0)	428 (2.2)	27 (2.9)
Iceland	459 (2.6)	487 (4.5)	27 (5.2)
Hong Kong	564 (7.8)	588 (6.5)	24 (10.2)
† United States	476 (5.5)	500 (4.6)	24 (7.2)
† Belgium (Fr)	507 (3.5)	526 (3.4)	19 (4.9)
† Belgium (Fl)	558 (3.5)	565 (5.7)	8 (6.7)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	498 (3.8)	530 (4.0)	32 (5.5)
Austria	509 (3.0)	539 (3.0)	30 (4.3)
Bulgaria	514 (7.5)	540 (6.3)	26 (9.8)
Netherlands	516 (4.1)	541 (6.7)	25 (7.8)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Slovenia	498 (3.0)	541 (3.1)	43 (4.3)
Romania	454 (3.4)	482 (4.0)	27 (5.3)
†[1] Germany	484 (4.1)	509 (4.5)	25 (6.1)
Colombia	369 (2.7)	385 (3.4)	16 (4.4)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	465 (2.1)	502 (2.8)	37 (3.5)
Greece	440 (2.8)	484 (3.1)	44 (4.2)
South Africa	348 (3.8)	354 (4.4)	7 (5.9)
Thailand	495 (4.8)	522 (5.7)	28 (7.5)



*Seventh and eighth grades in most countries; see Table 2 for infomation about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Differences in Performance Compared to Three Marker Levels of International Mathematics Achievement?

Tables 1.4 and 1.5 portray performance in terms of international levels of achievement for the eighth and seventh grades, respectively. Since the TIMSS achievement tests do not have any pre-specified performance standards, three marker levels were chosen on the basis of the combined performance of all students at a grade level in the study — the Top 10%, the Top Quarter (25%), and the Top Half (50%). For example, Table 1.4 shows that 10% of all eighth graders in countries participating in the TIMSS study achieved at the level of 656 or better. This score point, then, was designated as the marker level for the Top 10%. Similarly, the Top Quarter marker level was determined as 587 and the Top Half marker level as 509. At the seventh grade, the three marker levels are: Top 10% – 619, Top Quarter – 551, and Top Half – 476.

If every country had the same distribution of high-, medium-, and low-performing students, then each country would be expected to have approximately 10% of its students reaching the Top 10% level, 25% reaching the Top Quarter level, and 50% reaching the Top Half level. Although no country achieved exactly this pattern at either grade tested, the data in Tables 1.4 and 1.5 indicate that in both grades Ireland came close to the international norm from the perspective of relative percentages of high-performing students. In contrast, at both grades close to half the students in Singapore (45% at the eighth grade and 44% at the seventh grade) reached the Top 10% level, about three-fourths (74% and 70%) reached the Top Quarter level, and more than 90% performed at or above the Top Half level (94% and 91%).

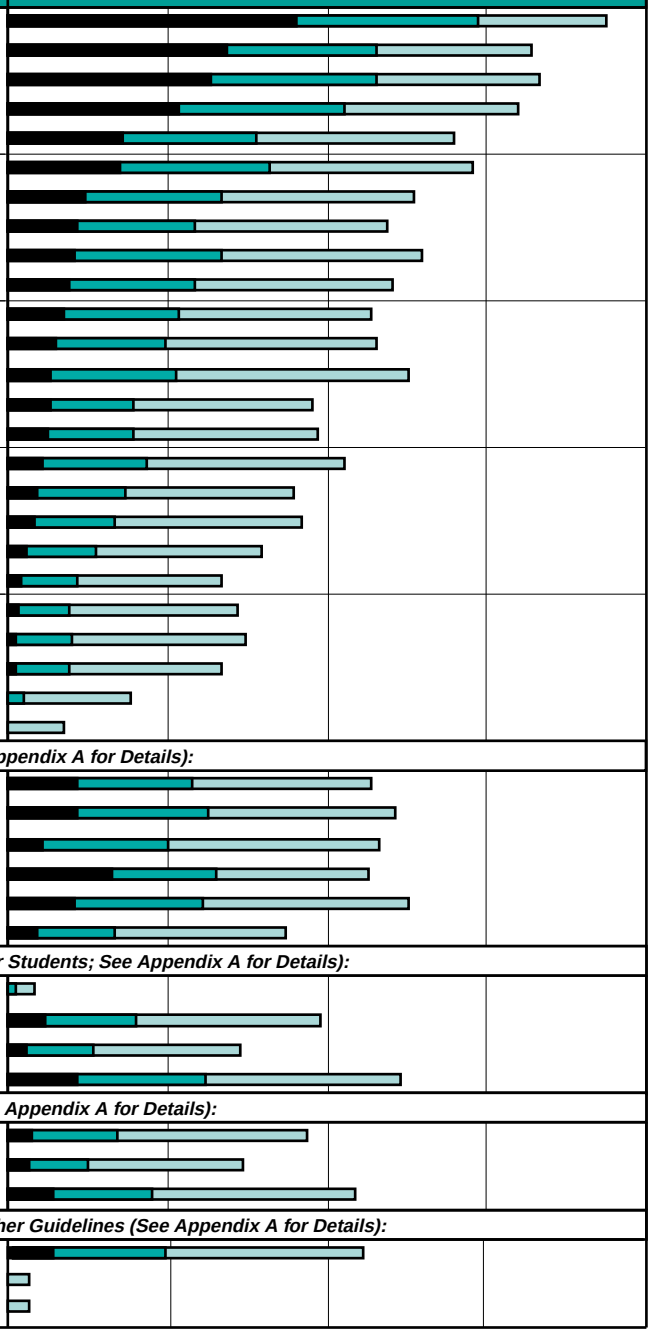
It can be informative to look at performance at each marker level. For example, the results in Table 1.4 show that students in New Zealand did not quite attain the Top 10% or Top Quarter levels for the eighth grade, with 6% and 20% of the students reaching those levels, respectively. However, performance approximated the marker level for the Top Half (48%). Achievement in England was nearly identical to that of New Zealand in this regard. In France, achievement fell somewhat short at the Top 10% level (7%), approximated the Top Quarter level (26%), and exceeded the Top Half level (63%).

Table 1.4

Percentages of Students Achieving International Marker Levels in Mathematics Upper Grade (Eighth Grade*)

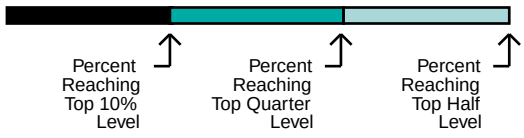
Country	Top 10% Level	Top Quarter Level	Top Half Level
Singapore	45 (2.5)	74 (2.1)	94 (0.8)
Korea	34 (1.1)	58 (1.0)	82 (0.8)
Japan	32 (0.8)	58 (0.9)	83 (0.6)
Hong Kong	27 (2.1)	53 (2.6)	80 (2.4)
Czech Republic	18 (1.9)	39 (2.3)	70 (1.9)
† Belgium (Fl)	17 (1.2)	41 (2.3)	73 (2.9)
Slovak Republic	12 (1.0)	33 (1.5)	64 (1.6)
Hungary	11 (0.8)	29 (1.3)	60 (1.6)
1 Switzerland	11 (0.7)	33 (1.2)	65 (1.4)
Russian Federation	10 (0.7)	29 (2.4)	60 (2.6)
Ireland	9 (1.0)	27 (1.9)	57 (2.4)
Canada	7 (0.7)	25 (1.1)	58 (1.2)
France	7 (0.8)	26 (1.5)	63 (1.5)
†2 England	7 (0.6)	20 (1.1)	48 (1.4)
New Zealand	6 (0.8)	20 (1.6)	48 (2.2)
Sweden	5 (0.5)	22 (1.2)	53 (1.5)
† United States	5 (0.6)	18 (1.5)	45 (2.3)
Norway	4 (0.4)	17 (0.9)	46 (1.2)
1 Latvia (LSS)	3 (0.5)	14 (1.2)	40 (1.5)
Cyprus	2 (0.3)	11 (0.6)	34 (1.1)
Spain	2 (0.2)	10 (0.7)	36 (1.2)
Iceland	1 (0.3)	10 (1.3)	37 (2.9)
1 Lithuania	1 (0.3)	10 (1.0)	34 (1.8)
Portugal	0 (0.1)	2 (0.4)	19 (1.3)
Iran, Islamic Rep.	0 (0.0)	0 (0.2)	9 (0.8)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	11 (0.9)	29 (1.5)	57 (1.7)
Austria	11 (0.7)	31 (1.3)	61 (1.4)
Belgium (Fr)	6 (0.6)	25 (1.5)	58 (1.7)
Bulgaria	16 (1.9)	33 (2.7)	57 (2.7)
Netherlands	10 (1.6)	30 (2.7)	63 (3.2)
Scotland	5 (0.9)	17 (2.1)	44 (2.7)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	0 (0.0)	1 (0.3)	4 (0.8)
†1 Germany	6 (0.7)	20 (1.7)	49 (2.3)
Romania	3 (0.4)	13 (1.1)	36 (2.0)
Slovenia	11 (0.7)	31 (1.4)	61 (1.5)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	4 (0.5)	17 (1.0)	47 (1.6)
Greece	3 (0.4)	13 (0.8)	37 (1.5)
Thailand	7 (1.2)	23 (2.6)	54 (2.7)
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):			
1 Israel	6 (0.9)	24 (2.5)	56 (2.6)
Kuwait	0 (0.0)	0 (0.1)	3 (0.5)
South Africa	0 (0.0)	0 (0.0)	2 (0.9)

Percent Reaching International Levels



The international levels correspond to the percentiles computed from the combined data from all of the participating countries.

Top 10% Level (90th Percentile) = 656
Top Quarter Level (75th Percentile) = 587
Top Half Level (50th Percentile) = 509



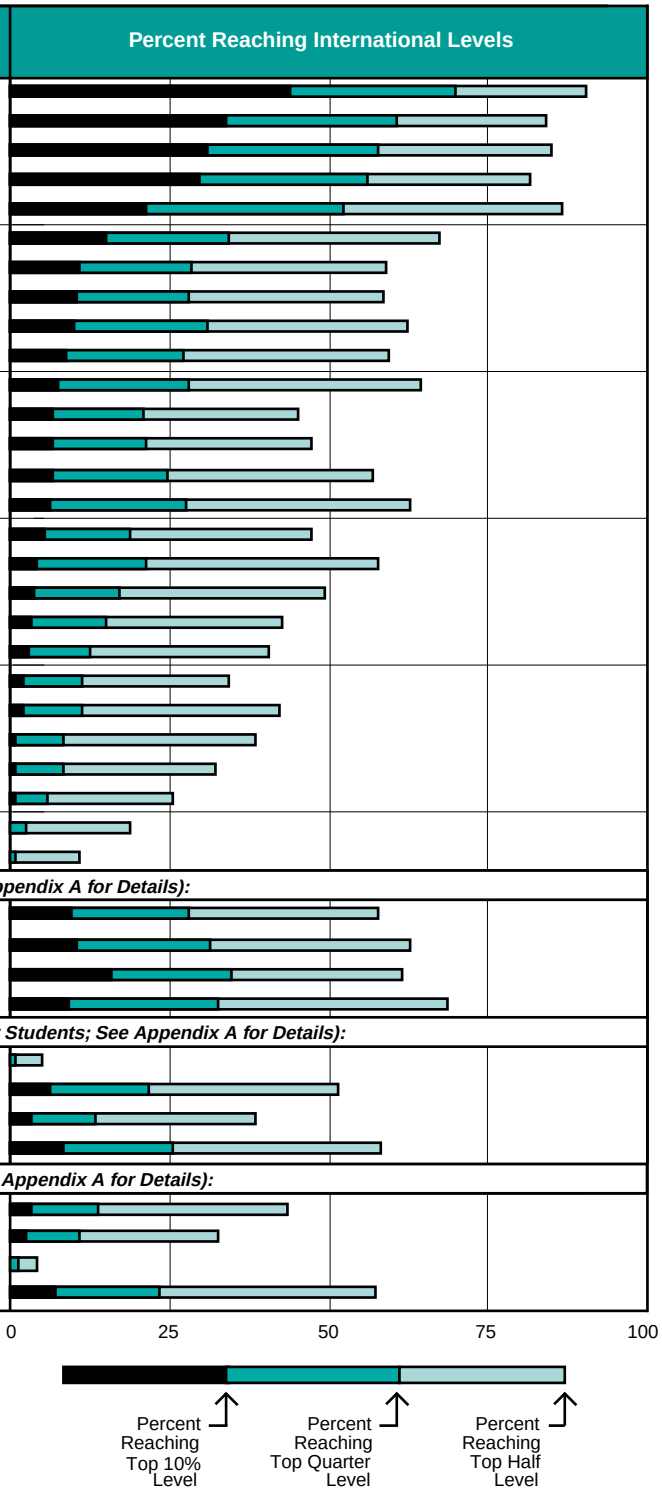
*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 1.5

Percentages of Students Achieving International Marker Levels in Mathematics Lower Grade (Seventh Grade*)

Country	Top 10% Level	Top Quarter Level	Top Half Level	Percent Reaching International Levels
Singapore	44 (3.0)	70 (2.7)	91 (1.4)	
Korea	34 (1.1)	61 (1.1)	84 (0.7)	
Japan	31 (1.0)	58 (0.9)	85 (0.6)	
Hong Kong	30 (2.5)	56 (3.3)	81 (2.8)	
† Belgium (Fl)	22 (1.8)	52 (2.0)	86 (1.2)	
Czech Republic	15 (1.8)	34 (2.4)	67 (1.9)	
Hungary	11 (1.1)	29 (1.5)	59 (1.8)	
Russian Federation	11 (1.1)	28 (1.6)	59 (1.8)	
Slovak Republic	10 (1.0)	31 (1.4)	62 (1.7)	
Ireland	9 (0.9)	27 (1.7)	60 (2.2)	
† Belgium (Fr)	7 (0.9)	28 (1.5)	64 (2.0)	
† United States	7 (1.2)	21 (2.3)	45 (2.7)	
†2 England	7 (0.9)	21 (1.4)	47 (1.7)	
Canada	7 (0.5)	25 (1.0)	57 (1.4)	
1 Switzerland	6 (0.5)	28 (0.9)	63 (1.3)	
New Zealand	5 (0.6)	19 (1.4)	47 (2.0)	
France	4 (0.4)	21 (1.3)	58 (1.9)	
Sweden	4 (0.4)	17 (0.9)	50 (1.5)	
† Scotland	4 (0.5)	15 (1.4)	43 (2.1)	
1 Latvia (LSS)	3 (0.4)	12 (0.9)	41 (1.6)	
Cyprus	2 (0.3)	11 (0.6)	35 (1.1)	
Norway	2 (0.3)	11 (1.0)	42 (1.4)	
Iceland	1 (0.3)	8 (0.9)	38 (1.9)	
Spain	1 (0.2)	8 (0.7)	32 (1.2)	
1 Lithuania	1 (0.2)	6 (0.7)	26 (1.6)	
Portugal	0 (0.1)	3 (0.4)	19 (1.3)	
Iran, Islamic Rep.	0 (0.0)	1 (0.2)	11 (0.9)	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):				
Australia	10 (1.0)	28 (1.6)	58 (1.7)	
Austria	10 (0.7)	31 (1.4)	63 (1.6)	
Bulgaria	16 (2.2)	35 (3.1)	62 (2.8)	
Netherlands	9 (1.3)	33 (2.4)	69 (2.2)	
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):				
Colombia	0 (0.0)	1 (0.2)	5 (0.9)	
†1 Germany	6 (0.8)	22 (1.8)	52 (2.0)	
Romania	3 (0.4)	14 (1.0)	39 (1.7)	
Slovenia	8 (0.7)	25 (1.4)	58 (1.6)	
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):				
Denmark	3 (0.4)	14 (0.9)	44 (1.5)	
Greece	2 (0.3)	11 (0.9)	32 (1.3)	
† South Africa	0 (0.0)	1 (0.6)	4 (1.1)	
Thailand	7 (1.2)	23 (2.3)	57 (2.5)	



The international levels correspond to the percentiles computed from the combined data from all of the participating countries.

Top 10% Level (90th Percentile) = 619
Top Quarter Level (75th Percentile) = 551
Top Half Level (50th Percentile) = 476

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Gender Differences in Mathematics Achievement?

Tables 1.6 and 1.7, showing the differences in achievement by gender, reveal that, in most countries, girls and boys had approximately the same average mathematics achievement as each other at both grades. However, the differences in achievement that did exist in some countries tended to favor boys rather than girls.

Each of the two tables, the first one for the eighth grade and the second for the seventh grade, presents mean mathematics achievement separately for boys and girls for each country, as well as the difference between the means. The visual representation of the gender difference for each country, shown by a bar, indicates the amount of the difference, whether the direction of the difference favors girls or boys, and whether or not the difference is statistically significant (indicated by a darkened bar). Regardless of their directions, about three-fourths of the differences were not statistically significant, indicating that, for most countries, gender differences in mathematics achievement generally are small or negligible in the middle years of schooling. That is, nearly three-quarters of the differences favoring boys at the eighth grade and more than three-quarters at the seventh grade were not statistically significant. Also, girls had higher mean achievement than boys in nine countries (across both grades), even though those results were not statistically significant either.

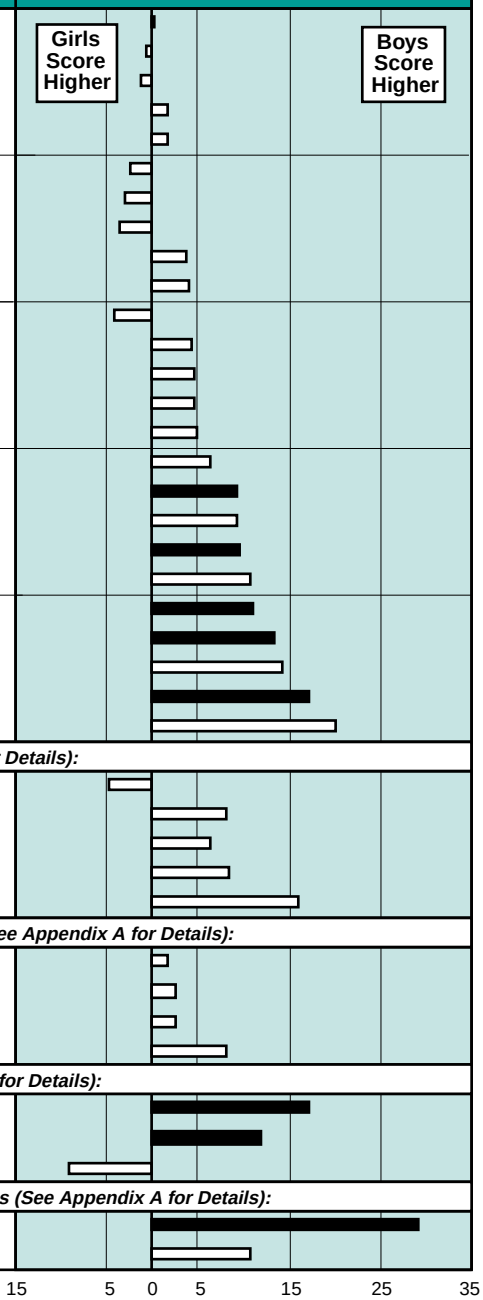
From another perspective, however, all the statistically significant differences favored boys rather than girls. At both grades, boys had significantly higher mathematics achievement than girls in Japan, Iran, and Korea. Further, boys outperformed girls at the eighth grade in Spain, Portugal, Denmark, Greece, and Israel, and at the seventh grade in Belgium (French), Switzerland, and England. Also, including those differences that were not statistically significant, the direction at both grades favored boys much more often than girls. A sign test across countries indicates that internationally there is a significant difference in achievement by gender favoring males. The gender differences in mathematics, however, were much less pronounced than those in science. The TIMSS science results for seventh and eighth grades show significant gender differences favoring males to be pervasive across most countries.[10]

[10] Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1996). *Science Achievement in the Middle School Years: The IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College.

Table 1.6

Gender Differences in Mathematics Achievement - Upper Grade (Eighth Grade*)

Country	Boys' Mean	Girls' Mean	Difference Absolute Value	Gender Difference
Hungary	537 (3.6)	537 (3.6)	0 (5.1)	
[1] Lithuania	477 (4.0)	478 (4.1)	1 (5.7)	
Russian Federation	535 (6.3)	536 (5.0)	1 (8.0)	
Iceland	488 (5.5)	486 (5.6)	2 (7.8)	
Sweden	520 (3.6)	518 (3.1)	2 (4.7)	
Singapore	642 (6.3)	645 (5.4)	2 (8.3)	
Cyprus	472 (2.8)	475 (2.5)	3 (3.7)	
Canada	526 (3.2)	530 (2.7)	4 (4.2)	
Slovak Republic	549 (3.7)	545 (3.6)	4 (5.2)	
Norway	505 (2.8)	501 (2.7)	4 (3.9)	
† Belgium (Fl)	563 (8.8)	567 (7.4)	4 (11.5)	
†[2] England	508 (5.1)	504 (3.5)	4 (6.2)	
[1] Latvia (LSS)	496 (3.8)	491 (3.5)	4 (5.2)	
† United States	502 (5.2)	497 (4.5)	5 (6.9)	
[1] Switzerland	548 (3.5)	543 (3.1)	5 (4.7)	
France	542 (3.1)	536 (3.8)	6 (4.9)	
Japan	609 (2.6)	600 (2.1)	9 (3.3)	
New Zealand	512 (5.9)	503 (5.3)	9 (7.9)	
Spain	492 (2.5)	483 (2.6)	10 (3.6)	
Czech Republic	569 (4.5)	558 (6.3)	11 (7.7)	
Portugal	460 (2.8)	449 (2.7)	11 (3.9)	
Iran, Islamic Rep.	434 (2.9)	421 (3.3)	13 (4.4)	
Ireland	535 (7.2)	520 (6.0)	14 (9.3)	
Korea	615 (3.2)	598 (3.4)	17 (4.7)	
Hong Kong	597 (7.7)	577 (7.7)	20 (10.9)	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):				
Australia	527 (5.1)	532 (4.6)	5 (6.9)	
Austria	544 (3.2)	536 (4.5)	8 (5.6)	
Belgium (Fr)	530 (4.7)	524 (3.7)	6 (6.0)	
Netherlands	545 (7.8)	536 (6.4)	8 (10.1)	
Scotland	506 (6.6)	490 (5.2)	16 (8.4)	
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):				
Colombia	386 (6.9)	384 (3.6)	2 (7.7)	
†[1] Germany	512 (5.1)	509 (5.0)	3 (7.1)	
Romania	483 (4.8)	480 (4.0)	3 (6.2)	
Slovenia	545 (3.8)	537 (3.3)	8 (5.0)	
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):				
Denmark	511 (3.2)	494 (3.4)	17 (4.7)	
Greece	490 (3.7)	478 (3.1)	12 (4.8)	
Thailand	517 (5.6)	526 (7.0)	9 (9.0)	
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):				
[1] Israel	539 (6.6)	509 (6.9)	29 (9.6)	
South Africa	360 (6.3)	349 (4.1)	11 (7.5)	



International Averages		
Boys	Girls	Difference
519	512	8
(Averages of all country means)		

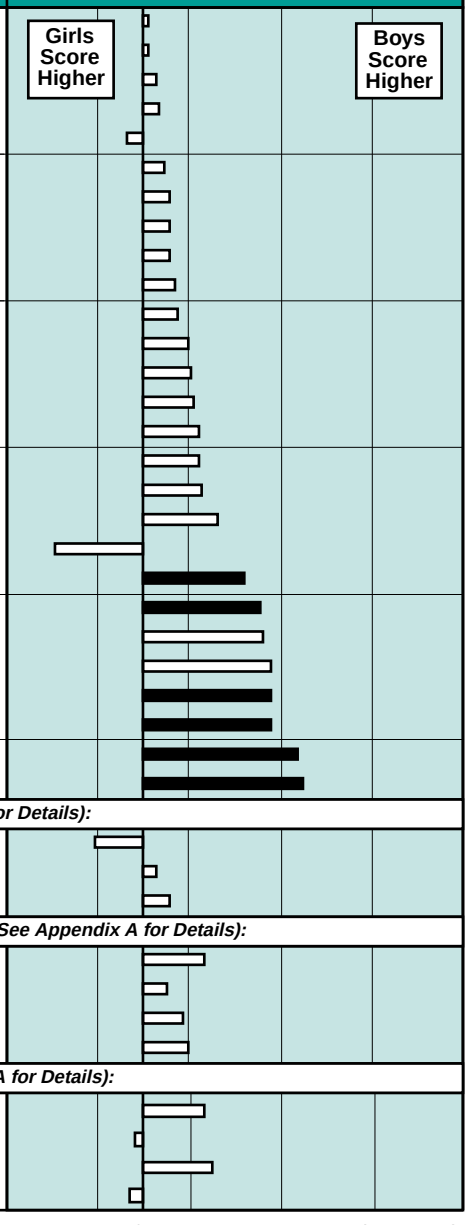
*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 1.7

Gender Differences in Mathematics Achievement - Lower Grade (Seventh Grade*)

Country	Boys' Mean	Girls' Mean	Difference Absolute Value	Gender Difference
Cyprus	446 (2.5)	446 (2.6)	0 (3.6)	
Singapore	601 (7.1)	601 (8.0)	0 (10.7)	
Hungary	503 (3.8)	501 (4.4)	1 (5.8)	
Canada	495 (2.7)	493 (2.6)	2 (3.8)	
† Belgium (Fl)	557 (4.5)	559 (4.7)	2 (6.5)	
Iceland	460 (2.7)	458 (3.2)	2 (4.2)	
† Scotland	465 (4.6)	462 (3.8)	3 (5.9)	
New Zealand	473 (4.6)	470 (3.8)	3 (5.9)	
Russian Federation	502 (5.1)	499 (3.5)	3 (6.1)	
Norway	462 (3.3)	459 (3.2)	4 (4.6)	
1 Latvia (LSS)	463 (3.5)	460 (3.3)	4 (4.8)	
† United States	478 (5.7)	473 (5.7)	5 (8.1)	
Sweden	480 (2.8)	475 (3.2)	5 (4.2)	
Spain	451 (2.7)	445 (2.7)	5 (3.8)	
Slovak Republic	511 (4.4)	505 (3.3)	6 (5.5)	
Portugal	426 (2.7)	420 (2.2)	6 (3.5)	
Czech Republic	527 (4.8)	520 (5.6)	6 (7.4)	
France	497 (3.6)	489 (3.3)	8 (4.9)	
1 Lithuania	423 (3.6)	433 (3.5)	10 (5.0)	
Japan	576 (2.7)	565 (2.0)	11 (3.4)	
† Belgium (Fr)	514 (4.1)	501 (4.2)	13 (5.9)	
Ireland	507 (6.0)	494 (4.8)	13 (7.7)	
Hong Kong	570 (9.7)	556 (8.3)	14 (12.8)	
Iran, Islamic Rep.	407 (2.7)	393 (2.3)	14 (3.5)	
1 Switzerland	513 (2.9)	498 (2.6)	14 (3.9)	
†2 England	484 (6.2)	467 (4.3)	17 (7.5)	
Korea	584 (3.7)	567 (4.4)	17 (5.7)	
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):				
Australia	495 (5.2)	500 (4.3)	5 (6.8)	
Austria	510 (4.6)	509 (3.3)	1 (5.6)	
Netherlands	517 (5.2)	515 (4.3)	3 (6.7)	
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):				
Colombia	372 (3.8)	365 (3.9)	7 (5.4)	
†1 Germany	486 (4.8)	484 (4.5)	2 (6.6)	
Romania	457 (3.7)	452 (3.7)	4 (5.2)	
Slovenia	501 (3.5)	496 (3.2)	5 (4.7)	
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):				
Denmark	468 (2.8)	462 (2.9)	7 (4.0)	
Greece	440 (3.2)	440 (3.0)	1 (4.4)	
South Africa	352 (5.3)	344 (3.3)	8 (6.2)	
Thailand	494 (4.8)	495 (5.7)	1 (7.5)	



International Averages		
Boys	Girls	Difference
486	481	6
(Averages of all country means)		

Gender difference statistically significant at .05 level.
Gender difference not statistically significant.

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Differences in Median Performance at Age 13?

For countries where the grades tested contained at least 75% of the 13-year-olds, TIMSS estimated the median performance for this age group. Table 1.8 provides this estimate as well as presenting estimates of the distribution of 13-year-olds across grades.[11] For many countries, the two grades tested included practically all of their 13-year-olds (nine countries have at least 98%), whereas, for some others, there were substantial percentages outside these grades, mostly in the grade below.[12] For countries included in Table 1.8, Hong Kong, Belgium (French), Hungary, France, Ireland, Latvia (LSS), Spain, Lithuania, Portugal, Austria, Romania, and Thailand had 10% or more of their 13-year-olds below the two grades tested.

The median is the point on the mathematics scale that divides the higher-performing 50% of the students from the lower-performing 50%. Like the mean, the median provides a useful summary statistic on which to compare performance across countries. It is used instead of the mean in this table because it can be reliably estimated even when scores from some members of the population are not available[13] (that is, those 13-year-olds outside the tested grades).

Notwithstanding the additional difficulties in calculating the age-based achievement estimates, the results for 13-year-olds appear quite consistent with those obtained for the two grade levels. The relative performance of countries in mathematics achievement on the basis of median performance of 13-year-olds is quite similar to that based on average eighth-grade and/or seventh-grade performance. Despite some slight differences in relative standings (generally within sampling error), the higher-performing countries in the eighth and seventh grades generally were those with higher-performing 13-year-olds.

[11] For information about the distribution of 13-year-olds in all countries, not just those with 75% coverage, see Table A.3 in Appendix A.

[12] The number of 13-year-olds below the lower grade and above the upper grade tested were extrapolated from the estimated distribution of 13-year-olds in the tested grades.

[13] Because TIMSS sampled students in the two adjacent grades with the most 13-year-olds within a country, it was possible to estimate the median for the 13-year-old students when the two tested grades included at least an estimated 75% of the 13-year-olds in that country. To compute the median, TIMSS assumed that those 13-year-old students in the grades below the tested grades would score below the median and those in the grades above the tested grades would score above the median. The percentages assumed to be above and below the median were added to the tails of the distribution before calculating the median using the modified distribution.

Table 1.8

Median Mathematics Achievement - 13-Year-Old Students
Includes Only Countries Where the Grades Tested Contained at Least 75% of the 13-Year-Olds

Country	Median	Lower Grade	Upper Grade	Estimated Distribution of 13-Year-Olds			
				Percent Below Lower Grade*	Percentage of 13-Year-Old Students Tested		Percent Above Upper Grade*
					Percent in Lower Grade	Percent in Upper Grade	
Singapore	608 (7.1)	Secondary 1	Secondary 2	3.1%	82.2%	14.7%	0.0%
Korea	591 (2.2)	1st Grade Middle School	2nd Grade Middle School	1.5%	69.9%	28.2%	0.4%
Japan	572 (3.7)	1st Grade Lower Secondary	2nd Grade Lower Secondary	0.3%	90.9%	8.8%	0.0%
Hong Kong	570 (7.8)	Secondary 1	Secondary 2	10.0%	44.2%	45.6%	0.2%
† Belgium (Fl)	562 (4.6)	1A	2A & 2P	5.4%	45.6%	48.8%	0.2%
[1] Switzerland	519 (2.4)	6 or 7	7 or 8	8.3%	47.6%	43.9%	0.2%
† Belgium (Fr)	516 (3.6)	1A	2A & 2P	13.3%	40.6%	46.0%	0.2%
Czech Republic	514 (5.2)	7	8	9.6%	73.3%	17.1%	0.0%
Russian Federation	511 (4.2)	7	8	4.5%	50.4%	44.3%	0.7%
Slovak Republic	511 (3.9)	7	8	4.7%	73.2%	22.1%	0.0%
Hungary	504 (3.7)	7	8	10.5%	65.1%	24.2%	20.0%
Canada	498 (5.9)	7	8	8.1%	48.4%	42.9%	0.6%
France	498 (3.0)	5ème	4ème (90%) or 4ème Technologique (10%)	20.5%	43.5%	34.7%	1.3%
Sweden	497 (2.4)	6	7	0.8%	44.9%	54.1%	0.1%
Ireland	492 (4.2)	1st Year	2nd Year	14.1%	69.0%	16.8%	0.2%
† Scotland	486 (5.7)	Secondary 1	Secondary 2	0.3%	24.0%	75.3%	0.5%
Norway	483 (2.8)	6	7	0.3%	42.5%	57.0%	0.2%
New Zealand	483 (7.2)	Form 2	Form 3	0.5%	51.7%	47.4%	0.4%
†[2] England	482 (4.4)	Year 8	Year 9	0.6%	57.2%	41.7%	0.5%
Iceland	479 (4.5)	7	8	0.2%	16.5%	83.0%	0.4%
† United States	472 (5.4)	7	8	9.0%	57.8%	33.1%	0.2%
Cyprus	460 (2.5)	7	8	1.7%	27.7%	69.9%	0.7%
[1] Latvia (LSS)	455 (3.2)	7	8	14.3%	59.5%	26.0%	0.2%
Spain	452 (3.3)	7 EGB	8 EGB	14.9%	45.8%	39.0%	0.3%
[1] Lithuania	429 (3.4)	7	8	10.1%	64.1%	25.6%	0.2%
Portugal	416 (1.8)	Grade 7	Grade 8	23.5%	44.1%	32.1%	0.3%
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix for Details):							
Australia	499 (4.3)	7 or 8	8 or 9	7.5%	63.6%	28.4%	0.5%
Austria	509 (3.1)	3. Klasse	4. Klasse	10.7%	62.4%	26.9%	0.0%
Bulgaria	516 (6.9)	7	8	3.2%	58.1%	36.9%	1.8%
Netherlands	519 (5.3)	Secondary 1	Secondary 2	9.8%	58.7%	31.2%	0.4%
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix for Details):							
Romania	419 (3.9)	7	8	23.9%	66.6%	9.3%	0.3%
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix for Details):							
Denmark	485 (3.5)	6	7	1.0%	34.6%	63.5%	0.9%
Greece	474 (3.8)	Secondary 1	Secondary 2	3.1%	11.2%	84.5%	1.2%
Thailand	483 (6.9)	Secondary 1	Secondary 2	18.0%	58.4%	19.6%	4.0%

*Data are extrapolated; students below the lower grade and above the upper grade were not included in the sample. Denmark, Sweden and Switzerland tested 3 grades.

†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.