

Chapter 1



International Student Achievement in Mathematics

Chapter 1 contains the TIMSS 2007 achievement results for fourth and eighth grade students in mathematics for each of the participating countries and benchmarking entities. It also presents trends in mathematics achievement over time for participants in previous TIMSS assessments in 1995, 1999, and 2003. Achievement differences by gender at both grades are also described.

How Do Countries Differ in Mathematics Achievement?

Exhibit 1.1 shows the distribution of student achievement for the participants in TIMSS 2007, including the average (mean) scale score with its 95 percent confidence interval and the ranges in performance for the middle half of the students (25th to 75th percentiles) as well as the extremes (5th and 95th percentiles). The first page of Exhibit 1.1 presents the distribution for the achievement for the 36 countries and 7 benchmarking participants at the fourth grade and the second page presents the distribution of student achievement for the 49 countries and 7 benchmarking participants at the eighth grade.¹ For each grade in Exhibit 1.1, countries are shown in decreasing order of average (mean) scale score (with the exception of Morocco at the eighth grade²) followed by the benchmarking participants also ordered from highest to lowest average achievement. The benchmarking participants followed the same procedures and met the same standards as the countries, the difference being that they are regional entities (in some cases parts of

¹ Because characteristics of their samples and data are not completely known, selected achievement results for Mongolia at the fourth and eighth grades are presented in Appendix E.

² Morocco did not meet the school participation rates as specified in the TIMSS guidelines due to a procedural difficulty with some schools, and consequently, its results are shown below a line.

countries shown above). Because there often are relatively small differences between participants in average achievement, Exhibit 1.2 shows whether or not the differences in average achievement are statistically significant.

TIMSS used item response theory (IRT) methods to summarize the achievement for each grade on a scale with a mean of 500 and a standard deviation of 100.³ The TIMSS mathematics scales for the fourth and eighth grades were established based on the 1995 assessments and the methodology enables comparable trend measures from assessment to assessment within each grade. It should be noted that the results for the fourth and eighth grades are not directly comparable. While the scales for the two grades are expressed in the same numerical units, they are not directly comparable in terms of being able to say how much achievement or learning at one grade equals how much achievement or learning at the other grade. That is, achievement on the TIMSS scales cannot be described in absolute terms (like all such scales developed using IRT technology). Comparisons can only be made in terms of relative performance (higher or lower), for example, among countries and population groups as well as between assessments.

In Exhibit 1.1, there is a symbol by a participant's average scale score indicating if the average achievement is significantly higher (up arrow) or lower (down arrow) than the **scale** average of 500. It should be noted that the scale average referenced in Exhibit 1.1 is different from the international average referenced in previous TIMSS reports. The TIMSS scale metric for the fourth grade and for the eighth grade was established in 1995 by setting the average of the mean scores of the countries that participated in TIMSS 1995 to 500 and the standard deviation to 100. To enable comparisons across TIMSS assessments, with each subsequent assessment the data from 1999, 2003, and 2007 also were placed on this metric so that scores are equivalent from assessment to assessment. Thus, the scale average has remained at 500 with each cycle of TIMSS and provides a fixed point of comparison through time. That is, a score of 500 in eighth or fourth grade mathematics in 2007 is equivalent to a score of 500 in eighth or fourth grade mathematics, respectively, in 2003, in 1999 (eighth grade only), and in 1995.

3 Given the matrix-sampling approach, the scaling process averages students' responses in a way that accounts for differences in the difficulty of different subsets of 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 further information, see the "IRT Scaling and Data Analysis" section of Appendix A.

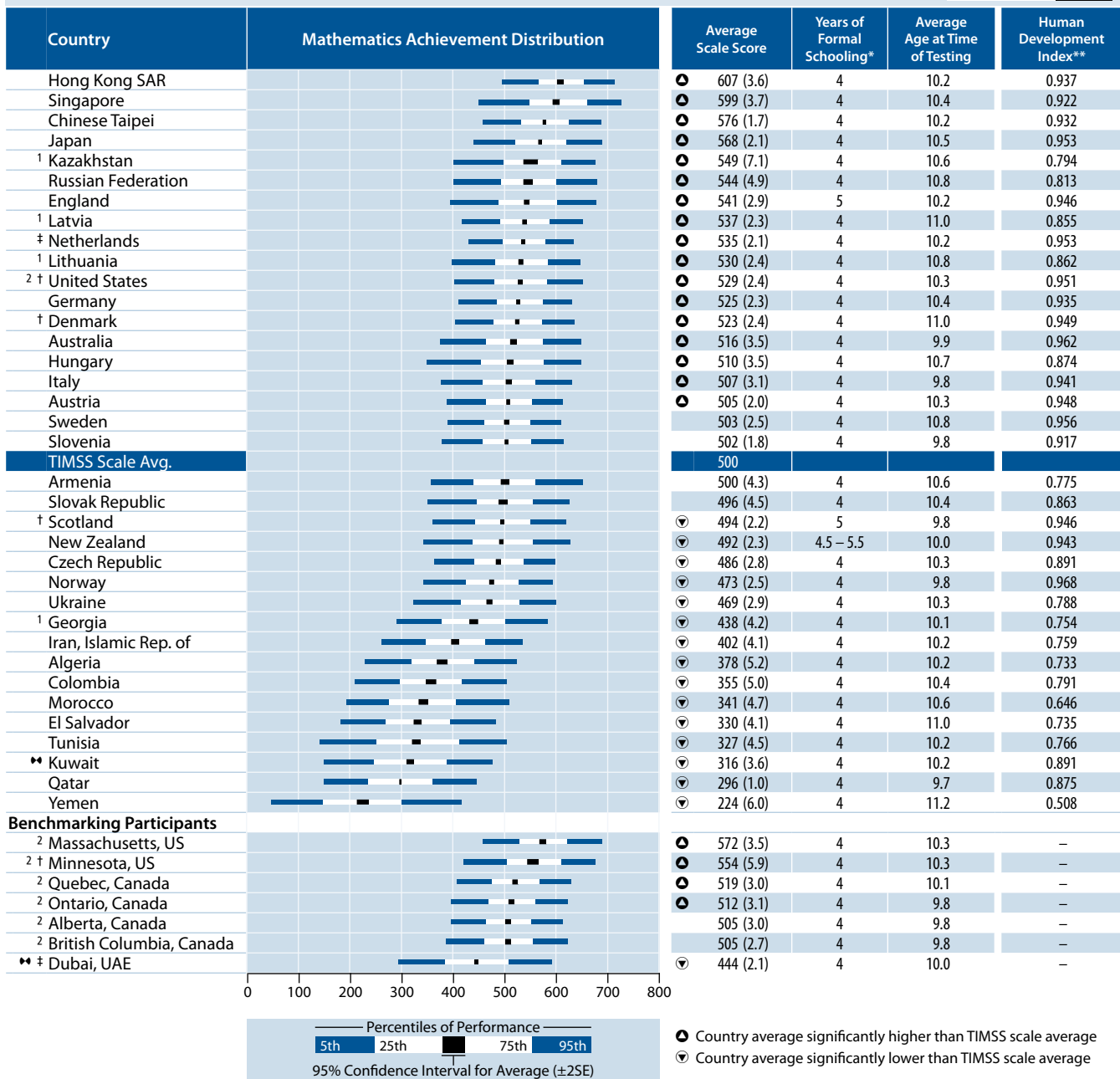
In contrast, the international average, obtained by averaging across the mean scores for each of the participating countries, needs to be recomputed for each new cycle based on the set of participating countries and has changed from cycle to cycle, becoming lower with each assessment, particularly at the eighth grade, depending on the set of countries taking part.⁴ Using a point of reference that can change substantially from cycle to cycle depending on which countries participate creates the possibility for misinterpretations, particularly if countries gauge their progress in terms of how far they are above or below this point. For example, in 2003 using the international average may have given the erroneous impression that some countries at the eighth grade had improved, when actually it was only that the international average had become lower. Thus, to avoid misinterpretations based on movement of the international average between cycles, TIMSS 2007 adopted the fixed average approach by using the scale average as the point of reference, and this approach will be used for all future cycles of TIMSS (i.e., in 2011, 2016, and so on). It can be noted that the same approach is used in PIRLS. In PIRLS 2001, the average of the mean scale scores of the countries was set to 500 (the scale average) and the standard deviation to 100, and the fixed reference point approach (scale average instead of international average) was adopted for use from then on.

Similar to earlier TIMSS assessments, Asian countries top Exhibit 1.1 at both the fourth and eighth grades. At the fourth grade, Hong Kong SAR and Singapore were the top performing countries. Using Exhibit 1.2 to help interpret the typically small differences in achievement among countries, these two countries performed similarly and had higher achievement than all of the other countries. They were followed by Chinese Taipei, that had higher achievement than all countries except Hong Kong SAR and Singapore, and, in turn, by Japan that had higher achievement than all of the remaining countries. Kazakhstan, the Russian Federation, England, Latvia, and the Netherlands also performed very well. These five countries performed similarly—not as well as the top four Asian countries, but with higher achievement than the other remaining countries participating

4 In 1995, the scale average for mathematics and the international average were both 500 at the fourth grade and at the eighth grade. In 1999, the scale average remained at 500; however, because different countries participated in 1999 than 1995, the international average at the eighth grade for TIMSS 1999 changed to 487, somewhat lower than the scale average. With yet a larger and different set of countries participating in TIMSS 2003, including some with low average achievement, the international average at grade 8 dropped to 467. At the fourth grade in 2003, the international average was 495 in mathematics.

Exhibit 1.1 TIMSS 2007 Distribution of Mathematics Achievement

TIMSS2007
Mathematics 4th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

* Represents years of schooling counting from the first year of ISCED Level 1.
 ** Taken from United Nations Development Programme's *Human Development Report 2007/2008*, p.229–232, except for Chinese Taipei taken from Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. *Statistical Yearbook 2007*. Data for England and Scotland are for the United Kingdom.
 † Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).
¹ National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

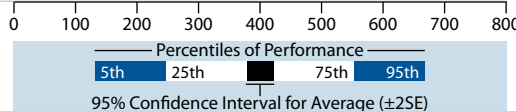
² National Defined Population covers 90% to 95% of National Target Population (see Appendix A).
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.
 () Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.
 A dash (–) indicates comparable data are not available.
 Note: See Exhibit D.1 for percentiles of achievement in mathematics.

Exhibit 1.1 TIMSS 2007 Distribution of Mathematics Achievement (Continued)

TIMSS2007
Mathematics 8th Grade

Country	Mathematics Achievement Distribution	Average Scale Score	Years of Formal Schooling*	Average Age at Time of Testing	Human Development Index**
Chinese Taipei		598 (4.5)	8	14.2	0.932
Korea, Rep. of		597 (2.7)	8	14.3	0.921
Singapore		593 (3.8)	8	14.4	0.922
† Hong Kong SAR		572 (5.8)	8	14.4	0.937
Japan		570 (2.4)	8	14.5	0.953
Hungary		517 (3.5)	8	14.6	0.874
† England		513 (4.8)	9	14.2	0.946
Russian Federation		512 (4.1)	7 or 8	14.6	0.802
² † United States		508 (2.8)	8	14.3	0.951
¹ Lithuania		506 (2.3)	8	14.9	0.862
Czech Republic		504 (2.4)	8	14.4	0.891
Slovenia		501 (2.1)	7 or 8	13.8	0.917
TIMSS Scale Avg.		500			
Armenia		499 (3.5)	8	14.9	0.775
Australia		496 (3.9)	8	13.9	0.962
Sweden		491 (2.3)	8	14.8	0.956
Malta		488 (1.2)	9	14.0	0.878
† Scotland		487 (3.7)	9	13.7	0.946
^{1 2} Serbia		486 (3.3)	8	14.9	0.810
Italy		480 (3.0)	8	13.9	0.941
Malaysia		474 (5.0)	8	14.3	0.811
Norway		469 (2.0)	8	13.8	0.968
Cyprus		465 (1.6)	8	13.8	0.903
Bulgaria		464 (5.0)	8	14.9	0.824
³ Israel		463 (3.9)	8	14.0	0.932
Ukraine		462 (3.6)	8	14.2	0.788
Romania		461 (4.1)	8	15.0	0.813
Bosnia and Herzegovina		456 (2.7)	8 or 9	14.7	0.803
Lebanon		449 (4.0)	8	14.4	0.772
Thailand		441 (5.0)	8	14.3	0.781
Turkey		432 (4.8)	8	14.0	0.775
Jordan		427 (4.1)	8	14.0	0.773
Tunisia		420 (2.4)	8	14.5	0.766
¹ Georgia		410 (5.9)	8	14.2	0.754
Iran, Islamic Rep. of		403 (4.1)	8	14.2	0.759
Bahrain		398 (1.6)	8	14.1	0.866
Indonesia		397 (3.8)	8	14.3	0.728
Syrian Arab Republic		395 (3.8)	8	13.9	0.724
Egypt		391 (3.6)	8	14.1	0.708
Algeria		387 (2.1)	8	14.5	0.733
Colombia		380 (3.6)	8	14.5	0.791
Oman		372 (3.4)	8	14.3	0.814
Palestinian Nat'l Auth.		367 (3.5)	8	14.0	0.731
Botswana		364 (2.3)	8	14.9	0.654
^{**} Kuwait		354 (2.3)	8	14.4	0.891
El Salvador		340 (2.8)	8	15.0	0.735
Saudi Arabia		329 (2.9)	8	14.4	0.812
Ghana		309 (4.4)	8	15.8	0.553
Qatar		307 (1.4)	8	13.9	0.875
[‡] Morocco		381 (3.0)	8	14.8	0.646
Benchmarking Participants					
² Massachusetts, US		547 (4.6)	8	14.2	–
² † Minnesota, US		532 (4.4)	8	14.3	–
³ Quebec, Canada		528 (3.5)	8	14.2	–
² Ontario, Canada		517 (3.5)	8	13.8	–
³ British Columbia, Canada		509 (3.0)	8	13.9	–
Basque Country, Spain		499 (3.0)	8	14.1	–
^{** ‡} Dubai, UAE		461 (2.4)	8	14.2	–

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



* Represents years of schooling counting from the first year of ISCED Level 1.

** Taken from United Nations Development Programme's *Human Development Report 2007/2008*, p.229–232, except for Chinese Taipei taken from Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *R.O.C. Statistical Yearbook 2007* and for Serbia taken from *Human Development Analyses of Serbia 2007*. Data for England and Scotland are for the United Kingdom.

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

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

¹ National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

² National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

³ National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

^{**} Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

Note: See Exhibit D.1 for percentiles of achievement in mathematics.

Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Mathematics Achievement

TIMSS2007
Mathematics **4th Grade**

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average 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 average achievement of the two countries.

Country	Average Scale Score	Hong Kong SAR	Singapore	Chinese Taipei	Japan	Kazakhstan	Russian Federation	England	Latvia	Netherlands	Lithuania	United States	Germany	Denmark	Australia	Hungary	Italy	Austria	Sweden	Slovenia	Armenia	Slovak Republic	Scotland	New Zealand	Czech Republic	Norway	Ukraine	Georgia	Iran, Islamic Rep. of	Algeria
Hong Kong SAR	607 (3.6)			⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	
Singapore	599 (3.7)			⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	
Chinese Taipei	576 (1.7)	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Japan	568 (2.1)	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Kazakhstan	549 (7.1)	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Russian Federation	544 (4.9)	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
England	541 (2.9)	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Latvia	537 (2.3)	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Netherlands	535 (2.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Lithuania	530 (2.4)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
United States	529 (2.4)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Germany	525 (2.3)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Denmark	523 (2.4)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Australia	516 (3.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Hungary	510 (3.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Italy	507 (3.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Austria	505 (2.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Sweden	503 (2.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Slovenia	502 (1.8)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Armenia	500 (4.3)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Slovak Republic	496 (4.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆	⬆		
Scotland	494 (2.2)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆	⬆		
New Zealand	492 (2.3)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆	⬆		
Czech Republic	486 (2.8)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆	⬆		
Norway	473 (2.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆	⬆		
Ukraine	469 (2.9)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇		⬆		
Georgia	438 (4.2)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Iran, Islamic Rep. of	402 (4.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Algeria	378 (5.2)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Colombia	355 (5.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Morocco	341 (4.7)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
El Salvador	330 (4.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Tunisia	327 (4.5)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Kuwait	316 (3.6)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Qatar	296 (1.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Yemen	224 (6.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Benchmarking Participants																														
Massachusetts, US	572 (3.5)	⬇	⬇			⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Minnesota, US	554 (5.9)	⬇	⬇	⬇	⬇			⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆		
Quebec, Canada	519 (3.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Ontario, Canada	512 (3.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Alberta, Canada	505 (3.0)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
British Columbia, Canada	505 (2.7)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		
Dubai, UAE	444 (2.1)	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬆		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Mathematics Achievement (Continued)

TIMSS2007
Mathematics **4th**
Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average 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 average achievement of the two countries.

Colombia	Morocco	El Salvador	Tunisia	Kuwait	Qatar	Yemen	Benchmarking Participants	Average Scale Score	Country
▲	▲	▲	▲	▲	▲	▲	Massachusetts, US	607 (3.6)	Hong Kong SAR
▲	▲	▲	▲	▲	▲	▲	Minnesota, US	599 (3.7)	Singapore
▲	▲	▲	▲	▲	▲	▲	Quebec, Canada	576 (1.7)	Chinese Taipei
▲	▲	▲	▲	▲	▲	▲	Ontario, Canada	568 (2.1)	Japan
▲	▲	▲	▲	▲	▲	▲	Alberta, Canada	549 (7.1)	Kazakhstan
▲	▲	▲	▲	▲	▲	▲	British Columbia, Canada	544 (4.9)	Russian Federation
▲	▲	▲	▲	▲	▲	▲	Dubai, UAE	541 (2.9)	England
▲	▲	▲	▲	▲	▲	▲		537 (2.3)	Latvia
▲	▲	▲	▲	▲	▲	▲		535 (2.1)	Netherlands
▲	▲	▲	▲	▲	▲	▲		530 (2.4)	Lithuania
▲	▲	▲	▲	▲	▲	▲		529 (2.4)	United States
▲	▲	▲	▲	▲	▲	▲		525 (2.3)	Germany
▲	▲	▲	▲	▲	▲	▲		523 (2.4)	Denmark
▲	▲	▲	▲	▲	▲	▲		516 (3.5)	Australia
▲	▲	▲	▲	▲	▲	▲		510 (3.5)	Hungary
▲	▲	▲	▲	▲	▲	▲		507 (3.1)	Italy
▲	▲	▲	▲	▲	▲	▲		505 (2.0)	Austria
▲	▲	▲	▲	▲	▲	▲		503 (2.5)	Sweden
▲	▲	▲	▲	▲	▲	▲		502 (1.8)	Slovenia
▲	▲	▲	▲	▲	▲	▲		500 (4.3)	Armenia
▲	▲	▲	▲	▲	▲	▲		496 (4.5)	Slovak Republic
▲	▲	▲	▲	▲	▲	▲		494 (2.2)	Scotland
▲	▲	▲	▲	▲	▲	▲		492 (2.3)	New Zealand
▲	▲	▲	▲	▲	▲	▲		486 (2.8)	Czech Republic
▲	▲	▲	▲	▲	▲	▲		473 (2.5)	Norway
▲	▲	▲	▲	▲	▲	▲		469 (2.9)	Ukraine
▲	▲	▲	▲	▲	▲	▲		438 (4.2)	Georgia
▲	▲	▲	▲	▲	▲	▲		402 (4.1)	Iran, Islamic Rep. of
▲	▲	▲	▲	▲	▲	▲		378 (5.2)	Algeria
▼	▲	▲	▲	▲	▲	▲		355 (5.0)	Colombia
▼	▲	▲	▲	▲	▲	▲		341 (4.7)	Morocco
▼	▲	▲	▲	▲	▲	▲		330 (4.1)	El Salvador
▼	▲	▲	▲	▲	▲	▲		327 (4.5)	Tunisia
▼	▲	▲	▲	▲	▲	▲		316 (3.6)	Kuwait
▼	▲	▲	▲	▲	▲	▲		296 (1.0)	Qatar
▼	▲	▲	▲	▲	▲	▲		224 (6.0)	Yemen
▲	▲	▲	▲	▲	▲	▲	Massachusetts, US	572 (3.5)	Massachusetts, US
▼	▲	▲	▲	▲	▲	▲	Minnesota, US	554 (5.9)	Minnesota, US
▼	▲	▲	▲	▲	▲	▲	Quebec, Canada	519 (3.0)	Quebec, Canada
▼	▲	▲	▲	▲	▲	▲	Ontario, Canada	512 (3.1)	Ontario, Canada
▼	▲	▲	▲	▲	▲	▲	Alberta, Canada	505 (3.0)	Alberta, Canada
▼	▲	▲	▲	▲	▲	▲	British Columbia, Canada	505 (2.7)	British Columbia, Canada
▼	▲	▲	▲	▲	▲	▲	Dubai, UAE	444 (2.1)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country ▼ Average achievement significantly lower than comparison country

Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Mathematics Achievement (Continued)

TIMSS2007
Mathematics **8th**
Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average 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 average achievement of the two countries.

Country	Average Scale Score	Chinese Taipei	Korea, Rep. of	Singapore	Hong Kong SAR	Japan	Hungary	England	Russian Federation	United States	Lithuania	Czech Republic	Slovenia	Armenia	Australia	Sweden	Malta	Scotland	Serbia	Italy	Malaysia	Norway	Cyprus	Bulgaria	Israel	Ukraine	Romania	Bosnia and Herzegovina	Lebanon	Thailand	
Chinese Taipei	598 (4.5)																														
Korea, Rep. of	597 (2.7)																														
Singapore	593 (3.8)																														
Hong Kong SAR	572 (5.8)	▼	▼	▼																											
Japan	570 (2.4)	▼	▼	▼																											
Hungary	517 (3.5)	▼	▼	▼	▼																										
England	513 (4.8)	▼	▼	▼	▼	▼																									
Russian Federation	512 (4.1)	▼	▼	▼	▼	▼																									
United States	508 (2.8)	▼	▼	▼	▼	▼																									
Lithuania	506 (2.3)	▼	▼	▼	▼	▼	▼																								
Czech Republic	504 (2.4)	▼	▼	▼	▼	▼	▼																								
Slovenia	501 (2.1)	▼	▼	▼	▼	▼	▼	▼																							
Armenia	499 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼																						
Australia	496 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Sweden	491 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Malta	488 (1.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Scotland	487 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Serbia	486 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Italy	480 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Malaysia	474 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Norway	469 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Cyprus	465 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Bulgaria	464 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Israel	463 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Ukraine	462 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Romania	461 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Bosnia and Herzegovina	456 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Lebanon	449 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Thailand	441 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Turkey	432 (4.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Jordan	427 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
Tunisia	420 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Georgia	410 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Iran, Islamic Rep. of	403 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Bahrain	398 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Indonesia	397 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Syrian Arab Republic	395 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Egypt	391 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Algeria	387 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Morocco	381 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Colombia	380 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Oman	372 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Palestinian Nat'l Auth.	367 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Botswana	364 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Kuwait	354 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
El Salvador	340 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Saudi Arabia	329 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Ghana	309 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Qatar	307 (1.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Benchmarking Participants																															
Massachusetts, US	547 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Minnesota, US	532 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Quebec, Canada	528 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Ontario, Canada	517 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
British Columbia, Canada	509 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Basque Country, Spain	499 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Dubai, UAE	461 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

at the fourth grade. Among the benchmarking participants, the state of Massachusetts in the United States performed similarly to Chinese Taipei, and the state of Minnesota similarly to Kazakhstan, the Russian Federation, and England.

At the fourth grade, top-performing Hong Kong SAR and Singapore had averages approximately 100 points above the 500 scale average (607 and 599, respectively), and the other countries described above (Chinese Taipei, Japan, Kazakhstan, the Russian Federation, England, Latvia, and the Netherlands) also performed above the scale average. In addition, eight more countries had average achievement higher than the scale average of 500, including Lithuania, the United States, Germany, Denmark, Australia, Hungary, Italy, and Austria. In addition to the benchmarking states of Massachusetts and Minnesota, two Canadian provinces, Quebec and Ontario, also performed above the scale average.

At the eighth grade, Exhibit 1.1 shows five Asian countries with the highest average achievement in mathematics. Using the information in Exhibit 1.2, Chinese Taipei, Korea, and Singapore had the highest average achievement, performing similarly and having substantially higher achievement than all the remaining countries (averages nearly 100 points above the scale average). These three countries were followed by Hong Kong SAR and Japan also performing similarly and having higher achievement than all the other countries except the top three performers.

It can be seen that there is a substantial gap in average achievement between the five Asian countries and the next group of four similarly performing countries including Hungary, England, the Russian Federation, and the United States—a 53-point difference between Japan (570) and Hungary (517). However, this group of four countries all had average achievement above the scale average (Exhibit 1.1). Next, although Lithuania and the Czech Republic performed similarly (506 and 504, respectively), as shown in Exhibit 1.1, achievement in Lithuania was above the scale average whereas achievement in the Czech Republic was not significantly different statistically from the scale average (500). At the eighth grade,

among the benchmarking participants, the two U.S. states, Massachusetts and Minnesota, and the three Canadian provinces, Quebec, Ontario, and British Columbia, performed above the scale average. The two U.S. states and the province of Quebec were outperformed by the five Asian countries, but had higher average achievement than the group of four countries including Hungary, England, the Russian Federation, and United States. The provinces of Ontario and British Columbia had average achievement similar to that group of four countries.

At the fourth grade, looking at the other end of the achievement continuum in Exhibit 1.2, beginning with Algeria (378) each country typically had higher average achievement than the next lower performing country, in turn, through Colombia (355), Morocco (341), El Salvador (330) and Tunisia (327), Kuwait (316), Qatar (296), and Yemen (224). At the eighth grade, there was a similar pattern beginning with Oman (372) having higher achievement than the Palestinian National Authority (367) and Botswana (364), and then Kuwait (354), El Salvador (340), Saudi Arabia (329), and concluding with Ghana (309) and Qatar (307).

At both grades, TIMSS 2007 involved countries from around the world and from a wide variety of circumstances. It might then be anticipated that the results would reveal substantial differences in average mathematics achievement between the highest- and lowest-performing countries and this proved to be the case (607 in Hong Kong SAR compared with 224 in Yemen at fourth grade and 598 in Chinese Taipei compared with 307 in Qatar at eighth grade). The percentiles shown in Exhibit 1.1 also show, however, the wide range of achievement within countries. The difference between the 95th and 5th percentiles within countries is often approximately 300 scale points, which is similar to the difference across countries.

TIMSS devoted considerable energy to maximizing comparability across the grades and ages tested, but this is difficult considering the variation internationally in many educational policies, primarily school entry ages and policies concerning retention and promotion from grade to grade. For the most part, TIMSS participants are to assess students in the fourth year

of schooling and the eighth year of schooling. However, to avoid testing very young children, the guidelines also specify that the average age of the students tested should not be below 9.5 years old for the fourth grade or 13.5 years old for the eighth grade. Thus, countries where students start school at a very young age must assess students at the next higher grade in accordance with the TIMSS guidelines.

Exhibit 1.1 includes the years of formal schooling and average age at time of testing of the students in each country. Every country tested the correct year of schooling in accordance with the TIMSS guidelines, which was the fourth grade and the eighth grade in most countries and why, for the matter of convenience in this report, the students will be referred to as fourth grade students or eighth grade students. It should be noted that five countries (England, Scotland, New Zealand, Malta, and Bosnia and Herzegovina) tested students in their fifth and/or ninth year of schooling in accordance with TIMSS guidelines, because their students start school at a very early age and otherwise would have been very young. Also, both the Russian Federation and Slovenia have been undergoing structural reforms requiring students to start school at a younger age so that students at the fourth and eighth grades would be the same age as students previously were in the third and seventh grades, but having had an additional year of schooling. To monitor this change, these two countries assessed students in the third and seventh years of schooling in previous assessments. The transition has been completed at the fourth grade, but not at the eighth grade where some of the students assessed in these two countries were in the seventh year of schooling.

Given that students typically are in their fourth or eighth year of schooling and the majority begins school at age 6 (see Appendix A), they are expected to be approximately 10 or 14 years old, on average, respectively. This was the case in most countries including the five countries testing students in their fifth and/or ninth years of schooling. In some countries, however, students do not start school until age 7 and, consequently, are expected to be approximately 11 or 15 years old, on average, respectively. Considering

the cultural and economic diversity of the TIMSS countries as well as variation in age of entry to school and retention policies, students with the same amount of schooling are of different ages.⁵ The interaction among these various factors and achievement is complicated, differing country by country. For example, the TIMSS data show the countries performing above the scale average ranging in students' average age from 9.8 to 11.0 years old at the fourth grade and from 14.2 to 14.9 years at the eighth grade. Students in countries performing below the scale average also range in average age, from 9.7 to 11.2 years at the fourth grade and from 13.7 to 15.8 years at the eighth grade.

To provide some context about the economic and educational development of the TIMSS participants, Exhibit 1.1 also includes each one's value on the Human Development Index provided by the United Nations Development Programme. The index has a minimum value of 0.0 and a maximum of 1.0. Countries with high values on the index have a long life expectancy, high levels of school enrollment and adult literacy, and a good standard of living, as measured by per capita Gross Domestic Product. Nearly all the TIMSS participants had index values in the 0.7 to 0.9 range except Botswana and Morocco (0.6) and Ghana and Yemen (0.5). At both grades, the countries performing above the 500 scale average had index values in the 0.8 to 0.9 range (the lowest is Kazakhstan (0.794) at the fourth grade) and those countries with values below 0.8 typically had average achievement below 500. However, not all countries with average achievement below the scale average had low index values. The countries with average achievement significantly below 500 included 6 with index values 0.8 or higher at the fourth grade and 17 at the eighth grade.

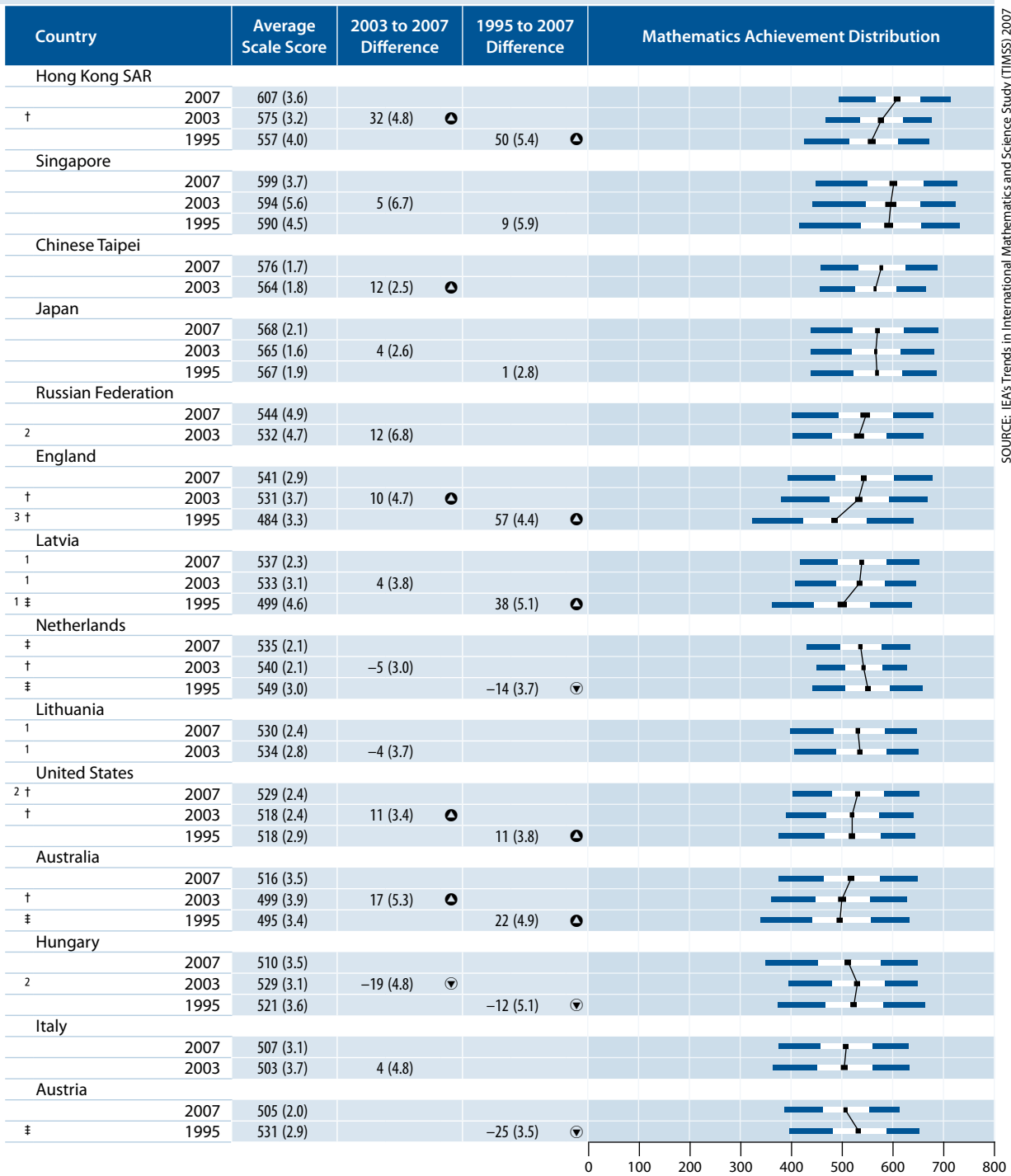
How Has Mathematics Achievement Changed Since 1995, 1999, and 2003?

Exhibit 1.3 displays changes in average mathematics achievement for the countries and benchmarking participants that have comparable data from previous TIMSS assessments at the fourth and eighth grades. The participants are shown in descending order of their average TIMSS 2007 achievement.

⁵ Martin, M.O., Mullis, I.V.S., & Foy, P. (2008). Interrelationships among reading achievement, grade level, and age in PIRLS 2006. In C. Papanastasiou (Ed.), *Proceedings of the IEA International Research Conference (IRC): PIRLS volume*. Nicosia, Cyprus: Cyprus University Press.

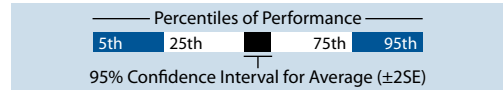
Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007

TIMSS2007
Mathematics 4th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 average significantly higher
▼ 2007 average significantly lower



† Met guidelines for sample participation rates only after replacement schools were included.

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included.

‡ Did not satisfy guidelines for sample participation rates.

1 National Target Population does not include all of the International Target Population defined by TIMSS.

2 National Defined Population covers 90% to 95% of National Target Population.

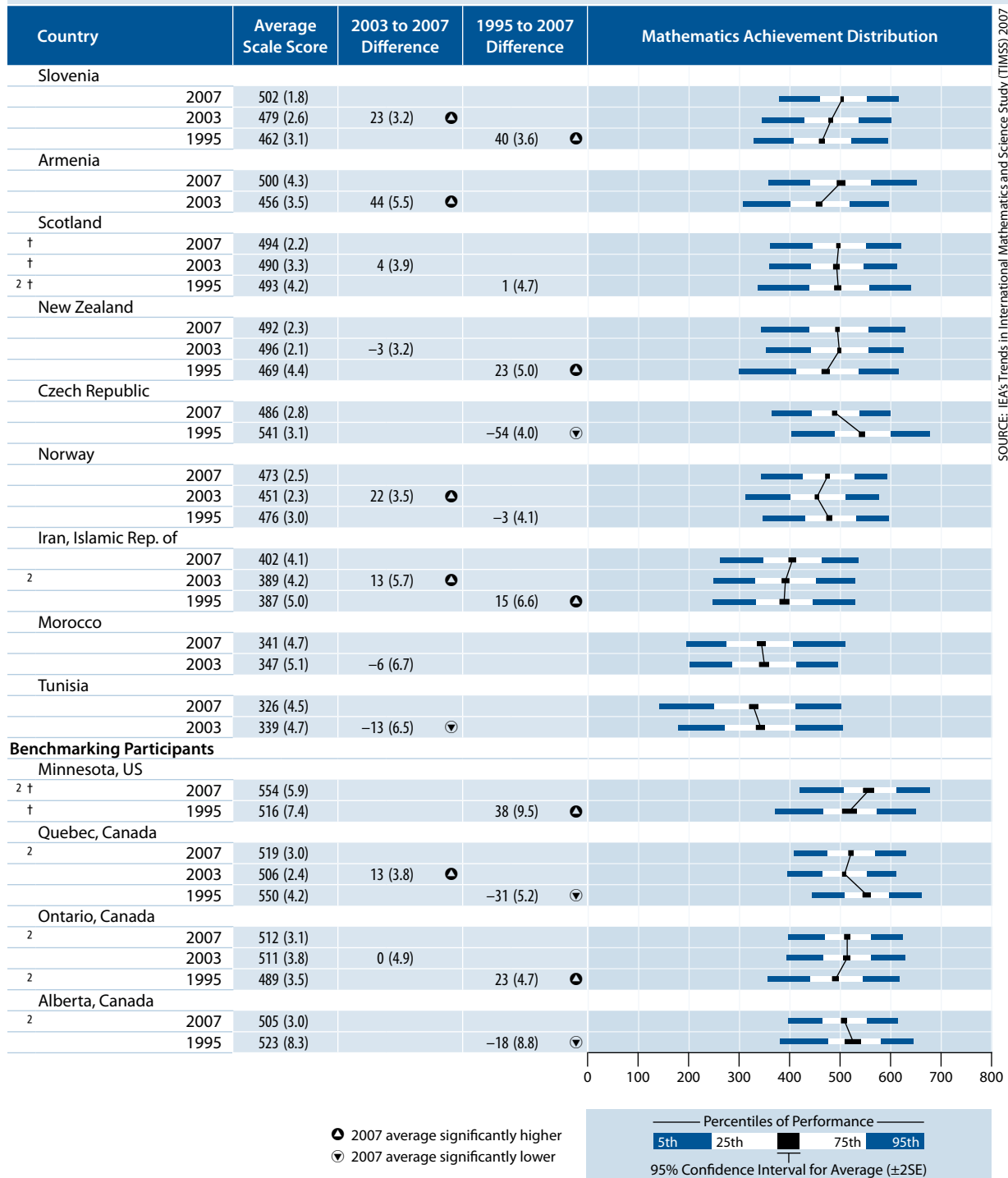
3 National Defined Population covers less than 90% of National Target Population (but at least 77%).

Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)

TIMSS2007
Mathematics 4th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

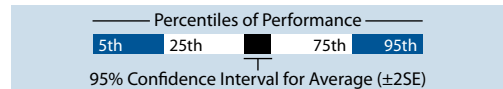
Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)

TIMSS2007
Mathematics 8th Grade

Country	Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 2007 Difference	Mathematics Achievement Distribution
Chinese Taipei					
2007	598 (4.5)				
2003	585 (4.6)	13 (6.4) ▲			
1999	585 (4.0)		13 (5.9) ▲		
Korea, Rep. of					
2007	597 (2.7)				
2003	589 (2.2)	8 (3.1) ▲			
1999	587 (2.0)		10 (3.4) ▲		
1995	581 (2.0)			17 (3.4) ▲	
Singapore					
2007	593 (3.8)				
2003	605 (3.6)	-13 (5.2) ▼			
1999	604 (6.3)		-12 (7.2)		
1995	609 (4.0)			-16 (5.6) ▼	
Hong Kong SAR					
2007	572 (5.8)				
2003	586 (3.3)	-14 (6.6) ▼			
1999	582 (4.3)		-10 (7.2)		
1995	569 (6.1)			4 (8.4)	
Japan					
2007	570 (2.4)				
2003	570 (2.1)	0 (3.1)			
1999	579 (1.7)		-9 (2.9) ▼		
1995	581 (1.6)			-11 (2.8) ▼	
Hungary					
2007	517 (3.5)				
2003	529 (3.2)	-12 (4.7) ▼			
1999	532 (3.7)		-15 (5.0) ▼		
1995	527 (3.2)			-10 (4.7) ▼	
England					
2007	513 (4.8)				
2003	498 (4.7)	15 (6.7) ▲			
1999	496 (4.1)		17 (6.4) ▲		
1995	498 (3.0)			16 (5.6) ▲	
Russian Federation					
2007	512 (4.1)				
2003	508 (3.7)	4 (5.5)			
1999	526 (5.9)		-14 (7.2) ▼		
1995	524 (5.3)			-12 (6.7)	
United States					
2007	508 (2.8)				
2003	504 (3.3)	4 (4.4)			
1999	502 (4.0)		7 (4.8)		
1995	492 (4.7)			16 (5.5) ▲	
Lithuania					
2007	506 (2.3)				
2003	502 (2.5)	4 (3.4)			
1999	482 (4.3)		24 (4.9) ▲		
1995	472 (4.1)			34 (4.7) ▲	
Czech Republic					
2007	504 (2.4)				
1999	520 (4.2)		-16 (4.8) ▼		
1995	546 (4.5)			-42 (5.1) ▼	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 average significantly higher
▼ 2007 average significantly lower

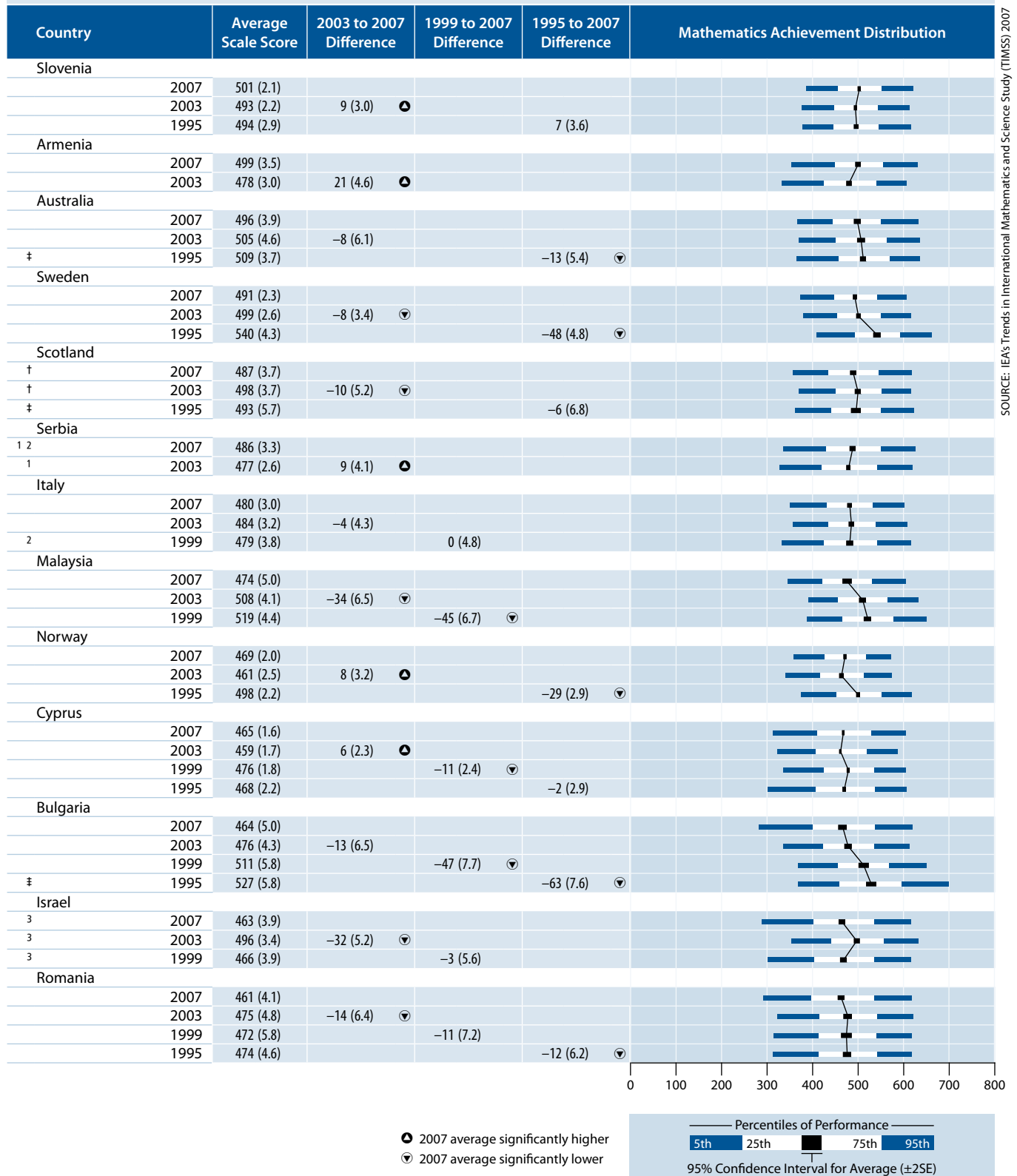


† Met guidelines for sample participation rates only after replacement schools were included.
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included.
‡ Did not satisfy guidelines for sample participation rates.
1 National Target Population does not include all of the International Target Population defined by TIMSS.
2 National Defined Population covers 90% to 95% of National Target Population.

3 National Defined Population covers less than 90% of National Target Population (but at least 77%).
** Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.
Trend notes: Data are not shown for Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.
() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)

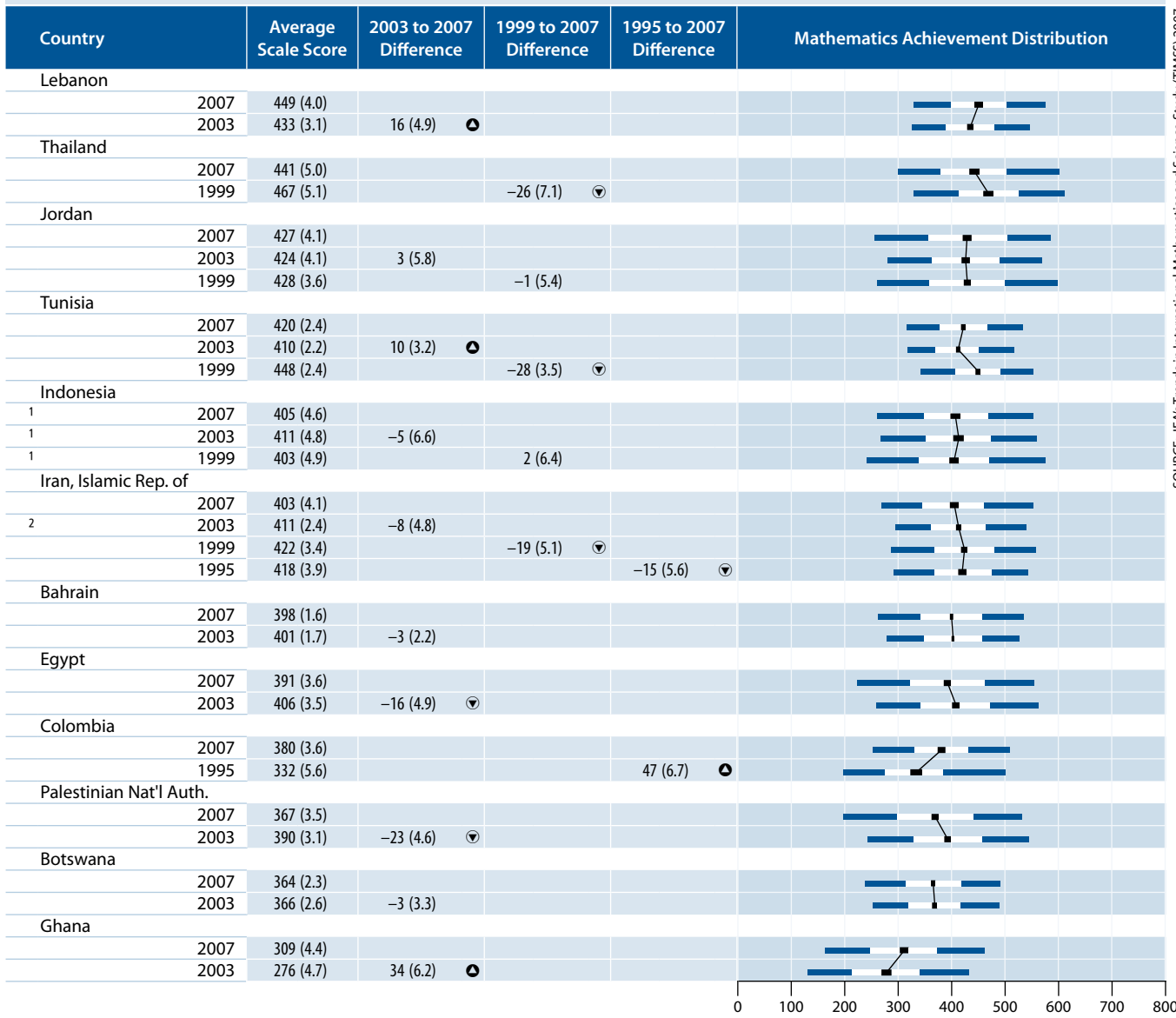
TIMSS2007
Mathematics 8th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)

TIMSS2007
Mathematics 8th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

- ▲ 2007 average significantly higher
- ▼ 2007 average significantly lower

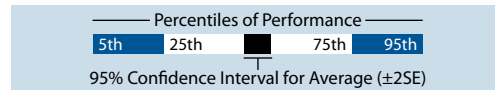
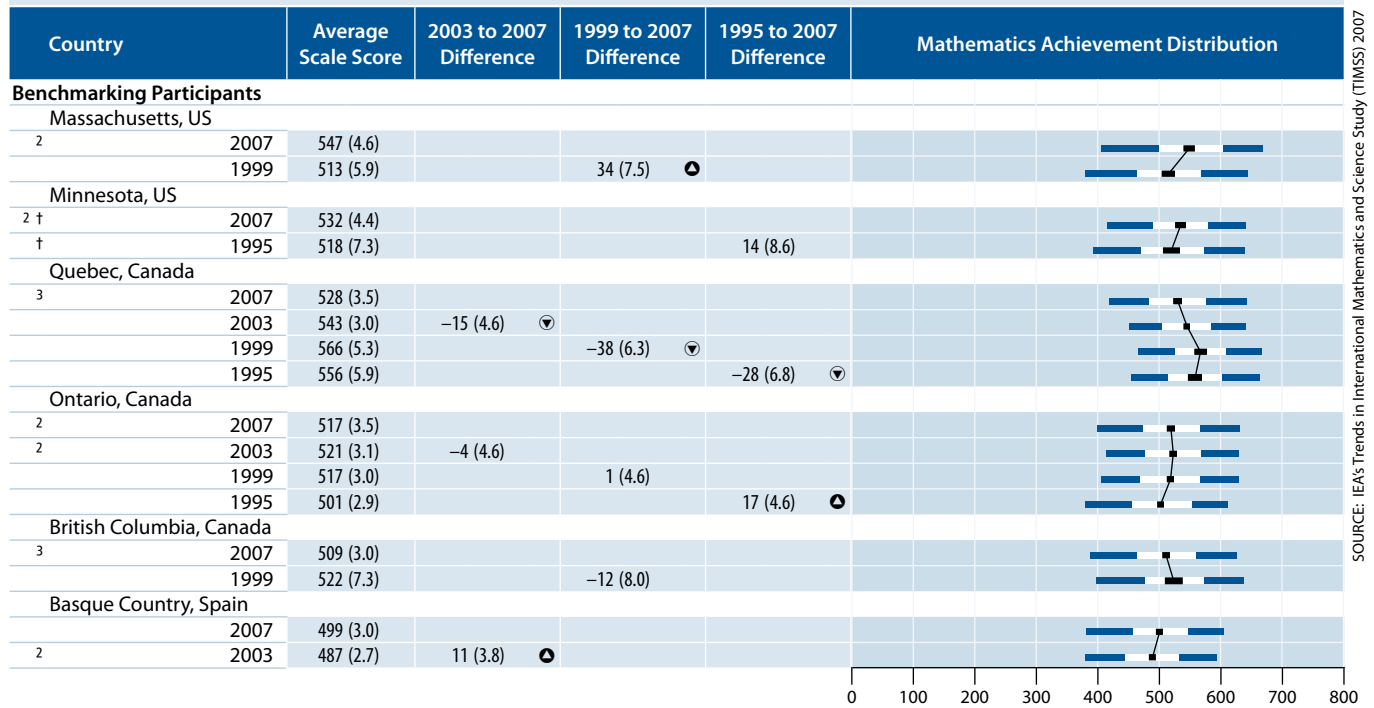


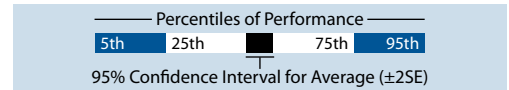
Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)

TIMSS2007
Mathematics 8th Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

⬆ 2007 average significantly higher
 ⬇ 2007 average significantly lower



At the fourth grade, 23 countries and 4 benchmarking participants have data from 1995 and 2003 or from either 1995 or 2003 that can be compared to 2007. There was no fourth grade assessment in TIMSS 1999. Thus, participants at the fourth grade have data from two or three points in time. At the eighth grade, 36 countries and 6 benchmarking participants have data from at least one previous assessment that can be compared with 2007, with 26 countries and 2 benchmarking participants having comparable data from three or all four TIMSS assessments—1995, 1999, 2003, and 2007.

It is interesting to consider the TIMSS 2007 achievement results in light of the information countries provided in the *TIMSS 2007 Encyclopedia*. For example, the trend results illustrate how TIMSS data can be used to monitor the impact of major changes in education systems. Many countries are engaged in implementing important structural, curricular, and instructional reforms. For example, according to ongoing reforms described in the *TIMSS 2007 Encyclopedia*, improvement in the Russian Federation and Slovenia may have been anticipated. As described previously, these two countries have been undergoing structural changes in their educational system that involved adding one more year of schooling at the primary level, as well as associated curricular and instructional reforms. For trend participants, Exhibit A.8 in Appendix A documents the years of formal schooling, average ages, percentages of exclusions, and participation rates for each assessment. In general, these have been relatively stable across the participants from assessment to assessment. However, as mentioned, there have been some structural changes in educational systems.

Looking at trends across all of the participating countries, not taking into account whether countries have participated in two, three, or four cycles (eighth grade) of TIMSS, more showed improvement in average achievement between their first cycle of participation and TIMSS 2007 than declines at the fourth grade, but this was not the pattern at the eighth grade. At the fourth grade, 10 countries had higher average achievement in 2007 than in their first TIMSS assessment, 5 had lower average achievement, and 8 showed no significant change. At the eighth grade, 10 countries had higher

average achievement in 2007 than in their initial assessment, 15 lower average achievement, and 11 showed no significant change.

Comparing only across the past 12 years, at the fourth grade, 16 countries have comparison data between 1995 and 2007. Of those, 8 had increased average achievement in 2007 compared to 1995, 4 had similar achievement, and 4 had decreases. At the eighth grade, of the 20 countries with 1995 data, 5 had increased average achievement in 2007, 5 similar achievement, and 10 had decreases. Taking an even closer look at the 12 countries that have trend data between 1995 and 2007 at both grades, the pattern persists with more improvements at the fourth than the eighth grade. Only the Czech Republic and Hungary had lower achievement at the fourth grade, as well as at the eighth grade. Six of these countries had higher achievement at the fourth grade in 2007 than in 1995, with England and the United States also showing improvement at the eighth grade. Two of them had no significant change at the eighth grade (Hong SAR and Slovenia) and two had declines (Australia and Iran). Of the 12 countries, the remaining 4 had equivalent average achievement at the fourth grade between 1995 and 2007, with one also having equivalency at the eighth grade (Scotland) but three having decreases (Japan, Norway, and Singapore). Thus, generally, and even in the same countries, between 1995 and 2007 there has been a tendency toward more improvement than declines at the fourth grade accompanied by less improvement or even declines at the eighth grade.

There was more consistency between the fourth and eighth grades in changes between 2003 and 2007. Looking across countries with trend data between 2003 and 2007, average achievement at the fourth grade either increased (9 countries) or stayed the same (10 countries) in most countries, with only 2 countries having decreases. At the eighth grade one-third of the countries (11) showed improvements, one-third (12) stayed the same, and one-third (10) showed declines. Among the 17 countries that participated in both grades, there was considerable consistency between grades. Ten changed in the same direction at both grades between 2003 and 2007: 5 with increases, 4 with essentially no changes, and 1 with a decrease. Five countries had more

positive trends at the fourth than the eighth grade (2 with increases at fourth grade and stable performance at eighth grade, 2 with stability at fourth grade and decreases at eighth grade, and 1 with an increase at fourth grade and a decrease at eighth grade). Tunisia, however, had the reverse, with a decrease at the fourth grade accompanied by an improvement at the eighth grade.

At the fourth grade, 8 countries and 2 benchmarking participants showed higher average mathematics achievement in 2007 than in 1995. Three of these countries—Hong Kong SAR, England, and Slovenia—had significant improvement from 1995 together with significant improvement from 2003 to 2007 suggesting a sustained improvement over the 12-year period from 1995 to 2007. For the United States, Australia, and Iran, the improvement in 2007 compared to 1995 largely reflects recent gains between 2003 and 2007. Latvia, New Zealand, and the province of Ontario also had higher average achievement in 2007 than 1995, but not between the two most recent assessments, indicating that the gains were essentially between 1995 and 2003. The state of Minnesota showed significant gains between 1995 and 2007, but has no data for intervening assessments. Norway appears to have recovered from an early decline, such that significant improvement between 2003 and 2007 resulted in essentially no change from 1995. In the province of Quebec, the recent gains did not equal the earlier declines so that achievement in 2007 is still below that of 1995. Chinese Taipei and Armenia showed increased average achievement between 2003 and 2007, the two assessments they participated in.

At the fourth grade, 4 countries and the province of Alberta (in addition to the province of Quebec described above) had lower average mathematics achievement in 2007 than in 1995. Of these, Austria, the Czech Republic, and the province of Alberta have previous data only from 1995. In Hungary, the decrease reflects a recent decline between 2003 and 2007 that overshadowed an upward shift between 1995 and 2003, whereas the Netherlands has shown a relatively steady decline from assessment to assessment. Tunisia participated in 2003 and 2007 and declined between the two assessments. In Singapore, Japan, and Scotland, average mathematics achievement has remained

essentially the same since 1995. The Russian Federation, Lithuania, Italy, and Morocco do not have comparable data from 1995, but average mathematics achievement did not change significantly between 2003 and 2007.

At the eighth grade, 5 countries and the province of Ontario had higher average mathematics achievement in 2007 than in 1995. Korea, England, the United States and Lithuania participated in all four assessments without having any significant declines between assessments, showing generally upward progress over the 12-year period. Average achievement increased in Colombia between 1995 and 2007, but it did not participate in the intervening assessments. After no change between 1995 and 2003, Slovenia improved between 2003 and 2007. Chinese Taipei participated in the three most recent assessments, showing improvement between 1999 and 2007, although the improvement largely reflects recent gains between 2003 and 2007. The state of Massachusetts improved between its two assessments in 1999 and 2007. Armenia, Serbia, Lebanon, Ghana, and the Basque Country of Spain showed improvement between 2003 and 2007, the two assessments they participated in.

Average mathematics achievement at the eighth grade remained relatively constant across assessments in Italy, Jordan, Indonesia, Bahrain, Botswana, the state of Minnesota and the province of British Columbia. Also, several countries participating at the eighth grade have had compensating increases and decreases in average mathematics achievement from assessment to assessment. For example, Cyprus had higher achievement in 2007 than 2003 essentially recovering from a previous decline and returning back to the 1995 level of achievement. After an initial increase, Hong Kong SAR had lower average achievement in 2007 than 2003 so that achievement is essentially the same as in 1995. The Russian Federation had lower average achievement in 2007 than in 1999—the high point for the four assessments, but achievement was not significantly different from 1995. Israel had a decrease between 2003 and 2007 equivalent to the previous increase between 1999 and 2003, bringing achievement back to the 1999 level.



At the eighth grade, 10 countries and the province of Quebec had lower average mathematics achievement in 2007 than in 1995. The Czech Republic, Australia, Sweden, and Bulgaria have had declines of various magnitudes from assessment to assessment. In Iran and Quebec the decreases have occurred since 1999, while in Singapore, Hungary, and Romania the decreases primarily were more recent between 2003 and 2007. Not all countries with declines between 1995 and 2007 showed declines between 2003 and 2007. For example, Japan showed no change between 2003 and 2007 perhaps stemming the earlier downward trend and Norway had higher average achievement in 2007 than 2003 (but not enough to recover from its previous decline). Malaysia has had successively lower average achievement with each assessment since 1999. Tunisia declined between 1999 and 2003, but has increased since then, although not back to the level it was at in 1999. In the Palestinian National Authority and Egypt, average achievement declined between its two assessments in 2003 and 2007.

Trends Across Grades: Fourth to Eighth Grade Cohort Analysis

Because TIMSS is conducted on a four-year cycle, the cohort of students that was assessed in the fourth grade in 2003 had reached the eighth grade by 2007, and thus was assessed as the eighth grade in 2007. This enables the 17 countries and 2 benchmarking participants that assessed both grades in both assessments to examine how their performance relative to each other changed as the fourth grade students of 2003 became the eighth grade students of 2007. The results are presented in Exhibit 1.4, which shows average mathematics achievement as a difference from the TIMSS scale average (500) for the fourth grade students in 2003 (upper-left panel) and in 2007 (top-right panel). The exhibit shows also achievement for the eighth grade students in 2003 (bottom-left panel) and in 2007 (bottom-right panel). The trends for fourth and eighth grade, however, were presented more fully in Exhibit 1.3. The purpose of Exhibit 1.4 is to provide information about relative progress across grades as the cohort of students assessed at the fourth grade in 2003 moved to the eighth grade four years later in 2007. That is, to compare relative performance at the fourth grade in 2003 (upper-left panel)

Exhibit 1.4 Cohort Comparison: 2003 Fourth Grade Students in Eighth Grade in 2007

TIMSS2007
Mathematics 4th & 8th
Grades

2003 – Fourth Grade			2007 – Fourth Grade		
Country	Difference From TIMSS Scale Avg.		Country	Difference From TIMSS Scale Avg.	
Singapore	94 (5.6)	▲	Hong Kong SAR	107 (3.6)	▲
Hong Kong SAR	75 (3.2)	▲	Singapore	99 (3.7)	▲
Japan	65 (1.6)	▲	Chinese Taipei	76 (1.7)	▲
Chinese Taipei	64 (1.8)	▲	Japan	68 (2.1)	▲
Lithuania	34 (2.8)	▲	Russian Federation	44 (4.9)	▲
Russian Federation	32 (4.7)	▲	England	41 (2.9)	▲
England	31 (3.7)	▲	Lithuania	30 (2.4)	▲
Hungary	29 (3.1)	▲	United States	29 (2.4)	▲
United States	18 (2.4)	▲	Australia	16 (3.5)	▲
Italy	3 (3.7)		Hungary	10 (3.5)	▲
Australia	-1 (3.9)		Italy	7 (3.1)	●
Scotland	-10 (3.3)	▼	Slovenia	2 (1.8)	
Slovenia	-21 (2.6)	▼	Armenia	0 (4.3)	
Armenia	-44 (3.5)	▼	Scotland	-6 (2.2)	▼
Norway	-49 (2.3)	▼	Norway	-27 (2.5)	▼
Iran, Islamic Rep. of	-111 (4.2)	▼	Iran, Islamic Rep. of	-98 (4.1)	▼
Tunisia	-161 (4.7)	▼	Tunisia	-173 (4.5)	▼
TIMSS Scale Avg.	500		TIMSS Scale Avg.	500	
Benchmarking Participants			Benchmarking Participants		
Ontario, Canada	11 (3.8)	▲	Quebec, Canada	19 (3.0)	▲
Quebec, Canada	6 (2.4)	▲	Ontario, Canada	12 (3.1)	▲

2003 – Eighth Grade			2007 – Eighth Grade		
Country	Difference From TIMSS Scale Avg.		Country	Difference From TIMSS Scale Avg.	
Singapore	105 (3.6)	▲	Chinese Taipei	98 (4.5)	▲
Hong Kong SAR	86 (3.3)	▲	Singapore	93 (3.8)	▲
Chinese Taipei	85 (4.6)	▲	Hong Kong SAR	72 (5.8)	▲
Japan	70 (2.1)	▲	Japan	70 (2.4)	▲
Hungary	29 (3.2)	▲	Hungary	17 (3.5)	▲
Russian Federation	8 (3.7)	▲	England	13 (4.8)	▲
Australia	5 (4.6)		Russian Federation	12 (4.1)	▲
United States	4 (3.3)		United States	8 (2.8)	▲
Lithuania	2 (2.5)		Lithuania	6 (2.3)	▲
England	-2 (4.7)		Slovenia	1 (2.1)	
Scotland	-2 (3.7)		Armenia	-1 (3.5)	
Slovenia	-7 (2.2)	▼	Australia	-4 (3.9)	
Italy	-16 (3.2)	▼	Scotland	-13 (3.7)	▼
Armenia	-22 (3.0)	▼	Italy	-20 (3.0)	▼
Norway	-39 (2.5)	▼	Norway	-31 (2.0)	▼
Iran, Islamic Rep. of	-89 (2.4)	▼	Tunisia	-80 (2.4)	▼
Tunisia	-90 (2.2)	▼	Iran, Islamic Rep. of	-97 (4.1)	▼
TIMSS Scale Avg.	500		TIMSS Scale Avg.	500	
Benchmarking Participants			Benchmarking Participants		
Quebec, Canada	43 (3.0)	▲	Quebec, Canada	28 (3.5)	▲
Ontario, Canada	21 (3.1)	▲	Ontario, Canada	17 (3.5)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Country average significantly higher than TIMSS scale average
▼ Country average significantly lower than TIMSS scale average

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

to relative performance at the eighth grade in 2007 (lower-right panel) as indicated by the arrow pointing diagonally downward.

Nine countries, including Singapore, Hong Kong SAR, Japan, Chinese Taipei, Lithuania, the Russian Federation, England, Hungary, and the United States as well as the two Canadian provinces of Ontario and Quebec performed above the scale average at the fourth grade in 2003 and again at the eighth grade in 2007 (although not in the same order of average achievement). Australia had achievement similar to the scale average in both 2003 and 2007. Scotland, Norway, Iran, and Tunisia also retained the same relative positions, performing below the scale average in the fourth grade in 2003 and again at the eighth grade in 2007. In comparison, Slovenia and Armenia moved from being below the scale average at the fourth grade in 2003 to having achievement similar to the scale average at the eighth grade in 2007. Italy had achievement at the fourth grade similar to the scale average in 2003, but below it at the eighth grade in 2007.

What Are the Gender Differences in Mathematics Achievement?

Exhibit 1.5 shows gender differences in fourth- and eighth-grade mathematics achievement in 2007. It presents average achievement separately for girls and boys for the TIMSS 2007 countries and benchmarking participants, as well as the difference between the averages. The difference between the average achievement for girls and for boys is shown by a bar indicating the amount of the difference, whether the direction of the difference was positive for girls or boys, and whether the difference is statistically significant (indicated by a darkened bar). Countries are shown in increasing order of this difference in average achievement between girls and boys. International averages also are shown. These were obtained by averaging across the mean scores for girls in each of the countries and the mean scores for boys in each of the countries. Benchmarking participants were not included in the calculation on the international averages.

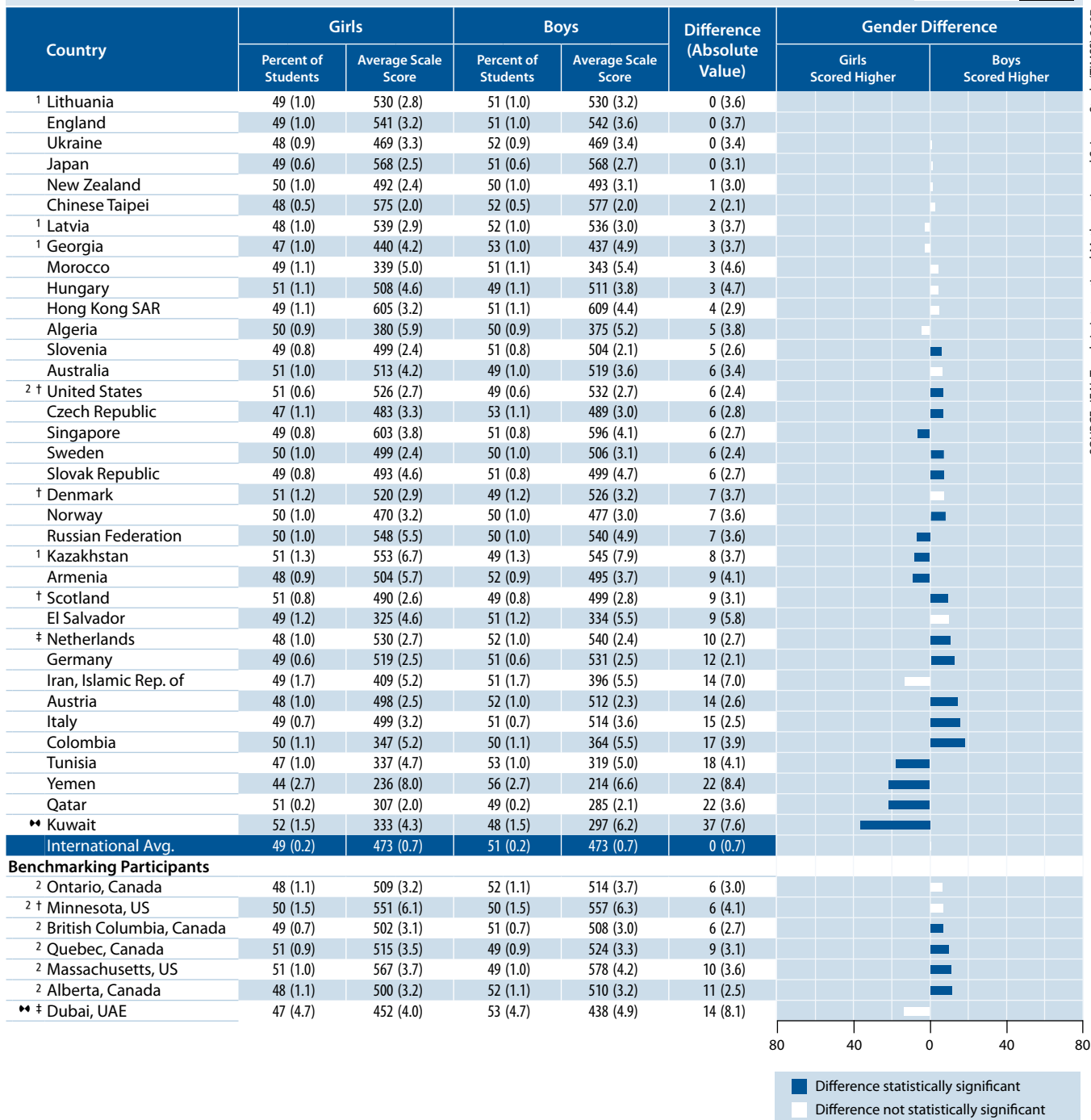
At the fourth grade, there was no difference in average achievement between boys and girls across the participating countries, on average,

although the situation varied from country to country. In approximately half the countries, the difference in average achievement in mathematics between girls and boys was negligible at the fourth grade. Girls had higher average mathematics achievement than boys in 8 countries, including Singapore, the Russian Federation, Kazakhstan, Armenia, Tunisia, Yemen, Qatar, and Kuwait. Boys had higher average achievement than girls in 12 countries, including Slovenia, the United States, the Czech Republic, Sweden, the Slovak Republic, Norway, Scotland, Netherlands, Germany, Austria, Italy, and Colombia. Among the benchmarking participants, boys had higher achievement than girls in three Canadian provinces, British Columbia, Quebec, and Alberta, and in the U.S. state of Massachusetts.

At the eighth grade, on average across the TIMSS 2007 countries, girls had higher average achievement than boys. Girls had higher achievement than boys in 16 of the participating countries, including Lithuania, Malaysia, Egypt, Bulgaria, Singapore, Botswana, Romania, Cyprus, Jordan, Kuwait, Saudi Arabia, Thailand, Bahrain, the Palestinian National Authority, Qatar, and Oman. Girls had higher average achievement than boys in many, but not all, of the countries in the Middle East. Boys had higher achievement than girls in 8 countries, including Algeria, Lebanon, Australia, the Syrian Arab Republic, El Salvador, Tunisia, Ghana, and Colombia, as well as in 2 Canadian provinces, British Columbia and Ontario.

Exhibit 1.6 shows changes in average achievement separately for boys and girls. At the fourth grade, changes are shown between 2003 and 2007 and between 1995 and 2007 (fourth grade was not assessed in 1999). Across the TIMSS participants, fourth grade girls showed improvement in 8 countries compared to 1995. In five of these countries, there also was improvement from 2003 to 2007, including Australia, England, Hong Kong SAR, Slovenia, and the United States. Also, girls in Armenia, Chinese Taipei, Norway, and the Russian Federation had higher average mathematics achievement in 2007 than in 2003. Girls had decreased average achievement across the 12-year period in Austria and the Czech Republic. In the Netherlands, fourth grade

Exhibit 1.5 TIMSS 2007 Average Mathematics Achievement by Gender

TIMSS2007
Mathematics 4th Grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

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

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

¹ National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

² National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.



Exhibit 1.5 TIMSS 2007 Average Mathematics Achievement by Gender (Continued)

TIMSS2007 Mathematics 8th Grade

Country	Girls		Boys		Difference (Absolute Value)	Gender Difference	
	Percent of Students	Average Scale Score	Percent of Students	Average Scale Score		Girls Scored Higher	Boys Scored Higher
Malta	51 (0.3)	488 (1.5)	49 (0.3)	488 (1.7)	0 (2.2)		
Turkey	47 (0.8)	432 (5.3)	53 (0.8)	432 (5.0)	1 (3.9)		
Hungary	50 (1.1)	517 (4.1)	50 (1.1)	517 (3.7)	1 (3.6)		
Chinese Taipei	48 (1.3)	599 (4.6)	52 (1.3)	598 (5.3)	1 (4.2)		
Bosnia and Herzegovina	49 (0.8)	456 (3.1)	51 (0.8)	455 (2.8)	1 (2.5)		
Slovenia	50 (0.8)	500 (2.7)	50 (0.8)	503 (2.6)	2 (3.2)		
Czech Republic	48 (0.8)	505 (2.5)	52 (0.8)	503 (2.8)	2 (2.4)		
³ Israel	53 (1.6)	465 (4.6)	47 (1.6)	462 (4.9)	3 (5.4)		
[†] Scotland	51 (1.0)	486 (3.8)	49 (1.0)	489 (4.4)	3 (3.5)		
² [†] United States	51 (0.7)	507 (3.0)	49 (0.7)	510 (3.1)	4 (2.2)		
Sweden	48 (0.9)	493 (2.6)	52 (0.9)	490 (2.5)	4 (2.5)		
Norway	49 (0.7)	471 (2.1)	51 (0.7)	467 (2.6)	4 (2.5)		
Indonesia	51 (1.0)	399 (4.1)	49 (1.0)	395 (4.4)	4 (4.0)		
Korea, Rep. of	48 (2.7)	595 (3.3)	52 (2.7)	599 (3.1)	4 (3.4)		
Armenia	50 (0.9)	501 (4.4)	50 (0.9)	497 (3.5)	4 (3.7)		
Japan	50 (1.0)	568 (3.2)	50 (1.0)	572 (3.2)	4 (4.3)		
¹ Georgia	50 (1.0)	412 (5.9)	50 (1.0)	408 (6.7)	4 (4.3)		
Russian Federation	52 (0.9)	514 (4.3)	48 (0.9)	509 (4.7)	5 (3.7)		
Ukraine	52 (0.8)	465 (3.9)	48 (0.8)	459 (3.9)	5 (2.9)		
Algeria	49 (0.6)	384 (2.4)	51 (0.6)	389 (2.2)	5 (1.8)		
[†] England	51 (1.9)	511 (5.0)	49 (1.9)	516 (6.1)	6 (5.7)		
Italy	48 (0.7)	477 (3.3)	52 (0.7)	483 (3.5)	6 (3.2)		
¹ ² Serbia	49 (0.7)	489 (3.6)	51 (0.7)	483 (4.0)	6 (3.9)		
¹ Lithuania	50 (1.1)	509 (3.0)	50 (1.1)	502 (2.3)	7 (2.6)		
Iran, Islamic Rep. of	46 (1.5)	407 (5.3)	54 (1.5)	400 (6.1)	7 (8.1)		
Malaysia	53 (1.5)	479 (5.6)	47 (1.5)	468 (5.3)	11 (4.4)		
[†] Hong Kong SAR	50 (1.3)	578 (5.0)	50 (1.3)	567 (8.0)	11 (6.7)		
Egypt	49 (2.7)	397 (5.0)	51 (2.7)	384 (4.6)	13 (6.4)		
Lebanon	54 (1.8)	443 (4.1)	46 (1.8)	456 (4.7)	13 (3.6)		
Bulgaria	50 (1.2)	471 (4.6)	50 (1.2)	456 (6.3)	15 (5.0)		
Singapore	49 (0.9)	600 (4.1)	51 (0.9)	586 (4.6)	15 (4.4)		
Australia	48 (1.9)	488 (5.5)	52 (1.9)	504 (5.4)	15 (7.7)		
Botswana	53 (0.8)	371 (2.4)	47 (0.8)	355 (3.2)	15 (3.3)		
Syrian Arab Republic	52 (1.9)	387 (4.3)	48 (1.9)	403 (5.1)	16 (5.6)		
Romania	49 (0.9)	470 (4.2)	51 (0.9)	452 (4.6)	18 (3.3)		
Cyprus	50 (0.6)	476 (2.2)	50 (0.6)	455 (2.4)	20 (3.2)		
Jordan	48 (2.0)	438 (6.4)	52 (2.0)	417 (5.6)	20 (8.8)		
El Salvador	52 (1.4)	331 (3.8)	48 (1.4)	351 (3.6)	21 (4.9)		
Tunisia	52 (0.8)	410 (2.8)	48 (0.8)	431 (2.7)	21 (2.4)		
Ghana	45 (0.8)	297 (5.0)	55 (0.8)	319 (4.4)	22 (3.6)		
^{••} Kuwait	54 (2.1)	364 (2.7)	46 (2.1)	342 (4.0)	22 (4.8)		
Saudi Arabia	48 (1.6)	341 (3.6)	52 (1.6)	319 (4.0)	23 (5.0)		
Thailand	50 (1.3)	453 (5.3)	50 (1.3)	430 (5.5)	23 (4.7)		
Colombia	51 (1.6)	364 (4.2)	49 (1.6)	396 (4.1)	32 (4.3)		
Bahrain	49 (0.4)	414 (2.2)	51 (0.4)	382 (2.6)	32 (3.6)		
Palestinian Nat'l Auth.	51 (1.4)	385 (4.2)	49 (1.4)	349 (5.4)	36 (6.5)		
Qatar	50 (0.2)	325 (2.1)	50 (0.2)	288 (2.0)	38 (2.9)		
Oman	52 (2.0)	399 (3.6)	48 (2.0)	344 (5.0)	54 (5.6)		
[‡] Morocco	53 (1.3)	377 (3.7)	47 (1.3)	385 (3.9)	9 (4.8)		
International Avg.	50 (0.2)	453 (0.7)	50 (0.2)	448 (0.7)	5 (0.6)		
Benchmarking Participants							
^{••} [‡] Dubai, UAE	49 (4.8)	461 (5.2)	51 (4.8)	461 (5.9)	0 (10.1)		
³ Quebec, Canada	49 (1.5)	527 (3.5)	51 (1.5)	529 (4.6)	2 (4.2)		
² [†] Minnesota, US	52 (1.3)	531 (4.4)	48 (1.3)	535 (5.1)	4 (3.7)		
Basque Country, Spain	48 (1.7)	496 (3.9)	52 (1.7)	501 (3.9)	4 (5.0)		
² Massachusetts, US	50 (1.0)	544 (4.8)	50 (1.0)	550 (5.1)	5 (3.8)		
³ British Columbia, Canada	51 (1.1)	507 (3.3)	49 (1.1)	512 (3.4)	6 (2.9)		
² Ontario, Canada	50 (1.1)	513 (4.1)	50 (1.1)	522 (4.0)	9 (4.1)		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

[†] Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
[‡] Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).
[‡] Did not satisfy guidelines for sample participation rates (see Appendix A).
¹ National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).
² National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

³ National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).
^{••} Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.
^() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

■ Difference statistically significant
 □ Difference not statistically significant

Exhibit 1.6 Trends in Average Mathematics Achievement by Gender – 1995 Through 2007

TIMSS2007
Mathematics 4th Grade

Country	Girls			Boys		
	2007 Average Scale Score	2003 to 2007 Difference	1995 to 2007 Difference	2007 Average Scale Score	2003 to 2007 Difference	1995 to 2007 Difference
Armenia	504 (5.7)	42 (6.8) ▲	◊ ◊	495 (3.7)	45 (5.3) ▲	◊ ◊
Australia	513 (4.2)	16 (6.1) ▲	20 (5.7) ▲	519 (3.6)	19 (5.6) ▲	23 (5.4) ▲
Austria	498 (2.5)	◊ ◊	-27 (4.3) ▼	512 (2.3)	◊ ◊	-24 (4.4) ▼
Chinese Taipei	575 (2.0)	11 (2.7) ▲	◊ ◊	577 (2.0)	13 (2.9) ▲	◊ ◊
Czech Republic	483 (3.3)	◊ ◊	-54 (4.6) ▼	489 (3.0)	◊ ◊	-54 (4.6) ▼
England	541 (3.2)	11 (5.0) ▲	62 (5.3) ▲	542 (3.6)	9 (5.8)	53 (5.2) ▲
Hong Kong SAR	605 (3.2)	30 (4.6) ▲	47 (5.0) ▲	609 (4.4)	34 (5.6) ▲	52 (6.3) ▲
Hungary	508 (4.6)	-19 (6.0) ▼	-11 (6.1)	511 (3.8)	-19 (5.1) ▼	-13 (5.5) ▼
Iran, Islamic Rep. of	409 (5.2)	15 (8.4)	30 (7.9) ▲	396 (5.5)	10 (7.8)	2 (9.7)
Italy	499 (3.2)	1 (5.2)	--	514 (3.6)	7 (5.2)	--
Japan	568 (2.5)	5 (3.1)	5 (3.2)	568 (2.7)	2 (3.4)	-3 (3.6)
Latvia	539 (2.9)	4 (4.3)	33 (5.9) ▲	536 (3.0)	5 (4.9)	43 (6.3) ▲
Lithuania	530 (2.8)	-5 (4.4)	◊ ◊	530 (3.2)	-6 (4.5)	◊ ◊
Morocco	339 (5.0)	-4 (7.9)	◊ ◊	343 (5.4)	-7 (7.4)	◊ ◊
Netherlands	530 (2.7)	-8 (3.8) ▼	-13 (4.2) ▼	540 (2.4)	-4 (3.2)	-17 (4.2) ▼
New Zealand	492 (2.4)	-3 (3.6)	19 (4.9) ▲	493 (3.1)	-3 (3.9)	28 (6.9) ▲
Norway	470 (3.2)	21 (4.2) ▲	-4 (5.4)	477 (3.0)	23 (4.0) ▲	-1 (4.7)
Russian Federation	548 (5.5)	18 (7.7) ▲	◊ ◊	540 (4.9)	7 (6.8)	◊ ◊
Scotland	490 (2.6)	5 (4.1)	-3 (4.9)	499 (2.8)	3 (5.2)	6 (5.4)
Singapore	603 (3.8)	4 (6.8)	8 (6.7)	596 (4.1)	6 (7.4)	10 (6.2)
Slovenia	499 (2.4)	23 (3.8) ▲	42 (4.5) ▲	504 (2.1)	23 (4.1) ▲	38 (4.1) ▲
Tunisia	336 (4.8)	-6 (6.9)	◊ ◊	317 (5.0)	-19 (7.0) ▼	◊ ◊
United States	526 (2.7)	12 (3.6) ▲	10 (4.1) ▲	532 (2.7)	10 (3.9) ▲	12 (4.1) ▲
Benchmarking Participants						
Alberta, Canada	500 (3.2)	◊ ◊	-23 (10.1) ▼	510 (3.2)	◊ ◊	-13 (8.4)
Minnesota, US	551 (6.1)	◊ ◊	34 (10.6) ▲	557 (6.3)	◊ ◊	42 (9.9) ▲
Ontario, Canada	509 (3.2)	3 (4.8)	22 (4.7) ▲	514 (3.7)	-2 (6.0)	24 (5.7) ▲
Quebec, Canada	515 (3.5)	12 (4.4) ▲	-34 (6.7) ▼	524 (3.3)	15 (4.4) ▲	-28 (5.7) ▼

- ▲ 2007 average significantly higher
▼ 2007 average significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

A diamond (◊) indicates the country did not participate in the assessment.

Exhibit 1.6 Trends in Average Mathematics Achievement by Gender – 1995 Through 2007 (Continued)

TIMSS2007
Mathematics **8th** Grade

Country	Girls				Boys			
	2007 Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 2007 Difference	2007 Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 2007 Difference
Armenia	501 (4.4)	18 (5.5) ▲	0 0	0 0	497 (3.5)	24 (4.9) ▲	0 0	0 0
Australia	488 (5.5)	-10 (8.0)	--	-23 (6.9) ▼	504 (5.4)	-7 (7.9)	--	-4 (7.2)
Bahrain	414 (2.2)	-3 (3.2)	0 0	0 0	382 (2.6)	-2 (3.6)	0 0	0 0
Botswana	371 (2.4)	3 (3.5)	0 0	0 0	355 (3.2)	-9 (4.3) ▼	0 0	0 0
Bulgaria	471 (4.6)	-5 (7.2)	-39 (7.5) ▼	-62 (7.6) ▼	456 (6.3)	-20 (7.7) ▼	-54 (9.4) ▼	-65 (8.9) ▼
Chinese Taipei	599 (4.6)	10 (6.8)	15 (6.1) ▲	0 0	598 (5.3)	16 (7.4) ▲	11 (7.5)	0 0
Colombia	364 (4.2)	0 0	0 0	44 (8.3) ▲	396 (4.1)	0 0	0 0	52 (9.2) ▲
Cyprus	476 (2.2)	8 (2.9) ▲	-3 (3.0)	5 (3.4)	455 (2.4)	4 (3.3)	-19 (3.6) ▼	-9 (4.0) ▼
Czech Republic	505 (2.5)	0 0	-7 (4.7)	-34 (5.9) ▼	503 (2.8)	0 0	-26 (6.4) ▼	-50 (5.4) ▼
Egypt	397 (5.0)	-9 (6.6)	0 0	0 0	384 (4.6)	-22 (6.8) ▼	0 0	0 0
England	511 (5.0)	12 (7.3)	24 (7.4) ▲	16 (6.4) ▲	516 (6.1)	18 (8.5) ▲	11 (7.9)	16 (8.2)
Ghana	297 (5.0)	31 (7.1) ▲	0 0	0 0	319 (4.4)	36 (6.6) ▲	0 0	0 0
Hong Kong SAR	578 (5.0)	-9 (6.3)	-5 (6.9)	19 (8.6) ▲	567 (8.0)	-18 (9.2) ▼	-14 (10.0)	-10 (10.8)
Hungary	517 (4.1)	-9 (5.5)	-12 (5.7) ▼	-10 (5.5)	517 (3.7)	-16 (5.1) ▼	-18 (5.7) ▼	-9 (5.2)
Indonesia	406 (4.7)	-5 (6.8)	6 (7.1)	0 0	404 (5.3)	-6 (7.5)	-1 (7.3)	0 0
Iran, Islamic Rep. of	407 (5.3)	-10 (6.8)	-1 (6.8)	2 (8.1)	400 (6.1)	-7 (7.4)	-32 (7.7) ▼	-29 (7.7) ▼
Israel	465 (4.6)	-27 (5.7) ▼	6 (6.3)	--	462 (4.9)	-38 (6.7) ▼	-12 (6.9)	--
Italy	477 (3.3)	-4 (4.5)	2 (5.6)	--	483 (3.5)	-4 (5.3)	-2 (5.6)	--
Japan	568 (3.2)	-1 (5.2)	-7 (4.0)	-9 (3.8) ▼	572 (3.2)	1 (4.8)	-10 (4.0) ▼	-13 (3.9) ▼
Jordan	438 (6.4)	-1 (7.9)	6 (8.0)	0 0	417 (5.6)	6 (8.1)	-8 (8.2)	0 0
Korea, Rep. of	595 (3.3)	9 (4.3) ▲	11 (4.6) ▲	24 (4.4) ▲	599 (3.1)	7 (4.0)	9 (3.8) ▲	11 (4.1) ▲
Lebanon	443 (4.1)	14 (5.5) ▲	0 0	0 0	456 (4.7)	18 (6.1) ▲	0 0	0 0
Lithuania	509 (3.0)	6 (4.2)	29 (5.5) ▲	37 (5.5) ▲	502 (2.3)	4 (3.8)	20 (5.3) ▲	31 (5.1) ▲
Malaysia	479 (5.6)	-33 (7.3) ▼	-43 (7.3) ▼	0 0	468 (5.3)	-36 (7.0) ▼	-49 (8.0) ▼	0 0
Norway	471 (2.1)	8 (3.4) ▲	0 0	-26 (3.3) ▼	467 (2.6)	7 (4.0)	0 0	-32 (3.9) ▼
Palestinian Nat'l Auth.	385 (4.2)	-9 (5.7)	0 0	0 0	349 (5.4)	-37 (7.2) ▼	0 0	0 0
Romania	470 (4.2)	-7 (6.6)	-4 (7.5)	-2 (6.1)	452 (4.6)	-21 (6.8) ▼	-18 (7.7) ▼	-22 (7.0) ▼
Russian Federation	514 (4.3)	4 (5.6)	-12 (7.4)	-10 (6.6)	509 (4.7)	3 (6.4)	-17 (7.9) ▼	-14 (7.8)
Scotland	486 (3.8)	-14 (5.8) ▼	0 0	0 (6.6)	489 (4.4)	-7 (5.8)	0 0	-12 (8.3)
Serbia	489 (3.6)	9 (4.7)	0 0	0 0	483 (4.0)	9 (5.0)	0 0	0 0
Singapore	600 (4.1)	-10 (5.3) ▼	-3 (7.3)	-10 (6.3)	586 (4.6)	-15 (6.3) ▼	-20 (8.8) ▼	-22 (6.6) ▼
Slovenia	500 (2.7)	6 (3.8)	--	8 (4.0) ▲	503 (2.6)	11 (3.7) ▲	--	5 (4.4)
Sweden	493 (2.6)	-6 (4.0)	0 0	-48 (5.3) ▼	490 (2.5)	-10 (3.7) ▼	0 0	-49 (5.4) ▼
Thailand	453 (5.3)	0 0	-16 (7.8) ▼	--	430 (5.5)	0 0	-35 (7.8) ▼	--
Tunisia	410 (2.8)	11 (3.8) ▲	-25 (3.7) ▼	0 0	431 (2.7)	8 (3.4) ▲	-29 (4.0) ▼	0 0
United States	507 (3.0)	5 (4.5)	9 (4.9)	17 (5.6) ▲	510 (3.1)	3 (4.7)	5 (5.7)	15 (6.1) ▲
Benchmarking Participants								
Basque Country, Spain	496 (3.9)	6 (4.6)	0 0	0 0	501 (3.9)	16 (5.3) ▲	0 0	0 0
British Columbia, Canada	507 (3.3)	0 0	-18 (7.8) ▼	0 0	512 (3.4)	0 0	-7 (9.1)	0 0
Massachusetts, US	544 (4.8)	0 0	34 (8.0) ▲	0 0	550 (5.1)	0 0	33 (7.9) ▲	0 0
Minnesota, US	531 (4.4)	0 0	0 0	14 (8.8)	535 (5.1)	0 0	0 0	14 (9.4)
Ontario, Canada	513 (4.1)	-7 (5.3)	-1 (5.3)	13 (5.0) ▲	522 (4.0)	0 (5.3)	2 (5.1)	18 (5.3) ▲
Quebec, Canada	527 (3.5)	-13 (5.1) ▼	-39 (6.7) ▼	-33 (7.6) ▼	529 (4.6)	-17 (5.6) ▼	-36 (7.3) ▼	-24 (7.9) ▼

▲ 2007 average significantly higher
▼ 2007 average significantly lower

Trend notes: Data are not shown for Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

A dash (–) indicates comparable data are not available.
A diamond (◊) indicates the country did not participate in the assessment.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

girls showed increasing declines in average mathematics achievement across the assessments.

Fourth grade boys often showed increases or decreases in achievement in the same countries as girls, indicating overall trends typically were reflected in similar changes for both sexes. The notable exception to this pattern is in Iran, where girls showed a 30-point increase between 1995 and 2007 compared to essentially no change for boys. Also, between 2003 and 2007 the improvement in the Russian Federation was significant for girls and not for boys, whereas in the decline in Tunisia was significant for boys and not for girls.

Among the benchmarking participants at fourth grade, the decrease in average achievement in the Canadian province of Alberta between 1995 and 2007 was significant for girls and not for boys. In the U.S. state of Minnesota, both girls and boys had higher achievement in 2007 than in 1995. This also was the trend in the Canadian province of Ontario, although achievement was unchanged recently between 2003 and 2007. In Quebec, both sexes had higher average achievement in 2007 than in 2003, but these improvements did not equal previous declines still resulting in lower achievement over the 12-year period for both girls and boys.

At the eighth grade, looking at the changes by gender between 1995 and 2007, girls had increases in average achievement in 7 countries and declines in 6 countries. The increases were in Colombia, England, Hong Kong SAR, Korea, Lithuania, Slovenia, and the United States. The improvements were similar for boys in these countries, except in Hong Kong SAR where boys had decreased average achievement, particularly between 2003 and 2007. The Canadian province of Ontario showed improvement for both boys and girls between 1995 and 2007, and the Canadian province of Quebec had declines for both sexes during the same period.

Among the 6 countries with declines in average achievement for girls at the eighth grade, in Bulgaria, the Czech Republic, Japan, Norway, and Sweden the boys also had lower average achievement in 2007 than in 1995. In Australia, only the girls had lower achievement in 2007 and not the boys.

However, in Cyprus, Iran, Romania, and Singapore, boys had lower average achievement in 2007 than in 1995. For countries with trends dating only back to 1999 and showing changes by gender, Chinese Taipei had increases for girls but not boys and Malaysia, Thailand, and Tunisia had decreases for both. Among the benchmarking participants, the U.S. state of Massachusetts had increases for both boys and girls and the Canadian province of British Columbia had a decrease for girls. For countries joining TIMSS in 2003 and showing changes in achievement by gender, both boys and girls had higher achievement in 2007 in Armenia, Ghana, and Lebanon, and the boys had lower achievement in Botswana, Egypt, and the Palestinian National Authority. In the Basque Country of Spain, boys had higher achievement in 2007 than in 2003.

