

# 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

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.

<sup>2</sup> 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.

<sup>3</sup> 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.<sup>4</sup> 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

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 Ath Mathematics TGrade

					mati	ematics - Glade
Country	Mathematics Achievement Distribution		Average Scale Score	Years of Formal Schooling*	Average Age at Time of Testing	Human Development Index**
Hong Kong SAR		٥	607 (3.6)	4	10.2	0.937
Singapore		٥	599 (3.7)	4	10.4	0.922
Chinese Taipei		٥	576 (1.7)	4	10.2	0.932
Japan		٥	568 (2.1)	4	10.5	0.953
¹ Kazakhstan		٥	549 (7.1)	4	10.6	0.794
Russian Federation		٥	544 (4.9)	4	10.8	0.813
England		٥	541 (2.9)	5	10.2	0.946
¹ Latvia		٥	537 (2.3)	4	11.0	0.855
‡ Netherlands		٥	535 (2.1)	4	10.2	0.953
¹ Lithuania		٥	530 (2.4)	4	10.8	0.862
<sup>2</sup> † United States		٥	529 (2.4)	4	10.3	0.951
Germany		٥	525 (2.3)	4	10.4	0.935
† Denmark		0	523 (2.4)	4	11.0	0.949
Australia		٥	516 (3.5)	4	9.9	0.962
Hungary		0	510 (3.5)	4	10.7	0.874
Italy		٥	507 (3.1)	4	9.8	0.941
Austria		٥	505 (2.0)	4	10.3	0.948
Sweden		ŭ	503 (2.5)	4	10.8	0.956
Slovenia			502 (1.8)	4	9.8	0.917
TIMSS Scale Avg.			500	T	7.0	0.517
Armenia			500 (4.3)	4	10.6	0.775
Slovak Republic			496 (4.5)	4	10.4	0.863
† Scotland		•	494 (2.2)	5	9.8	0.946
New Zealand		•	492 (2.2)	4.5 – 5.5	10.0	0.943
Czech Republic		•	486 (2.8)	4.5 – 5.5	10.3	0.891
Norway		•	473 (2.5)	4	9.8	0.968
Ukraine		•	469 (2.9)	4	10.3	0.788
¹ Georgia		•	438 (4.2)	4	10.1	0.754
Iran, Islamic Rep. of		•	402 (4.1)	4	10.1	0.759
Algeria		•	378 (5.2)	4	10.2	0.733
Colombia		•	355 (5.0)	4	10.4	0.791
Morocco		•	341 (4.7)	4	10.6	0.646
El Salvador		•	330 (4.1)	4	11.0	0.735
Tunisia		•	327 (4.5)	4	10.2	0.766
M Kuwait		•	316 (3.6)	4	10.2	0.891
Oatar		•	296 (1.0)	4	9.7	0.875
Yemen		•	224 (6.0)	4	11.2	0.508
Benchmarking Participants		•	224 (0.0)	7	11.2	0.300
<sup>2</sup> Massachusetts, US		٥	572 (3.5)	4	10.3	_
<sup>2</sup> † Minnesota, US		0	554 (5.9)	4	10.3	<u>_</u>
<sup>2</sup> Quebec, Canada		٥	519 (3.0)	4	10.1	_
<sup>2</sup> Ontario, Canada		٥	512 (3.1)	4	9.8	<u>_</u>
<sup>2</sup> Alberta, Canada		_	505 (3.0)	4	9.8	_
<sup>2</sup> British Columbia, Canada			505 (3.0)	4	9.8	_
→ ‡ Dubai, UAE		€	444 (2.1)	4	10.0	_
0		7 800	TTT (2.1)	7	10.0	
	Percentiles of Performance  5th 25th 75th 95% Confidence Interval for Average (±2SE)		•		higher than TIMS lower than TIMS	•

- 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).
- 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 Oth Mathematics OGrade

						ematics Odiade
Country	Mathematics Achievement Distribution	9	Average Scale Score	Years of Formal Schooling*	Average Age at Time of Testing	Human Development Index**
Chinese Taipei		٥	598 (4.5)	8	14.2	0.932
		0	. ,	8	14.3	0.932
Korea, Rep. of			597 (2.7)			
Singapore		0	593 (3.8)	8	14.4	0.922
† Hong Kong SAR		٥	572 (5.8)	8	14.4	0.937
Japan		٥	570 (2.4)	8	14.5	0.953
Hungary		٥	517 (3.5)	8	14.6	0.874
† England		٥	513 (4.8)	9	14.2	0.946
Russian Federation		٥	512 (4.1)	7 or 8	14.6	0.802
<sup>2 †</sup> United States		٥	508 (2.8)	8	14.3	0.951
<sup>1</sup> Lithuania		0	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	7 01 0	1510	015 11
Armenia			499 (3.5)	8	14.9	0.775
Australia			496 (3.9)	8	13.9	0.962
Sweden		•	. ,			0.956
			491 (2.3)	8	14.8	
Malta		•	488 (1.2)	9	14.0	0.878
† Scotland		•	487 (3.7)	9	13.7	0.946
<sup>1 2</sup> Serbia		•	486 (3.3)	8	14.9	0.810
Italy		lacktriangledown	480 (3.0)	8	13.9	0.941
Malaysia		♥	474 (5.0)	8	14.3	0.811
Norway		lacktriangledown	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
<sup>3</sup> 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
		•	. ,			0.772
Thailand			441 (5.0)	8	14.3	
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
<sup>1</sup> Georgia		lacktriangledown	410 (5.9)	8	14.2	0.754
Iran, Islamic Rep. of		♥	403 (4.1)	8	14.2	0.759
Bahrain		lacktriangledown	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
M 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
enchmarking Participants						
<sup>2</sup> Massachusetts, US		0	547 (4.6)	8	14.2	-
<sup>2</sup> † Minnesota, US		٥	532 (4.4)	8	14.3	-
<sup>3</sup> Quebec, Canada		0	528 (3.5)	8	14.2	_
<sup>2</sup> Ontario, Canada		٥	517 (3.5)	8	13.8	-
<sup>3</sup> British Columbia, Canada		٥	509 (3.0)	8	13.9	_
Basque Country, Spain			499 (3.0)	8	14.1	_
• ‡ Dubai, UAE		•	461 (2.4)	8	14.2	_
		1	401 (Z.4)	0	14.2	_
0	100 200 300 400 500 600 700 80	00				
	Percentiles of Performance	^	Country	ao cianifeanti	higher than TIME	C ccalo avorac-
	5th 25th 75th 95th		•		higher than TIMS	_
	95% Confidence Interval for Average (+2SE)	♥ (	Country avera	ige significantly	lower than TIMSS	scale average

- 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).
- 95% Confidence Interval for Average (±2SE)

  © Country average significantly lower than TIMSS scale average
  - National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).
     National Defined Population covers 90% to 95% of National Target Population (see Appendix A).
  - 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**



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)			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Singapore	599 (3.7)			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0
Chinese Taipei	576 (1.7)	€	◉		٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Japan	568 (2.1)	•	◉	◉		٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Kazakhstan	549 (7.1)	€	◉	♥	♥						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Russian Federation	544 (4.9)	♥	♥	♥	♥						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
England	541 (2.9)	€	◉	◉	€						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Latvia	537 (2.3)	€	€	€	€						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Netherlands	535 (2.1)	€	◉	€	€								٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Lithuania	530 (2.4)	€	€	€	€	◉	€	◉	<b>(</b>					٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
United States	529 (2.4)	•	•	•	•	•	•	•	•						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Germany	525 (2.3)	•	•	•	•	<b>(</b>	•	•		◉					٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Denmark	523 (2.4)	•	•	•	•	•	•	•	•	•	◉				_	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	۵	٥	٥	٥	٥
Australia	516 (3.5)	•	•	( <b>v</b> )	•	•	•	•	•	•	•	♥	•				٥	_	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Hungary	510 (3.5)	•	•	•	•	•	•	•	•	•	•	•	•	€						٥	Ŭ	٥	٥	٥	٥	٥	٥	٥	_	٥
Italy	507 (3.1)	•	•	•	•	•	•	•	•	•	•	•	•	•	( <b>v</b> )							٥	٥	٥	٥	٥	٥	٥	٥	٥
Austria	505 (2.0)	•	•	•	•	•	•	•	•	•	•	•	•	•	•								٥	٥	0	٥	٥	٥	٥	٥
Sweden	503 (2.5)	•	•	•	•	•	•	•	•	•	•	•	•	•	•								٥	٥	٥	٥	٥	٥	٥	٥
Slovenia	502 (1.8)	•	•	•	•	•	•	•	•	•	•	•	•	•		•							٥	-	٥	٥	٥	٥	-	٥
Armenia	500 (4.3)	•	•	•	•	•	•	•	•	•	<ul><li>▼</li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li></ul>	•	•	•	•	•							_	_	٥	٥	٥	٥	٥	٥
Slovak Republic	496 (4.5)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	€	•									٥	٥	٥	_	٥
Scotland	494 (2.2)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	€	•	€					٥	٥	٥	٥	٥	٥
New Zealand	494 (2.2)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					0	٥	٥	٥	٥	٥
Czech Republic	486 (2.8)	•	•	•	•	•	•	•	•	•	<b>(</b>	•	•	•	•	•	•	•	•	•	•		•			٥	٥	٥	٥	٥
Norway	473 (2.5)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	♥	•	€	€	-	0	٥	٥	٥
Ukraine	469 (2.9)	•	•	•	•		_		•		-	•									•	•	•		•			٥	٥	٥
		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li>✓</li></ul>	<ul><li>•</li><li>•</li><li>•</li></ul>	•		•	•	<ul><li>•</li><li>•</li><li>•</li></ul>	•			U		٥
Georgia	438 (4.2)			_		•	•	•		•	•		•	•	•	•	_	_		•	•	_				•	•		0	
Iran, Islamic Rep. of	402 (4.1)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		٥
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)	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	•	♥	♥	♥	♥	♥	♥	♥	♥	♥	•	♥	♥	♥	♥	•	♥	♥	♥
enchmarking Participants																														
Massachusetts, US	572 (3.5)	€	◉			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Minnesota, US	554 (5.9)	€	◉	◉	◉				٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Quebec, Canada	519 (3.0)	€	◉	◉	◉	lacktriangledown	lacktriangledown	◉	♥	◉	$\odot$	lacktriangledown				٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Ontario, Canada	512 (3.1)	•	◉	◉	◉	lacktriangledown	lacktriangledown	◉	◉	◉	lacktriangledown	lacktriangledown	◉	•					٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Alberta, Canada	505 (3.0)	€	◉	◉	€	$\odot$	•	◉	♥	◉	$\odot$	lacktriangledown	♥	•	•								٥	٥	٥	٥	٥	٥	٥	٥
British Columbia, Canada	505 (2.7)	•	◉					◉																	٥					
Dubai, UAE	444 (2.1)		♥									_	_									_		_		_	_		_	٥



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



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	<b>Benchmarking Participants</b>	Massachusetts, US	Minnesota, US	Quebec, Canada	Ontario, Canada	Alberta, Canada	British Columbia, Canada	Dubai, UAE	Average Scale Score	Country	natics and Science Study (TIMSS) 2007
O O O O O O O O O O O O O O O O O O O	0	٥	٥	٥	٥	٥	٥	_	٥	٥	٥	٥	٥	٥	٥	607 (3.6)	Hong Kong SAR	hen:
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		٥	٥	٥	٥	٥	٥	٥	599 (3.7)	Singapore	Ma
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥			٥	٥	٥	٥	٥	٥	576 (1.7)	Chinese Taipei	ona
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥			٥	٥	٥	٥	٥	٥	568 (2.1)	Japan	rnati
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		lacktriangledown		٥	٥	٥	٥	٥	549 (7.1)	Kazakhstan	Inter
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		lacktriangledown		٥	٥	٥	٥	٥	544 (4.9)	Russian Federation	sin
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		lacktriangledown		٥	٥	٥	٥	٥	541 (2.9)	England	end
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		lacktriangledown	◉	٥	٥	٥	٥	٥	537 (2.3)	Latvia	√s Tr
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		♥	♥	٥	٥	٥	٥	٥	535 (2.1)	Netherlands	<u></u>
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	٥		◉	◉	٥	٥	٥	٥	٥	530 (2.4)		J. C.
O O O O O O O O O O O O O O O O O O O	٥	٥	٥	٥	٥	٥	_		◉	♥	٥	٥	٥	٥	_			SOL
O O O O O O O O O O O O O O O O O O O	٥	-	-	٥	-	٥	_					_	٥		_		·	
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_					٥	_	_	_			
O O O O O O O O O O O O O O O O O O O	_	_	_	_	-	_	_						٥	٥	-			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_									. ,		
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	-	-	_	_	_	_								-	. ,		
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_											
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	-	-	_	-	-	_								_			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_								_	. ,		
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	-	_	_								-			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_											
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	-	-	_	_	_	_								-			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_											
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	-	-	_	-	-	_								_			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	_	_	_					_			_			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	_	_	_	_	-	_	_								Ŭ			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	٥	٥	٥	٥	٥	٥	٥								•			
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	٥	٥	٥	٥	٥	٥	٥		€	♥	♥	♥	♥		€			
♥         ■         ■         ●		٥	٥	٥	٥	٥	٥		◉	♥	◉	◉	♥	◉	◉		Colombia	
• • • • • • • • • • • • • • • • • • •	◉			٥	٥	٥	٥		◉	◉	◉	◉	◉	◉	◉	341 (4.7)	Morocco	
♥ ♥ ♥ ♥         ♥ ♥ ♥ ♥ ♥         Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø Ø	lacktriangledown				٥	٥	٥		$\odot$	◉	◉	◉	◉	$\odot$	◉	330 (4.1)	El Salvador	
♥ ♥ ♥ ♥ ♥       • • • • • • • • • • • • • • • • • • •	lacktriangledown	◉			٥	٥	٥		◉	◉	◉	◉	◉	lacktriangledown	◉	327 (4.5)	Tunisia	
Image: Control of the contr	lacktriangledown	◉	◉	◉		٥	٥		lacktriangledown	◉	lacktriangledown	lacktriangledown	◉	lacktriangledown	◉	316 (3.6)	Kuwait	
Benchmarking Participants  O O O O O O O O O O O O O O O O O O O	lacktriangledown	◉	◉	◉	◉		٥		lacktriangledown	♥	◉	◉	◉	lacktriangledown	◉	296 (1.0)	Qatar	
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	•	♥	◉	♥	♥	♥			♥	♥	♥	♥	♥	$\odot$	♥	224 (6.0)	Yemen	
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○																	Benchmarking Participants	
● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	0	٥	٥	٥	٥	٥	٥			٥	٥	٥	٥	٥	٥	572 (3.5)		
O O O O O O O O O O O O O O O O O O O									lacktriangledown		٥	٥				554 (5.9)		
O         O									◉	♥			٥	٥	٥			
●         ●         ●         ●         ●         British Columbia, Canada									♥	♥								
•         •															٥			
	0	٥	٥	٥	٥	٥	٥		•	•	•	•	•	•		444 (2.1)	Dubai, UAE	

• 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)**



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

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, or in there is no statistically	sigimicanic ai								9-1																					
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)				٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0
Korea, Rep. of	597 (2.7)				٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0	0
Singapore	593 (3.8)				٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0
Hong Kong SAR	572 (5.8)	♥	♥	◉			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Japan	570 (2.4)	•	€	€			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥
Hungary	517 (3.5)	•	♥	•	€	♥	Ĭ			Ť	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	_	٥
England	513 (4.8)	•	♥	€	€	♥							٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	-	Ö
Russian Federation	512 (4.1)	•	•	•	•	•							٥	٥	٥	٥	٥	٥	٥	۵	۵	٥	٥	۵	٥	۵	۵	٥		٥
United States	508 (2.8)	•	•	•	•	•							٥	0	٥	٥	_	0	ō	٥	٥	0	٥	0	ō	٥	0	٥	_	0
Lithuania	506 (2.8)	•	•	•	•		•						_	_	٥	٥	^	0	0	٥	^	٥	٥	٥	٥	٥	~	~	_	0
Czech Republic	500 (2.3)	•	•	•	•	•	•								_	٥	٥	0	0	٥	0	٥	٥	٥	0	٥	٥	٥	_	0
	504 (2.4)	•	•	•		•	•	♥	♥	♥						٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	^	~	_	٥
Slovenia	,		•	_		_		•		•						0	٥	٥	0	_	٥	٥	٥	٥	0	٥	٥	٥	-	٥
Armenia	499 (3.5)	•		•	•	•	•		•								٥	0	٥	٥	٥	٥	٥	٥		٥	0	0	^	0
Australia	496 (3.9)	•	•	•	•		•	•		•	•						O		O	_	٥	_	_	_	0	_	0	0	0	0
Sweden	491 (2.3)	•	•	•	▼	♥	•	•	•	•	•	•	•							0	٥	٥	0	٥	٥	٥	0	0	0	0
Malta	488 (1.2)	•	•	•						•	•	•	•		•					O	_	0	0	0	0	0	0	0	0	0
Scotland	487 (3.7)	•	•	•	▼	♥	•	•	•	•	•	•	•	•							٥	٥	0	٥	٥	٥	0	0	_	0
Serbia	486 (3.3)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	_	_				٥	0	0	0	0	0	0	0	0	0
Italy	480 (3.0)	•	•	•	•	•	<b>(</b>	•	•	•	•	•	<b>(</b>	•	•	•	•	_	_			٥	٥	٥	O	٥	O		_	٥
Malaysia	474 (5.0)	•	•	(▼)	<b>(</b>	( <b>v</b> )	•	( <b>v</b> )	<b>(V</b> )	(▼)	( <b>v</b> )	<b>(v</b> )	( <b>v</b> )	•	•	•	•	•	•	_										٥
Norway	469 (2.0)	•	•	•	•	•	<b>(v</b> )	♥	<b>(</b>	•	•	♥	<b>(</b>	•	•	•	<b>v</b>	•	•	•										0
Cyprus	465 (1.6)	•	♥	♥	♥	•	♥	♥	•	♥	•	•	♥	•	•	♥	♥	♥	♥	♥								٥		0
Bulgaria	464 (5.0)	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥										٥
Israel	463 (3.9)	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥										0
Ukraine	462 (3.6)	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥										0
Romania	461 (4.1)	♥	♥	♥	♥	♥	lacktriangledown	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥									٥	0
Bosnia and Herzegovina	456 (2.7)	♥	♥	♥	♥	♥	lacktriangledown	♥	♥	♥	♥	♥	♥	♥	♥	♥	◉	♥	♥	♥	♥	◉	♥							0
Lebanon	449 (4.0)	♥	♥	◉	♥	♥	lacktriangledown	♥	◉	◉	◉	lacktriangledown	♥	◉	♥	♥	lacktriangledown	lacktriangledown	◉	◉	◉	lacktriangledown	◉	lacktriangledown	♥	lacktriangledown	lacktriangledown			
Thailand	441 (5.0)	♥	◉	◉	◉	◉	lacktriangledown	♥	◉	◉	◉	◉	◉	◉	◉	◉	◉	lacktriangledown	◉	◉	◉	◉	◉	lacktriangledown	◉	◉	◉	◉		
Turkey	432 (4.8)	♥	◉	◉	◉	◉	lacktriangledown	♥	◉	◉	◉	$\bigcirc$	◉	$\bigcirc$	◉	♥	lacktriangledown	lacktriangledown	◉	$\bigcirc$	◉	lacktriangledown	◉	lacktriangledown	◉	$\bigcirc$	$\bigcirc$	◉	◉	
Jordan	427 (4.1)	◉	♥	◉	◉	◉	lacktriangledown	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉
Tunisia	420 (2.4)	♥	♥	♥	♥	♥	♥	♥	♥	♥	•	$\bigcirc$	♥	◉	♥	◉	♥	◉	◉	◉	♥	◉	◉	$\bigcirc$	♥	◉	$\bigcirc$	♥	♥	♥
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)	◉	◉	♥	◉	♥	◉	♥	◉	♥	◉	◉	♥	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	<b>(</b>
Egypt	391 (3.6)	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )	( <b>v</b> )
Algeria	387 (2.1)	(▼)	♥	( <b>v</b> )	♥	( <b>v</b> )	€	♥	♥	( <b>v</b> )	•	♥	( <b>v</b> )	♥	♥	♥	( <b>v</b> )	♥	♥	♥	( <b>v</b> )	◉	◉	♥	( <b>v</b> )	•	•	•	•	( <b>v</b> )
Morocco	381 (3.0)		( <b>v</b> )		•			•	•		•									•				<b>(</b>		•	•		( <b>v</b> )	
Colombia	380 (3.6)	_	♥	€	♥	_	_				•					•				♥	_	◉		♥	_	♥	♥	•	•	<b>(</b>
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								•																					•	_
Qatar	309 (4.4) 307 (1.4)																											•	_	_
	JU/ (1.4)	•	·	·	•	·	•	·	•	·	v	•	·	•	·	·	·	·	·	•	•	·	·	•	·	•	•	·	•	•
Benchmarking Participants				_	_	_	-			-		_	-	_					-	_					-	_	_			
Massachusetts, US	547 (4.6)																											0		
Minnesota, US	532 (4.4)																											0		
Quebec, Canada	528 (3.5)						٥	٥	٥	0																		٥		
Ontario, Canada	517 (3.5)		♥								٥	٥																٥		
British Columbia, Canada	509 (3.0)		♥										٥	٥	٥	٥												٥		
Basque Country, Spain	499 (3.0)							♥															٥	٥	٥	٥	٥	٥		
Dubai, UAE	461 (2.4)	•	•	♥	♥	♥	•	♥	♥	♥	♥	♥	♥	♥	♥	•	♥	♥	♥	♥	♥	♥							٥	0

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



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.

Turkey	Jordan	Tunisia	Georgia	Iran, Islamic Rep. of	Bahrain	Indonesia	Syrian Arab Republic	Egypt	Algeria	Morocco	Colombia	Oman	Palestinian Nat'l Auth.	Botswana	Kuwait	El Salvador	Saudi Arabia	Ghana	Qatar	<b>Benchmarking Participants</b>	Massachusetts, US	Minnesota, US	Quebec, Canada	Ontario, Canada	British Columbia, Canada	Basque Country, Spain	Dubai, UAE	Average Scale Score	Country  Chinese Taipei Korea, Rep. of Singapore Hong Kong SAR Japan Hungary England Russian Federation United States Lithuania Czech Republic
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		٥	٥	٥	٥	٥		٥	598 (4.5)	Chinese Taipei
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		٥	٥	٥	٥	٥	0	٥	597 (2.7)	Korea, Rep. of
٥	٥	٥	0	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0	٥	٥	٥	٥		٥	٥	0	٥	٥	0	٥	593 (3.8)	Singapore
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	572 (5.8)	Hong Kong SAR ្ន្រី
0	٥	٥	٥	٥	0	0	0	٥	٥	0	0	٥	0	0	0	0	0	0	0		<b>○</b>	<b>○</b>	<b>○</b>	٥	٥	0	0	570 (2.4)	Japan <u>=</u>
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	0	٥	٥	٥	0	٥	٥		•	•	•			0	0	517 (3.5) 513 (4.8)	Hungary ခွ် England ခွ်
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		•	•	•			0	0	512 (4.1)	Russian Federation
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		•	•	•			٥	٥	508 (2.8)	United States
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		lacktriangledown	◉	◉	◉			٥	506 (2.3)	Lithuania 및
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		◉	◉	lacktriangledown	◉			٥	504 (2.4)	Czech Republic ွ
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		♥	♥	♥	♥	♥		٥	501 (2.1)	Slovenia
٥	0	0	٥	٥	0	0	0	0	٥	0	0	0	0	٥	0	٥	0	٥	0		•	•	•	•	•		0	499 (3.5)	Armenia
0	0	0	0	٥	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		•	•	•	•	•		0	496 (3.9)	Australia
0	٥	٥	٥	0	0	٥	٥	٥	٥	٥	0	٥	0	٥	0	٥	0	0	٥		<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li><li></li></ul>	<ul><li>▼</li><li></li><li></li></ul>	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>	•	0	491 (2.3) 488 (1.2)	Sweden Malta
0	٥	٥	٥	0	0	٥	0	٥	٥	0	0	0	0	0	0	0	0	0	0		•	•	•	•	•	•	0	487 (3.7)	Scotland
0	٥	0	٥	٥	0	٥	0	0	٥	0	0	0	0	0	0	٥	٥	٥	0		•	♥	◉	♥	♥	♥	٥	486 (3.3)	Serbia
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		◉	◉	◉	◉	◉	lacktriangledown	٥	480 (3.0)	Italy
0	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		$\odot$	◉	◉	♥	♥	lacktriangledown	٥	474 (5.0)	Malaysia
٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		♥	♥	♥	♥	♥	•	٥	469 (2.0)	Norway
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		•	•	•	•	•	•		465 (1.6)	Cyprus
0	0	٥	٥	0	0	0	0	٥	٥	0	0	٥	0	0	0	0	0	0	0		<ul><li>▼</li><li></li></ul>	•	<ul><li>▼</li><li></li><li>▼</li></ul>	•	•	•		464 (5.0)	Bulgaria
0	0	٥	٥	٥	0	٥	٥	٥	٥	0	0	٥	٥	٥	0	٥	0	0	٥		•	<ul><li>▼</li><li></li></ul>	•	<ul><li>▼</li><li></li></ul>	•	<ul><li>▼</li></ul>		463 (3.9) 462 (3.6)	Israel Ukraine
٥	٥	٥	٥	0	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		•	•	(v)	•	•	•		462 (3.6)	Romania
٥	٥	٥	٥	٥	0	٥	٥	٥	٥	٥	٥	٥	0	٥	0	٥	0	٥	٥		•	•	•	•	•	•		456 (2.7)	Bosnia and Herzegovina
0	٥	0	٥	٥	0	٥	0	0	٥	0	0	0	0	0	0	٥	٥	٥	0		•	♥	◉	♥	♥	♥	♥	449 (4.0)	Lebanon
	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		◉	◉	◉	◉	◉	lacktriangledown	◉	441 (5.0)	Thailand
		٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		♥	♥	◉	♥	♥	lacktriangledown	♥	432 (4.8)	Turkey
			٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥	٥		•	•	•	•	•	•	•	427 (4.1)	Jordan
•				٥	٥	٥	٥	0	0	0	0	0	0	0	0	0	0	0	0		•	•	•	•	•	•	•	420 (2.4)	Tunisia
•	•						٥	0	0	0	0	٥	0	0	0	0	0	0	0		<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li><li></li></ul>	<ul><li>▼</li><li></li><li></li></ul>	•	•	<ul><li>The state of the state</li></ul>	<ul><li>▼</li><li></li><li></li></ul>	410 (5.9)	Georgia
•	•	<ul><li>▼</li><li></li></ul>						9	0	٥	٥	٥	٥	٥	0	0	0	0	٥		•	•	•	<ul><li>▼</li><li></li></ul>	•	•	•	403 (4.1) 398 (1.6)	Iran, Islamic Rep. of Bahrain
•	•	•							٥	0	٥	0	0	0	0	٥	0	٥	0		•	•	•	•	•	•	•	397 (3.8)	Indonesia
•	•	•	◉							0	٥	0	0	٥	٥	٥	0	٥	٥		•	•	•	•	•	•	•	395 (3.8)	Syrian Arab Republic
•	◉	•	•	•						٥	٥	_	_	٥	٥	_	٥	٥	٥		lacktriangledown	◉	◉	lacktriangledown	•	lacktriangledown	♥	391 (3.6)	Egypt
◉		◉		€		◉						٥	٥				٥						♥			lacktriangledown		387 (2.1)	Algeria
•	•	•	•	•			•	•					0	0		0		0			•	•		•		•		381 (3.0)	Morocco
•	•	•	•		•	•	•	•					٥				٥				•	•	•	•		•		380 (3.6)	Colombia
•	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>	<b>v</b>		<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>		♥	•			0	0		0				<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li></ul>	<ul><li>▼</li><li></li><li>▼</li></ul>	<ul><li>▼</li><li></li></ul>		<ul><li>▼</li><li></li><li></li></ul>		372 (3.4) 367 (3.5)	Oman Palestinian Nat'l Auth.
•	•	•	•	•	•		•		•		•	•			0		0				•	•		•		•		364 (2.3)	Botswana
•	•	•	•	•	•		•		•		•		•	•				٥			•	•	•	•		•		354 (2.3)	Kuwait
•	•	•	•		•		•		•				•	•	•	Ĺ		٥			•			•		•		340 (2.8)	El Salvador
•	◉	◉	◉	◉		◉	◉	◉	◉	◉	€	◉	◉	◉	◉				٥							•		329 (2.9)	Saudi Arabia
•												◉												•				309 (4.4)	Ghana
•	♥	♥	♥	♥	lacktriangledown	♥	lacktriangledown	◉	•	♥	•	♥	♥	♥	lacktriangledown	♥	♥				♥	♥	lacktriangledown	lacktriangledown	lacktriangledown	lacktriangledown	♥	307 (1.4)	Qatar
																													<b>Benchmarking Participants</b>
0	٥											٥										٥	٥	٥				547 (4.6)	Massachusetts, US
0	_											0		0		0		٥			•					٥		532 (4.4)	Minnesota, US
0												0									•			O	O	0		528 (3.5)	Quebec, Canada
0	0											0									•	<ul><li>The state of the state</li></ul>					0	517 (3.5)	Ontario, Canada
_	0											0									<ul><li>▼</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li><li>I</li>&lt;</ul>	•		•	( <b>v</b> )	9	0	509 (3.0) 499 (3.0)	British Columbia, Canada Basque Country, Spain
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			•				•		461 (2.4)	Dubai, UAE

• Average achievement significantly higher than comparison country • Average achievement significantly lower than comparison country



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.<sup>5</sup> 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 o.o 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.

<sup>5</sup> 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



Country		Average	2003 to 200	)7	1995 to 20	17	
		Scale Score	Difference		Difference		Mathematics Achievement Distribution
Hong Kong SAR							
	2007	607 (3.6)					— <u> </u>
	2003	575 (3.2)	32 (4.8)	٥			/_
	1995	557 (4.0)			50 (5.4)	٥	
Singapore							
	2007	599 (3.7)					<u>=</u>
	2003	594 (5.6)	5 (6.7)		0 (5.0)		
China a Tainai	1995	590 (4.5)			9 (5.9)		
Chinese Taipei	2007	F7( (1.7)					
	2007	576 (1.7) 564 (1.8)	12 (2.5)	٥			
	2003	304 (1.0)	12 (2.3)	O			
Japan	2007	568 (2.1)					
	2007	565 (1.6)	4 (2.6)				= = = =
	1995	567 (1.9)	4 (2.0)		1 (2.8)		
Russian Federation	,,,,	507 (1.7)			1 (2.0)		
	2007	544 (4.9)					
2	2003	532 (4.7)	12 (6.8)				
England		( )	(***)				
	2007	541 (2.9)					<del></del>
t	2003	531 (3.7)	10 (4.7)	٥			
t	1995	484 (3.3)			57 (4.4)	٥	
Latvia							
	2007	537 (2.3)					
1	2003	533 (3.1)	4 (3.8)				— <i>—</i> —
	1995	499 (4.6)			38 (5.1)	٥	
Netherlands							
	2007	535 (2.1)					
	2003	540 (2.1)	-5 (3.0)			-	
‡	1995	549 (3.0)			-14 (3.7)	♥	
Lithuania	2007	530 (2.4)					
1	2007	530 (2.4) 534 (2.8)	-4 (3.7)				
United States	2003	334 (2.0)	-4 (3.7)				
†	2007	E20 (2.4)					
	2007	529 (2.4) 518 (2.4)	11 (3.4)	٥			= { =
	1995	518 (2.4)	11 (5.4)	•	11 (3.8)	٥	
Australia	1773	310 (2.7)			11 (5.0)		
	2007	516 (3.5)					
t	2003	499 (3.9)	17 (5.3)	٥			
	1995	495 (3.4)	(5.5)		22 (4.9)	٥	
Hungary		(,			()		
	2007	510 (3.5)					
2	2003	529 (3.1)	-19 (4.8)	♥			
	1995	521 (3.6)			-12 (5.1)	•	
Italy							
	2007	507 (3.1)					
	2003	503 (3.7)	4 (4.8)				
Austria							
	2007	505 (2.0)			a ·		
‡	1995	531 (2.9)			-25 (3.5)	€	
						0	
			<b>2</b> 2007 average	e sian	ificantly highe	r	Percentiles of Performance
			2007 average 2007 average	_			5th 25th 75th 95th 95% Confidence Interval for Average (±2SE)
				- 5	,		250/ 5 5 1 1 1 15 4 (1255)

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

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.



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

Did not satisfy guidelines for sample participation rates.

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

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

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

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



					·	Mathema
Country	Average Scale Score	2003 to 2007 Difference	1995 to 20 Differen		Mathematics Achievement Distribution	SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007
Slovenia						. ≥ ≥
2007	502 (1.8)					Ď.
2003	479 (2.6)	23 (3.2)				ė. S
1995	462 (3.1)		40 (3.6)	٥		ien
Armenia						S
2007	500 (4.3)					san
2003	456 (3.5)	44 (5.5)				atic
Scotland						her
† 2007	494 (2.2)					May te
† 2003	490 (3.3)	4 (3.9)				ec
<sup>2</sup> † 1995	493 (4.2)		1 (4.7)			atio
New Zealand						terr
2007	492 (2.3)					r c
2003	496 (2.1)	-3 (3.2)			<del></del>	ds.
1995	469 (4.4)		23 (5.0)	٥		Trer
Czech Republic						FA's
2007						نز ــــــــــــــــــــــــــــــــــــ
1995	541 (3.1)		-54 (4.0)	•		E E
Norway						S
2007	473 (2.5)					
2003	451 (2.3)	22 (3.5)				
1995	476 (3.0)		-3 (4.1)			
Iran, Islamic Rep. of						
2007	402 (4.1)				<del></del> -	
2 2003	389 (4.2)	13 (5.7)			<del>- 1 -</del>	
1995	387 (5.0)		15 (6.6)	٥		
Morocco						
2007						
2003	347 (5.1)	-6 (6.7)				
Tunisia	224 (4.5)					
2007	326 (4.5)					
2003	339 (4.7)	−13 (6.5) 🐨				
Benchmarking Participants						
Minnesota, US	FF4 (F 0)					
2007	554 (5.9)		20 (0.5)			
.,,,,	516 (7.4)		38 (9.5)	٥		
Quebec, Canada	E10 /2 0\					
2007	519 (3.0)	12 (2 0)				
2003	506 (2.4)	13 (3.8)	-31 (5.2)	•		
Ontario, Canada	550 (4.2)		-31 (5.2)	lacktriangle		
<sup>2</sup> 2007	512 (3.1)					
2007	512 (3.1)	0 (4.9)				
<sup>2</sup> 1995	489 (3.5)	0 (4.7)	23 (4.7)	٥		
Alberta, Canada	409 (3.3)		23 (4.7)	<u> </u>		
<sup>2</sup> 2007	505 (3.0)					
1995			-18 (8.8)	•		
1993	323 (0.3)		-10 (0.0)	·		

2007 average significantly higher

● 2007 average significantly lower



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

TIMSS2007 Oth Mathematics Grade

Country	Average Scale Score	2003 to 2007 Difference	1999 to 20 Difference		1995 to 20 Difference		Mathematics Achievement Distribution
Chinese Taipei							
2007	598 (4.5)						<del></del>
2003	585 (4.6)	13 (6.4)					<b></b>
1999	585 (4.0)		13 (5.9)	٥			
Korea, Rep. of							
2007	597 (2.7)						
2003	589 (2.2)	8 (3.1)					
1999	587 (2.0)		10 (3.4)	٥			
1995	581 (2.0)				17 (3.4)	٥	
Singapore							
2007	593 (3.8)						
2003	605 (3.6)	−13 (5.2) 🐨					<del></del>
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) 🗨					<del></del>
† 1999	582 (4.3)		-10 (7.2)				— <i>†</i> —
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)						<b>—</b> •
2 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)						<del></del>
<sup>‡</sup> 2003	498 (4.7)	15 (6.7)					
† 1999	496 (4.1)		17 (6.4)	٥			
† 1995	498 (3.0)				16 (5.6)	٥	
Russian Federation	542 (4.4)						
2007	512 (4.1)	. (5.5)					
2003	508 (3.7)	4 (5.5)	44 (7.2)				
1999 2 1995	526 (5.9)		-14 (7.2)	♥	42 (67)		
1,7,5	524 (5.3)				-12 (6.7)		
United States † 2007	F00 (2.0)						
	508 (2.8)	4 (4 4)					
	504 (3.3)	4 (4.4)	7 (4 0)				
1999	502 (4.0)		7 (4.8)		16 (5 5)	^	
t 1995 Lithuania	492 (4.7)				16 (5.5)	٥	
1 2007	506 (2.3)						
1 2003	500 (2.5)	4 (3.4)					
• 1999	482 (4.3)	4 (3.4)	24 (4.9)	٥			
<sup>2</sup> 1995	462 (4.3)		24 (4.7)	J	34 (4.7)	٥	
Czech Republic	4/2 (4.1)				J4 (4.7)	3	
2007	504 (2.4)						
1999	520 (4.2)		-16 (4.8)	♥			
1995	546 (4.5)		10 (4.0)	•	-42 (5.1)	•	
1993	J 10 (T.J)				12 (3.1)	Г	
						Ö	100 200 300 400 500 600 700

**▼** 2007 average significantly lower

95% Confidence Interval for Average (±2SE)

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.



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.

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

 $<sup>^{2}</sup>$   $\,$  National Defined Population covers 90% to 95% of National Target Population.

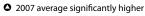
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%)

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.

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

TIMSS2007 Oth Mathematics Grade

		0	20024 2005	10004 200	10054 200	
Country		Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 200 Difference	Mathematics Achievement Distribution
Slovenia						
	2007	501 (2.1)				
	2003	493 (2.2)	9 (3.0)			
	1995	494 (2.9)			7 (3.6)	
Armenia						
	2007	499 (3.5)				
	2003	478 (3.0)	21 (4.6)			
Australia		. ,	, ,			
	2007	496 (3.9)				
	2003	505 (4.6)	-8 (6.1)			
‡	1995	509 (3.7)	. (44 )		-13 (5.4)	•
Sweden		. ,			, ,	
	2007	491 (2.3)				
	2003	499 (2.6)	-8 (3.4) ●			
	1995	540 (4.3)	,,		-48 (4.8)	•
Scotland		()			()	
†	2007	487 (3.7)				
t	2003	498 (3.7)	−10 (5.2) 🗨			
‡	1995	493 (5.7)	(3.2)		-6 (6.8)	
Serbia	1,,,,	.,,			0 (0.0)	
2	2007	486 (3.3)				
1	2007	477 (2.6)	9 (4.1)			
Italy	2003	177 (2.0)	) (T.1)			
italy	2007	480 (3.0)				
	2007	484 (3.2)	-4 (4.3)			
2	1999	479 (3.8)	T (T.5)	0 (4.8)		
Malaysia	1000	477 (3.0)		0 (4.0)		
Malaysia	2007	474 (5.0)				
	2007	508 (4.1)	−34 (6.5) •			
	1999	519 (4.4)	-54 (0.5) ·	-45 (6.7) ·	)	
Norway	1999	313 (4.4)		-43 (0.7)		
NOIWay	2007	469 (2.0)				
	2007	461 (2.5)	8 (3.2)			
	1995	498 (2.2)	8 (3.2)		-29 (2.9)	•
Cuprus	1993	490 (2.2)			-29 (2.9)	•
Cyprus	2007	165 (1.6)				
		465 (1.6)	6 (2.2)			
	2003 1999	459 (1.7)	6 (2.3)	-11 (2.4)		
		476 (1.8)		-11 (Z.4)		
Pulas :: 's	1995	468 (2.2)			-2 (2.9)	
Bulgaria	2007	464 (5.0)				<u> </u>
	2007	464 (5.0)	12 (6.5)			
	2003	476 (4.3)	-13 (6.5)	47 (7.7)		
+	1999	511 (5.8)		-47 (7.7) ·		
‡	1995	527 (5.8)			-63 (7.6)	•
Israel	2225	462 (2.0)				
3	2007	463 (3.9)	22 (5 -) -			
3	2003	496 (3.4)	−32 (5.2) 🐨			
3	1999	466 (3.9)		-3 (5.6)		
Romania						
	2007	461 (4.1)				
	2003	475 (4.8)	−14 (6.4) 🗨			
	1999	472 (5.8)		-11 (7.2)		
	1995	474 (4.6)			-12 (6.2)	•



lacktriangledown 2007 average significantly lower

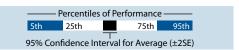




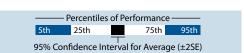
Exhibit 1.3 Trends in Mathematics Achievement – 1995 Through 2007 (Continued)



		Average	2003 to 200	07	1999 to 20	07	1995 to 200	7	
Country		Scale Score	Difference		Differenc		Difference		Mathematics Achievement Distribution
Lebanon		l							
	2007	449 (4.0)							<del></del>
	2003	433 (3.1)	16 (4.9)	٥					
Thailand									
	2007	441 (5.0)							
	1999	467 (5.1)			-26 (7.1)	♥			
Jordan									
	2007	427 (4.1)							
	2003	424 (4.1)	3 (5.8)						
	1999	428 (3.6)			-1 (5.4)				·
Tunisia									
	2007	420 (2.4)							<del></del>
	2003	410 (2.2)	10 (3.2)	٥					
	1999	448 (2.4)			-28 (3.5)	♥			
Indonesia									
1	2007	405 (4.6)							<del>- , -</del>
1	2003	411 (4.8)	-5 (6.6)						<del>- + -</del>
1	1999	403 (4.9)			2 (6.4)				
Iran, Islamic Re									
	2007	403 (4.1)							
2	2003	411 (2.4)	-8 (4.8)						
	1999	422 (3.4)			-19 (5.1)	♥			<del>- } -</del>
	1995	418 (3.9)					-15 (5.6)	•	
Bahrain									
	2007	398 (1.6)	- ()						
	2003	401 (1.7)	-3 (2.2)						
Egypt		204 (2.4)							
	2007	391 (3.6)	44 (4.0)						
	2003	406 (3.5)	-16 (4.9)	♥					
Colombia	2007	200 (2.4)							
	2007	380 (3.6)					47 (67)	_	
Dalastinian Nat	1995	332 (5.6)					47 (6.7)	٥	
Palestinian Nat		267 (2.5)							
	2007	367 (3.5)	22 (4.6)						
Potowana	2003	390 (3.1)	-23 (4.6)	€					
Botswana	2007	264 /2 2)							
	2007	364 (2.3)	-3 (3.3)						
Ghana	2003	366 (2.6)	-5 (5.5)						
Gildild	2007	200 (4.4)							
	2007	309 (4.4) 276 (4.7)	34 (6.2)	٥					
	2003	2/0 (4./)	34 (0.2)	9					

• 2007 average significantly higher

lacktriangledown 2007 average significantly lower





TIMSS2007 Oth Mathematics Grade Trends in Mathematics Achievement – 1995 Through 2007 (Continued) Exhibit 1.3 SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007 2003 to 2007 1999 to 2007 Average 1995 to 2007 Country **Mathematics Achievement Distribution** Scale Score Difference Difference Difference **Benchmarking Participants** Massachusetts, US 547 (4.6) 2007 1999 513 (5.9) 34 (7.5) Minnesota, US 2007 532 (4.4) 1995 518 (7.3) 14 (8.6) Quebec, Canada 2007 528 (3.5) 2003 543 (3.0) -15 (4.6) 1999 566 (5.3) -38 (6.3)1995 556 (5.9) -28 (6.8) ♥ Ontario, Canada 517 (3.5) 2007 2 2003 521 (3.1) -4 (4.6) 517 (3.0) 1999 1 (4.6) 1995 501 (2.9) ٥ 17 (4.6) British Columbia, Canada 2007 509 (3.0) 1999 522 (7.3) -12 (8.0) Basque Country, Spain 499 (3.0) 2007 2 2003 487 (2.7) 11 (3.8) ٥

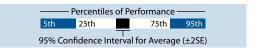
Ó

100

200

300

<sup>2007</sup> average significantly lower



500

600

700

800



 <sup>2007</sup> average significantly higher

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 4th 8th Mathematics Grades

2003 – Fourth Grade							
Country	Difference From TIMSS Scale Avg.						
Singapore	94 (5.6)	٥					
Hong Kong SAR	75 (3.2)	٥					
Japan	65 (1.6)	٥					
Chinese Taipei	64 (1.8)	٥					
Lithuania	34 (2.8)	٥					
Russian Federation	32 (4.7)	٥					
England	31 (3.7)	٥					
Hungary	29 (3.1)	٥					
United States	18 (2.4)	٥					
Italy	3 (3.7)						
Australia	-1 (3.9)						
Scotland	-10 (3.3)	♥					
Slovenia	-21 (2.6)	♥					
Armenia	-44 (3.5)	♥					
Norway	-49 (2.3)	♥					
Iran, Islamic Rep. of	-111 (4.2)	♥					
Tunisia	-161 (4.7)	♥					
TIMSS Scale Avg.	500						
Benchmarking Participants							
Ontario, Canada	11 (3.8)	٥					
Quebec, Canada	6 (2.4)	٥					

2007 – Fou	rth Grade					
Country	Difference From TIMSS Scale Avg.					
Hong Kong SAR	107 (3.6)	٥				
Singapore	99 (3.7)	٥				
Chinese Taipei	76 (1.7)	٥				
Japan	68 (2.1)	٥				
Russian Federation	44 (4.9)	٥				
England	41 (2.9)	٥				
Lithuania	30 (2.4)	٥				
United States	29 (2.4)					
Australia	16 (3.5)	٥				
Hungary	10 (3.5)	٥				
Italy	7 (3.1)	٥				
Slovenia	2 (1.8)					
Armenia	0 (4.3)					
Scotland	-6 (2.2)	♥				
Norway	-27 (2.5)	♥				
Iran, Islamic Rep. of	-98 (4.1)	♥				
Tunisia	-173 (4.5)	♥				
TIMSS Scale Avg. 500						
Benchmarking Participants						
Quebec, Canada	19 (3.0)	٥				
Ontario, Canada	12 (3.1)	٥				

2003 – Eighth Grade							
Country	Difference From TIMSS Scale Avg.						
Singapore	105 (3.6)	٥					
Hong Kong SAR	86 (3.3)	٥					
Chinese Taipei	85 (4.6)	٥					
Japan	70 (2.1)	٥					
Hungary	29 (3.2)	٥					
Russian Federation	8 (3.7)	٥					
Australia	5 (4.6)						
United States	4 (3.3)						
Lithuania	2 (2.5)						
England	-2 (4.7)						
Scotland	-2 (3.7)						
Slovenia	-7 (2.2)	♥					
Italy	-16 (3.2)	♥					
Armenia	-22 (3.0)	♥					
Norway	-39 (2.5)	◉					
Iran, Islamic Rep. of	-89 (2.4)	♥					
Tunisia	-90 (2.2)	◉					
TIMSS Scale Avg.	500						
Benchmarking Participants							
Quebec, Canada	43 (3.0)	٥					
Ontario, Canada	21 (3.1)	٥					

2007 – Eighth Grade							
Country	Difference From TIMSS Scale Avg.						
Chinese Taipei	98 (4.5)	٥					
Singapore	93 (3.8)	٥					
Hong Kong SAR	72 (5.8)	٥					
Japan	70 (2.4)	٥					
Hungary	17 (3.5)	٥					
England	13 (4.8)	٥					
Russian Federation	12 (4.1)	٥					
United States	8 (2.8)	٥					
Lithuania	6 (2.3)	٥					
Slovenia	1 (2.1)						
Armenia	-1 (3.5)						
Australia	-4 (3.9)						
Scotland	-13 (3.7)	♥					
Italy	-20 (3.0)	♥					
Norway	-31 (2.0)	◉					
Tunisia	-80 (2.4)	♥					
Iran, Islamic Rep. of	-97 (4.1)	♥					
TIMSS Scale Avg.	500						
Benchmarking Participants							
Quebec, Canada	28 (3.5)	٥					
Ontario, Canada	17 (3.5)	٥					

- Country average significantly higher than TIMSS scale average
- $\ensuremath{\,\overline{\oplus}\,}$  Country average significantly lower than TIMSS scale average



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

<sup>()</sup> 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	/ th
Mathematics	Grade

Lithuania		G	irls	В	oys	Difference	Gender	Difference	
England	Í							Boys Scored Highe	er
Ukraine	<sup>1</sup> Lithuania	49 (1.0)	530 (2.8)	51 (1.0)	530 (3.2)	0 (3.6)			
Japan 49 (0.6) 588 (2.5) 51 (0.6) 588 (2.7) 0 (2.3) New Zealand 50 (1.0) 492 (2.4) 50 (1.0) 493 (3.1) 1 (3.0) Chinese Taipel 48 (0.5) 575 (2.0) 52 (0.5) 577 (2.0) 2 (2.1) 1 (	England	49 (1.0)	541 (3.2)	51 (1.0)	542 (3.6)	0 (3.7)			
New Zealand  Sol (10)  48 (0.5)  575 (2.0)  \$2 (0.5)  \$77 (2.0)  \$77	Ukraine	48 (0.9)	469 (3.3)	52 (0.9)	469 (3.4)	0 (3.4)			
New Zealand  50 (1.0)  48 (2.4)  50 (1.0)  48 (3.1)  1 Latvia  48 (1.0)  539 (2.9)  52 (1.0)  536 (3.0)  3 (3.7)  1 Georgia  47 (1.0)  48 (1.0)  539 (2.9)  52 (1.0)  536 (3.0)  3 (3.7)  3 (3.7)  1 Georgia  47 (1.0)  48 (1.0)  539 (2.9)  52 (1.0)  536 (3.0)  3 (3.7)  3 (3.7)  48 (3.6)  49 (1.1)  508 (4.0)  49 (1.1)  511 (3.8)  3 (4.7)  Hungary  51 (1.1)  508 (4.6)  49 (1.1)  511 (3.8)  3 (4.7)  Hong Kong SAR  49 (1.1)  508 (4.6)  49 (1.1)  511 (3.8)  51 (3.1)  51	Japan	49 (0.6)	568 (2.5)	51 (0.6)	568 (2.7)	0 (3.1)			
Chinese Taipei	New Zealand	50 (1.0)	492 (2.4)		493 (3.1)				
1 Latvia       48 (1.0)       539 (2.9)       52 (1.0)       536 (3.0)       3 (3.7)         1 Georgia       47 (1.0)       440 (4.2)       53 (1.0)       437 (4.9)       3 (3.7)         Morocco       49 (1.1)       339 (5.0)       51 (1.1)       518 (4.6)       49 (1.1)       511 (3.8)       3 (4.7)         Hong Kong SAR       49 (1.1)       605 (3.2)       51 (1.1)       609 (4.4)       4 (2.9)         Algeria       50 (0.9)       380 (5.9)       50 (0.9)       375 (5.2)       5 (3.8)         Slovenia       49 (0.8)       499 (2.4)       49 (1.0)       519 (3.6)       6 (3.4)         *1 United States       51 (0.6)       526 (2.7)       49 (0.6)       532 (2.7)       6 (2.4)         Czech Republic       47 (1.1)       483 (3.3)       53 (1.1)       489 (3.0)       6 (2.8)         Singapore       49 (0.8)       603 (3.8)       51 (0.8)       596 (4.1)       6 (2.7)         Sweden       50 (1.0)       499 (2.4)       50 (1.0)       499 (2.4)       6 (2.7)         Norway       50 (1.0)       499 (2.4)       50 (1.0)       490 (2.4)       6 (2.7)         Norway       50 (1.0)       540 (5.9)       49 (1.2)       526 (3.2)       7 (3.7)	Chinese Taipei	48 (0.5)	575 (2.0)	52 (0.5)	577 (2.0)	2 (2.1)			
Morocco	<sup>1</sup> Latvia	48 (1.0)	539 (2.9)		536 (3.0)				
Hungary 51 (1.1) 508 (4.6) 49 (1.1) 511 (3.8) 3 (4.7) Hong Kong SAR 49 (1.1) 605 (3.2) 51 (1.1) 609 (4.4) 4 (2.9) 1	<sup>1</sup> Georgia	47 (1.0)	440 (4.2)	53 (1.0)	437 (4.9)	3 (3.7)			
Hungary 51 (1.1) 508 (4.6) 49 (1.1) 609 (4.4) 4 (2.9)   Hong Kong SAR 49 (1.1) 605 (3.2) 51 (1.1) 609 (4.4) 4 (2.9)   Algeria 50 (0.9) 380 (5.9) 50 (0.9) 375 (5.2) 5 (3.8)   Slovenia 49 (0.8) 499 (2.4) 51 (0.8) 504 (2.1) 5 (2.6)   Australia 51 (1.0) 513 (4.2) 49 (1.0) 519 (3.6) 6 (3.4)   2† United States 51 (0.6) 526 (2.7) 49 (0.6) 532 (2.7) 6 (2.4)   Czech Republic 47 (1.1) 483 (3.3) 53 (3.8) 51 (0.8) 596 (4.1) 6 (2.7)   Sweden 50 (1.0) 499 (2.4) 50 (1.0) 506 (3.1) 6 (2.4)   Slovak Republic 49 (0.8) 493 (4.6) 51 (0.8) 596 (4.1) 6 (2.7)    † Denmark 51 (1.2) 520 (2.9) 49 (1.2) 526 (3.2) 7 (3.7)   Norway 50 (1.0) 470 (3.2) 50 (1.0) 477 (3.0) 7 (3.6)   Russian Federation 50 (1.0) 548 (5.5) 50 (1.0) 540 (4.9) 7 (3.6)    * Kazakhstan 51 (1.3) 553 (6.7) 49 (1.3) 545 (7.9) 8 (3.7)   Armenia 48 (0.9) 504 (5.7) 52 (0.9) 495 (3.7) 9 (4.1)    * Scotland 51 (0.8) 490 (2.6) 49 (0.8) 499 (2.8) 9 (3.1)    El Salvador 49 (1.2) 325 (4.6) 51 (1.2) 334 (5.5) 9 (5.8)    * Netherlands 48 (1.0) 530 (2.7) 52 (1.0) 540 (2.9) 10 (2.7) 11    * Rustian Rep. of 49 (1.7) 499 (3.2) 51 (0.7) 514 (3.6) 15 (2.5)    * Netherlands 48 (1.0) 530 (2.7) 52 (1.0) 540 (2.9) 11    * Rustian Rep. of 49 (1.7) 499 (3.2) 51 (0.7) 514 (3.6) 15 (2.5)    * Netherlands 48 (1.0) 530 (2.7) 52 (1.0) 514 (3.6) 15 (2.5)    * Oclombia 50 (1.1) 347 (5.2) 50 (1.1) 347 (5.2) 52 (1.0) 514 (3.6) 15 (2.5)    * Tunisia 47 (1.0) 337 (4.7) 33 (1.0) 319 (5.0) 18 (4.1)    * Tunisia 47 (1.0) 337 (4.7) 33 (1.0) 319 (5.0) 18 (4.1)    * Yemen 44 (2.7) 226 (8.0) 56 (2.7) 214 (6.6) 22 (8.4)    * Ochombia 50 (1.1) 347 (5.2) 50 (1.1) 516 (3.7) 516 (3.0) 18 (4.1)    * Tunisia 48 (1.0) 559 (3.2) 55 (1.0) 517 (3.9) 151 (3.6) 151 (3.5) 161 (3.7) 518 (3.7	Morocco	49 (1.1)		51 (1.1)	343 (5.4)				
Hong Kong SAR 49 (1.1) 605 (3.2) 51 (1.1) 600 (4.4) 4 (2.9) Algeria 50 (0.9) 380 (5.9) 50 (0.9) 375 (5.2) 5 (3.8) Slovenia 49 (0.8) 499 (2.4) 51 (0.8) 504 (2.1) 5 (2.6) Australia 51 (1.0) 513 (4.2) 49 (1.0) 519 (3.6) 6 (3.4) 2** United States 51 (0.6) 526 (2.7) 49 (0.6) 532 (2.7) 6 (2.4)  **Czech Republic 47 (1.1) 433 (3.3) 53 (1.1) 489 (3.0) 6 (2.8) Singapore 49 (0.8) 603 (3.8) 51 (0.8) 596 (4.1) 6 (2.7) Sweden 50 (1.0) 499 (2.4) 50 (1.0) 506 (3.1) 6 (2.4)  **Slovak Republic 49 (0.8) 493 (4.6) 51 (0.8) 499 (4.7) 6 (2.7)  **Demark 51 (1.2) 520 (2.9) 49 (1.2) 526 (3.2) 7 (3.7)  **Norway 50 (1.0) 470 (3.2) 50 (1.0) 470 (3.2) 50 (1.0) 499 (2.4)  **Russian Federation 50 (1.0) 548 (5.5) 50 (1.0) 540 (4.9) 7 (3.6)  **Russian Federation 50 (1.0) 548 (5.5) 50 (1.0) 540 (4.9) 7 (3.6)  **Armenia 48 (0.9) 504 (5.7) 52 (0.9) 495 (3.7) 9 (4.1)  **Scotland 51 (0.8) 490 (2.6) 49 (0.8) 499 (2.8) 9 (3.1)  **El Salvador 49 (1.2) 325 (4.6) 51 (1.2) 334 (5.5) 9 (5.8)  **Netherlands 48 (1.0) 530 (2.7) 52 (1.0) 540 (2.4) 10 (2.7)  **Austria 48 (1.0) 498 (2.5) 52 (1.0) 510 (2.3) 14 (2.6)  **Italy 49 (0.7) 499 (3.2) 51 (0.7) 514 (3.6) 15 (2.5)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.5) 14 (7.0)  **Austria 48 (1.0) 498 (2.5) 52 (1.0) 510 (2.3) 14 (2.6)  **Luvait 32 (1.5) 333 (4.7) 33 (1.0) 319 (5.0) 18 (4.1)  **Yemen 44 (2.7) 236 (8.0) 56 (2.7) 214 (6.6) 22 (8.4)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.0) 18 (4.1)  **Yemen 44 (2.7) 236 (8.0) 50 (2.7) 214 (6.6) 22 (8.4)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.0) 18 (4.1)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.0) 18 (4.1)  **Tunisia 47 (1.0) 337 (4.7) 55 (6.1) 50 (5.7) 57 (6.2) 37 (7.6)  **Tunisia 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 59 (6.2) 37 (7.6)  **Tunisia 48 (1.1) 509 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  **Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 59 (6.2) 37 (7.6)  **Tunisia 48 (1.1) 509 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  **Tunisia 47 (1.0) 567 (3.7) 49 (1.0) 576 (3.2) 11 (2.5)  **Tunisia 47 (1.0) 567 (3.7) 49 (1.0)		51 (1.1)							
Algeria					, ,				
Slowenia									
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Iran, Islamic Rep. of       49 (1.7)       409 (5.2)       51 (1.7)       396 (5.5)       14 (7.0)         Austria       48 (1.0)       498 (2.5)       52 (1.0)       512 (2.3)       14 (2.6)         Italy       49 (0.7)       499 (3.2)       51 (0.7)       514 (3.6)       15 (2.5)         Colombia       50 (1.1)       347 (5.2)       50 (1.1)       364 (5.5)       17 (3.9)         Tunisia       47 (1.0)       337 (4.7)       53 (1.0)       319 (5.0)       18 (4.1)         Yemen       44 (2.7)       236 (8.0)       56 (2.7)       214 (6.6)       22 (8.4)         Qatar       51 (0.2)       307 (2.0)       49 (0.2)       285 (2.1)       22 (3.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       37 (7.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       37 (7.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       37 (7.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       473 (0.7)       0 (0.7)         nchmarking Participants       2       Ontario, Canada       48 (1.1)       509 (3.2)       52 (1.1)       514 (3.7)       6 (3.0)         2 Brit									
Austria 48 (1.0) 498 (2.5) 52 (1.0) 512 (2.3) 14 (2.6)	· · · · · · · · · · · · · · · · · · ·								
Italy       49 (0.7)       499 (3.2)       51 (0.7)       514 (3.6)       15 (2.5)         Colombia       50 (1.1)       347 (5.2)       50 (1.1)       364 (5.5)       17 (3.9)         Tunisia       47 (1.0)       337 (4.7)       53 (1.0)       319 (5.0)       18 (4.1)         Yemen       44 (2.7)       236 (8.0)       56 (2.7)       214 (6.6)       22 (8.4)         Qatar       51 (0.2)       307 (2.0)       49 (0.2)       285 (2.1)       22 (3.6)         ✓ Kuwait       52 (1.5)       333 (4.3)       48 (1.5)       297 (6.2)       37 (7.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       473 (0.7)       0 (0.7)         nchmarking Participants       2 Ontario, Canada       48 (1.1)       509 (3.2)       52 (1.1)       514 (3.7)       6 (3.0)         2 † Minnesota, US       50 (1.5)       551 (6.1)       50 (1.5)       557 (6.3)       6 (4.1)         2 Quebec, Canada       49 (0.7)       502 (3.1)       51 (0.7)       508 (3.0)       6 (2.7)         2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)									
Colombia 50 (1.1) 347 (5.2) 50 (1.1) 364 (5.5) 17 (3.9)  Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.0) 18 (4.1)  Yemen 44 (2.7) 236 (8.0) 56 (2.7) 214 (6.6) 22 (8.4)  Qatar 51 (0.2) 307 (2.0) 49 (0.2) 285 (2.1) 22 (3.6)  ** Kuwait 52 (1.5) 333 (4.3) 48 (1.5) 297 (6.2) 37 (7.6)  International Avg. 49 (0.2) 473 (0.7) 51 (0.2) 473 (0.7) 0 (0.7)  **Inchmarking Participants  2 Ontario, Canada 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0)  2 † Minnesota, US 50 (1.5) 551 (6.1) 50 (1.5) 557 (6.3) 6 (4.1)  2 British Columbia, Canada 49 (0.7) 502 (3.1) 51 (0.7) 508 (3.0) 6 (2.7)  2 Quebec, Canada 51 (0.9) 515 (3.5) 49 (0.9) 524 (3.3) 9 (3.1)  2 Massachusetts, US 51 (1.0) 567 (3.7) 49 (1.0) 578 (4.2) 10 (3.6)  2 Alberta, Canada 48 (1.1) 500 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  4 Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)									
Tunisia 47 (1.0) 337 (4.7) 53 (1.0) 319 (5.0) 18 (4.1)  Yemen 44 (2.7) 236 (8.0) 56 (2.7) 214 (6.6) 22 (8.4)  Qatar 51 (0.2) 307 (2.0) 49 (0.2) 285 (2.1) 22 (3.6)  ★ Kuwait 52 (1.5) 333 (4.3) 48 (1.5) 297 (6.2) 37 (7.6)  International Avg. 49 (0.2) 473 (0.7) 51 (0.2) 473 (0.7) 0 (0.7)  **Chmarking Participants  2 Ontario, Canada 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0)  2 † Minnesota, US 50 (1.5) 551 (6.1) 50 (1.5) 557 (6.3) 6 (4.1)  2 British Columbia, Canada 49 (0.7) 502 (3.1) 51 (0.7) 508 (3.0) 6 (2.7)  2 Quebec, Canada 51 (0.9) 515 (3.5) 49 (0.9) 524 (3.3) 9 (3.1)  2 Massachusetts, US 51 (1.0) 567 (3.7) 49 (1.0) 578 (4.2) 10 (3.6)  2 Alberta, Canada 48 (1.1) 500 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  4 Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)									
Yemen 44 (2.7) 236 (8.0) 56 (2.7) 214 (6.6) 22 (8.4)  Qatar 51 (0.2) 307 (2.0) 49 (0.2) 285 (2.1) 22 (3.6)  ★ Kuwait 52 (1.5) 333 (4.3) 48 (1.5) 297 (6.2) 37 (7.6)  International Avg. 49 (0.2) 473 (0.7) 51 (0.2) 473 (0.7) 0 (0.7)  Inchmarking Participants  2 Ontario, Canada 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0)  2 † Minnesota, US 50 (1.5) 551 (6.1) 50 (1.5) 557 (6.3) 6 (4.1)  2 British Columbia, Canada 49 (0.7) 502 (3.1) 51 (0.7) 508 (3.0) 6 (2.7)  2 Quebec, Canada 51 (0.9) 515 (3.5) 49 (0.9) 524 (3.3) 9 (3.1)  2 Massachusetts, US 51 (1.0) 567 (3.7) 49 (1.0) 578 (4.2) 10 (3.6)  2 Alberta, Canada 48 (1.1) 500 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  4 Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)									
Qatar       51 (0.2)       307 (2.0)       49 (0.2)       285 (2.1)       22 (3.6)         ★ Kuwait       52 (1.5)       333 (4.3)       48 (1.5)       297 (6.2)       37 (7.6)         International Avg.       49 (0.2)       473 (0.7)       51 (0.2)       473 (0.7)       0 (0.7)         nchmarking Participants       2       52 (1.1)       514 (3.7)       6 (3.0)         2 Thirding Canada       48 (1.1)       509 (3.2)       52 (1.1)       514 (3.7)       6 (3.0)         2 Hitish Columbia, Canada       49 (0.7)       502 (3.1)       51 (0.7)       508 (3.0)       6 (2.7)         2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         4 Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)	Tunisia						_		
** Kuwait 52 (1.5) 333 (4.3) 48 (1.5) 297 (6.2) 37 (7.6) International Avg. 49 (0.2) 473 (0.7) 51 (0.2) 473 (0.7) 0 (0.7)  ** Contario, Canada 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0) 2	Yemen								
International Avg. 49 (0.2) 473 (0.7) 51 (0.2) 473 (0.7) 0 (0.7)  Inchmarking Participants  2 Ontario, Canada 48 (1.1) 509 (3.2) 52 (1.1) 514 (3.7) 6 (3.0)  2 † Minnesota, US 50 (1.5) 551 (6.1) 50 (1.5) 557 (6.3) 6 (4.1)  2 British Columbia, Canada 49 (0.7) 502 (3.1) 51 (0.7) 508 (3.0) 6 (2.7)  2 Quebec, Canada 51 (0.9) 515 (3.5) 49 (0.9) 524 (3.3) 9 (3.1)  2 Massachusetts, US 51 (1.0) 567 (3.7) 49 (1.0) 578 (4.2) 10 (3.6)  2 Alberta, Canada 48 (1.1) 500 (3.2) 52 (1.1) 510 (3.2) 11 (2.5)  4 Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)	Qatar	51 (0.2)	307 (2.0)	49 (0.2)			_		
**Princhmarking Participants**  2 Ontario, Canada		52 (1.5)	333 (4.3)	48 (1.5)	297 (6.2)	37 (7.6)			
2 Ontario, Canada       48 (1.1)       509 (3.2)       52 (1.1)       514 (3.7)       6 (3.0)         2 † Minnesota, US       50 (1.5)       551 (6.1)       50 (1.5)       557 (6.3)       6 (4.1)         2 British Columbia, Canada       49 (0.7)       502 (3.1)       51 (0.7)       508 (3.0)       6 (2.7)         2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         • ‡ Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)	International Avg.	49 (0.2)	473 (0.7)	51 (0.2)	473 (0.7)	0 (0.7)			
2 † Minnesota, US       50 (1.5)       551 (6.1)       50 (1.5)       557 (6.3)       6 (4.1)         2 British Columbia, Canada       49 (0.7)       502 (3.1)       51 (0.7)       508 (3.0)       6 (2.7)         2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         4 † Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)	enchmarking Participants								
2 British Columbia, Canada       49 (0.7)       502 (3.1)       51 (0.7)       508 (3.0)       6 (2.7)         2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         4 Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)		48 (1.1)	509 (3.2)	52 (1.1)	514 (3.7)				
2 Quebec, Canada       51 (0.9)       515 (3.5)       49 (0.9)       524 (3.3)       9 (3.1)         2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         4 † Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)		50 (1.5)	551 (6.1)	50 (1.5)	557 (6.3)	6 (4.1)			
2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         • ‡ Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)	<sup>2</sup> British Columbia, Canada	49 (0.7)		51 (0.7)	508 (3.0)				
2 Massachusetts, US       51 (1.0)       567 (3.7)       49 (1.0)       578 (4.2)       10 (3.6)         2 Alberta, Canada       48 (1.1)       500 (3.2)       52 (1.1)       510 (3.2)       11 (2.5)         • ‡ Dubai, UAE       47 (4.7)       452 (4.0)       53 (4.7)       438 (4.9)       14 (8.1)	<sup>2</sup> Quebec, Canada	51 (0.9)	515 (3.5)	49 (0.9)		9 (3.1)			
<sup>2</sup> Alberta, Canada 48 (1.1) 500 (3.2) 52 (1.1) 510 (3.2) 11 (2.5) • † Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)	<sup>2</sup> Massachusetts, US	51 (1.0)		49 (1.0)	578 (4.2)	10 (3.6)			
• ‡ Dubai, UAE 47 (4.7) 452 (4.0) 53 (4.7) 438 (4.9) 14 (8.1)									
80 40 0 40									
00 40 0 40						8	30 40	0 40	

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



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).

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

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.

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

TIMSS2007 Oth Mathematics Grade

		iirls	В	oys	Difference	Gender Difference					
Country	Percent of Students	Average Scale Score	Percent of Students	Average Scale Score	(Absolute Value)	Girls Scored Higher	Boys Scored Higher				
Malta	51 (0.3)	488 (1.5)	49 (0.3)	488 (1.7)	0 (2.2)	Scored ringrici	Scored riigher				
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)						
<sup>3</sup> 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)						
† 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 (0.9)	568 (3.2)	50 (0.9)	572 (3.2)	4 (4.3)						
<sup>1</sup> 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 (0.9)	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)						
<sup>2</sup> 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 (3.6)						
Saudi Arabia	48 (1.6)	341 (3.6)	52 (1.6)	342 (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 (4.3)						
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)						
international Avg.	30 (0.2)	133 (0.7)	<del>30 (0.2)</del>	T10 (0.7)	3 (0.0)						
† Dubai, UAE	49 (4.8)	461 (5.2)	51 (4.8)	461 (5.9)	0 (10.1)						
<sup>3</sup> Quebec, Canada	49 (4.8)	527 (3.5)	51 (4.8)	529 (4.6)	2 (4.2)						
† Minnesota, US	52 (1.3)	531 (4.4)	48 (1.3)	535 (5.1)	4 (3.7)						
Basque Country, Spain											
<sup>2</sup> Massachusetts, US	48 (1.7) 50 (1.0)	496 (3.9)	52 (1.7) 50 (1.0)	501 (3.9)	4 (5.0) 5 (3.8)						
<sup>3</sup> British Columbia, Canada	50 (1.0) 51 (1.1)	544 (4.8)	50 (1.0)	550 (5.1) 512 (3.4)	5 (3.8)						
<sup>2</sup> Ontario, Canada	51 (1.1) 50 (1.1)	507 (3.3) 513 (4.1)	49 (1.1) 50 (1.1)	512 (3.4) 522 (4.0)	6 (2.9) 9 (4.1)						
- Officatio, Callada	JU (1.1)	JIJ (4.1)	JU (1.1)	JZZ (4.U)	7 (4.1)						

 $<sup>\</sup>label{lem:matter} \mbox{Met guidelines for sample participation rates only after replacement schools were}$ 

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



Difference not statistically significant

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).

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

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

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.

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



		Girls		Boys				07 e e · · · · · · · · · · · · · · · · ·		
Country	2007 Average Scale Score	2003 to 200 Difference			2007 Average 2003 to 2007 Scale Score Difference			1995 to 2007 Difference		
Armenia	504 (5.7)	42 (6.8)	٥	<b>◊ ◊</b>		495 (3.7)	45 (5.3)	٥	<b>◊ ◊</b>	
Australia	513 (4.2)	16 (6.1)	٥	20 (5.7)	٥	519 (3.6)	19 (5.6)	٥	23 (5.4)	٥
Austria	498 (2.5)	$\Diamond$ $\Diamond$		-27 (4.3)	♥	512 (2.3)	$\Diamond$ $\Diamond$		-24 (4.4)	♥
Chinese Taipei	575 (2.0)	11 (2.7)	٥	◊ ◊		577 (2.0)	13 (2.9)	٥	◊ ◊	
Czech Republic	483 (3.3)	◊ ◊		-54 (4.6)	♥	489 (3.0)	$\Diamond$ $\Diamond$		-54 (4.6)	♥
England	541 (3.2)	11 (5.0)	٥	62 (5.3)	٥	542 (3.6)	9 (5.8)		53 (5.2)	٥
Hong Kong SAR	605 (3.2)	30 (4.6)	٥	47 (5.0)	٥	609 (4.4)	34 (5.6)	٥	52 (6.3)	٥
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)	٥	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)	٥	536 (3.0)	5 (4.9)		43 (6.3)	٥
Lithuania	530 (2.8)	-5 (4.4)		◊ ◊		530 (3.2)	-6 (4.5)		$\Diamond$ $\Diamond$	
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)	٥	493 (3.1)	-3 (3.9)		28 (6.9)	٥
Norway	470 (3.2)	21 (4.2)	٥	-4 (5.4)		477 (3.0)	23 (4.0)	٥	-1 (4.7)	
Russian Federation	548 (5.5)	18 (7.7)	٥	◊ ◊		540 (4.9)	7 (6.8)		$\Diamond$ $\Diamond$	
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)	٥	42 (4.5)	٥	504 (2.1)	23 (4.1)	٥	38 (4.1)	٥
Tunisia	336 (4.8)	-6 (6.9)		◊ ◊		317 (5.0)	-19 (7.0)	♥	◊ ◊	
United States	526 (2.7)	12 (3.6)	٥	10 (4.1)	٥	532 (2.7)	10 (3.9)	٥	12 (4.1)	٥
Benchmarking Participants										
Alberta, Canada	500 (3.2)	◊ ◊		-23 (10.1)	♥	510 (3.2)	◊ ◊		-13 (8.4)	
Minnesota, US	551 (6.1)	◊ ◊		34 (10.6)	٥	557 (6.3)	$\Diamond$ $\Diamond$		42 (9.9)	٥
Ontario, Canada	509 (3.2)	3 (4.8)		22 (4.7)	٥	514 (3.7)	-2 (6.0)		24 (5.7)	٥
Quebec, Canada	515 (3.5)	12 (4.4)	٥	-34 (6.7)	♥	524 (3.3)	15 (4.4)	٥	-28 (5.7)	♥

<sup>2007</sup> average significantly higher

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.

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



lacktriangledown 2007 average significantly lower

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

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

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



	Girls							Boys						
Country	2007 Average Scale Score	2003 to 200 Difference		1999 to 20 Differenc		1995 to 200 Difference		2007 Average Scale Score	2003 to 20 Differenc		1999 to 200 Difference		1995 to 20 Difference	
Armenia	501 (4.4)	18 (5.5)	٥	<b>◊ ◊</b>		<b>◊ ◊</b>		497 (3.5)	24 (4.9)	٥	◊ ◊		◊ ◊	
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)		◊ ◊		◊ ◊		382 (2.6)	-2 (3.6)		<b>◊ ◊</b>		◊ ◊	
Botswana	371 (2.4)	3 (3.5)		◊ ◊		$\Diamond$ $\Diamond$		355 (3.2)	-9 (4.3)	♥	$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$	
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)	٥	◊ ◊		598 (5.3)	16 (7.4)	٥	11 (7.5)		$\Diamond$ $\Diamond$	
Colombia	364 (4.2)	◊ ◊		$\Diamond$ $\Diamond$		44 (8.3)	٥	396 (4.1)	$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$		52 (9.2)	٥
Cyprus	476 (2.2)	8 (2.9)	٥	-3 (3.0)		5 (3.4)		455 (2.4)	4 (3.3)		-19 (3.6)	♥	-9 (4.0)	♥
Czech Republic	505 (2.5)	◊ ◊		-7 (4.7)		-34 (5.9)	lacktriangledown	503 (2.8)	$\Diamond$ $\Diamond$		-26 (6.4)	♥	-50 (5.4)	♥
Egypt	397 (5.0)	-9 (6.6)		$\Diamond$ $\Diamond$		◊ ◊		384 (4.6)	-22 (6.8)	♥	$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$	
England	511 (5.0)	12 (7.3)		24 (7.4)	٥	16 (6.4)	٥	516 (6.1)	18 (8.5)	٥	11 (7.9)		16 (8.2)	
Ghana	297 (5.0)	31 (7.1)	٥	$\Diamond$ $\Diamond$		◊ ◊		319 (4.4)	36 (6.6)	٥	◊ ◊		$\Diamond$ $\Diamond$	
Hong Kong SAR	578 (5.0)	-9 (6.3)		-5 (6.9)		19 (8.6)	٥	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)		◊ ◊		404 (5.3)	-6 (7.5)		-1 (7.3)		$\Diamond$ $\Diamond$	
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)		$\Diamond$ $\Diamond$		417 (5.6)	6 (8.1)		-8 (8.2)		$\Diamond$ $\Diamond$	
Korea, Rep. of	595 (3.3)	9 (4.3)	٥	11 (4.6)	٥	24 (4.4)	٥	599 (3.1)	7 (4.0)		9 (3.8)	٥	11 (4.1)	٥
Lebanon	443 (4.1)	14 (5.5)	٥	◊ ◊		$\Diamond$ $\Diamond$		456 (4.7)	18 (6.1)	٥	$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$	
Lithuania	509 (3.0)	6 (4.2)		29 (5.5)	٥	37 (5.5)	٥	502 (2.3)	4 (3.8)		20 (5.3)	٥	31 (5.1)	٥
Malaysia	479 (5.6)	-33 (7.3)	♥	-43 (7.3)	♥	◊ ◊		468 (5.3)	-36 (7.0)	♥	-49 (8.0)	♥	◊ ◊	
Norway	471 (2.1)	8 (3.4)	٥	<b>◊ ◊</b>		-26 (3.3)	◉	467 (2.6)	7 (4.0)		◊ ◊		-32 (3.9)	◉
Palestinian Nat'l Auth.	385 (4.2)	-9 (5.7)		$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$		349 (5.4)	-37 (7.2)	♥	◊ ◊		$\Diamond$ $\Diamond$	
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 (6.6)		489 (4.4)	-7 (5.8)		◊ ◊		-12 (8.3)	
Serbia	489 (3.6)	9 (4.7)		◊ ◊		$\Diamond$ $\Diamond$		483 (4.0)	9 (5.0)		$\Diamond$ $\Diamond$		$\Diamond$ $\Diamond$	
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)	٥	503 (2.6)	11 (3.7)	٥			5 (4.4)	
Sweden	493 (2.6)	-6 (4.0)		<b>◊ ◊</b>		-48 (5.3)	◉	490 (2.5)	-10 (3.7)	◉	◊ ◊		-49 (5.4)	€
Thailand	453 (5.3)	◊ ◊		-16 (7.8)	♥			430 (5.5)	◊ ◊		-35 (7.8)	♥		
Tunisia	410 (2.8)	11 (3.8)	٥	-25 (3.7)	◉	◊ ◊		431 (2.7)	8 (3.4)	٥	-29 (4.0)	◉	◊ ◊	
United States	507 (3.0)	5 (4.5)		9 (4.9)		17 (5.6)	٥	510 (3.1)	3 (4.7)		5 (5.7)		15 (6.1)	٥
Benchmarking Participants														
Basque Country, Spain	496 (3.9)	6 (4.6)		◊ ◊	_	◊ ◊		501 (3.9)	16 (5.3)	٥	◊ ◊		◊ ◊	
British Columbia, Canada	507 (3.3)	◊ ◊		-18 (7.8)	€	<b>◊◊</b>		512 (3.4)	◊ ◊		-7 (9.1)		<b>◊◊</b>	
Massachusetts, US	544 (4.8)	<b>◊◊</b>		34 (8.0)	٥	<b>◊ ◊</b>		550 (5.1)	<b>◊ ◊</b>		33 (7.9)	٥	<b>⋄</b> ⋄	
Minnesota, US	531 (4.4)	<b>◊◊</b>		◊ ◊		14 (8.8)		535 (5.1)	<b>◊◊</b>		◊ ◊		14 (9.4)	
Ontario, Canada	513 (4.1)	-7 (5.3)		-1 (5.3)		13 (5.0)	٥	522 (4.0)	0 (5.3)		2 (5.1)		18 (5.3)	٥
Quebec, Canada	527 (3.5)	-7 (5.3) -13 (5.1)	•	-39 (6.7)	•	-33 (7.6)	€	529 (4.6)	-17 (5.6)	€	-36 (7.3)	€	-24 (7.9)	•
Quenec, Carlada	321 (3.3)	-15 (5.1)	(T)	-37 (0.7)	•	-33 (7.0)	•	JZ7 (4.U)	-17 (5.0)	•	-30 (7.3)	•	-24 (1.9)	•

<sup>2007</sup> average significantly higher

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 (0) indicates the country did not participate in the assessment.



lacktriangledown 2007 average significantly lower

<sup>()</sup> 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.

