Chapter 3

Average Achievement in the Mathematics Content Areas

Chapter 3 presents results by the major content areas in mathematics to provide information about the possible effects of curricular variation on average achievement. Average performance is provided for five content areas at the eighth and fourth grades: number, algebra (patterns and relationships at the fourth grade), measurement, geometry, and data. Relative achievement is shown among the content areas for each country and results are presented by gender. Trends from 1999 are shown for the eighth grade (insufficient items are available from 1995 to report trends within content areas).

The TIMSS 2003 mathematics assessments at the eighth and fourth grades were designed to allow as fair comparisons as possible among participating countries. Considerable effort was devoted to updating the mathematics framework newly published in the *TIMSS Assessment Frameworks and Specifications 2003*.[1] IEA gratefully acknowledges the generous support of the US National Science Foundation in helping to fund this work, which took about two years, including a special international expert panel, iterative reviews by the NRCs, and a curriculum questionnaire completed by the countries. The effort focused on specifying the particular topics and subtopics to be assessed at each grade within each content area. Following on the framework

1 Mullis, I.V.S., Martin, M.O., Smith, T.A., Garden, R.A., Gregory, K.D., Gonzalez, E.J., Chrostowski, S..J, and O'Connor, K.M. (2003), *TIMSS Assessment Frameworks and Specifications 2003 (2nd Edition)*, Chestnut Hill, MA: Boston College. Please see Appendix A for more information about the framework and test development process.

development, also with additional funding from the US National Science Foundation, an enormous, collaborative test development effort involving the participating countries occurred at both grades to reflect the framework and its new emphasis on problem solving. Nevertheless, curriculum data collected as part of TIMSS[2] indicate differences in the grade level at which particular topics are introduced and in the teaching emphases given some topics. In addition, within countries there can be variation among teachers in the relative emphasis given particular topics.

The TIMSS 2003 mathematics tests for the eighth and fourth grades were designed to enable reporting by five content areas in accordance with the TIMSS mathematics framework. These areas, with their main topics, are:

Number

1. whole numbers
2. fractions and decimals
3. integers
4. ratio, proportion, and percent.

   At grade 4, integers are not included and the last topic includes only simple proportional reasoning

Algebra

1. patterns
2. algebraic expressions
3. equations and formulas
4. relationships

At grade 4, algebraic expressions is not included.

2 Chapter 5 contains information about the official curriculum in each country as well as teachers' reports about the topics students have been taught. Appendix C provides an analysis of the match between the test and curriculum in different TIMSS 2003 countries and the effect of this match on the results.

Measurement

1. attributes and units
2. tools, techniques, and formula

Geometry

1. lines and angles
2. two- and three-dimensional shapes
3. congruence and similarity
4. locations and spatial relationships
5. symmetry and transformations.

Data

1. data collection and organization
2. data representation
3. data interpretation
4. uncertainty and probability.

At grade 4, uncertainty and probability is not included.

How Does Achievement Differ Across Mathematics Content Areas?

Exhibit 3.1 presents average achievement in each of the five mathematics content areas at the eighth grade and the fourth grade. Countries are displayed in alphabetical order, and symbols indicate whether a country's performance is statistically significantly above or below the international average. To provide a basis of comparison for the performance of each country in each content area, the international average for each content area was scaled to be 467, the same as the overall international average.

Exhibit 3.1: Average Achievement in Mathematics Content Areas

MATHEMATICS Grade 8

▲ Country average significantly higher than international average

▼ Country average significantly lower than international average

Countries	Average Scale Scores for Mathematics Content Areas				
	Number	Algebra	Measurement	Geometry	Data
Armenia	473 (3.1) ▲	489 (2.6) ▲	488 (3.3) ▲	481 (3.1) ▲	419 (2.7) ▼
Australia	498 (4.6) ▲	499 (4.4) ▲	511 (4.3) ▲	491 (4.8) ▲	531 (3.8) ▲
Bahrain	380 (1.9) ▼	411 (2.5) ▼	388 (2.1) ▼	438 (2.1) ▼	414 (2.1) ▼
Belgium (Flemish)	539 (2.7) ▲	523 (2.8) ▲	535 (2.5) ▲	527 (3.1) ▲	546 (2.9) ▲
Botswana	382 (2.2) ▼	377 (2.7) ▼	377 (2.0) ▼	335 (3.9) ▼	375 (2.7) ▼
Bulgaria	477 (4.1) ▲	481 (4.0) ▲	473 (4.6)	484 (4.5) ▲	458 (3.9) ▼
Chile	390 (3.1) ▼	384 (3.1) ▼	404 (2.9) ▼	378 (3.3) ▼	412 (3.4) ▼
Chinese Taipei	585 (4.6) ▲	585 (4.9) ▲	574 (4.4) ▲	588 (5.1) ▲	568 (3.4) ▲
Cyprus	464 (1.5) ▼	455 (1.7) ▼	459 (2.2) ▼	457 (2.4) ▼	458 (1.7) ▼
Egypt	421 (3.0) ▼	408 (3.9) ▼	401 (3.3) ▼	408 (3.6) ▼	393 (3.2) ▼
Estonia	523 (3.1) ▲	528 (2.6) ▲	528 (3.0) ▲	540 (2.6) ▲	535 (2.8) ▲
Ghana	289 (5.1) ▼	288 (4.8) ▼	262 (3.7) ▼	278 (4.3) ▼	293 (4.1) ▼
† Hong Kong, SAR	586 (3.2) ▲	580 (3.2) ▲	584 (3.3) ▲	588 (3.6) ▲	566 (3.0) ▲
Hungary	529 (3.6) ▲	534 (3.1) ▲	525 (3.1) ▲	515 (3.1) ▲	526 (2.9) ▲
1 Indonesia	421 (4.6) ▼	418 (4.5) ▼	394 (4.9) ▼	413 (4.6) ▼	418 (4.0) ▼
Iran, Islamic Rep. of	416 (2.3) ▼	412 (3.1) ▼	399 (2.6) ▼	437 (3.1) ▼	404 (2.6) ▼
2 Israel	504 (3.3) ▲	498 (3.2) ▲	480 (3.4) ▲	488 (3.7) ▲	492 (3.3) ▲
Italy	480 (3.2) ▲	477 (3.4) ▲	500 (3.2) ▲	469 (3.5)	490 (3.0) ▲
Japan	557 (2.3) ▲	568 (2.0) ▲	559 (2.0) ▲	587 (2.1) ▲	573 (1.9) ▲
Jordan	413 (4.4) ▼	434 (4.4) ▼	418 (4.4) ▼	446 (4.0) ▼	430 (3.5) ▼
◆◆ Korea, Rep. of	586 (2.1) ▲	597 (2.2) ▲	577 (2.0) ▲	598 (2.6) ▲	569 (2.0) ▲
Latvia	507 (3.2) ▲	508 (3.2) ▲	500 (3.0) ▲	515 (3.3) ▲	506 (3.8) ▲
Lebanon	430 (3.3) ▼	448 (3.1) ▼	430 (3.7) ▼	459 (3.0) ▼	394 (4.0) ▼
1 Lithuania	500 (2.7) ▲	501 (2.4) ▲	492 (3.0) ▲	506 (2.5) ▲	502 (2.5) ▲
2 Macedonia, Rep. of	438 (3.5) ▼	442 (3.6) ▼	434 (3.6) ▼	442 (3.7) ▼	419 (3.6) ▼
Malaysia	524 (4.0) ▲	495 (3.9) ▲	504 (4.5) ▲	495 (4.8) ▲	505 (3.2) ▲
Moldova, Rep. of	463 (3.8)	464 (4.2)	468 (4.0)	463 (4.7)	428 (3.4) ▼
1 ‡ Morocco	384 (2.7) ▼	400 (2.8) ▼	376 (3.4) ▼	415 (2.3) ▼	374 (2.5) ▼
† Netherlands	539 (3.6) ▲	514 (4.0) ▲	549 (3.7) ▲	513 (4.1) ▲	560 (3.1) ▲
New Zealand	481 (6.0) ▲	490 (5.2) ▲	500 (4.8) ▲	488 (4.6) ▲	526 (5.1) ▲
Norway	456 (2.3) ▼	428 (2.7) ▼	481 (2.9) ▲	461 (2.8) ▼	498 (2.5) ▲
Palestinian Nat'l Auth.	385 (3.6) ▼	392 (3.5) ▼	386 (2.8) ▼	423 (3.1) ▼	390 (2.8) ▼
Philippines	393 (5.1) ▼	400 (5.2) ▼	372 (4.8) ▼	344 (5.3) ▼	390 (4.5) ▼
Romania	474 (4.9)	480 (4.7) ▲	485 (4.7) ▲	476 (4.9) ▲	445 (4.6) ▼
Russian Federation	505 (4.0) ▲	516 (3.2) ▲	507 (3.9) ▲	515 (4.2) ▲	484 (3.2) ▲
Saudi Arabia	307 (5.3) ▼	331 (4.7) ▼	338 (3.4) ▼	382 (4.3) ▼	339 (3.8) ▼
† Scotland	484 (4.2) ▲	488 (3.9) ▲	508 (3.6) ▲	491 (3.3) ▲	531 (3.7) ▲
1 Serbia	477 (2.8) ▲	488 (2.5) ▲	475 (2.5) ▲	471 (3.0)	456 (2.6) ▼
Singapore	618 (3.5) ▲	590 (3.5) ▲	611 (3.6) ▲	580 (3.7) ▲	579 (3.2) ▲
Slovak Republic	514 (3.3) ▲	505 (3.3) ▲	508 (3.7) ▲	501 (3.6) ▲	495 (2.9) ▲
Slovenia	498 (2.0) ▲	487 (2.3) ▲	496 (2.3) ▲	483 (2.5) ▲	494 (2.3) ▲
South Africa	274 (5.4) ▼	275 (5.1) ▼	298 (4.7) ▼	247 (5.4) ▼	296 (5.3) ▼
Sweden	496 (2.6) ▲	480 (3.0) ▲	512 (2.6) ▲	467 (3.4)	539 (2.9) ▲
Tunisia	419 (2.3) ▼	405 (2.4) ▼	407 (2.2) ▼	427 (2.0) ▼	387 (2.2) ▼
‡ United States	508 (3.4) ▲	510 (3.1) ▲	495 (3.2) ▲	472 (3.1)	527 (3.2) ▲
‡ England	485 (5.0) ▲	492 (4.5) ▲	505 (4.3) ▲	492 (4.5) ▲	535 (4.1) ▲
International Avg.	467 (0.5)	467 (0.5)	467 (0.5)	467 (0.5)	467 (0.5)
Benchmarking Participants					
Basque Country, Spain	490 (2.6) ▲	490 (2.7) ▲	488 (2.4) ▲	456 (3.2) ▼	499 (2.7) ▲
Indiana State, US	516 (5.8) ▲	510 (5.3) ▲	503 (5.5) ▲	468 (5.1)	528 (4.9) ▲
Ontario Province, Can.	516 (3.4) ▲	515 (2.6) ▲	520 (2.8) ▲	513 (3.2) ▲	538 (2.7) ▲
Quebec Province, Can.	546 (3.4) ▲	529 (3.2) ▲	541 (3.6) ▲	542 (3.3) ▲	544 (2.6) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, at the beginning of the next school year.

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

Exhibit 3.1: Average Achievement in Mathematics Content Areas

MATHEMATICS Grade 4

Countries	Average Scale Scores for Mathematics Content Areas									
	Number		Patterns and Relationships		Measurement		Geometry		Data	
Armenia	473 (3.0)	▼	461 (4.1)	▼	465 (3.1)	▼	431 (3.8)	▼	417 (3.6)	▼
† Australia	479 (4.3)	▼	495 (3.7)		514 (3.7)	▲	524 (3.7)	▲	525 (3.6)	▲
Belgium (Flemish)	549 (1.9)	▲	542 (1.9)	▲	550 (1.4)	▲	533 (1.8)	▲	548 (2.2)	▲
Chinese Taipei	568 (1.8)	▲	555 (2.4)	▲	557 (1.6)	▲	553 (2.5)	▲	564 (2.3)	▲
Cyprus	514 (2.7)	▲	519 (2.4)	▲	506 (2.3)	▲	505 (2.3)	▲	509 (2.3)	▲
† England	519 (4.1)	▲	523 (3.9)	▲	535 (3.3)	▲	542 (3.7)	▲	552 (3.4)	▲
† Hong Kong, SAR	574 (3.3)	▲	568 (3.5)	▲	563 (2.7)	▲	557 (2.9)	▲	562 (2.3)	▲
Hungary	524 (2.9)	▲	545 (3.7)	▲	532 (2.7)	▲	514 (3.3)	▲	513 (3.2)	▲
Iran, Islamic Rep. of	410 (3.7)	▼	394 (3.9)	▼	398 (3.2)	▼	416 (3.9)	▼	356 (4.4)	▼
Italy	502 (3.6)	▲	496 (4.3)		504 (3.4)	▲	522 (3.5)	▲	497 (3.0)	
Japan	556 (2.0)	▲	554 (1.4)	▲	568 (1.6)	▲	559 (1.9)	▲	593 (1.6)	▲
Latvia	531 (2.6)	▲	532 (3.4)	▲	545 (2.6)	▲	523 (2.2)	▲	526 (2.7)	▲
1 Lithuania	535 (2.9)	▲	531 (3.0)	▲	540 (2.7)	▲	524 (2.2)	▲	517 (2.5)	▲
Moldova, Rep. of	507 (4.7)	▲	521 (5.1)	▲	505 (4.0)	▲	501 (4.9)		477 (4.3)	▼
Morocco	359 (4.7)	▼	360 (4.7)	▼	345 (5.5)	▼	362 (4.9)	▼	355 (5.0)	▼
† Netherlands	536 (2.2)	▲	527 (2.4)	▲	545 (2.2)	▲	521 (3.2)	▲	553 (2.4)	▲
New Zealand	475 (2.3)	▼	495 (2.9)		503 (2.0)	▲	517 (1.8)	▲	522 (2.0)	▲
Norway	440 (2.2)	▼	439 (2.7)	▼	475 (2.2)	▼	478 (2.2)	▼	479 (2.3)	▼
Philippines	380 (7.4)	▼	382 (7.0)	▼	330 (7.8)	▼	335 (8.8)	▼	384 (7.5)	▼
Russian Federation	532 (4.6)	▲	531 (5.0)	▲	538 (3.8)	▲	528 (4.8)	▲	505 (4.1)	▲
† Scotland	475 (3.3)	▼	495 (2.9)		499 (3.1)		511 (2.5)	▲	516 (2.7)	▲
Singapore	612 (6.0)	▲	579 (5.4)	▲	566 (4.6)	▲	570 (5.5)	▲	575 (3.9)	▲
Slovenia	461 (2.7)	▼	490 (2.7)	▼	497 (2.8)		498 (2.2)		486 (2.7)	▼
Tunisia	360 (4.1)	▼	330 (4.7)	▼	308 (5.5)	▼	346 (5.1)	▼	308 (4.7)	▼
† United States	516 (2.6)	▲	524 (2.7)	▲	500 (2.1)		518 (2.2)	▲	549 (2.0)	▲
International Avg.	495 (0.7)		495 (0.7)		495 (0.7)		495 (0.7)		495 (0.6)	
Benchmarking Participants										
Indiana State, US	531 (3.4)	▲	535 (3.4)	▲	515 (3.0)	▲	525 (3.5)	▲	557 (2.9)	▲
Ontario Province, Can.	494 (5.0)		513 (3.4)	▲	512 (3.8)	▲	535 (3.8)	▲	544 (3.5)	▲
Quebec Province, Can.	508 (2.5)	▲	499 (2.6)		504 (2.1)	▲	522 (2.3)	▲	506 (2.3)	▲

▲ Country average significantly higher than international average

▼ Country average significantly lower than international average

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

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

At both grades, the countries scoring highest in the overall mathematics assessments also tended to be the highest-scoring countries (though not always in the same rank order) in each of the major content areas. Correspondingly, countries scoring lowest on the overall tests tended to have low-average performance across all five content areas.

At the eighth grade, the differences in average achievement between the highest- and lowest-performing countries were greatest for geometry and measurement (351 and 349 scale-score points, respectively), next for number (344), then algebra (322), and least for data (286). In contrast to the consistency in performance across content areas displayed by the higher- and lower-performing countries overall, performance varied substantially for some middle-performing countries. For example, Armenia performed significantly above the international average in all the content areas except data, where, in contrast, it performed below the international average.

At the fourth grade, with fewer and less variable countries, the differences in achievement within the content areas were smaller between the highest- and lowest-performing countries. Interestingly, the largest difference by far – 285 scale-score points – was in data (which had the least difference at the eighth grade). Countries did report considerable differences in instructional emphasis given to this content area, especially at the fourth grade. For the other four content areas, the differences were 260 for measurement, 253 for number, 249 for patterns and relationships, and 245 for geometry.

In Appendix B, Exhibits B.1 through B.5 for the eighth grade and Exhibits B.6 through B.10 for the fourth grade compare average achievement among individual countries for each of the content areas, respectively. The exhibits show whether or not the differences in average achievement between pairs of countries are statistically significant.

In Which Content Areas Are Countries Relatively Strong or Weak?

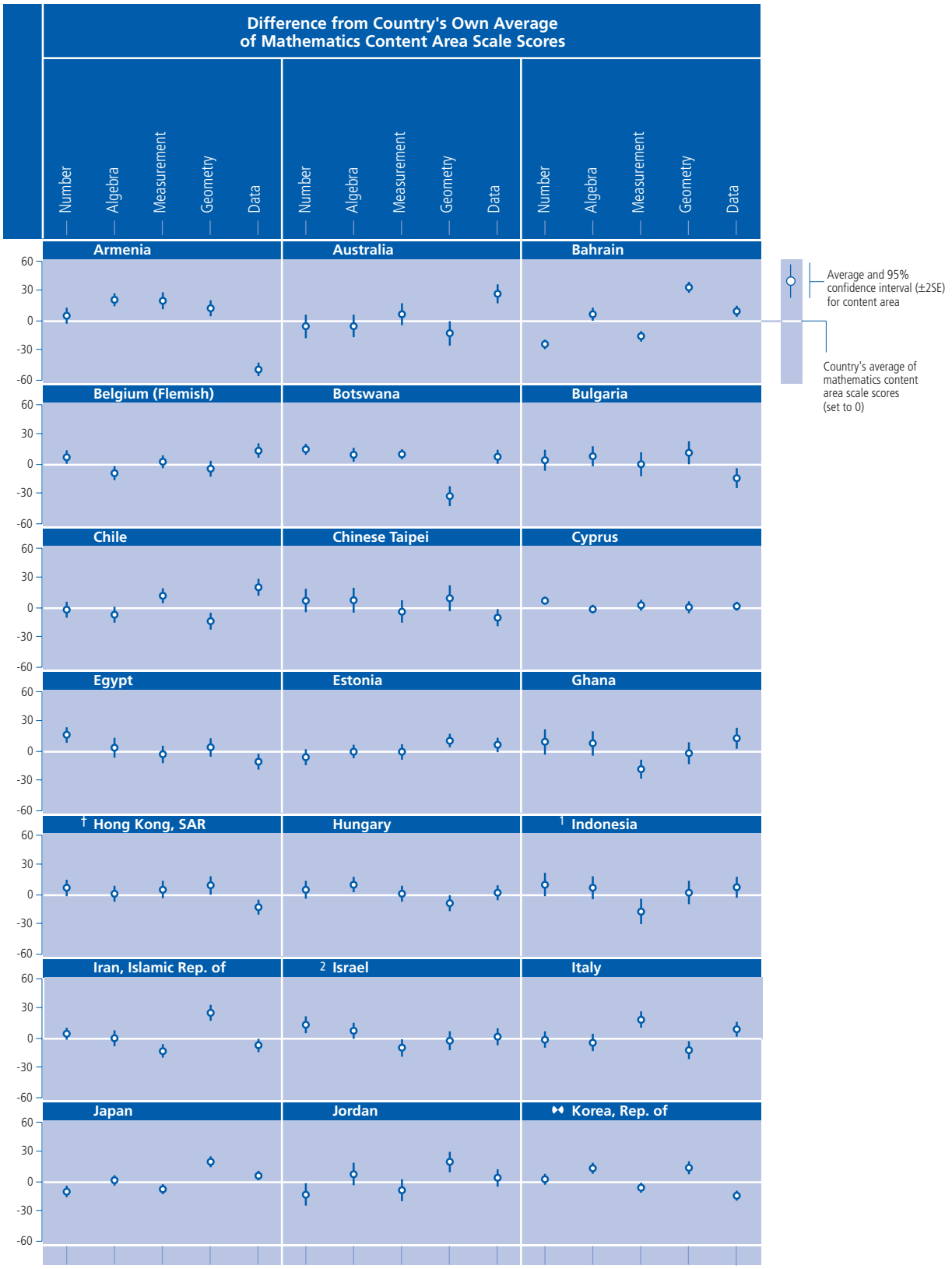
To highlight relative strengths and weaknesses within each country, Exhibit 3.2 profiles the relative average achievement in mathematics content areas within each country at the eighth and fourth grades. For each country, Exhibit 3.2 displays the difference between average performance in each content area and average performance overall. The profiles reveal that many countries performed relatively better or worse in several content areas than they did overall. At the eighth grade, for example, it can be seen that Botswana performed relatively worse in geometry than in the other four content areas. At the fourth grade, Norway performed relatively less well in number and in patterns and relationships, and relatively better in the areas of measurement, geometry, and data.

Differences in relative performance may be related to one or more of a number of factors, such as emphases in intended curricula or widely used textbooks, strengths or weaknesses in curriculum implementation, and the grade level at which topics are introduced. Differences in the match between the implemented curriculum and content measured by the test may also be a factor.

The profiles of relative performance reveal more variation across the content areas in some countries than in others. Average achievement across content areas showed considerable variation in several countries. For example, at the eighth grade, considerable variation of 60 or more scale-score points (one area at least 30 above and one 30 below) was found in Lebanon, Norway, Saudi Arabia, Sweden, and the US state of Indiana. At the fourth grade, no countries had such large differences even though several had a particular strength or weakness. On the other hand, there were only a small number of scale points of difference between highest and lowest content area means in some countries, with the best example being Cyprus at both grades. For the latter countries, the TIMSS 2003 data indicate a greater balance in mathematics content covered through the grades.

Exhibit 3.2: Profiles of Within-Country Relative Performance in Mathematics Content Areas

MATHEMATICS Grade 8



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

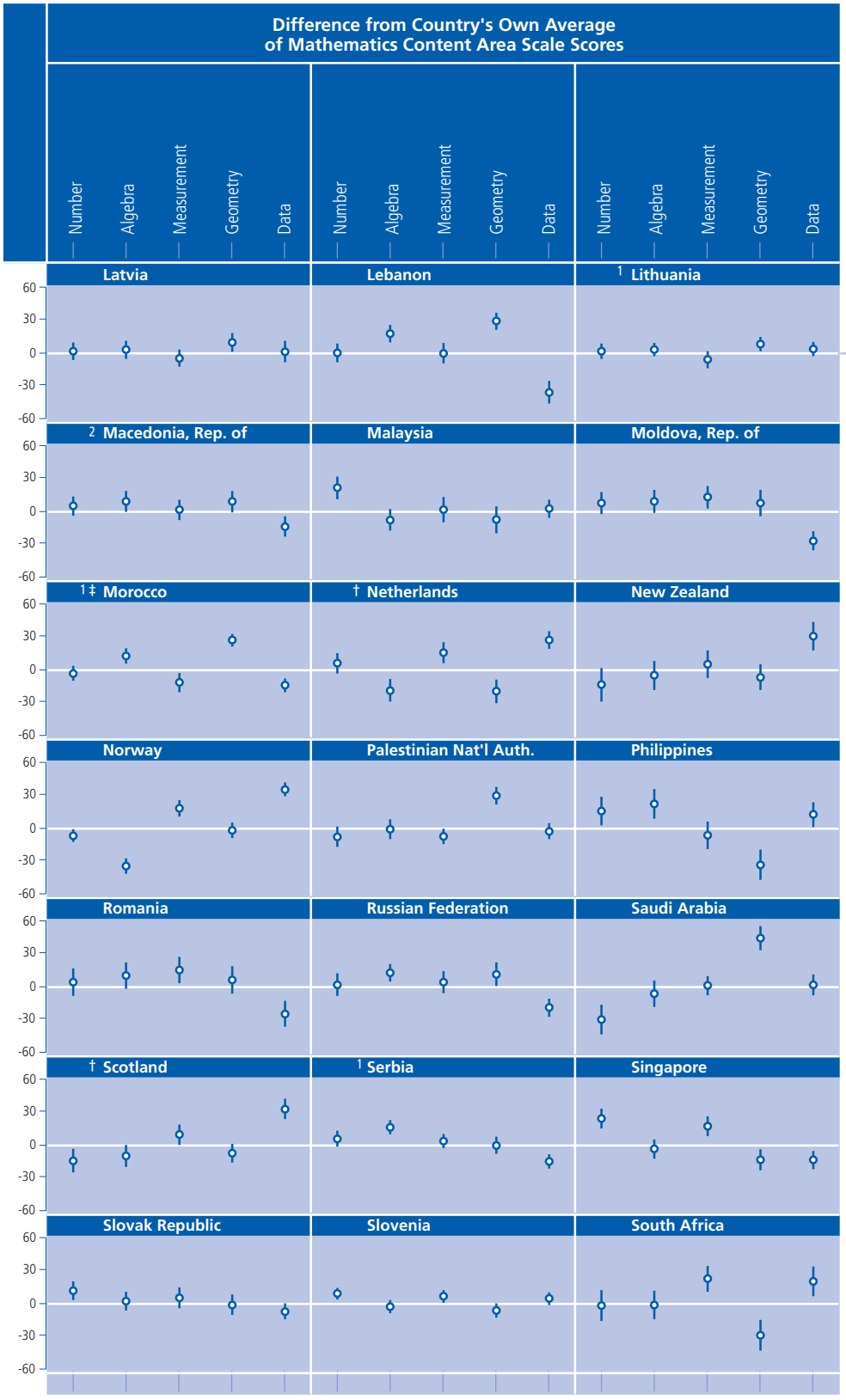
1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, at the beginning of the next school year.

Exhibit 3.2: Profiles of Within-Country Relative Performance in Mathematics Content Areas
(Continued...)

MATHEMATICS Grade 8



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

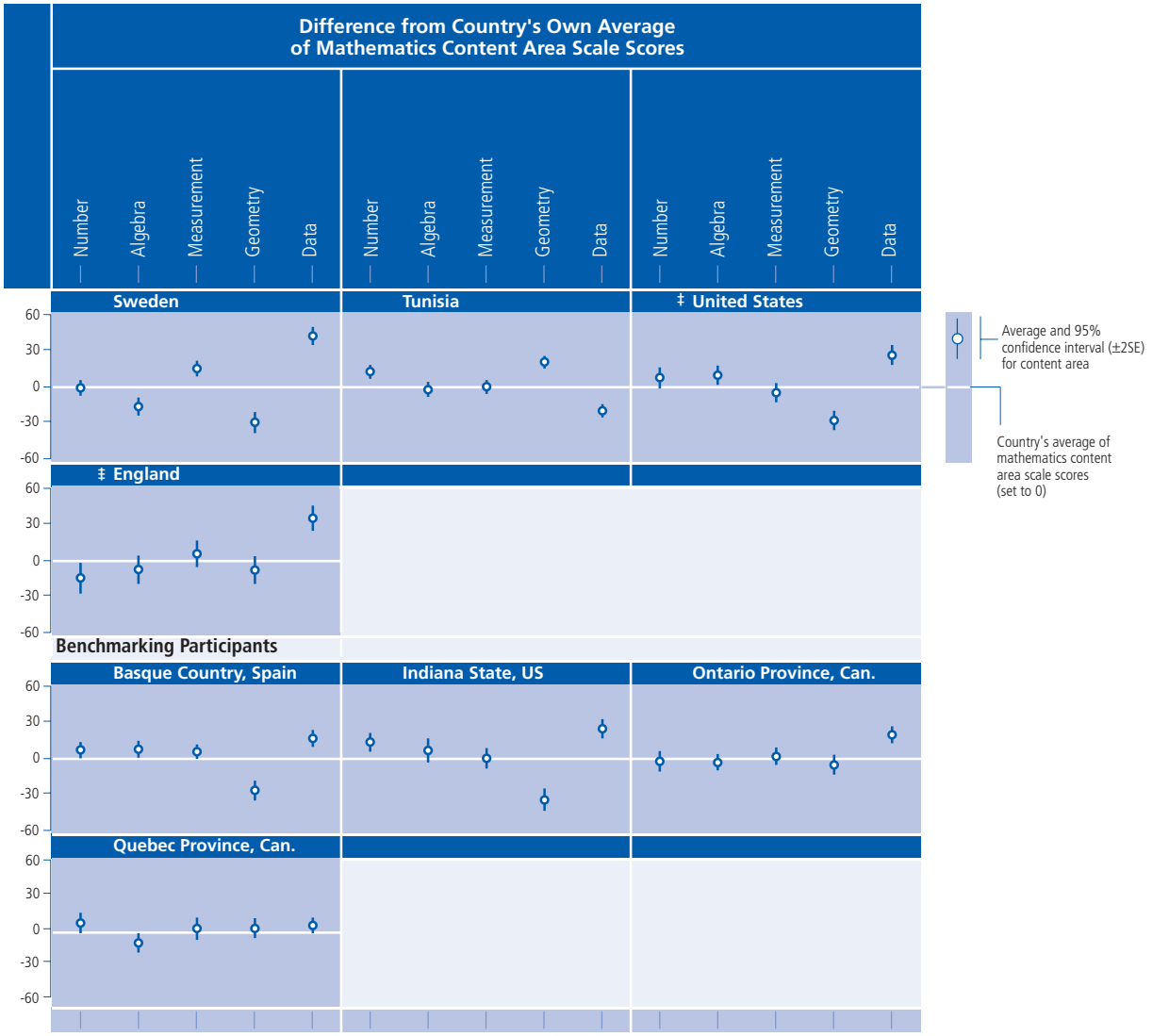
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Mathematics Content Areas
(…Continued)

MATHEMATICS Grade 8



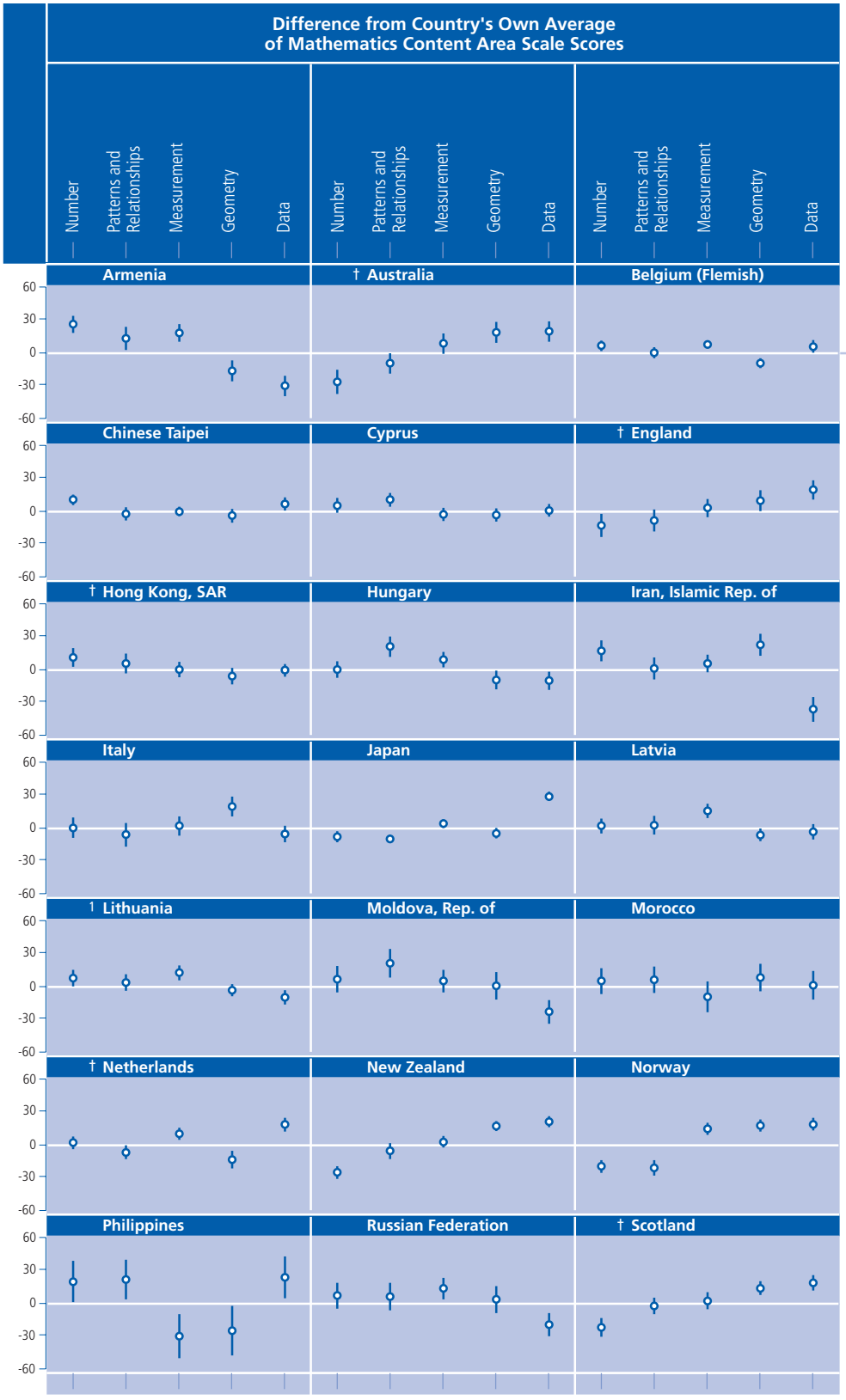
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Mathematics Content Areas
(Continued...)

MATHEMATICS Grade 4



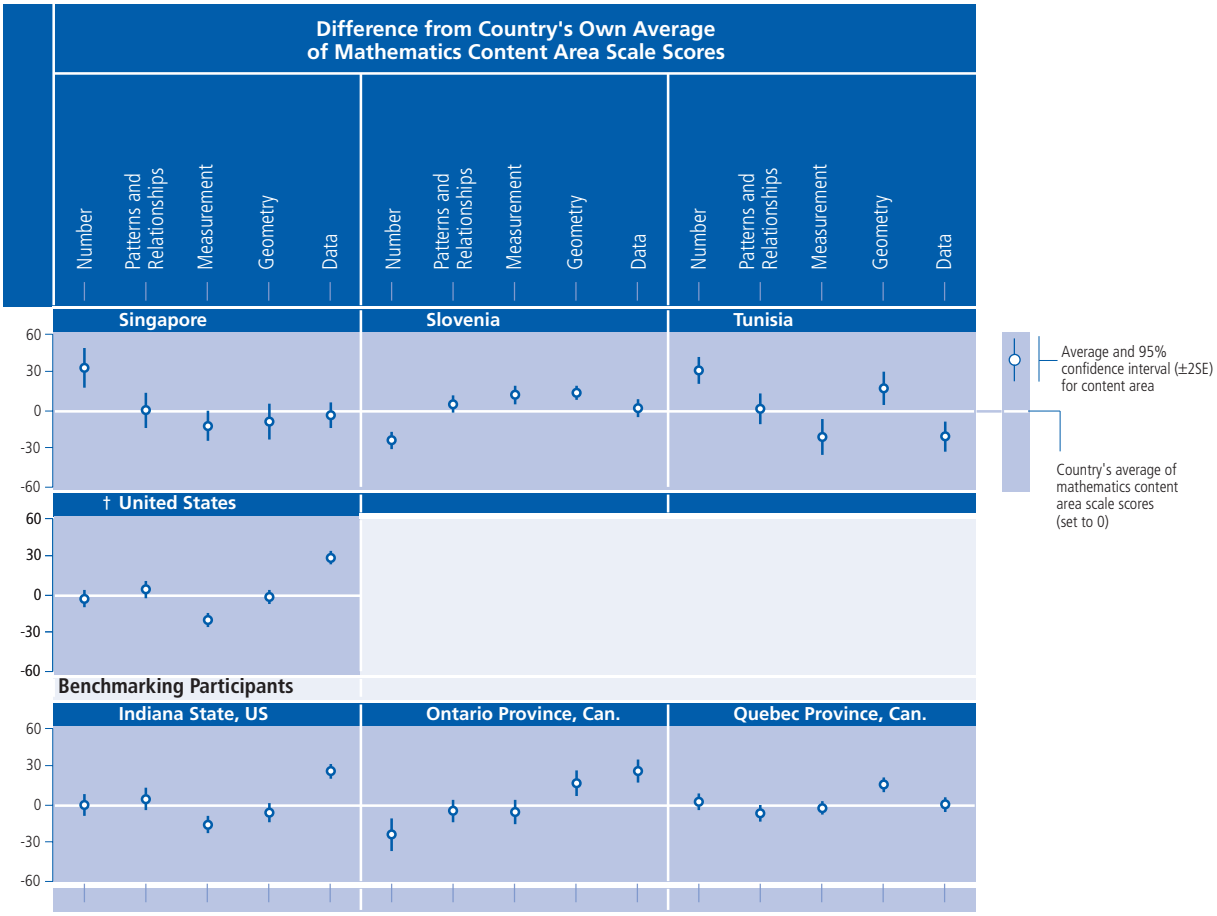
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Mathematics Content Areas
(…Continued)

MATHEMATICS Grade 4



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

What Are the Gender Differences in Achievement for the Content Areas?

Exhibit 3.3 displays average achievement in mathematics content areas by gender for the eighth and fourth grades. The most striking results at the eighth grade were the large number of significant differences favoring girls in algebra compared to those in measurement favoring boys.[3] In algebra, girls had higher average achievement than boys in 22 countries and one benchmarking participant compared to the boys having higher achievement in only 3 countries. On average internationally, the girls had an advantage of 9 points. In measurement, boys had higher average achievement than the girls in 13 countries and 2 benchmarking participants compared to the girls having higher achievement in only 2 countries. The overall difference was 6 points higher for boys, on average. For each TIMSS assessment, examining item statistics to detect any gender bias is an important stage of item selection. It is therefore reasonable to assume that where significant differences do occur, they result from differences in performance rather than problem situations favoring one gender or the other. For the other three content areas, there were essentially no gender differences, on average, internationally, even though there were differences within particular countries. In number, girls performed significantly higher in 10 countries and boys in 12 countries and 2 benchmarking participants. Girls had significantly higher achievement in 8 countries in both geometry and data, whereas boys had the better performance in 13 and 9 entities, respectively.

At the fourth grade, the gender pattern was the same as the eighth grade in measurement. Boys had significantly higher achievement than girls in 12 countries and 2 benchmarking participants, whereas girls did not outperform boys in any country. The difference in achievement across countries was 5 points higher for boys. However, for patterns and relationships (the fourth grade equivalent for algebra), the results did not mirror those at eighth grade. Essentially, girls had higher achievement in 3 participating entities and so did boys. At the fourth grade, interestingly, the content area in which girls did better

3 The results for TIMSS 2003 show many more significant differences than TIMSS 1999 because a Bonferroni procedure was applied in 1999 across countries leading to extremely conservative estimates given the large number of countries.

Exhibit 3.3: Average Achievement in Mathematics Content Areas by Gender

MATHEMATICS Grade 8

Countries	Average Scale Scores for Mathematics Content Areas											
	Number				Algebra				Measurement			
	Girls		Boys		Girls		Boys		Girls		Boys	
Armenia	478 (3.5)	▲	468 (3.6)		496 (3.0)	▲	482 (3.8)		489 (3.5)		488 (4.1)	
Australia	490 (5.5)		507 (5.9)	▲	496 (5.5)		501 (5.4)		504 (5.3)		518 (5.7)	▲
Bahrain	392 (3.6)	▲	369 (2.8)		434 (3.2)	▲	387 (3.3)		394 (3.2)	▲	383 (2.5)	
Belgium (Flemish)	532 (3.1)		547 (3.6)	▲	521 (3.5)		526 (4.2)		529 (3.2)		541 (3.6)	▲
Botswana	386 (2.3)	▲	378 (3.2)		382 (3.2)	▲	371 (2.8)		376 (2.8)		379 (3.0)	
Bulgaria	477 (5.2)		476 (4.3)		485 (4.8)		477 (4.3)		471 (5.9)		474 (4.7)	
Chile	381 (3.7)		398 (3.9)	▲	380 (3.7)		389 (3.9)	▲	393 (3.7)		414 (3.6)	▲
Chinese Taipei	588 (5.1)		582 (5.2)		592 (5.4)	▲	579 (5.3)		573 (5.1)		576 (4.7)	
Cyprus	471 (2.2)	▲	457 (2.5)		469 (2.1)	▲	442 (2.6)		463 (3.1)		455 (2.9)	
Egypt	420 (3.8)		421 (4.5)		413 (4.7)		403 (5.6)		396 (4.3)		405 (4.7)	
Estonia	525 (3.5)		520 (3.5)		529 (3.1)		528 (3.2)		530 (3.9)		526 (3.7)	
Ghana	282 (5.3)		295 (5.4)	▲	281 (4.7)		293 (5.8)	▲	256 (4.8)		267 (5.4)	
† Hong Kong, SAR	587 (3.7)		585 (4.3)		582 (3.5)		578 (4.3)		583 (3.9)		585 (4.4)	
Hungary	524 (4.1)		533 (4.0)	▲	535 (3.7)		532 (3.5)		517 (3.6)		532 (3.6)	▲
1 Indonesia	424 (4.9)		418 (5.2)		422 (5.1)		414 (4.7)		394 (5.3)		394 (5.4)	
Iran, Islamic Rep. of	420 (4.2)		414 (3.9)		429 (4.3)	▲	400 (4.4)		393 (5.0)		402 (3.8)	
2 Israel	498 (3.9)		509 (4.3)	▲	499 (3.4)		496 (4.2)		473 (3.3)		488 (4.7)	▲
Italy	477 (3.3)		483 (4.0)		478 (3.4)		475 (3.9)		494 (3.0)		506 (3.9)	▲
Japan	554 (4.5)		560 (4.0)		570 (3.9)		566 (3.4)		559 (4.0)		559 (3.3)	
Jordan	426 (5.5)	▲	401 (6.3)		452 (4.8)	▲	417 (6.4)		426 (5.7)	▲	410 (5.5)	
◆◆ Korea, Rep. of	582 (2.9)		589 (2.5)	▲	596 (3.3)		598 (2.9)		575 (3.1)		579 (2.1)	
Latvia	508 (3.3)		506 (3.7)		515 (3.1)	▲	501 (3.8)		497 (3.6)		504 (3.6)	
Lebanon	427 (3.7)		434 (4.3)		448 (3.7)		447 (4.2)		420 (4.1)		442 (4.6)	▲
1 Lithuania	500 (3.0)		497 (3.2)		508 (2.6)	▲	494 (3.0)		490 (4.1)		493 (3.9)	
2 Macedonia, Rep. of	441 (3.8)	▲	434 (3.7)		452 (4.5)	▲	432 (4.5)		433 (4.0)		435 (4.1)	
Malaysia	529 (4.7)	▲	519 (4.4)		501 (4.6)	▲	488 (4.2)		505 (5.7)		503 (4.9)	
Moldova, Rep. of	468 (3.8)	▲	457 (4.4)		473 (4.4)	▲	455 (4.8)		468 (4.4)		468 (4.4)	
1 ‡ Morocco	377 (3.6)		394 (3.4)	▲	400 (3.0)		402 (4.1)		369 (3.1)		385 (7.1)	
† Netherlands	534 (4.0)		544 (4.1)	▲	515 (4.4)		513 (4.7)		542 (4.0)		555 (4.3)	▲
New Zealand	480 (5.5)		483 (7.6)		494 (4.5)		485 (7.4)		498 (4.6)		503 (6.2)	
Norway	457 (2.8)		455 (3.2)		432 (2.8)	▲	424 (3.9)		479 (3.6)		483 (3.2)	
Palestinian Nat'l Auth.	387 (4.4)		383 (5.7)		404 (4.5)	▲	378 (5.4)		380 (3.9)		392 (4.4)	▲
Philippines	401 (5.2)	▲	384 (5.6)		408 (5.4)	▲	390 (5.7)		373 (5.1)		370 (5.7)	
Romania	477 (5.3)		472 (5.1)		487 (5.1)	▲	473 (5.1)		484 (5.1)		487 (5.0)	
Russian Federation	506 (4.0)		504 (4.5)		522 (3.0)	▲	510 (4.0)		505 (4.2)		510 (4.2)	
Saudi Arabia	293 (8.9)		318 (5.9)	▲	333 (8.0)		329 (6.1)		326 (4.4)		347 (4.9)	▲
† Scotland	486 (4.9)		482 (4.5)		493 (4.5)	▲	484 (4.3)		508 (4.4)		508 (3.8)	
1 Serbia	480 (3.5)		475 (2.8)		496 (3.1)	▲	480 (2.9)		474 (3.2)		476 (3.2)	
Singapore	623 (3.3)	▲	612 (4.2)		597 (3.4)	▲	583 (4.3)		613 (3.8)		608 (4.2)	
Slovak Republic	514 (3.3)		514 (4.1)		510 (3.3)	▲	500 (3.9)		504 (3.7)		511 (4.5)	▲
Slovenia	499 (2.5)		498 (2.5)		494 (3.1)	▲	479 (2.5)		493 (2.7)		499 (3.6)	
South Africa	273 (6.4)		274 (6.0)		273 (6.0)		275 (6.0)		296 (5.5)		301 (5.6)	
Sweden	495 (2.9)		497 (2.7)		482 (3.9)		478 (3.1)		509 (3.3)		515 (2.8)	
Tunisia	408 (2.3)		432 (2.8)	▲	398 (3.1)		412 (2.5)	▲	394 (2.7)		421 (3.4)	▲
‡ United States	504 (3.5)		512 (3.6)	▲	510 (3.2)		509 (3.3)		489 (3.4)		501 (3.3)	▲
‡ England	484 (5.8)		486 (6.1)		494 (5.3)		490 (5.6)		504 (5.1)		506 (5.2)	
International Avg.	467 (0.6)		467 (0.6)		471 (0.6)	▲	462 (0.6)		464 (0.6)		470 (0.6)	▲
Benchmarking Participants												
Basque Country, Spain	489 (2.7)		490 (3.5)		499 (3.2)	▲	482 (3.6)		490 (3.0)		487 (3.3)	
Indiana State, US	508 (5.7)		524 (6.6)	▲	510 (5.4)		509 (5.8)		493 (5.7)		512 (6.5)	▲
Ontario Province, Can.	514 (3.8)		518 (3.9)		517 (3.0)		512 (3.0)		517 (2.9)		523 (3.7)	
Quebec Province, Can.	542 (4.2)		550 (3.5)	▲	527 (3.7)		531 (3.7)		535 (4.2)		548 (3.8)	▲

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, at the beginning of the next school year.

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

Exhibit 3.3: Average Achievement in Mathematics Content Areas by Gender

MATHEMATICS Grade 8

Countries	Average Scale Scores for Mathematics Content Areas							
	Geometry				Data			
	Girls		Boys		Girls		Boys	
Armenia	485 (3.4)	▲	476 (3.5)		425 (3.6)	▲	412 (3.3)	
Australia	485 (5.7)		497 (6.1)		527 (4.8)		536 (4.3)	
Bahrain	453 (2.4)	▲	422 (2.8)		427 (2.2)	▲	401 (2.7)	
Belgium (Flemish)	522 (3.7)		533 (5.0)		541 (3.8)		552 (4.2)	▲
Botswana	328 (4.9)		343 (4.2)	▲	375 (3.6)		374 (3.3)	
Bulgaria	483 (5.4)		486 (4.8)		454 (4.8)		462 (5.0)	
Chile	369 (3.9)		386 (4.6)	▲	405 (3.9)		419 (4.1)	▲
Chinese Taipei	595 (5.9)	▲	581 (5.6)		570 (3.6)		566 (4.0)	
Cyprus	464 (3.2)	▲	451 (2.7)		465 (2.5)	▲	451 (2.0)	
Egypt	407 (4.9)		409 (5.3)		393 (4.2)		394 (4.7)	
Estonia	539 (3.0)		540 (3.2)		538 (3.2)	▲	532 (3.2)	
Ghana	259 (6.0)		293 (4.2)	▲	286 (4.5)		299 (4.6)	▲
† Hong Kong, SAR	587 (4.3)		589 (4.8)		568 (3.3)		564 (4.1)	
Hungary	510 (4.0)		521 (3.5)	▲	523 (3.6)		528 (3.3)	
1 Indonesia	408 (4.5)		419 (5.8)	▲	417 (4.8)		420 (4.6)	
Iran, Islamic Rep. of	446 (4.8)		432 (4.7)		407 (4.5)		403 (4.4)	
2 Israel	487 (3.8)		488 (4.8)		486 (3.7)		497 (4.4)	▲
Italy	466 (3.4)		472 (4.0)	▲	484 (3.0)		496 (3.6)	▲
Japan	588 (3.9)		585 (3.5)		570 (3.4)		575 (2.3)	
Jordan	455 (4.4)	▲	438 (5.8)		441 (3.7)	▲	420 (4.7)	
◆◆ Korea, Rep. of	593 (3.9)		601 (2.4)	▲	564 (2.8)		574 (2.7)	▲
Latvia	518 (3.9)		512 (3.6)		513 (3.7)	▲	500 (4.5)	
Lebanon	453 (3.2)		467 (4.2)	▲	391 (5.2)		398 (4.6)	
1 Lithuania	508 (3.2)		505 (4.8)		501 (3.2)		503 (3.0)	
2 Macedonia, Rep. of	445 (4.2)		438 (4.4)		421 (4.8)		416 (4.9)	
Malaysia	494 (6.0)		495 (5.2)		507 (3.8)		503 (3.6)	
Moldova, Rep. of	467 (4.6)	▲	458 (5.5)		431 (3.7)		425 (4.2)	
1 ‡ Morocco	408 (3.9)		423 (3.6)	▲	364 (3.8)		384 (3.8)	▲
† Netherlands	512 (4.3)		514 (5.1)		556 (3.6)		564 (4.0)	
New Zealand	490 (4.5)		486 (5.8)		530 (4.7)		522 (6.7)	
Norway	463 (3.9)		459 (3.7)		500 (2.8)		497 (3.4)	
Palestinian Nat'l Auth.	426 (4.2)		419 (4.8)		397 (3.9)	▲	382 (5.2)	
Philippines	344 (5.4)		346 (6.3)		395 (4.2)	▲	384 (5.7)	
Romania	474 (5.3)		479 (5.5)		445 (5.2)		445 (4.9)	
Russian Federation	517 (4.2)		513 (4.7)		483 (3.4)		485 (3.9)	
Saudi Arabia	381 (7.2)		382 (4.9)		345 (5.9)		334 (5.3)	
† Scotland	493 (4.4)		488 (3.6)		533 (4.3)		529 (3.9)	
1 Serbia	475 (3.2)	▲	467 (3.7)		454 (3.1)		458 (3.4)	
Singapore	584 (3.8)	▲	575 (4.5)		581 (3.0)		578 (4.0)	
Slovak Republic	497 (3.9)		505 (4.8)		488 (3.5)		502 (3.9)	▲
Slovenia	486 (4.0)		480 (3.6)		495 (2.9)		492 (3.0)	
South Africa	246 (6.0)		245 (6.4)		297 (6.2)		294 (5.7)	
Sweden	469 (4.0)		465 (3.3)		540 (3.6)		539 (3.6)	
Tunisia	419 (2.4)		437 (2.4)	▲	373 (2.1)		402 (3.5)	▲
‡ United States	469 (3.0)		475 (3.8)	▲	526 (3.3)		527 (3.5)	
‡ England	490 (5.6)		494 (5.9)		535 (4.7)		535 (5.4)	
International Avg.	466 (0.6)		467 (0.6)		467 (0.5)		467 (0.6)	
Benchmarking Participants								
Basque Country, Spain	457 (3.2)		454 (4.2)		500 (3.6)		498 (3.4)	
Indiana State, US	462 (5.9)		474 (5.5)	▲	526 (4.9)		530 (5.8)	
Ontario Province, Can.	511 (3.5)		514 (3.7)		536 (3.1)		540 (3.3)	
Quebec Province, Can.	538 (3.9)		545 (3.7)	▲	541 (3.0)		546 (3.2)	

▲ Significantly higher than other gender

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, 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.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 3.3: Average Achievement in Mathematics Content Areas by Gender

MATHEMATICS Grade 4

Countries	Average Scale Scores for Mathematics Content Areas					
	Number		Patterns and Relationships		Measurement	
	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	480 (3.3) ▲	467 (3.2)	468 (4.6) ▲	453 (4.6)	468 (3.3)	463 (3.9)
† Australia	476 (5.1)	481 (5.0)	493 (4.5)	497 (4.3)	510 (4.4)	517 (4.1)
Belgium (Flemish)	547 (2.1)	550 (2.5)	542 (2.7)	543 (2.2)	547 (1.7)	552 (2.1) ▲
Chinese Taipei	568 (2.5)	567 (2.1)	555 (2.4)	555 (2.9)	556 (2.0)	558 (1.9)
Cyprus	510 (3.1)	517 (3.0) ▲	516 (3.4)	522 (2.9)	498 (2.4)	513 (3.1) ▲
† England	520 (4.4)	518 (4.8)	523 (4.1)	524 (4.5)	531 (3.5)	539 (3.8) ▲
† Hong Kong, SAR	575 (3.5)	573 (3.6)	568 (4.4)	568 (3.6)	561 (3.0)	564 (2.9)
Hungary	522 (3.5)	525 (3.4)	550 (4.1) ▲	539 (4.9)	527 (3.5)	538 (2.8) ▲
Iran, Islamic Rep. of	415 (6.1)	407 (5.0)	402 (6.5)	389 (5.3)	401 (5.5)	397 (4.3)
Italy	499 (4.0)	506 (3.7) ▲	496 (5.3)	496 (5.3)	496 (3.8)	512 (3.8) ▲
Japan	553 (2.5)	558 (2.3)	551 (1.9)	557 (2.0) ▲	567 (2.0)	569 (2.0)
Latvia	532 (3.1)	530 (3.3)	533 (3.9)	530 (3.8)	542 (3.1)	548 (3.0)
1 Lithuania	536 (3.5)	536 (3.6)	531 (3.5)	533 (4.1)	539 (2.9)	544 (3.7)
Moldova, Rep. of	513 (5.0) ▲	501 (4.8)	527 (5.6) ▲	515 (5.3)	506 (4.4)	504 (4.3)
Morocco	355 (6.0)	363 (4.8)	356 (5.9)	365 (5.2)	336 (6.5)	353 (5.7) ▲
† Netherlands	531 (2.6)	541 (2.8) ▲	527 (3.6)	528 (2.5)	540 (2.6)	549 (2.3) ▲
New Zealand	473 (3.4)	477 (2.6)	496 (4.0)	493 (3.7)	501 (3.2)	505 (2.1)
Norway	437 (3.2)	444 (2.4) ▲	439 (3.0)	438 (3.0)	469 (2.9)	480 (2.9) ▲
Philippines	388 (8.9) ▲	372 (6.3)	384 (8.2)	380 (6.7)	332 (9.4)	328 (7.4)
Russian Federation	532 (5.1)	531 (4.7)	531 (5.6)	531 (5.3)	533 (4.3)	544 (4.0) ▲
† Scotland	471 (3.6)	479 (4.5)	492 (2.7)	498 (4.2)	492 (3.2)	507 (3.9) ▲
Singapore	617 (5.9) ▲	608 (6.7)	583 (5.4)	575 (6.0)	569 (4.5)	564 (5.2)
Slovenia	458 (3.4)	465 (3.4)	487 (3.0)	493 (4.9)	493 (3.1)	501 (3.5) ▲
Tunisia	361 (4.8)	360 (4.1)	331 (5.4)	329 (5.4)	311 (6.3)	306 (5.5)
† United States	513 (2.5)	520 (3.2) ▲	521 (2.7)	526 (3.1) ▲	494 (2.0)	505 (2.7) ▲
International Avg.	495 (0.8)	496 (0.8)	496 (0.8)	495 (0.8)	493 (0.8)	498 (0.7) ▲
Benchmarking Participants						
Indiana State, US	529 (3.5)	532 (4.5)	535 (3.4)	536 (4.6)	515 (3.8)	515 (3.7)
Ontario Province, Can.	490 (4.2)	498 (6.7)	508 (4.0)	517 (4.3) ▲	506 (3.6)	517 (4.8) ▲
Quebec Province, Can.	503 (2.9)	514 (3.0) ▲	499 (3.5)	499 (3.1)	499 (2.7)	508 (2.9) ▲

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

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

Exhibit 3.3: Average Achievement in Mathematics Content Areas by Gender

MATHEMATICS Grade 4

Countries	Average Scale Scores for Mathematics Content Areas			
	Geometry		Data	
	Girls	Boys	Girls	Boys
Armenia	437 (3.9) ▲	425 (4.4)	424 (4.0) ▲	411 (4.0)
† Australia	529 (3.6) ▲	519 (4.9)	529 (4.3)	521 (4.7)
Belgium (Flemish)	534 (2.0)	531 (2.3)	547 (2.8)	549 (2.9)
Chinese Taipei	554 (2.6)	552 (2.7)	568 (2.1) ▲	560 (3.3)
Cyprus	506 (2.5)	504 (2.7)	506 (2.4)	513 (3.1) ▲
† England	545 (4.4)	538 (4.4)	554 (4.3)	549 (4.3)
† Hong Kong, SAR	559 (3.8)	555 (2.9)	563 (2.6)	561 (2.7)
Hungary	515 (4.1)	513 (3.7)	515 (4.6)	512 (3.8)
Iran, Islamic Rep. of	430 (5.9) ▲	407 (4.7)	360 (7.3)	354 (5.4)
Italy	523 (4.2)	521 (3.4)	495 (3.9)	499 (3.5)
Japan	562 (1.9)	557 (2.7)	595 (2.4)	591 (2.4)
Latvia	525 (2.0) ▲	520 (2.9)	529 (3.2)	522 (3.5)
1 Lithuania	525 (2.7)	526 (2.7)	519 (3.3)	518 (3.3)
Moldova, Rep. of	505 (5.5) ▲	496 (4.8)	483 (4.9) ▲	470 (4.3)
Morocco	362 (7.3)	362 (5.2)	356 (6.2)	354 (4.9)
† Netherlands	522 (4.1)	519 (3.1)	552 (2.8)	554 (3.1)
New Zealand	521 (2.4) ▲	514 (2.5)	524 (2.9)	519 (2.9)
Norway	482 (2.7) ▲	473 (2.9)	480 (2.8)	478 (3.0)
Philippines	336 (10.6)	334 (7.8)	393 (8.8) ▲	374 (7.2)
Russian Federation	528 (5.2)	528 (4.9)	502 (4.8)	508 (4.3)
† Scotland	513 (2.8)	509 (3.3)	513 (3.2)	519 (3.6)
Singapore	573 (5.4)	566 (6.1)	579 (3.8) ▲	571 (4.4)
Slovenia	502 (3.1)	495 (2.5)	486 (3.6)	487 (3.9)
Tunisia	351 (6.2)	342 (5.4)	311 (5.3)	305 (5.0)
† United States	517 (2.5)	519 (2.4)	546 (1.9)	551 (2.5) ▲
International Avg.	498 (0.8) ▲	493 (0.8)	497 (0.8) ▲	494 (0.7)
Benchmarking Participants				
Indiana State, US	524 (3.4)	526 (5.0)	557 (4.4)	558 (3.6)
Ontario Province, Can.	532 (3.6)	537 (5.2)	542 (4.4)	546 (4.5)
Quebec Province, Can.	525 (2.1)	519 (3.6)	505 (3.0)	508 (3.4)

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

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

than boys across countries was geometry. The girls had higher achievement in 7 countries and the boys none. Internationally, there was a 5-point difference favoring girls. The results were relatively similar for the genders in number (4 countries favoring girls and 6 entities favoring boys) and in data (5 countries favoring girls and 2 favoring boys). In data, however, the small difference between in the international averages was significantly higher for girls.

In some respects, the patterns in the performance of girls and boys found in TIMSS 2003 are consistent with previous IEA mathematics assessments. Girls tended to perform better than boys in algebra in both previous TIMSS assessments and the Second International Mathematics Study (SIMS),[4] while boys were markedly stronger in measurement in previous studies.

What Changes Have Occurred in Content Area Achievement?

To examine changes in achievement in the mathematics content areas, Exhibit 3.4 shows the average percent correct for eighth-grade students in 2003 and 1999 for items given in both the 2003 and 1999 TIMSS assessments. If achievement improved significantly between assessments, the 1999 result is annotated with an up arrow or down arrow. This content area trend analysis uses average percent correct rather than average scale score because there were insufficient items to reliably link the results for both assessments to the TIMSS scale in all of the five different content areas. The first column in the table shows overall trends in the average percentage correct metric. For the most part, significant differences agree with those in the overall scale score (and the direction is always consistent).

During the four years between 1999 and 2003, countries were consistent in either showing improvements or declines. No country showed statistically significant improvements in some areas while showing declines in other areas. Israel had statistically significant improvements in all five content areas. Lithuania improved in three areas. Participants improving in two areas included the Philippines,

4 Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Gregory, K.D., Garden, R.A., O'Connor, K.M., Chrostowki, S.J., and Smith, T.A. (2000), *TIMSS 1999 International Mathematics Report: Findings from IEA's Repeat of the Third International Mathematics and Science Study at the Eighth Grade,* Chestnut Hill: MA: Boston College. Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1996), *Mathematics Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS),* Chestnut Hill, MA: Boston College. Robitaille D.F. (1989), "Student's Achievements: Population A" in D.F. Robitaille and R.A. Garden (eds.), *The IEA Study of Mathematics II: Contexts and Outcomes of School Mathematics,* New York: Pergamon Press, p.121

the United States, and the Canadian province of Ontario. On the other hand, Bulgaria, Japan, the Slovak Republic, and Tunisia had statistically significant decreases in all five content areas. In Belgium (Flemish), Iran, and Jordan average achievement showed statistically significant decreases in four content areas. Cyprus and Malaysia showed significant decreases in three content areas, Macedonia in two areas, and the Russian Federation in one.

Exhibit 3.4: Trends in Average Percent Correct in Mathematics Content Areas*

MATHEMATICS Grade 8

Countries	Average Percent Correct for Mathematics Content Areas					
	Total Mathematics Trend Items (79 items)		Number Trend Items (25 items)		Algebra Trend Items (16 items)	
	2003	1999	2003	1999	2003	1999
Australia	52 (1.0)	– –	53 (1.0)	– –	47 (1.3)	– –
Belgium (Flemish)	60 (0.7)	64 (0.8) ▼	61 (0.8)	64 (1.0) ▼	52 (0.8)	56 (1.0) ▼
Bulgaria	45 (1.0)	53 (1.5) ▼	47 (1.0)	54 (1.5) ▼	43 (1.1)	53 (1.6) ▼
Chile	29 (0.6)	29 (0.8)	31 (0.6)	32 (0.9)	23 (0.7)	24 (0.9)
Chinese Taipei	69 (1.0)	70 (0.9)	70 (1.1)	73 (0.9)	66 (1.2)	68 (1.1)
Cyprus	43 (0.4)	46 (0.4) ▼	46 (0.5)	49 (0.5) ▼	38 (0.6)	40 (0.7)
Hong Kong, SAR	70 (0.7)	71 (1.1)	69 (0.8)	71 (1.2)	68 (0.9)	69 (1.3)
Hungary	57 (0.9)	59 (0.8)	59 (1.0)	60 (0.9)	56 (1.0)	57 (0.9)
Indonesia	32 (0.8)	34 (0.8)	35 (0.9)	36 (0.8)	30 (0.8)	32 (0.9)
Iran, Islamic Rep. of	32 (0.5)	35 (0.7) ▼	36 (0.5)	39 (0.7) ▼	29 (0.6)	31 (0.8) ▼
Israel	50 (0.9)	43 (0.9) ▲	52 (0.9)	44 (0.9) ▲	48 (0.9)	42 (1.1) ▲
Italy	47 (0.9)	48 (0.9)	48 (0.9)	49 (0.9)	42 (1.1)	41 (0.9)
Japan	66 (0.6)	70 (0.5) ▼	65 (0.7)	70 (0.6) ▼	64 (0.7)	69 (0.7) ▼
Jordan	33 (0.8)	36 (0.6) ▼	35 (0.8)	38 (0.7) ▼	31 (0.9)	33 (0.8) ▼
Korea, Rep. of	72 (0.5)	71 (0.5)	73 (0.6)	72 (0.5)	71 (0.6)	68 (0.7) ▲
Latvia (LSS)	51 (1.0)	51 (0.8)	53 (1.1)	53 (0.9)	48 (1.2)	47 (0.9)
Lithuania	50 (0.7)	47 (1.0) ▲	51 (0.7)	50 (1.1)	46 (0.8)	44 (1.2)
Macedonia, Rep. of	36 (0.7)	38 (0.8)	38 (0.8)	37 (0.9)	35 (0.9)	38 (1.0) ▼
Malaysia	52 (1.1)	56 (1.2) ▼	57 (1.1)	62 (1.2) ▼	42 (1.0)	46 (1.0) ▼
Moldova, Rep. of	43 (0.9)	44 (1.0)	47 (1.0)	46 (1.1)	40 (1.0)	41 (1.0)
Netherlands	60 (1.0)	58 (2.0)	60 (1.0)	58 (2.1)	51 (1.1)	51 (2.3)
New Zealand	48 (1.2)	47 (1.3)	47 (1.2)	47 (1.3)	43 (1.4)	43 (1.4)
Philippines	27 (0.8)	25 (0.7) ▲	31 (0.8)	30 (0.8)	27 (1.0)	20 (0.9) ▲
Romania	45 (1.2)	46 (1.3)	46 (1.1)	46 (1.4)	44 (1.4)	44 (1.5)
Russian Federation	53 (1.0)	55 (1.3)	54 (1.1)	57 (1.4) ▼	52 (1.0)	54 (1.3)
Singapore	74 (1.0)	76 (1.4)	78 (0.9)	80 (1.2)	69 (1.1)	69 (1.6)
Slovak Republic	52 (0.9)	59 (1.1) ▼	55 (1.0)	62 (1.2) ▼	49 (1.0)	55 (1.3) ▼
Slovenia	50 (0.7)	– –	53 (0.7)	– –	45 (0.9)	– –
South Africa	18 (0.7)	19 (0.7)	20 (0.7)	22 (0.7)	14 (0.7)	15 (0.7)
Tunisia	30 (0.4)	39 (0.5) ▼	33 (0.5)	41 (0.5) ▼	26 (0.5)	33 (0.6) ▼
United States	51 (0.9)	50 (0.9)	54 (0.9)	54 (1.0)	50 (1.0)	47 (1.0) ▲
‡ England	49 (1.1)	47 (1.1)	49 (1.1)	47 (1.1)	43 (1.2)	42 (1.2)
International Avg.	48 (0.2)	50 (0.2) ▼	50 (0.2)	51 (0.2) ▼	45 (0.2)	46 (0.2) ▼
Benchmarking Participants						
Indiana State, US	52 (1.3)	52 (1.7)	56 (1.4)	56 (1.8)	49 (1.3)	49 (1.8)
Ontario Province, Can.	55 (0.8)	53 (0.8)	55 (0.9)	56 (1.0)	51 (0.9)	48 (0.9)
Quebec Province, Can.	61 (0.8)	65 (1.5) ▼	62 (0.9)	65 (1.8)	56 (1.0)	60 (1.2) ▼

▲ 2003 significantly higher than 1999

▼ 2003 significantly lower than 1999

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

* Applies only to items that appeared on both the 1999 and 2003 assessments. Fourth grade data are not available.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Trend notes: Because of differences in population coverage, 1999 data are not shown for Australia and Slovenia. Korea tested later in 2003 than in 1999, at the beginning of the next school year. Similarly, Lithuania tested later in 1999 than in 2003. Data for Latvia in this exhibit include Latvian-speaking schools only.

( ) 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.

Exhibit 3.4: Trends in Average Percent Correct in Mathematics Content Areas*

MATHEMATICS Grade 8

Countries	Average Percent Correct for Mathematics Content Areas											
	Measurement Trend Items (16 items)			Geometry Trend Items (12 items)			Data Trend Items (10 items)		
	2003	1999		2003	1999		2003	1999	
Australia	47 (1.2)	– –		50 (1.1)	– –		71 (1.1)	– –	
Belgium (Flemish)	54 (0.8)	60 (0.8)	▼	61 (0.9)	64 (1.0)	▼	79 (0.7)	81 (0.8)	
Bulgaria	35 (1.2)	45 (1.5)	▼	50 (0.9)	58 (1.6)	▼	58 (1.1)	62 (1.6)	▼
Chile	21 (0.6)	19 (0.8)		30 (0.7)	32 (0.9)		44 (1.0)	45 (1.0)	
Chinese Taipei	61 (1.1)	64 (1.0)		71 (1.0)	72 (0.9)		79 (0.8)	80 (0.7)	
Cyprus	34 (0.6)	40 (0.6)	▼	45 (0.5)	47 (0.6)	▼	61 (0.7)	61 (1.0)	
Hong Kong, SAR	66 (0.9)	66 (1.2)		73 (0.8)	72 (1.1)		76 (0.6)	78 (0.9)	
Hungary	51 (1.0)	53 (1.0)		55 (1.0)	55 (1.1)		69 (1.0)	71 (0.9)	
Indonesia	21 (0.8)	22 (0.8)		36 (0.8)	37 (1.0)		47 (1.1)	47 (1.1)	
Iran, Islamic Rep. of	20 (0.5)	22 (0.8)		36 (0.6)	39 (0.8)	▼	46 (0.8)	49 (1.0)	▼
Israel	39 (0.9)	32 (0.9)	▲	51 (1.1)	44 (0.9)	▲	65 (1.1)	59 (1.1)	▲
Italy	43 (1.0)	44 (1.0)		46 (1.0)	47 (1.0)		64 (0.9)	64 (1.2)	
Japan	58 (0.7)	63 (0.7)	▼	74 (0.6)	75 (0.6)	▼	76 (0.5)	79 (0.5)	▼
Jordan	23 (0.8)	27 (0.8)	▼	37 (0.8)	41 (0.7)	▼	46 (1.1)	49 (0.7)	
Korea, Rep. of	63 (0.7)	64 (0.6)		75 (0.6)	74 (0.6)		80 (0.4)	82 (0.4)	▼
Latvia (LSS)	38 (1.0)	40 (1.1)		57 (1.2)	59 (1.0)		67 (1.4)	63 (1.0)	▲
Lithuania	38 (0.8)	34 (1.2)	▲	54 (0.8)	49 (1.3)	▲	68 (0.8)	64 (1.2)	▲
Macedonia, Rep. of	27 (0.9)	29 (1.0)		39 (0.7)	42 (1.0)	▼	49 (1.0)	48 (1.0)	
Malaysia	45 (1.3)	51 (1.4)	▼	51 (1.2)	53 (1.3)		67 (1.0)	68 (1.0)	
Moldova, Rep. of	36 (1.1)	37 (1.3)		46 (1.3)	47 (1.2)		49 (1.0)	50 (1.1)	
Netherlands	58 (1.2)	56 (2.0)		57 (1.2)	58 (1.7)		79 (1.0)	75 (2.4)	
New Zealand	42 (1.5)	42 (1.5)		49 (1.3)	48 (1.3)		66 (1.4)	65 (1.4)	
Philippines	18 (0.8)	15 (0.6)	▲	25 (0.7)	25 (0.8)		40 (0.9)	39 (0.9)	
Romania	39 (1.4)	40 (1.4)		45 (1.3)	48 (1.3)		55 (1.4)	54 (1.3)	
Russian Federation	44 (1.2)	47 (1.6)		56 (1.1)	58 (1.5)		64 (1.2)	65 (1.3)	
Singapore	74 (1.1)	76 (1.6)		71 (1.1)	73 (1.6)		79 (0.8)	81 (1.2)	
Slovak Republic	44 (1.1)	53 (1.5)	▼	53 (1.0)	61 (1.2)	▼	64 (1.0)	71 (1.1)	▼
Slovenia	42 (0.9)	– –		50 (0.9)	– –		67 (0.9)	– –	
South Africa	12 (0.7)	13 (0.6)		19 (0.8)	21 (0.8)		29 (1.1)	30 (0.9)	
Tunisia	20 (0.5)	32 (0.7)	▼	34 (0.6)	46 (0.6)	▼	39 (0.6)	52 (0.7)	▼
United States	42 (1.0)	40 (1.1)		45 (0.9)	44 (1.0)		72 (0.8)	68 (0.9)	▲
‡ England	45 (1.3)	43 (1.3)		50 (1.3)	47 (1.3)	▲	69 (1.3)	66 (1.4)	
International Avg.	41 (0.2)	42 (0.2)	▼	50 (0.2)	51 (0.2)	▼	62 (0.2)	62 (0.2)	
Benchmarking Participants									
Indiana State, US	42 (1.7)	43 (2.0)		44 (1.7)	44 (1.9)		72 (1.3)	72 (1.9)	
Ontario Province, Can.	47 (0.9)	45 (1.1)		56 (1.1)	52 (1.0)	▲	75 (0.8)	71 (0.9)	▲
Quebec Province, Can.	54 (1.1)	60 (2.0)	▼	64 (0.9)	68 (2.0)		74 (0.6)	77 (1.4)	▼

▲ 2003 significantly higher than 1999

▼ 2003 significantly lower than 1999

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

* Applies only to items that appeared on both the 1999 and 2003 assessments. Fourth grade data are not available.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Trend notes: Because of differences in population coverage, 1999 data are not shown for Australia and Slovenia. Korea tested later in 2003 than in 1999, at the beginning of the next school year. Similarly, Lithuania tested later in 1999 than in 2003. Data for Latvia in this exhibit include Latvian-speaking schools only.

( ) 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.