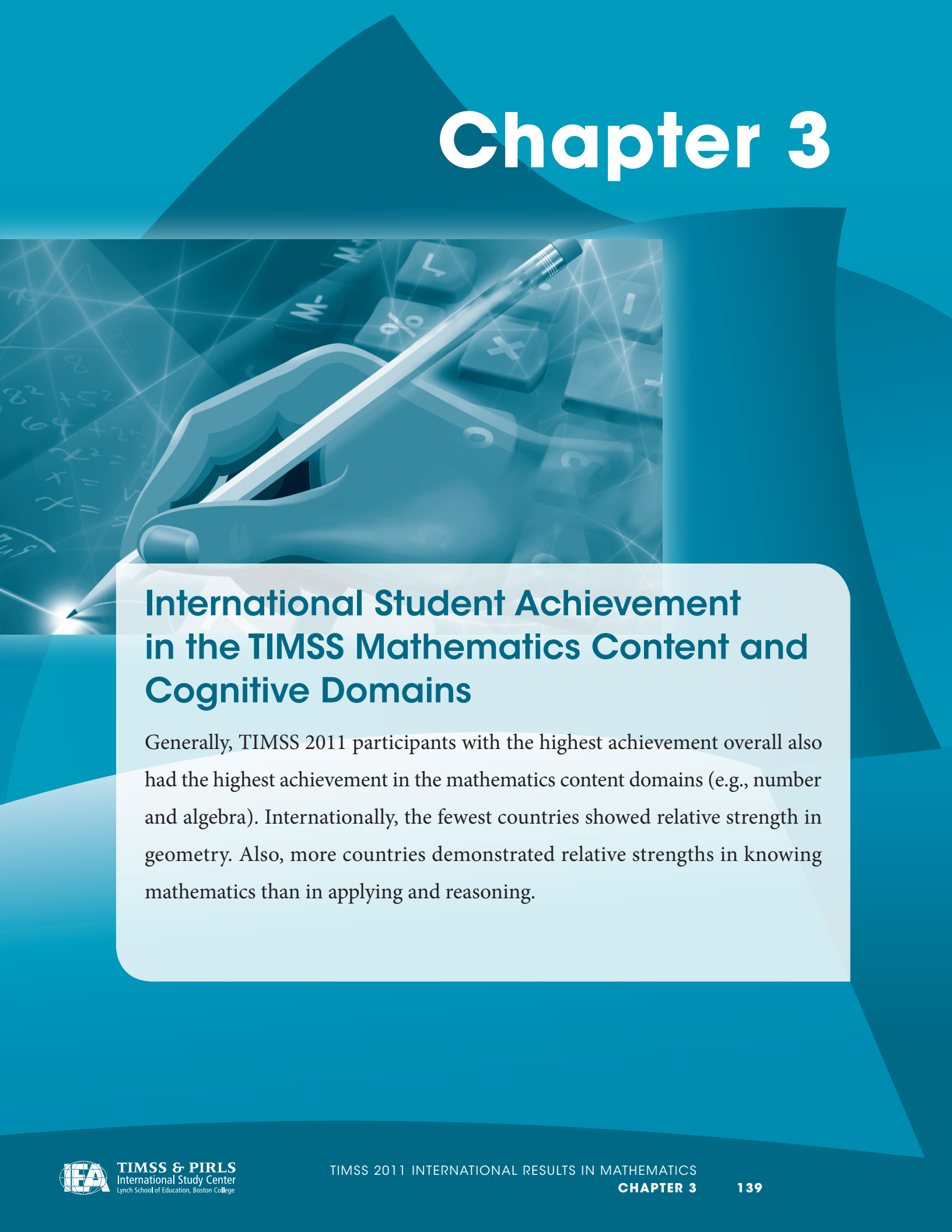


Chapter 3



International Student Achievement in the TIMSS Mathematics Content and Cognitive Domains

Generally, TIMSS 2011 participants with the highest achievement overall also had the highest achievement in the mathematics content domains (e.g., number and algebra). Internationally, the fewest countries showed relative strength in geometry. Also, more countries demonstrated relative strengths in knowing mathematics than in applying and reasoning.

As described in the *TIMSS 2011 Assessment Frameworks*, the mathematics assessment is organized around two dimensions: a content dimension specifying the subject matter or content domains to be assessed in mathematics, and a cognitive dimension specifying the thinking processes that students are likely to use as they engage with the content. Each item in the mathematics assessment is associated with one content domain and one cognitive domain, providing for both content-based and cognitive-oriented perspectives on student achievement in mathematics.

There are three content domains at the fourth grade: number, geometric shapes and measures, and data display; and there are four domains at the eighth grade: number, algebra, geometry, and data and chance. The same three cognitive domains—knowing, applying, and reasoning—were used at both the fourth and eighth grades. Knowing refers to the student’s knowledge base of mathematics facts, concepts, tools, and procedures. Applying focuses on the student’s ability to apply knowledge and conceptual understanding in a problem situation. Reasoning goes beyond the solution of routine problems to encompass unfamiliar situations, complex contexts, and multi-step problems.

Chapter 3 presents the TIMSS 2011 results at the fourth and eighth grades for the content and cognitive domains. Previous TIMSS assessments have found that most countries performed relatively better in one or other of the content domains; and similarly, that countries can have relative strengths in one cognitive domain compared to another. In addition to providing TIMSS 2011 average achievement for the content and cognitive domains, the chapter provides changes in achievement in the domains compared to TIMSS 2007, and achievement differences by gender.

Relative Achievement by Mathematics Content Domains

Exhibit 3.1 presents the average achievement for TIMSS 2011 participants in the fourth grade content domains of number, geometric shapes and measures, and data display relative to overall fourth grade mathematics achievement. To provide a way for the TIMSS 2011 participants to examine relative performance in the content domains, IRT scaling was used to place achievement in each of the three domains on the TIMSS fourth grade mathematics scale. The items on which the content domains were based varied in difficulty, as shown in Appendix E, which contains the average percent correct across the items on each domain. For example, the fourth grade students found the number and geometric shapes and measures items (47% and 49% correct, on average)

somewhat more difficult than the data display items (58%). There was also some variation in the difficulty of the eighth grade content domains, with algebra most difficult (37% correct, on average), followed by geometry (39%), number (43%), and data and chance (45%). However, the scaling process took the differences in difficulty into account, so that average achievement for each of the content domains can be compared relative to overall mathematics achievement at each grade level.

In Exhibit 3.1, the first column presents average overall mathematics achievement for each participant in the TIMSS 2011 fourth grade assessment, followed by average achievement in the three content domains of number, geometric shapes and measures, and data display. The participants are presented in order by overall mathematics achievement, first for the fourth grade followed by the sixth grade, and the benchmarking participants. The average scale score for each content domain is shown, together with the difference between achievement in overall mathematics and achievement in the content domain. Up and down arrows are used to indicate whether a country's average content domain score is significantly higher or lower than its overall mathematics average score.

Generally, the TIMSS 2011 participants with the highest achievement overall also had the highest achievement in the content domains. However, many countries performed relatively higher in one or two of the content domains compared to their overall performance; and relatively lower in one or two others. For example, among the top-performing countries, Singapore performed relatively better in number than in mathematics overall, and relatively less well in geometric shapes and measures and data display, while Korea performed equally well in all three domains. Hong Kong SAR and Chinese Taipei also performed relatively better in number than in mathematics overall, but Hong Kong performed relatively better in geometric shapes and measures and less well in data display while Chinese Taipei did relatively better in data display and less well in geometric shapes and measures. Looking across the results in Exhibit 3.1, there is considerable diversity among countries with relative strengths and weaknesses in the content domains. It is noteworthy that countries with lower average mathematics achievement tended to perform relatively better in number than in mathematics overall, and relatively less well in geometric shapes and measures.

Exhibit 3.2 presents average achievement in the eighth grade content domains of number, algebra, geometry, and data and chance. Similar to the

Exhibit 3.1: Achievement in Mathematics Content Domains

Country	Overall Mathematics Average Scale Score	Number		Geometric Shapes and Measures		Data Display	
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score
² Singapore	606 (3.2)	619 (3.4)	13 (0.8) ▲	589 (3.6)	-17 (1.5) ▼	588 (3.4)	-18 (1.7) ▼
Korea, Rep. of	605 (1.9)	606 (2.0)	1 (1.6) ▲	607 (1.7)	2 (1.4) ▲	603 (1.9)	-2 (2.0) ▼
² Hong Kong SAR	602 (3.4)	604 (3.3)	3 (1.0) ▲	605 (3.4)	3 (0.9) ▲	593 (3.6)	-8 (2.1) ▼
Chinese Taipei	591 (2.0)	599 (2.0)	8 (1.2) ▲	573 (2.1)	-19 (1.3) ▼	600 (2.6)	9 (1.6) ▲
Japan	585 (1.7)	584 (1.6)	-1 (0.9) ▼	589 (2.0)	4 (1.1) ▲	590 (2.9)	4 (2.9) ▲
[†] Northern Ireland	562 (2.9)	566 (2.9)	4 (1.6) ▲	560 (3.3)	-2 (2.1) ▼	555 (3.0)	-8 (1.5) ▼
Belgium (Flemish)	549 (1.9)	552 (2.2)	2 (1.4) ▲	552 (2.0)	3 (1.0) ▲	536 (3.0)	-13 (2.0) ▼
Finland	545 (2.3)	545 (2.3)	0 (0.9) ▼	543 (2.9)	-2 (2.2) ▼	551 (3.5)	5 (3.2) ▲
England	542 (3.5)	539 (3.7)	-3 (1.1) ▼	545 (3.9)	3 (1.6) ▲	549 (4.6)	7 (2.9) ▲
Russian Federation	542 (3.7)	545 (3.3)	3 (1.4) ▲	542 (4.3)	-1 (1.5) ▼	533 (4.1)	-9 (2.3) ▼
² United States	541 (1.8)	543 (2.0)	2 (0.9) ▲	535 (2.2)	-6 (0.8) ▼	545 (1.8)	4 (1.1) ▲
[†] Netherlands	540 (1.7)	543 (1.7)	3 (1.1) ▲	524 (2.9)	-16 (2.6) ▼	559 (2.9)	19 (1.7) ▲
² Denmark	537 (2.6)	534 (2.4)	-3 (0.9) ▼	548 (3.0)	11 (2.0) ▲	532 (3.0)	-5 (1.5) ▼
^{1 2} Lithuania	534 (2.4)	537 (2.4)	4 (1.1) ▲	531 (3.0)	-3 (1.9) ▼	526 (3.0)	-7 (2.0) ▼
Portugal	532 (3.4)	522 (3.7)	-10 (1.6) ▼	548 (4.4)	16 (2.2) ▲	548 (2.8)	16 (2.0) ▲
Germany	528 (2.2)	520 (2.3)	-8 (0.7) ▼	536 (2.6)	8 (1.1) ▲	546 (2.8)	18 (1.6) ▲
Ireland	527 (2.6)	533 (2.6)	5 (1.4) ▲	520 (3.1)	-7 (1.6) ▼	523 (2.8)	-4 (2.0) ▼
² Serbia	516 (3.0)	529 (3.0)	13 (1.4) ▲	497 (3.8)	-19 (1.6) ▼	503 (3.8)	-13 (2.0) ▼
Australia	516 (2.9)	508 (3.2)	-8 (1.0) ▼	534 (3.0)	18 (1.6) ▲	515 (3.1)	-1 (2.2) ▼
Hungary	515 (3.4)	515 (3.2)	0 (1.2) ▼	520 (3.6)	5 (1.3) ▲	510 (4.2)	-5 (1.7) ▼
Slovenia	513 (2.2)	503 (2.7)	-10 (2.0) ▼	526 (2.3)	13 (1.6) ▲	532 (2.6)	19 (1.8) ▲
Czech Republic	511 (2.4)	509 (2.5)	-2 (1.3) ▼	513 (3.0)	2 (1.4) ▲	519 (3.1)	8 (1.4) ▲
Austria	508 (2.6)	506 (2.5)	-2 (1.1) ▼	512 (3.4)	4 (1.4) ▲	515 (3.1)	7 (1.6) ▲
Italy	508 (2.6)	510 (2.7)	2 (1.6) ▲	513 (3.1)	5 (1.0) ▲	495 (3.1)	-13 (1.8) ▼
Slovak Republic	507 (3.8)	511 (3.7)	5 (1.5) ▲	500 (4.3)	-7 (1.5) ▼	504 (4.6)	-3 (2.1) ▼
Sweden	504 (2.0)	500 (2.2)	-4 (0.8) ▼	500 (2.4)	-4 (1.3) ▼	523 (3.0)	20 (1.9) ▲
² Kazakhstan	501 (4.5)	515 (4.1)	14 (1.1) ▲	491 (5.3)	-10 (1.8) ▼	476 (5.7)	-25 (1.9) ▼
Malta	496 (1.3)	498 (1.9)	2 (1.7) ▲	487 (1.5)	-9 (1.5) ▼	498 (1.6)	2 (2.0) ▼
[‡] Norway	495 (2.8)	488 (3.1)	-7 (1.9) ▼	507 (3.0)	12 (1.7) ▲	494 (3.2)	-1 (2.3) ▼
² Croatia	490 (1.9)	491 (1.8)	1 (0.9) ▼	490 (2.5)	0 (1.3) ▼	488 (2.7)	-2 (2.1) ▼
New Zealand	486 (2.6)	483 (2.5)	-3 (0.8) ▼	483 (2.5)	-3 (1.5) ▼	491 (2.7)	5 (1.2) ▲
Spain	482 (2.9)	487 (3.0)	4 (1.1) ▲	476 (3.0)	-6 (1.3) ▼	479 (3.6)	-3 (2.0) ▼
Romania	482 (5.8)	497 (5.6)	15 (2.1) ▲	469 (5.7)	-14 (1.9) ▼	457 (6.8)	-26 (3.5) ▼
Poland	481 (2.2)	480 (2.2)	-1 (1.1) ▼	475 (2.7)	-6 (1.3) ▼	489 (2.9)	7 (1.7) ▲
Turkey	469 (4.7)	477 (4.5)	7 (0.9) ▲	447 (5.0)	-22 (1.3) ▼	478 (5.2)	9 (1.4) ▲
² Azerbaijan	463 (5.8)	491 (5.3)	28 (1.3) ▲	437 (7.3)	-26 (2.1) ▼	407 (6.4)	-55 (1.9) ▼
Chile	462 (2.3)	462 (2.7)	0 (1.6) ▼	455 (3.0)	-6 (1.5) ▼	465 (2.5)	4 (1.8) ▲
Thailand	458 (4.8)	464 (4.5)	6 (1.2) ▲	437 (5.6)	-21 (2.0) ▼	467 (5.1)	9 (2.5) ▲
Armenia	452 (3.5)	484 (3.2)	32 (1.4) ▲	424 (4.2)	-28 (1.7) ▼	386 (4.9)	-66 (2.8) ▼
¹ Georgia	450 (3.7)	473 (3.1)	23 (1.5) ▲	411 (4.3)	-39 (2.3) ▼	433 (4.0)	-18 (1.4) ▼
Bahrain	436 (3.3)	439 (3.0)	3 (1.1) ▲	422 (3.9)	-14 (2.5) ▼	442 (4.1)	6 (2.0) ▲
United Arab Emirates	434 (2.0)	438 (2.1)	4 (0.8) ▲	418 (2.3)	-16 (0.7) ▼	437 (1.9)	3 (1.1) ▲
Iran, Islamic Rep. of	431 (3.5)	440 (3.3)	9 (1.3) ▲	435 (3.9)	4 (1.3) ▲	397 (4.3)	-33 (2.0) ▼
² Qatar	413 (3.5)	417 (3.3)	4 (1.8) ▲	399 (3.9)	-14 (2.5) ▼	416 (4.6)	3 (3.2) ▲
Saudi Arabia	410 (5.3)	410 (5.7)	0 (2.1) ▼	404 (6.4)	-6 (2.7) ▼	403 (6.0)	-7 (4.2) ▼
^ψ Oman	385 (2.9)	384 (3.1)	-1 (1.3) ▼	376 (3.3)	-9 (1.4) ▼	381 (3.1)	-4 (1.5) ▼
^ψ Tunisia	359 (3.9)	390 (3.7)	31 (1.7) ▲	329 (4.6)	-30 (3.2) ▼	300 (5.5)	-60 (3.1) ▼
^{1 *} Kuwait	342 (3.4)	333 (4.1)	-9 (2.4) ▼	321 (4.2)	-21 (2.8) ▼	347 (3.8)	5 (2.2) ▲
[*] Morocco	335 (4.0)	340 (3.8)	6 (2.5) ▲	350 (4.0)	15 (1.5) ▲	271 (4.7)	-64 (1.7) ▼
[*] Yemen	248 (6.0)	261 (6.4)	13 (2.7) ▲	193 (6.5)	-55 (2.9) ▼	204 (6.0)	-44 (2.2) ▼

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

▲ Subscale score significantly higher than overall mathematics score
▼ Subscale score significantly lower than overall mathematics score

* Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes †, ‡, and §.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.1: Achievement in Mathematics Content Domains (Continued)

Country	Overall Mathematics Average Scale Score	Number		Geometric Shapes and Measures		Data Display		
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Sixth Grade Participants								
Botswana	419 (3.7)	421 (3.7)	2 (1.3)	404 (4.4)	-15 (2.0)	427 (4.0)	8 (1.9)	
^ψ Honduras	396 (5.5)	418 (4.9)	21 (2.6) ▲	365 (5.9)	-31 (2.1) ▼	377 (6.6)	-20 (1.9) ▼	
[⋆] Yemen	348 (5.7)	367 (5.5)	19 (1.6) ▲	304 (6.3)	-44 (2.7) ▼	337 (6.0)	-11 (1.7) ▼	
Benchmarking Participants								
^{1 2} North Carolina, US	554 (4.2)	564 (4.0)	10 (2.0) ▲	536 (5.0)	-18 (1.8) ▼	558 (5.2)	4 (4.0)	
^{1 3} Florida, US	545 (2.9)	548 (3.2)	3 (1.1) ▲	546 (3.8)	0 (2.5)	541 (3.4)	-4 (2.2)	
Quebec, Canada	533 (2.4)	531 (2.6)	-1 (1.2)	536 (3.2)	3 (1.6) ▲	538 (3.7)	5 (3.1)	
Ontario, Canada	518 (3.1)	504 (3.4)	-14 (1.0) ▼	535 (3.4)	17 (1.9) ▲	536 (3.5)	18 (2.1) ▲	
² Alberta, Canada	507 (2.5)	505 (2.7)	-1 (1.1)	496 (2.6)	-11 (1.2) ▼	524 (3.1)	17 (1.9) ▲	
Dubai, UAE	468 (1.6)	474 (1.7)	6 (1.0) ▲	449 (2.3)	-19 (1.5) ▼	471 (3.1)	3 (2.6)	
Abu Dhabi, UAE	417 (4.6)	420 (4.7)	3 (1.9)	401 (5.3)	-16 (1.7) ▼	418 (4.3)	1 (1.6)	

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.2: Achievement in Mathematics Content Domains

Country	Overall Mathematics Average Scale Score	Number		Algebra	
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score
Korea, Rep. of	613 (2.9)	618 (2.6)	5 (1.2) ▲	617 (3.2)	4 (1.6) ▲
² Singapore	611 (3.8)	611 (3.6)	0 (1.4)	614 (4.1)	3 (0.9) ▲
Chinese Taipei	609 (3.2)	598 (3.1)	-12 (1.0) ▼	628 (3.8)	19 (1.5) ▲
Hong Kong SAR	586 (3.8)	588 (3.7)	2 (1.2) ▲	583 (3.9)	-3 (1.2) ▼
Japan	570 (2.6)	557 (3.0)	-13 (1.6) ▼	570 (3.0)	0 (1.6)
² Russian Federation	539 (3.6)	534 (3.2)	-5 (1.0) ▼	556 (3.7)	17 (1.7) ▲
³ Israel	516 (4.1)	518 (4.0)	2 (1.1)	521 (4.7)	5 (1.7) ▲
Finland	514 (2.5)	527 (2.4)	13 (1.1) ▲	492 (2.9)	-22 (1.5) ▼
² United States	509 (2.6)	514 (3.0)	4 (1.0) ▲	512 (2.6)	2 (1.0) ▲
[‡] England	507 (5.5)	512 (5.8)	5 (1.4) ▲	489 (5.7)	-17 (1.5) ▼
Hungary	505 (3.5)	510 (3.9)	5 (1.1) ▲	496 (4.0)	-8 (1.8) ▼
Australia	505 (5.1)	513 (5.4)	8 (0.9) ▲	489 (5.3)	-16 (1.6) ▼
Slovenia	505 (2.2)	511 (2.5)	6 (1.1) ▲	493 (2.6)	-12 (1.8) ▼
¹ Lithuania	502 (2.5)	501 (2.5)	-1 (1.5)	492 (2.8)	-10 (1.5) ▼
Italy	498 (2.4)	496 (2.9)	-2 (1.7) ▼	491 (2.7)	-8 (1.3) ▼
New Zealand	488 (5.5)	492 (5.9)	5 (1.2) ▲	472 (5.5)	-16 (1.2) ▼
Kazakhstan	487 (4.0)	479 (4.0)	-8 (1.8) ▼	506 (4.4)	19 (1.4) ▲
Sweden	484 (1.9)	504 (1.8)	19 (1.0) ▲	459 (2.2)	-26 (1.2) ▼
Ukraine	479 (3.9)	472 (4.1)	-7 (1.8) ▼	487 (4.4)	8 (1.6) ▲
Norway	475 (2.4)	492 (2.8)	18 (1.1) ▲	432 (2.7)	-43 (1.3) ▼
Armenia	467 (2.7)	474 (2.4)	7 (1.0) ▲	496 (2.8)	29 (1.1) ▲
Romania	458 (4.0)	448 (4.1)	-10 (1.7) ▼	477 (4.3)	19 (1.6) ▲
United Arab Emirates	456 (2.1)	459 (2.2)	3 (0.8) ▲	468 (2.2)	12 (1.3) ▲
Turkey	452 (3.9)	435 (3.9)	-18 (1.5) ▼	455 (4.2)	2 (1.2) ▲
Lebanon	449 (3.7)	451 (3.8)	2 (1.9)	471 (3.8)	22 (1.5) ▲
Malaysia	440 (5.4)	451 (5.8)	11 (1.2) ▲	430 (5.2)	-10 (1.3) ▼
¹ Georgia	431 (3.8)	435 (3.5)	4 (1.5) ▲	450 (3.8)	19 (1.6) ▲
Thailand	427 (4.3)	425 (4.6)	-2 (1.0) ▼	425 (4.3)	-2 (1.2)
^ψ Macedonia, Rep. of	426 (5.2)	418 (5.1)	-8 (2.3) ▼	448 (5.3)	22 (2.3) ▲
Tunisia	425 (2.8)	431 (2.8)	6 (1.8) ▲	419 (2.9)	-6 (1.7) ▼
Chile	416 (2.6)	413 (2.9)	-4 (1.2) ▼	403 (3.6)	-14 (2.1) ▼
^ψ Iran, Islamic Rep. of	415 (4.3)	402 (4.9)	-13 (2.7) ▼	422 (4.3)	7 (1.9) ▲
^ψ Qatar	410 (3.1)	408 (3.4)	-1 (1.9)	425 (2.8)	15 (1.9) ▲
^ψ Bahrain	409 (2.0)	397 (1.7)	-13 (1.4) ▼	424 (1.7)	15 (1.2) ▲
^ψ Jordan	406 (3.7)	390 (3.8)	-15 (1.4) ▼	432 (3.9)	26 (1.1) ▲
^ψ Palestinian Nat'l Auth.	404 (3.5)	400 (3.4)	-5 (1.2) ▼	419 (3.3)	14 (1.6) ▲
^ψ Saudi Arabia	394 (4.6)	393 (4.8)	-1 (1.9)	399 (4.9)	6 (1.3) ▲
^ψ Indonesia	386 (4.3)	375 (4.8)	-11 (2.0) ▼	392 (3.8)	6 (1.3) ▲
^ψ Syrian Arab Republic	380 (4.5)	373 (4.0)	-7 (1.8) ▼	391 (4.9)	11 (2.8) ▲
[✱] Morocco	371 (2.0)	379 (2.6)	8 (1.3) ▲	357 (2.7)	-15 (1.6) ▼
^ψ Oman	366 (2.8)	351 (3.0)	-16 (1.9) ▼	383 (2.8)	17 (1.4) ▲
[✱] Ghana	331 (4.3)	321 (4.5)	-10 (1.8) ▼	358 (4.0)	28 (2.1) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

✱ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.3 for target population coverage notes 1, 2, and 3. See Appendix C.9 for sampling guidelines and sampling participation notes †, ‡, and §.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.2: Achievement in Mathematics Content Domains (Continued)

Country	Geometry		Data and Chance		
	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Korea, Rep. of	612 (2.7)	-1 (2.0)	616 (2.5)	3 (1.4)	▲
² Singapore	609 (3.9)	-2 (1.9)	607 (4.4)	-4 (1.3)	▼
Chinese Taipei	625 (3.7)	16 (1.3)	584 (3.0)	-25 (1.7)	▼
Hong Kong SAR	597 (4.3)	12 (1.3)	581 (4.1)	-4 (1.6)	▼
Japan	586 (3.5)	16 (2.4)	579 (3.0)	10 (2.5)	▲
² Russian Federation	533 (4.0)	-6 (1.8)	511 (3.9)	-28 (1.6)	▼
³ Israel	496 (4.6)	-20 (1.6)	515 (4.8)	0 (2.1)	
Finland	502 (2.9)	-12 (1.2)	542 (3.1)	28 (2.1)	▲
² United States	485 (2.7)	-25 (0.7)	527 (3.3)	18 (1.1)	▲
[‡] England	498 (5.7)	-9 (2.7)	543 (6.8)	36 (2.8)	▲
Hungary	501 (4.1)	-3 (2.2)	517 (4.3)	12 (2.3)	▲
Australia	499 (5.4)	-6 (1.7)	534 (5.9)	30 (1.8)	▲
Slovenia	504 (3.1)	-1 (2.0)	518 (3.3)	13 (2.1)	▲
¹ Lithuania	500 (3.1)	-3 (1.2)	515 (2.8)	13 (2.2)	▲
Italy	512 (3.5)	14 (2.5)	499 (3.2)	1 (2.3)	
New Zealand	483 (5.5)	-5 (2.1)	513 (6.7)	26 (2.9)	▲
Kazakhstan	491 (4.4)	4 (1.4)	444 (4.5)	-43 (1.6)	▼
Sweden	456 (2.3)	-28 (1.3)	504 (2.7)	20 (1.2)	▲
Ukraine	476 (4.3)	-3 (1.6)	471 (4.0)	-8 (2.2)	▼
Norway	461 (3.5)	-14 (1.8)	513 (3.6)	39 (2.6)	▲
Armenia	450 (3.3)	-16 (1.7)	376 (3.7)	-90 (1.8)	▼
Romania	453 (4.5)	-5 (1.5)	429 (4.0)	-29 (1.2)	▼
United Arab Emirates	431 (2.4)	-25 (1.1)	440 (2.4)	-15 (0.6)	▼
Turkey	454 (4.3)	2 (1.5)	467 (4.0)	15 (1.5)	▲
Lebanon	447 (3.8)	-2 (2.1)	393 (5.2)	-56 (2.5)	▼
Malaysia	432 (6.4)	-8 (1.5)	429 (5.3)	-11 (1.2)	▼
¹ Georgia	406 (4.2)	-25 (2.2)	392 (4.5)	-39 (2.3)	▼
Thailand	415 (5.4)	-12 (2.8)	431 (4.1)	3 (1.9)	
^ψ Macedonia, Rep. of	419 (6.0)	-7 (2.4)	389 (5.9)	-37 (3.6)	▼
Tunisia	426 (3.2)	1 (1.4)	398 (3.3)	-27 (1.7)	▼
Chile	419 (3.1)	3 (2.2)	426 (3.1)	9 (1.8)	▲
^ψ Iran, Islamic Rep. of	437 (4.8)	22 (2.6)	393 (4.9)	-22 (3.0)	▼
^ψ Qatar	387 (3.6)	-22 (2.6)	390 (3.6)	-20 (1.7)	▼
^ψ Bahrain	398 (2.6)	-11 (1.9)	407 (2.6)	-2 (2.1)	
^ψ Jordan	407 (3.7)	1 (1.1)	379 (3.7)	-26 (1.5)	▼
^ψ Palestinian Nat'l Auth.	416 (3.6)	12 (1.8)	368 (3.6)	-36 (1.3)	▼
^ψ Saudi Arabia	364 (5.3)	-30 (2.0)	387 (5.1)	-7 (2.7)	▼
^ψ Indonesia	377 (5.3)	-9 (2.3)	376 (4.8)	-10 (2.2)	▼
^ψ Syrian Arab Republic	386 (5.0)	6 (2.5)	343 (4.7)	-37 (1.8)	▼
[✳] Morocco	390 (2.5)	19 (2.1)	332 (2.0)	-39 (1.7)	▼
^ψ Oman	377 (2.7)	11 (1.4)	342 (3.1)	-24 (2.0)	▼
[✳] Ghana	315 (4.3)	-16 (2.2)	296 (4.5)	-35 (1.7)	▼

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

Exhibit 3.2: Achievement in Mathematics Content Domains (Continued)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Country	Overall Mathematics Average Scale Score	Number		Algebra		
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Ninth Grade Participants						
^ψ Botswana	397 (2.5)	392 (3.3)	-5 (1.6) ▼	407 (3.2)	10 (1.7) ▲	
* South Africa	352 (2.5)	359 (2.6)	7 (1.4) ▲	361 (2.5)	9 (1.3) ▲	
² * Honduras	338 (3.7)	352 (3.5)	14 (2.2) ▲	327 (4.5)	-11 (2.8) ▼	
Benchmarking Participants						
^{1 2} Massachusetts, US	561 (5.3)	567 (5.9)	7 (1.4) ▲	559 (5.6)	-1 (1.1)	
¹ Minnesota, US	545 (4.6)	556 (5.3)	11 (1.4) ▲	543 (4.9)	-2 (1.2)	
^{1 3} North Carolina, US	537 (6.8)	547 (7.3)	10 (1.5) ▲	537 (6.8)	0 (1.6)	
Quebec, Canada	532 (2.3)	543 (2.5)	11 (0.7) ▲	516 (2.9)	-16 (1.0) ▼	
^{1 2} Indiana, US	522 (5.1)	528 (5.4)	6 (1.7) ▲	520 (5.3)	-2 (1.4)	
¹ Colorado, US	518 (4.9)	521 (5.1)	3 (2.0)	512 (5.1)	-6 (1.4) ▼	
^{1 2} Connecticut, US	518 (4.8)	527 (4.9)	10 (1.8) ▲	510 (5.4)	-7 (1.7) ▼	
^{1 2} Florida, US	513 (6.4)	517 (7.0)	4 (1.8) ▲	513 (6.4)	-1 (2.0)	
² Ontario, Canada	512 (2.5)	519 (2.6)	7 (1.3) ▲	497 (2.4)	-15 (0.8) ▼	
² Alberta, Canada	505 (2.6)	523 (3.0)	18 (1.1) ▲	485 (2.7)	-20 (1.4) ▼	
^{1 2} California, US	493 (4.9)	492 (5.2)	0 (1.7)	509 (5.2)	17 (2.5) ▲	
Dubai, UAE	478 (2.1)	479 (2.3)	2 (1.0)	489 (2.4)	11 (1.7) ▲	
¹ Alabama, US	466 (5.9)	463 (7.1)	-3 (2.6) ▼	471 (5.3)	5 (1.6) ▲	
Abu Dhabi, UAE	449 (3.7)	452 (3.8)	4 (1.0) ▲	459 (3.8)	10 (2.0) ▲	

Country	Overall Mathematics Average Scale Score	Geometry		Data and Chance		
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Ninth Grade Participants						
^ψ Botswana	397 (2.5)	381 (3.0)	-16 (1.7) ▼	391 (3.2)	-6 (1.7) ▼	
* South Africa	352 (2.5)	315 (3.1)	-36 (2.1) ▼	333 (3.4)	-19 (1.7) ▼	
² * Honduras	338 (3.7)	309 (4.1)	-29 (3.1) ▼	319 (5.0)	-19 (3.9) ▼	
Benchmarking Participants						
^{1 2} Massachusetts, US	561 (5.3)	548 (5.5)	-13 (2.0) ▼	584 (7.3)	24 (2.6) ▲	
¹ Minnesota, US	545 (4.6)	515 (6.2)	-29 (2.9) ▼	571 (6.2)	26 (2.6) ▲	
^{1 3} North Carolina, US	537 (6.8)	515 (8.1)	-22 (3.7) ▼	548 (8.3)	11 (2.9) ▲	
Quebec, Canada	532 (2.3)	529 (2.7)	-3 (0.7) ▼	549 (2.8)	17 (1.2) ▲	
^{1 2} Indiana, US	522 (5.1)	498 (5.3)	-23 (2.2) ▼	545 (6.0)	23 (2.9) ▲	
¹ Colorado, US	518 (4.9)	505 (5.7)	-13 (2.8) ▼	540 (5.7)	23 (1.9) ▲	
^{1 2} Connecticut, US	518 (4.8)	490 (5.1)	-27 (2.3) ▼	546 (6.3)	29 (2.7) ▲	
^{1 2} Florida, US	513 (6.4)	499 (6.8)	-14 (2.3) ▼	528 (9.0)	15 (3.5) ▲	
² Ontario, Canada	512 (2.5)	512 (2.7)	0 (1.7)	531 (4.1)	19 (2.4) ▲	
² Alberta, Canada	505 (2.6)	485 (3.0)	-21 (1.7) ▼	529 (3.8)	24 (1.9) ▲	
^{1 2} California, US	493 (4.9)	454 (5.0)	-38 (1.8) ▼	495 (6.0)	2 (2.4)	
Dubai, UAE	478 (2.1)	453 (3.0)	-25 (2.0) ▼	468 (2.8)	-10 (1.9) ▼	
¹ Alabama, US	466 (5.9)	443 (6.0)	-23 (2.2) ▼	480 (7.9)	14 (4.0) ▲	
Abu Dhabi, UAE	449 (3.7)	424 (4.4)	-25 (2.4) ▼	434 (4.3)	-15 (1.7) ▼	

▲ Subscale score significantly higher than overall mathematics score
▼ Subscale score significantly lower than overall mathematics score

fourth grade, there is considerable diversity in countries' strengths and weaknesses in the content domains, even among the high-achieving Asian countries. For example, although the differences were small, Korea performed somewhat better in number, algebra, and data and chance than in mathematics overall, whereas Singapore performed better in algebra and less well in data and chance. Chinese Taipei had more pronounced achievement differences among the content domains, with achievement in algebra and geometry well above overall mathematics achievement, and number and data and chance well below (although still very high in comparison to most other countries). Hong Kong SAR and Japan present other configurations of relative strength, with Hong Kong performing relatively better in number and geometry and less well in algebra and data and chance, and Japan performing less well in number but better in geometry and data and chance than in mathematics overall. Looking across the countries participating at the eighth grade, many (25) had relatively higher achievement in algebra than they did overall, and fewer (only 10) had relatively higher achievement in geometry. At the ninth grade and among the benchmarking participants, there were some different patterns, in particular, with nine US states generally reflecting overall achievement in the United States. Nearly all of the ninth grade and Benchmarking participants had a relative weakness in geometry, but many showed relative strengths in number as well as data and chance.

Relative Achievement by Mathematics Cognitive Domains

Exhibits 3.3 and 3.4 present average achievement at the fourth and eighth grades, respectively, in the cognitive domains of knowing, applying, and reasoning relative to overall mathematics achievement for TIMSS 2011 participants. Because these three scales represent quite different skills, it was expected that the assessment items would have different difficulty levels. The average percent correct in the cognitive domains shown in Appendix E were 55 percent for knowing, 50 percent for applying, and 40 percent for reasoning at the fourth grade, and 49 percent, 39 percent, and 30 percent, respectively, at the eighth grade. However, as with the content domains, the IRT scaling adjusts for these difficulty levels in placing achievement in the three cognitive domains on the overall mathematics scales for the fourth and eighth grades, and allows each TIMSS 2011 participant to compare performance in the cognitive domains relative to overall mathematics achievement.

Exhibit 3.3: Achievement in Mathematics Cognitive Domains

Country	Overall Mathematics Average Scale Score	Knowing		Applying		Reasoning	
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score
² Singapore	606 (3.2)	629 (3.5)	23 (1.4) ▲	602 (3.4)	-4 (1.1) ▼	588 (3.7)	-18 (1.2) ▼
Korea, Rep. of	605 (1.9)	614 (2.0)	9 (1.6) ▲	600 (2.2)	-5 (2.1) ▼	603 (2.3)	-2 (1.5)
² Hong Kong SAR	602 (3.4)	619 (3.2)	17 (1.2) ▲	597 (3.2)	-4 (0.8) ▼	589 (3.4)	-13 (1.4) ▼
Chinese Taipei	591 (2.0)	599 (2.1)	8 (1.6) ▲	593 (2.0)	2 (1.0) ▲	577 (2.5)	-14 (2.0) ▼
Japan	585 (1.7)	590 (1.7)	5 (1.0) ▲	579 (1.6)	-6 (1.1) ▼	592 (2.0)	6 (1.0) ▲
[†] Northern Ireland	562 (2.9)	580 (3.4)	17 (1.7) ▲	565 (2.9)	2 (2.0)	538 (3.3)	-25 (2.1) ▼
Belgium (Flemish)	549 (1.9)	564 (1.9)	15 (0.9) ▲	546 (2.2)	-3 (1.1) ▼	532 (2.7)	-17 (1.6) ▼
Finland	545 (2.3)	548 (2.6)	2 (1.3)	544 (2.7)	-2 (1.8)	546 (2.2)	0 (1.1)
England	542 (3.5)	552 (4.3)	10 (2.7) ▲	542 (3.7)	0 (1.5)	531 (3.7)	-11 (2.2) ▼
Russian Federation	542 (3.7)	541 (3.4)	-1 (1.7)	539 (3.9)	-3 (1.1) ▼	548 (3.6)	6 (1.5) ▲
² United States	541 (1.8)	556 (2.1)	15 (0.9) ▲	539 (2.1)	-2 (0.7) ▼	525 (2.2)	-15 (0.9) ▼
[†] Netherlands	540 (1.7)	537 (2.0)	-3 (1.4) ▼	540 (1.6)	0 (0.9)	543 (2.6)	3 (1.6) ▲
² Denmark	537 (2.6)	531 (2.6)	-6 (1.4) ▼	539 (2.9)	2 (1.7)	543 (2.7)	6 (1.4) ▲
^{1 2} Lithuania	534 (2.4)	525 (3.0)	-9 (1.4) ▼	540 (2.5)	7 (0.8) ▲	536 (2.5)	3 (1.4)
Portugal	532 (3.4)	531 (3.5)	-2 (1.4) ▼	534 (3.9)	2 (1.3)	531 (4.1)	-2 (2.0)
Germany	528 (2.2)	524 (2.3)	-4 (1.0) ▼	528 (2.3)	0 (1.1)	532 (3.0)	4 (2.1) ▲
Ireland	527 (2.6)	539 (3.1)	12 (1.5) ▲	529 (2.7)	1 (1.4)	510 (3.1)	-18 (2.2) ▼
² Serbia	516 (3.0)	520 (2.9)	4 (1.3) ▲	511 (3.1)	-5 (1.3) ▼	514 (3.7)	-2 (2.3)
Australia	516 (2.9)	516 (3.5)	1 (1.7)	519 (3.0)	3 (1.5) ▲	513 (2.6)	-3 (1.8)
Hungary	515 (3.4)	519 (3.8)	4 (0.9) ▲	513 (3.3)	-2 (1.2)	514 (3.7)	-1 (1.4)
Slovenia	513 (2.2)	510 (2.8)	-3 (1.7) ▼	514 (2.3)	1 (1.5)	516 (2.9)	3 (2.0)
Czech Republic	511 (2.4)	502 (2.4)	-9 (1.3) ▼	512 (2.8)	1 (1.3)	523 (2.7)	12 (1.3) ▲
Austria	508 (2.6)	507 (2.5)	-1 (0.8) ▼	506 (2.6)	-3 (1.3) ▼	513 (3.3)	5 (2.1) ▲
Italy	508 (2.6)	510 (2.7)	2 (1.8)	506 (2.8)	-2 (1.4)	505 (3.4)	-2 (1.7)
Slovak Republic	507 (3.8)	506 (3.8)	-1 (1.3) ▼	505 (4.0)	-2 (1.7)	511 (3.9)	4 (1.0) ▲
Sweden	504 (2.0)	489 (2.2)	-15 (1.1) ▼	507 (2.2)	4 (1.3) ▲	520 (3.0)	16 (1.8) ▲
² Kazakhstan	501 (4.5)	503 (4.7)	2 (1.7)	499 (5.0)	-2 (2.0)	501 (4.7)	0 (1.5)
Malta	496 (1.3)	504 (1.5)	8 (1.3) ▲	497 (2.0)	1 (1.9)	475 (1.7)	-20 (1.7) ▼
[‡] Norway	495 (2.8)	487 (3.1)	-8 (2.0) ▼	499 (3.0)	4 (1.6) ▲	501 (3.3)	6 (2.4) ▲
² Croatia	490 (1.9)	495 (1.9)	4 (1.4) ▲	484 (2.0)	-6 (1.2) ▼	492 (2.9)	2 (2.3)
New Zealand	486 (2.6)	476 (3.2)	-10 (1.2) ▼	490 (2.4)	4 (1.1) ▲	490 (2.5)	4 (1.5) ▲
Spain	482 (2.9)	482 (3.3)	0 (1.7)	483 (3.1)	1 (1.6)	483 (2.9)	0 (1.7)
Romania	482 (5.8)	484 (6.3)	2 (2.1)	478 (6.0)	-4 (1.7) ▼	486 (5.9)	4 (2.5)
Poland	481 (2.2)	475 (2.6)	-6 (1.7) ▼	480 (2.6)	-2 (1.4)	493 (2.4)	12 (1.4) ▲
Turkey	469 (4.7)	475 (5.4)	6 (1.9) ▲	469 (4.8)	-1 (1.3)	462 (4.5)	-8 (1.8) ▼
² Azerbaijan	463 (5.8)	473 (6.4)	10 (1.8) ▲	457 (6.0)	-6 (1.2) ▼	445 (5.9)	-18 (1.7) ▼
Chile	462 (2.3)	455 (2.5)	-6 (1.4) ▼	463 (2.5)	1 (1.3)	469 (2.5)	7 (1.5) ▲
Thailand	458 (4.8)	453 (5.1)	-5 (1.3) ▼	458 (4.8)	0 (1.3)	464 (4.7)	6 (1.8) ▲
Armenia	452 (3.5)	461 (4.0)	9 (1.9) ▲	446 (4.0)	-6 (1.5) ▼	442 (3.8)	-10 (2.0) ▼
¹ Georgia	450 (3.7)	449 (3.7)	-1 (2.0)	447 (3.4)	-3 (1.4)	450 (3.5)	0 (1.7)
Bahrain	436 (3.3)	438 (3.8)	2 (2.7)	431 (3.4)	-5 (1.7) ▼	439 (3.4)	3 (1.5) ▲
United Arab Emirates	434 (2.0)	437 (2.2)	3 (1.2) ▲	430 (2.1)	-4 (1.0) ▼	434 (2.4)	-1 (1.3)
Iran, Islamic Rep. of	431 (3.5)	435 (3.8)	4 (1.4) ▲	427 (3.6)	-3 (1.1) ▼	423 (3.0)	-8 (1.1) ▼
² Qatar	413 (3.5)	411 (3.8)	-2 (1.8) ▼	411 (3.4)	-2 (1.7)	416 (4.4)	3 (3.5)
Saudi Arabia	410 (5.3)	409 (6.1)	-1 (2.5) ▼	405 (5.9)	-5 (2.1) ▼	412 (6.0)	2 (2.8)
^ψ Oman	385 (2.9)	380 (3.2)	-5 (1.5) ▼	382 (2.9)	-3 (1.3) ▼	391 (2.6)	6 (1.4) ▲
^ψ Tunisia	359 (3.9)	370 (4.0)	11 (1.9) ▲	346 (4.4)	-13 (1.6) ▼	335 (4.7)	-25 (2.3) ▼
^{1 *} Kuwait	342 (3.4)	343 (3.5)	1 (1.9)	330 (4.5)	-12 (3.5) ▼	329 (3.6)	-12 (3.2) ▼
[*] Morocco	335 (4.0)	320 (4.2)	-14 (1.8) ▼	332 (3.9)	-2 (1.7)	347 (4.2)	12 (2.5) ▲
[*] Yemen	248 (6.0)	217 (6.8)	-31 (2.4) ▼	237 (6.3)	-11 (2.0) ▼	244 (5.5)	-4 (3.6)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

▲ Subscale score significantly higher than overall mathematics score
▼ Subscale score significantly lower than overall mathematics score

* Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes †, ‡, and §.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.3: Achievement in Mathematics Cognitive Domains (Continued)

Country	Overall Mathematics Average Scale Score	Knowing		Applying		Reasoning		
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Sixth Grade Participants								
Botswana	419 (3.7)	424 (4.5)	5 (2.4) ▲	421 (3.9)	1 (1.0)	402 (3.7)	-18 (2.0) ▼	
ψ Honduras	396 (5.5)	385 (5.5)	-12 (1.8) ▼	398 (5.7)	1 (2.1)	403 (5.8)	6 (1.8) ▲	
* Yemen	348 (5.7)	338 (6.0)	-11 (2.2) ▼	345 (5.8)	-3 (1.6) ▼	355 (6.0)	7 (3.2) ▲	
Benchmarking Participants								
^{1 2} North Carolina, US	554 (4.2)	574 (4.3)	20 (2.2) ▲	553 (4.7)	-1 (2.3)	533 (4.5)	-21 (2.4) ▼	
^{1 3} Florida, US	545 (2.9)	568 (3.9)	23 (2.2) ▲	542 (3.6)	-4 (2.1)	523 (3.9)	-22 (2.4) ▼	
Quebec, Canada	533 (2.4)	536 (2.6)	3 (1.2) ▲	529 (2.6)	-4 (1.1) ▼	534 (2.5)	1 (1.4)	
Ontario, Canada	518 (3.1)	510 (3.5)	-8 (1.5) ▼	521 (3.5)	3 (1.0) ▲	522 (3.1)	4 (1.2) ▲	
² Alberta, Canada	507 (2.5)	498 (2.9)	-8 (1.7) ▼	508 (2.6)	1 (1.6)	514 (3.0)	7 (2.2) ▲	
Dubai, UAE	468 (1.6)	472 (2.4)	4 (1.5) ▲	465 (2.3)	-3 (1.9) ▼	464 (2.2)	-4 (1.9) ▼	
Abu Dhabi, UAE	417 (4.6)	418 (5.0)	1 (2.2) ▲	413 (4.7)	-4 (1.4) ▼	418 (4.5)	1 (2.0)	

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.4: Achievement in Mathematics Cognitive Domains

Country	Overall Mathematics Average Scale Score	Knowing		Applying		Reasoning	
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score
Korea, Rep. of	613 (2.9)	616 (2.9)	3 (1.9)	617 (2.9)	4 (1.1) ▲	612 (2.5)	0 (1.0)
² Singapore	611 (3.8)	617 (3.8)	6 (1.0) ▲	613 (3.9)	2 (0.7) ▲	604 (4.3)	-7 (1.0) ▼
Chinese Taipei	609 (3.2)	611 (3.7)	2 (1.4)	614 (3.5)	5 (1.7) ▲	609 (3.4)	0 (1.5)
Hong Kong SAR	586 (3.8)	591 (3.9)	6 (1.2) ▲	587 (3.7)	2 (1.0)	580 (3.9)	-6 (1.1) ▼
Japan	570 (2.6)	558 (2.7)	-12 (1.5) ▼	574 (2.5)	4 (1.3) ▲	579 (3.0)	9 (1.8) ▲
² Russian Federation	539 (3.6)	548 (3.6)	9 (1.0) ▲	538 (3.5)	-1 (1.3) ▼	531 (3.7)	-8 (1.2) ▼
³ Israel	516 (4.1)	516 (4.1)	0 (1.1)	513 (4.4)	-3 (1.4) ▼	520 (4.0)	4 (1.7) ▲
Finland	514 (2.5)	508 (2.5)	-6 (1.0) ▼	520 (2.5)	6 (1.4) ▲	512 (2.7)	-2 (1.5)
² United States	509 (2.6)	519 (2.7)	10 (0.8) ▲	503 (2.8)	-6 (1.0) ▼	503 (2.7)	-6 (0.7) ▼
‡ England	507 (5.5)	501 (5.4)	-5 (1.1) ▼	508 (5.5)	2 (1.2)	510 (5.5)	3 (2.0)
Hungary	505 (3.5)	507 (3.8)	2 (1.6)	505 (3.5)	0 (1.2)	502 (3.7)	-3 (0.8) ▼
Australia	505 (5.1)	504 (5.1)	-1 (1.1)	506 (4.8)	1 (1.0)	506 (4.9)	1 (1.0)
Slovenia	505 (2.2)	508 (2.4)	3 (1.1) ▲	502 (2.1)	-2 (0.7) ▼	500 (2.7)	-5 (1.3) ▼
¹ Lithuania	502 (2.5)	502 (2.6)	-1 (1.1)	508 (2.4)	5 (1.0) ▲	493 (2.5)	-10 (1.9) ▼
Italy	498 (2.4)	494 (2.6)	-4 (0.8) ▼	503 (2.2)	4 (1.0) ▲	496 (2.6)	-2 (1.0) ▼
New Zealand	488 (5.5)	481 (5.6)	-7 (1.1) ▼	491 (5.0)	3 (1.3) ▲	494 (5.3)	6 (1.6) ▲
Kazakhstan	487 (4.0)	489 (4.4)	2 (1.3)	484 (4.2)	-3 (1.0) ▼	482 (4.7)	-5 (2.1) ▼
Sweden	484 (1.9)	478 (2.0)	-7 (1.5) ▼	489 (2.2)	5 (1.0) ▲	478 (2.4)	-7 (1.1) ▼
Ukraine	479 (3.9)	481 (4.4)	2 (1.7)	480 (4.3)	1 (1.8)	467 (4.2)	-12 (1.8) ▼
Norway	475 (2.4)	465 (2.5)	-10 (1.2) ▼	480 (2.6)	6 (1.3) ▲	478 (2.9)	3 (1.9)
Armenia	467 (2.7)	476 (2.9)	9 (1.3) ▲	458 (3.0)	-8 (1.5) ▼	451 (3.0)	-15 (1.6) ▼
Romania	458 (4.0)	460 (4.4)	2 (1.4)	454 (3.9)	-4 (1.5) ▼	455 (4.0)	-3 (1.6)
United Arab Emirates	456 (2.1)	467 (2.2)	11 (0.7) ▲	442 (2.2)	-14 (0.8) ▼	449 (2.1)	-7 (0.7) ▼
Turkey	452 (3.9)	441 (4.1)	-12 (1.3) ▼	459 (4.0)	6 (1.2) ▲	465 (3.5)	12 (1.1) ▲
Lebanon	449 (3.7)	464 (3.9)	15 (1.8) ▲	436 (4.1)	-13 (1.4) ▼	426 (4.7)	-24 (1.9) ▼
Malaysia	440 (5.4)	444 (5.7)	4 (0.9) ▲	439 (5.2)	-1 (0.9)	426 (5.5)	-14 (2.0) ▼
¹ Georgia	431 (3.8)	438 (4.2)	6 (1.9) ▲	425 (3.6)	-6 (1.3) ▼	414 (4.2)	-17 (2.2) ▼
Thailand	427 (4.3)	423 (4.7)	-4 (1.5) ▼	428 (4.1)	1 (1.1)	429 (4.3)	2 (1.1)
‡ Macedonia, Rep. of	426 (5.2)	430 (5.6)	4 (2.5)	417 (5.2)	-9 (1.7) ▼	424 (5.9)	-3 (3.3)
Tunisia	425 (2.8)	425 (2.8)	0 (0.8)	421 (2.9)	-4 (1.3) ▼	423 (2.7)	-2 (1.0) ▼
Chile	416 (2.6)	405 (2.9)	-11 (1.4) ▼	425 (2.5)	9 (0.9) ▲	422 (2.8)	5 (1.5) ▲
‡ Iran, Islamic Rep. of	415 (4.3)	410 (4.4)	-5 (1.5) ▼	411 (4.6)	-4 (2.2) ▼	428 (4.3)	13 (1.6) ▲
‡ Qatar	410 (3.1)	418 (2.9)	8 (1.5) ▲	396 (3.3)	-13 (1.7) ▼	406 (3.3)	-3 (1.8)
‡ Bahrain	409 (2.0)	411 (2.4)	2 (2.0)	400 (2.4)	-9 (1.8) ▼	415 (2.1)	5 (1.9) ▲
‡ Jordan	406 (3.7)	405 (4.3)	-1 (1.5) ▼	397 (3.8)	-9 (1.4) ▼	416 (3.8)	10 (1.9) ▲
‡ Palestinian Nat'l Auth.	404 (3.5)	406 (3.5)	2 (1.1) ▲	397 (3.5)	-7 (1.1) ▼	404 (4.1)	0 (1.6)
‡ Saudi Arabia	394 (4.6)	402 (4.6)	8 (0.9) ▲	375 (4.8)	-19 (1.2) ▼	388 (4.7)	-6 (2.8) ▼
‡ Indonesia	386 (4.3)	378 (4.8)	-8 (1.1) ▼	384 (4.7)	-2 (1.5) ▼	388 (3.8)	2 (1.7)
‡ Syrian Arab Republic	380 (4.5)	374 (4.4)	-6 (2.4) ▼	379 (4.2)	-1 (2.4)	371 (5.4)	-9 (2.8) ▼
‡ Morocco	371 (2.0)	363 (2.2)	-8 (1.2) ▼	378 (1.9)	7 (1.4) ▲	357 (2.7)	-14 (1.7) ▼
‡ Oman	366 (2.8)	365 (3.0)	-2 (1.4) ▼	360 (3.0)	-6 (1.6) ▼	369 (2.8)	3 (1.6)
‡ Ghana	331 (4.3)	331 (4.4)	1 (2.1)	316 (4.1)	-15 (1.3) ▼	324 (4.8)	-7 (1.9) ▼

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

‡ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ‡ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.3 for target population coverage notes 1, 2, and 3. See Appendix C.9 for sampling guidelines and sampling participation notes †, ‡, and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.4: Achievement in Mathematics Cognitive Domains (Continued)

Country	Overall Mathematics Average Scale Score	Knowing		Applying		Reasoning		
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	
Ninth Grade Participants								
^ψ Botswana	397 (2.5)	404 (2.6)	7 (1.2) ▲	383 (2.8)	-13 (1.3) ▼	398 (2.4)	1 (1.2)	
^{*k} South Africa	352 (2.5)	352 (2.3)	0 (0.7)	336 (2.7)	-16 (0.9) ▼	363 (2.5)	11 (1.4) ▲	
² ^{*k} Honduras	338 (3.7)	335 (4.5)	-3 (2.9)	340 (3.6)	2 (2.1)	322 (4.3)	-16 (2.1) ▼	
Benchmarking Participants								
^{1 2} Massachusetts, US	561 (5.3)	569 (5.9)	8 (2.1) ▲	555 (5.6)	-6 (1.4) ▼	562 (5.9)	1 (1.7)	
¹ Minnesota, US	545 (4.6)	556 (4.9)	11 (2.0) ▲	540 (5.5)	-5 (1.7) ▼	536 (5.4)	-9 (1.8) ▼	
^{1 2} North Carolina, US	537 (6.8)	548 (7.4)	11 (1.5) ▲	531 (7.5)	-6 (2.0) ▼	531 (6.8)	-6 (2.2) ▼	
Quebec, Canada	532 (2.3)	528 (2.9)	-3 (1.5) ▼	536 (2.7)	4 (1.3) ▲	529 (2.7)	-3 (1.2) ▼	
^{1 2} Indiana, US	522 (5.1)	534 (5.2)	12 (1.0) ▲	516 (5.6)	-6 (0.9) ▼	511 (5.5)	-11 (1.4) ▼	
¹ Colorado, US	518 (4.9)	519 (4.9)	2 (2.2) ▲	515 (5.1)	-3 (1.7) ▼	517 (5.2)	-1 (2.7)	
^{1 2} Connecticut, US	518 (4.8)	528 (5.3)	10 (2.2) ▲	511 (4.9)	-7 (1.2) ▼	511 (5.1)	-7 (1.7) ▼	
^{1 2} Florida, US	513 (6.4)	524 (7.1)	10 (1.6) ▲	504 (7.3)	-9 (2.0) ▼	505 (7.0)	-8 (1.6) ▼	
² Ontario, Canada	512 (2.5)	503 (2.6)	-9 (1.0) ▼	510 (2.4)	-2 (1.1)	524 (2.8)	13 (1.3) ▲	
² Alberta, Canada	505 (2.6)	500 (2.5)	-5 (1.2) ▼	505 (2.8)	0 (1.6)	512 (3.0)	7 (1.1) ▲	
^{1 2} California, US	493 (4.9)	507 (5.2)	15 (1.0) ▲	480 (5.6)	-12 (1.5) ▼	483 (5.0)	-9 (1.5) ▼	
Dubai, UAE	478 (2.1)	488 (2.3)	11 (1.5) ▲	465 (2.4)	-12 (1.4) ▼	470 (2.7)	-8 (1.8) ▼	
¹ Alabama, US	466 (5.9)	476 (6.2)	10 (1.5) ▲	458 (6.6)	-8 (1.4) ▼	454 (7.2)	-12 (3.6) ▼	
Abu Dhabi, UAE	449 (3.7)	459 (3.8)	11 (0.8) ▲	434 (4.3)	-14 (1.7) ▼	442 (4.1)	-7 (1.3) ▼	

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

- ▲ Subscale score significantly higher than overall mathematics score
- ▼ Subscale score significantly lower than overall mathematics score

The presentation of results for the cognitive domains in Exhibits 3.3 and 3.4 follows the layout of results in the content domains (Exhibits 3.1 and 3.2). Similar to the results for the content domains, generally, the TIMSS 2011 participants with the highest mathematics achievement overall also had highest achievement in the cognitive domains, although most countries showed a relative strength in one cognitive domain or another. At the fourth grade, the highest achieving countries and benchmarking participants performed relatively better in the knowing domain than overall and, with some exceptions, relatively less well in applying and reasoning. In general, more participants in the fourth grade assessment had relatively higher achievement in knowing (than lower achievement in this domain) compared to mathematics overall, and nearly half performed less well in applying compared to only few performing better in applying than overall. Participants were equally divided between performing relatively better and relatively less well in the reasoning domain.

At the eighth grade, the highest achieving countries showed a variety of relative strengths in the cognitive domains, with Korea and Chinese Taipei performing relatively better in applying, Singapore performing relatively better in knowing and applying and less well in reasoning, Hong Kong SAR doing better in knowing and less well in reasoning, and Japan doing less well in knowing and relatively better in applying and reasoning. Across the countries participating at the eighth and ninth grades, approximately the same number performed relatively higher in knowing than in mathematics overall as performed relatively lower. However, compared to mathematics overall, fewer performed relatively higher in applying and reasoning than performed lower.

Trends in Achievement in Mathematics Content Domains

Exhibits 3.5 and 3.6 show changes from 2007 to 2011 in average achievement in the mathematics content domains for fourth and eighth grade students, respectively. Countries are shown in alphabetical order, followed by the benchmarking participants.

Many of the TIMSS 2011 fourth grade participants that also participated in 2007 and have comparable data showed an increase in mathematics achievement over this four-year period. Referring back to Exhibit 1.5, it can be seen that 10 countries (Chinese Taipei, the Czech Republic, Denmark, Georgia, Iran, Japan, Norway, Slovenia, Tunisia, and the United States) and 2 benchmarking participants (Québec and Dubai) had higher average mathematics achievement in 2011 than in 2007, and no participant had lower

achievement. Exhibit 3.5 shows that in six of the countries with an increase—Chinese Taipei, the Czech Republic, Iran, Norway, Slovenia, and Tunisia—and in both benchmarking participants, the overall increase was due to increased achievement in all three mathematics content domains. However, there were also countries where the overall mathematics increase was due primarily to increases in particular domains. In Denmark, the 2007–2011 increase was due to improved performance in number, whereas in Georgia it was due to improved performance in geometric shapes and measures and data display. The increases in overall mathematics achievement in Japan and the United States resulted from improvements in number and geometric shapes and measures.

Although not showing overall increases in mathematics achievement between 2007 and 2011, Austria and the Netherlands had improved performance in data display; Germany and Hungary in geometric shapes and measures and data display; Lithuania in geometric shapes and measures; and the Slovak Republic in number and data display. Australia had a decrease in data display, and New Zealand decreases in geometric shapes and measures and data display. Alberta province had increased achievement in number, but lower achievement in geometric shapes and measures and data display.

Of the TIMSS 2011 eighth grade participants that also participated in 2007 and have comparable data, there were both participants with increases and participants with decreases in average mathematics achievement over the period. From Exhibit 1.6 it can be seen that nine countries (Bahrain, Chinese Taipei, Georgia, Italy, Korea, Palestine, the Russian Federation, Singapore, and the Ukraine) and Dubai, UAE had higher average mathematics achievement in 2011 than in 2007, and six countries (Hungary, Jordan, Malaysia, Sweden, Syria, and Thailand) had lower achievement. Exhibit 3.6 shows that in four of the countries with an overall increase—Italy, Palestine, the Russian Federation, and the Ukraine—the increase was due to improved performance in all four mathematics content domains. In Chinese Taipei, the increase was due to improvements in number and geometry; in Bahrain, Georgia, and Dubai due to improved number, algebra, and data and chance; in Korea due to improved number, geometry, and data and chance; and in Singapore due to improved algebra, geometry, and data and chance. Among the countries with an overall decrease in mathematics achievement, only Jordan and Malaysia had decreases in all four content domains. Syria had declines in number, geometry, and data and chance. Of the others, the decline in Hungary was due mainly to a drop in algebra performance; in Sweden

Exhibit 3.5: Trends in Achievement for Mathematics Content Domains

Country	Number			Geometric Shapes and Measures		
	2011 Average Scale Score	2007 Average Scale Score	Difference	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	508 (3.2)	503 (3.5)	5 (4.8)	534 (3.0)	536 (3.7)	-3 (4.8)
Austria	506 (2.5)	506 (2.2)	0 (3.3)	512 (3.4)	506 (2.8)	6 (4.4)
Chinese Taipei	599 (2.0)	583 (1.8)	17 (2.7) ▲	573 (2.1)	566 (2.7)	7 (3.4) ▲
Czech Republic	509 (2.5)	486 (2.9)	23 (3.8) ▲	513 (3.0)	487 (3.3)	26 (4.5) ▲
Denmark	534 (2.4)	513 (2.9)	21 (3.8) ▲	548 (3.0)	546 (3.2)	2 (4.4)
England	539 (3.7)	535 (3.1)	4 (4.8)	545 (3.9)	552 (3.3)	-6 (5.1)
Georgia	473 (3.1)	470 (3.7)	2 (4.8)	411 (4.3)	395 (5.9)	16 (7.3) ▲
Germany	520 (2.3)	524 (2.2)	-4 (3.2)	536 (2.6)	527 (2.4)	9 (3.6) ▲
Hong Kong SAR	604 (3.3)	608 (3.7)	-4 (5.0)	605 (3.4)	613 (3.7)	-9 (5.1)
Hungary	515 (3.2)	515 (3.5)	0 (4.8)	520 (3.6)	507 (3.9)	14 (5.3) ▲
Iran, Islamic Rep. of	440 (3.3)	407 (3.5)	32 (4.8) ▲	435 (3.9)	408 (3.9)	26 (5.6) ▲
Italy	510 (2.7)	510 (3.0)	0 (4.0)	513 (3.1)	507 (3.6)	6 (4.8)
Japan	584 (1.6)	564 (2.1)	20 (2.7) ▲	589 (2.0)	575 (2.6)	14 (3.3) ▲
Lithuania	537 (2.4)	536 (2.2)	1 (3.3)	531 (3.0)	518 (3.0)	12 (4.2) ▲
Netherlands	543 (1.7)	539 (2.2)	4 (2.7)	524 (2.9)	522 (2.7)	2 (4.0)
New Zealand	483 (2.5)	485 (2.6)	-3 (3.6)	483 (2.5)	495 (2.6)	-12 (3.6) ▼
Norway	488 (3.1)	468 (2.8)	20 (4.2) ▲	507 (3.0)	479 (3.6)	27 (4.7) ▲
Russian Federation	545 (3.3)	549 (4.4)	-4 (5.4)	542 (4.3)	543 (6.2)	-1 (7.5)
Singapore	619 (3.4)	611 (4.1)	8 (5.4)	589 (3.6)	584 (4.4)	5 (5.7)
Slovak Republic	511 (3.7)	500 (3.9)	11 (5.4) ▲	500 (4.3)	494 (5.3)	6 (6.8)
Slovenia	503 (2.7)	490 (1.9)	13 (3.2) ▲	526 (2.3)	520 (2.0)	6 (3.0) ▲
Sweden	500 (2.2)	495 (2.5)	5 (3.3)	500 (2.4)	503 (2.9)	-4 (3.8)
^ψ Tunisia	390 (3.7)	359 (4.5)	31 (5.8) ▲	329 (4.6)	296 (5.4)	33 (7.1) ▲
United States	543 (2.0)	529 (2.6)	13 (3.3) ▲	535 (2.2)	522 (3.0)	13 (3.7) ▲
Benchmarking Participants						
Alberta, Canada	505 (2.7)	496 (3.1)	10 (4.2) ▲	496 (2.6)	508 (3.5)	-12 (4.4) ▼
Ontario, Canada	504 (3.4)	495 (3.5)	9 (4.9)	535 (3.4)	530 (3.6)	5 (5.0)
Quebec, Canada	531 (2.6)	515 (3.0)	16 (4.0) ▲	536 (3.2)	524 (3.9)	12 (5.0) ▲
Dubai, UAE	474 (1.7)	452 (2.0)	21 (2.6) ▲	449 (2.3)	424 (3.3)	26 (4.1) ▲

▲ 2011 average significantly higher
▼ 2011 average significantly lower

^ψ Reservations about reliability of average achievement in TIMSS 2011, because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.5: Trends in Achievement for Mathematics Content Domains (Continued)

Country	Data Display			
	2011 Average Scale Score	2007 Average Scale Score	Difference	
Australia	515 (3.1)	532 (4.1)	-17 (5.2)	▼
Austria	515 (3.1)	502 (3.4)	13 (4.6)	▲
Chinese Taipei	600 (2.6)	576 (2.3)	24 (3.4)	▲
Czech Republic	519 (3.1)	482 (4.2)	37 (5.2)	▲
Denmark	532 (3.0)	527 (4.2)	5 (5.2)	
England	549 (4.6)	551 (3.1)	-1 (5.6)	
Georgia	433 (4.0)	390 (5.4)	43 (6.7)	▲
Germany	546 (2.8)	532 (3.7)	14 (4.6)	▲
Hong Kong SAR	593 (3.6)	600 (3.4)	-7 (5.0)	
Hungary	510 (4.2)	497 (4.2)	13 (6.0)	▲
Iran, Islamic Rep. of	397 (4.3)	374 (5.0)	24 (6.6)	▲
Italy	495 (3.1)	499 (4.1)	-4 (5.1)	
Japan	590 (2.9)	588 (3.5)	2 (4.6)	
Lithuania	526 (3.0)	529 (3.6)	-3 (4.7)	
Netherlands	559 (2.9)	545 (2.8)	14 (4.0)	▲
New Zealand	491 (2.7)	506 (3.0)	-15 (4.1)	▼
Norway	494 (3.2)	474 (2.9)	20 (4.4)	▲
Russian Federation	533 (4.1)	529 (6.2)	4 (7.4)	
Singapore	588 (3.4)	597 (3.9)	-9 (5.2)	
Slovak Republic	504 (4.6)	482 (5.4)	22 (7.1)	▲
Slovenia	532 (2.6)	512 (2.6)	21 (3.7)	▲
Sweden	523 (3.0)	527 (3.2)	-4 (4.3)	
^ψ Tunisia	300 (5.5)	267 (5.5)	33 (7.8)	▲
United States	545 (1.8)	546 (2.9)	-1 (3.4)	
Benchmarking Participants				
Alberta, Canada	524 (3.1)	537 (4.5)	-13 (5.4)	▼
Ontario, Canada	536 (3.5)	545 (4.0)	-9 (5.3)	
Quebec, Canada	538 (3.7)	523 (4.4)	15 (5.7)	▲
Dubai, UAE	471 (3.1)	444 (3.1)	27 (4.3)	▲

- ▲ 2011 average significantly higher
 ▼ 2011 average significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.6: Trends in Achievement for Mathematics Content Domains

Country	Number			Algebra		
	2011 Average Scale Score	2007 Average Scale Score	Difference	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	513 (5.4)	504 (4.0)	9 (6.7)	489 (5.3)	474 (4.2)	15 (6.7) ▲
Ψ Bahrain	397 (1.7)	381 (2.5)	15 (3.0) ▲	424 (1.7)	397 (1.7)	28 (2.4) ▲
Chinese Taipei	598 (3.1)	586 (4.3)	12 (5.3) ▲	628 (3.8)	629 (6.0)	-1 (7.1)
England	512 (5.8)	511 (5.4)	1 (7.9)	489 (5.7)	496 (5.1)	-7 (7.6)
Georgia	435 (3.5)	416 (6.2)	19 (7.1) ▲	450 (3.8)	416 (7.3)	34 (8.2) ▲
Hong Kong SAR	588 (3.7)	575 (5.9)	13 (7.0)	583 (3.9)	575 (6.0)	8 (7.1)
Hungary	510 (3.9)	520 (3.9)	-11 (5.5)	496 (4.0)	508 (3.8)	-11 (5.5) ▼
Ψ Indonesia	375 (4.8)	393 (4.1)	-18 (6.3) ▼	392 (3.8)	399 (3.9)	-7 (5.5)
Ψ Iran, Islamic Rep. of	402 (4.9)	388 (4.3)	14 (6.6) ▲	422 (4.3)	405 (4.2)	18 (6.0) ▲
Italy	496 (2.9)	480 (3.1)	16 (4.2) ▲	491 (2.7)	460 (3.6)	30 (4.5) ▲
Japan	557 (3.0)	558 (2.4)	-2 (3.8)	570 (3.0)	567 (2.9)	3 (4.2)
Ψ Jordan	390 (3.8)	412 (4.9)	-22 (6.2) ▼	432 (3.9)	445 (4.4)	-14 (5.9) ▼
Korea, Rep. of	618 (2.6)	592 (2.4)	25 (3.6) ▲	617 (3.2)	608 (3.3)	9 (4.6)
Lebanon	451 (3.8)	453 (3.7)	-1 (5.3)	471 (3.8)	468 (3.5)	3 (5.1)
Lithuania	501 (2.5)	507 (2.8)	-6 (3.8)	492 (2.8)	487 (2.9)	5 (4.0)
Malaysia	451 (5.8)	494 (5.5)	-43 (8.0) ▼	430 (5.2)	455 (4.9)	-26 (7.2) ▼
Norway	492 (2.8)	485 (2.1)	8 (3.5) ▲	432 (2.7)	424 (2.8)	8 (3.9) ▲
Ψ Oman	351 (3.0)	354 (3.0)	-4 (4.3)	383 (2.8)	384 (3.4)	0 (4.4)
Ψ Palestinian Nat'l Auth.	400 (3.4)	355 (3.8)	44 (5.1) ▲	419 (3.3)	370 (4.0)	48 (5.2) ▲
Romania	448 (4.1)	455 (3.8)	-7 (5.6)	477 (4.3)	480 (5.0)	-3 (6.6)
Russian Federation	534 (3.2)	510 (4.2)	25 (5.3) ▲	556 (3.7)	525 (4.8)	31 (6.1) ▲
Singapore	611 (3.6)	605 (3.7)	6 (5.2)	614 (4.1)	591 (3.9)	23 (5.7) ▲
Slovenia	511 (2.5)	504 (2.5)	7 (3.6)	493 (2.6)	491 (2.6)	2 (3.7)
Sweden	504 (1.8)	505 (1.9)	-2 (2.6)	459 (2.2)	459 (2.7)	0 (3.5)
Ψ Syrian Arab Republic	373 (4.0)	385 (4.1)	-12 (5.7) ▼	391 (4.9)	398 (4.1)	-6 (6.4)
Thailand	425 (4.6)	443 (5.2)	-18 (7.0) ▼	425 (4.3)	431 (5.5)	-5 (7.0)
Tunisia	431 (2.8)	420 (2.8)	11 (3.9) ▲	419 (2.9)	419 (3.0)	0 (4.2)
Ukraine	472 (4.1)	458 (4.1)	14 (5.8) ▲	487 (4.4)	465 (4.2)	23 (6.1) ▲
United States	514 (3.0)	514 (3.0)	0 (4.2)	512 (2.6)	507 (3.0)	5 (4.0)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Benchmarking Participants

Ontario, Canada	519 (2.6)	528 (4.2)	-9 (4.9)	497 (2.4)	496 (3.9)	1 (4.6)
Quebec, Canada	543 (2.5)	537 (3.6)	5 (4.4)	516 (2.9)	512 (3.6)	4 (4.6)
Dubai, UAE	479 (2.3)	458 (3.2)	21 (3.9) ▲	489 (2.4)	476 (2.6)	13 (3.6) ▲
Massachusetts, US	567 (5.9)	554 (5.3)	13 (8.0)	559 (5.6)	547 (5.4)	13 (7.8)
Minnesota, US	556 (5.3)	542 (4.4)	14 (6.9) ▲	543 (4.9)	524 (5.0)	19 (7.0) ▲

▲ 2011 average significantly higher

▼ 2011 average significantly lower

Ψ Reservations about reliability of average achievement in TIMSS 2011, because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.6: Trends in Achievement for Mathematics Content Domains (Continued)

Country	Geometry			Data and Chance		
	2011 Average Scale Score	2007 Average Scale Score	Difference	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	499 (5.4)	488 (3.9)	11 (6.6)	534 (5.9)	526 (4.3)	8 (7.3)
Ψ Bahrain	398 (2.6)	403 (2.8)	-5 (3.9)	407 (2.6)	400 (2.6)	8 (3.7) ▲
Chinese Taipei	625 (3.7)	605 (5.6)	20 (6.7) ▲	584 (3.0)	579 (4.5)	5 (5.4)
England	498 (5.7)	513 (5.0)	-15 (7.6) ▼	543 (6.8)	552 (6.0)	-9 (9.1)
Georgia	406 (4.2)	402 (7.2)	5 (8.4)	392 (4.5)	350 (5.1)	42 (6.8) ▲
Hong Kong SAR	597 (4.3)	580 (6.2)	18 (7.6) ▲	581 (4.1)	560 (6.0)	21 (7.2) ▲
Hungary	501 (4.1)	510 (4.1)	-9 (5.8)	517 (4.3)	527 (4.0)	-10 (5.9)
Ψ Indonesia	377 (5.3)	387 (4.7)	-11 (7.0)	376 (4.8)	382 (4.3)	-6 (6.4)
Ψ Iran, Islamic Rep. of	437 (4.8)	414 (4.8)	23 (6.8) ▲	393 (4.9)	396 (4.0)	-3 (6.4)
Italy	512 (3.5)	491 (3.5)	21 (5.0) ▲	499 (3.2)	485 (3.7)	15 (4.9) ▲
Japan	586 (3.5)	584 (2.6)	2 (4.4)	579 (3.0)	591 (2.7)	-11 (4.0) ▼
Ψ Jordan	407 (3.7)	429 (4.2)	-22 (5.6) ▼	379 (3.7)	406 (4.4)	-27 (5.7) ▼
Korea, Rep. of	612 (2.7)	600 (2.6)	12 (3.8) ▲	616 (2.5)	602 (2.6)	14 (3.6) ▲
Lebanon	447 (3.8)	455 (4.2)	-8 (5.7)	393 (5.2)	388 (5.2)	5 (7.3)
Lithuania	500 (3.1)	509 (3.1)	-9 (4.4) ▼	515 (2.8)	526 (2.8)	-10 (4.0) ▼
Malaysia	432 (6.4)	474 (6.2)	-42 (8.9) ▼	429 (5.3)	459 (5.0)	-30 (7.3) ▼
Norway	461 (3.5)	458 (2.6)	3 (4.4)	513 (3.6)	502 (2.8)	11 (4.6) ▲
Ψ Oman	377 (2.7)	377 (3.2)	0 (4.2)	342 (3.1)	365 (4.0)	-23 (5.1) ▼
Ψ Palestinian Nat'l Auth.	416 (3.6)	378 (4.3)	38 (5.6) ▲	368 (3.6)	344 (3.7)	24 (5.2) ▲
Romania	453 (4.5)	463 (4.4)	-10 (6.3)	429 (4.0)	415 (4.4)	13 (5.9) ▲
Russian Federation	533 (4.0)	510 (4.8)	23 (6.2) ▲	511 (3.9)	483 (4.7)	28 (6.1) ▲
Singapore	609 (3.9)	590 (4.0)	19 (5.6) ▲	607 (4.4)	589 (5.1)	18 (6.7) ▲
Slovenia	504 (3.1)	500 (3.0)	4 (4.3)	518 (3.3)	509 (2.9)	9 (4.4) ▲
Sweden	456 (2.3)	472 (2.7)	-17 (3.6) ▼	504 (2.7)	526 (3.8)	-22 (4.7) ▼
Ψ Syrian Arab Republic	386 (5.0)	409 (4.1)	-22 (6.5) ▼	343 (4.7)	364 (2.9)	-20 (5.5) ▼
Thailand	415 (5.4)	437 (5.9)	-22 (8.0) ▼	431 (4.1)	438 (4.9)	-8 (6.4)
Tunisia	426 (3.2)	431 (2.8)	-5 (4.2)	398 (3.3)	392 (2.9)	7 (4.4)
Ukraine	476 (4.3)	464 (4.0)	11 (5.9) ▲	471 (4.0)	448 (4.2)	22 (5.8) ▲
United States	485 (2.7)	480 (2.8)	5 (3.9)	527 (3.3)	533 (3.5)	-5 (4.8)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Benchmarking Participants

Ontario, Canada	512 (2.7)	510 (4.7)	1 (5.4)	531 (4.1)	547 (5.0)	-17 (6.5) ▼
Quebec, Canada	529 (2.7)	527 (3.6)	1 (4.5)	549 (2.8)	540 (3.8)	8 (4.7)
Dubai, UAE	453 (3.0)	445 (3.6)	7 (4.7)	468 (2.8)	444 (3.4)	23 (4.4) ▲
Massachusetts, US	548 (5.5)	523 (5.0)	25 (7.5) ▲	584 (7.3)	579 (6.3)	5 (9.6)
Minnesota, US	515 (6.2)	507 (4.8)	8 (7.9)	571 (6.2)	571 (7.0)	0 (9.4)

▲ 2011 average significantly higher

▼ 2011 average significantly lower

due to lower geometry and data and chance achievement; and in Thailand due to a decrease in number and geometry achievement.

Although not showing an overall increase in eighth grade mathematics achievement between 2007 and 2011, a number of participants had improved performance in one or more content domains, including Australia (algebra), Hong Kong SAR (geometry, data and chance), Iran (number, algebra, geometry), Norway (number, algebra, data and chance), Slovenia (data and chance), Tunisia (number), Massachusetts (geometry), and Minnesota (number, algebra). Several participants also had lower achievement in one or more content domains in 2011 without having lower overall mathematics achievement, including England (geometry), Indonesia (number), Japan (data and chance), Lithuania (geometry, data and chance), Oman (data and chance), and Ontario (data and chance).

Trends in Achievement in Mathematics Cognitive Domains

Exhibits 3.7 and 3.8 show changes from 2007 to 2011 in average achievement in the mathematics cognitive domains for fourth and eighth grade students, respectively. As with the content domains, overall increases or decreases in mathematics achievement since 2007 were reflected in increases or decreases in the cognitive domains. As shown in Exhibit 3.7, the overall increase in mathematics achievement was due to increases in all three cognitive domains in the Czech Republic, Denmark, Iran, Japan, Norway, Slovenia, and Tunisia as well as Québec and Dubai. In Chinese Taipei and the United States, the overall increase was due mainly to increases in the knowing and applying domains, whereas in Georgia it was the result of improvement in the applying and reasoning domains. Although not showing an overall increase in fourth grade mathematics achievement between 2007 and 2011, a number of countries had improved performance in one or more cognitive domains, including Germany, the Netherlands, and Ontario province (knowing), Lithuania (reasoning), and the Slovak Republic (knowing, reasoning). New Zealand, while not having lower overall mathematics achievement, performed less well in reasoning in 2011 than in 2007.

Exhibit 3.8 shows that for six of the nine countries with higher average mathematics achievement in 2011 than in 2007 (Georgia, Italy, Palestine, the Russian Federation, Singapore, and the Ukraine) and for Dubai, the increase was due to improved performance in all three mathematics cognitive domains. Whereas for Bahrain, the increase was mainly due to improved performance in knowing and reasoning; for Chinese Taipei, improved performance in applying; and, for Korea, improved performance in applying and reasoning.

Among the six countries with an overall decrease, Jordan and Malaysia had lower achievement in all three cognitive domains. Of the others, Hungary had lower achievement in knowing and reasoning, Sweden in reasoning, and Syria as well as Thailand in applying and reasoning.

Countries without an overall increase in eighth grade mathematics achievement between 2007 and 2011 but with improved performance in one or another cognitive domains included Australia, Hong Kong SAR, Iran, Norway, Slovenia, Tunisia, and the state of Minnesota. Indonesia and Japan had lower achievement in the knowing domain in 2011 than in 2007, and Oman in the reasoning domain.

Achievement in the Mathematics Content and Cognitive Domains by Gender

Exhibits 3.9 and 3.10 present the TIMSS 2011 gender differences in average achievement for the content domains at the fourth and eighth grades. At the fourth grade, boys had higher achievement in number than girls in 22 countries and five benchmarking entities, compared to only four countries where girls outperformed boys. Boys had higher achievement in geometric shapes and measures than girls in nine countries and two benchmarking entities, compared with eight countries and one benchmarking entity where girls outperformed boys. In data display, girls had higher achievement than boys in eleven countries and one benchmarking entity, compared to just four countries where boys had higher achievement. On average across the fourth grade countries, boys had a 3-point advantage in number whereas girls had a 2-point advantage in geometric shapes and measures and a 4-point advantage in data display. At the sixth grade, girls in Botswana performed better than boys in all three content domains, and in Honduras, boys performed better in number than girls.

As shown in Exhibit 3.10, on average across the eighth grade countries, boys had higher achievement than girls in number (468 vs. 464) but girls had higher achievement in algebra (476 vs. 464), geometry (464 vs. 461), and data and chance (459 vs. 456). Boys outperformed girls in number in 18 countries and nine benchmarking entities, while girls outperformed boys in algebra in 22 countries and five benchmarking entities, in geometry in nine countries and one benchmarking entity, and in data and chance in one country.

Exhibits 3.11 and 3.12 present gender differences in the cognitive domains for the fourth and eighth grades. On average across the fourth grade countries, boys had higher achievement than girls in the reasoning domain. However, across the eighth grade countries, girls outperformed boys on average in both the knowing and reasoning domains.

Exhibit 3.7: Trends in Achievement for Mathematics Cognitive Domains

Country	Knowing			Applying		
	2011 Average Scale Score	2007 Average Scale Score	Difference	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	516 (3.5)	511 (4.4)	5 (5.6)	519 (3.0)	522 (3.8)	-3 (4.8)
Austria	507 (2.5)	504 (2.1)	4 (3.3)	506 (2.6)	505 (2.0)	0 (3.3)
Chinese Taipei	599 (2.1)	586 (1.9)	13 (2.8) ▲	593 (2.0)	574 (1.9)	19 (2.8) ▲
Czech Republic	502 (2.4)	472 (2.5)	30 (3.5) ▲	512 (2.8)	493 (2.9)	19 (4.0) ▲
Denmark	531 (2.6)	514 (2.8)	18 (3.9) ▲	539 (2.9)	527 (2.8)	12 (4.1) ▲
England	552 (4.3)	546 (3.7)	6 (5.6)	542 (3.7)	542 (3.3)	0 (5.0)
Georgia	449 (3.7)	445 (4.2)	4 (5.7)	447 (3.4)	430 (4.7)	17 (5.8) ▲
Germany	524 (2.3)	515 (2.1)	9 (3.1) ▲	528 (2.3)	530 (2.4)	-2 (3.3)
Hong Kong SAR	619 (3.2)	622 (3.7)	-3 (4.9)	597 (3.2)	606 (3.8)	-9 (5.0)
Hungary	519 (3.8)	511 (3.6)	8 (5.2)	513 (3.3)	506 (3.8)	7 (5.0)
Iran, Islamic Rep. of	435 (3.8)	404 (3.8)	31 (5.4) ▲	427 (3.6)	397 (3.9)	30 (5.3) ▲
Italy	510 (2.7)	512 (3.5)	-3 (4.4)	506 (2.8)	499 (3.1)	7 (4.2)
Japan	590 (1.7)	567 (2.4)	24 (2.9) ▲	579 (1.6)	570 (2.2)	9 (2.7) ▲
Lithuania	525 (3.0)	520 (2.8)	5 (4.1)	540 (2.5)	540 (2.7)	0 (3.6)
Netherlands	537 (2.0)	528 (2.4)	9 (3.1) ▲	540 (1.6)	540 (2.2)	0 (2.7)
New Zealand	476 (3.2)	484 (2.7)	-7 (4.2)	490 (2.4)	493 (2.6)	-3 (3.5)
Norway	487 (3.1)	459 (3.0)	28 (4.3) ▲	499 (3.0)	475 (2.9)	24 (4.2) ▲
Russian Federation	541 (3.4)	539 (4.9)	2 (5.9)	539 (3.9)	549 (5.3)	-9 (6.6)
Singapore	629 (3.5)	625 (4.3)	4 (5.5)	602 (3.4)	597 (4.1)	5 (5.4)
Slovak Republic	506 (3.8)	491 (4.3)	15 (5.7) ▲	505 (4.0)	496 (4.4)	9 (5.9)
Slovenia	510 (2.8)	498 (2.0)	12 (3.4) ▲	514 (2.3)	502 (2.0)	12 (3.1) ▲
Sweden	489 (2.2)	483 (2.6)	6 (3.4)	507 (2.2)	506 (2.3)	1 (3.2)
^ψ Tunisia	370 (4.0)	330 (5.3)	40 (6.7) ▲	346 (4.4)	319 (5.2)	27 (6.8) ▲
United States	556 (2.1)	541 (2.8)	14 (3.5) ▲	539 (2.1)	524 (2.8)	15 (3.5) ▲
Benchmarking Participants						
Alberta, Canada	498 (2.9)	494 (3.3)	4 (4.4)	508 (2.6)	503 (3.1)	4 (4.0)
Ontario, Canada	510 (3.5)	498 (3.4)	11 (4.8) ▲	521 (3.5)	513 (3.3)	8 (4.8)
Quebec, Canada	536 (2.6)	519 (3.1)	18 (4.0) ▲	529 (2.6)	516 (2.9)	13 (3.9) ▲
Dubai, UAE	472 (2.4)	454 (2.4)	18 (3.4) ▲	465 (2.3)	436 (1.8)	29 (2.9) ▲

▲ 2011 average significantly higher

▼ 2011 average significantly lower

^ψ Reservations about reliability of average achievement in TIMSS 2011, because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.7: Trends in Achievement for Mathematics Cognitive Domains (Continued)

Country	Reasoning		
	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	513 (2.6)	516 (3.7)	-3 (4.6)
Austria	513 (3.3)	506 (2.3)	7 (4.0)
Chinese Taipei	577 (2.5)	571 (2.0)	6 (3.2)
Czech Republic	523 (2.7)	491 (3.7)	31 (4.6) ▲
Denmark	543 (2.7)	525 (2.2)	17 (3.5) ▲
England	531 (3.7)	539 (3.4)	-8 (5.0)
Georgia	450 (3.5)	433 (4.6)	18 (5.8) ▲
Germany	532 (3.0)	530 (2.9)	2 (4.2)
Hong Kong SAR	589 (3.4)	596 (3.8)	-7 (5.1)
Hungary	514 (3.7)	510 (4.2)	5 (5.6)
Iran, Islamic Rep. of	423 (3.0)	401 (4.3)	22 (5.3) ▲
Italy	505 (3.4)	511 (3.3)	-5 (4.8)
Japan	592 (2.0)	569 (2.2)	22 (3.0) ▲
Lithuania	536 (2.5)	529 (2.8)	8 (3.7) ▲
Netherlands	543 (2.6)	537 (2.5)	7 (3.6)
New Zealand	490 (2.5)	502 (2.8)	-12 (3.8) ▼
Norway	501 (3.3)	486 (2.9)	15 (4.4) ▲
Russian Federation	548 (3.6)	544 (5.3)	4 (6.4)
Singapore	588 (3.7)	584 (4.1)	4 (5.5)
Slovak Republic	511 (3.9)	499 (4.5)	12 (6.0) ▲
Slovenia	516 (2.9)	504 (2.4)	12 (3.7) ▲
Sweden	520 (3.0)	519 (2.8)	0 (4.1)
^ψ Tunisia	335 (4.7)	313 (5.4)	21 (7.2) ▲
United States	525 (2.2)	525 (2.4)	1 (3.2)
Benchmarking Participants			
Alberta, Canada	514 (3.0)	520 (3.2)	-6 (4.4)
Ontario, Canada	522 (3.1)	526 (2.9)	-5 (4.2)
Quebec, Canada	534 (2.5)	523 (3.2)	12 (4.0) ▲
Dubai, UAE	464 (2.2)	441 (2.9)	23 (3.7) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

- ▲ 2011 average significantly higher
- ▼ 2011 average significantly lower

Exhibit 3.8: Trends in Achievement for Mathematics Cognitive Domains

Country	Knowing			Applying		
	2011 Average Scale Score	2007 Average Scale Score	Difference	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	504 (5.1)	490 (3.8)	14 (6.3) ▲	506 (4.8)	498 (3.6)	8 (6.0)
Ψ Bahrain	411 (2.4)	389 (1.9)	23 (3.0) ▲	400 (2.4)	400 (2.4)	0 (3.4)
Chinese Taipei	611 (3.7)	604 (4.9)	7 (6.1)	614 (3.5)	597 (4.6)	17 (5.8) ▲
England	501 (5.4)	508 (4.6)	-6 (7.1)	508 (5.5)	514 (5.1)	-5 (7.4)
Georgia	438 (4.2)	419 (6.0)	19 (7.3) ▲	425 (3.6)	399 (5.7)	26 (6.8) ▲
Hong Kong SAR	591 (3.9)	583 (6.0)	8 (7.2)	587 (3.7)	572 (6.2)	15 (7.2) ▲
Hungary	507 (3.8)	522 (3.7)	-15 (5.3) ▼	505 (3.5)	513 (3.3)	-9 (4.8)
Ψ Indonesia	378 (4.8)	391 (4.0)	-13 (6.2) ▼	384 (4.7)	396 (3.7)	-12 (6.0)
Ψ Iran, Islamic Rep. of	410 (4.4)	397 (4.1)	13 (6.1) ▲	411 (4.6)	399 (4.3)	12 (6.3)
Italy	494 (2.6)	474 (3.3)	20 (4.2) ▲	503 (2.2)	482 (2.9)	20 (3.6) ▲
Japan	558 (2.7)	569 (2.8)	-11 (3.9) ▼	574 (2.5)	568 (2.4)	6 (3.5)
Ψ Jordan	405 (4.3)	425 (4.4)	-20 (6.2) ▼	397 (3.8)	421 (4.5)	-24 (5.9) ▼
Korea, Rep. of	616 (2.9)	608 (3.2)	8 (4.3)	617 (2.9)	600 (2.8)	16 (4.0) ▲
Lebanon	464 (3.9)	457 (4.2)	7 (5.7)	436 (4.1)	447 (4.6)	-11 (6.1)
Lithuania	502 (2.6)	509 (2.7)	-8 (3.8) ▼	508 (2.4)	511 (2.5)	-3 (3.5)
Malaysia	444 (5.7)	473 (5.4)	-29 (7.9) ▼	439 (5.2)	477 (5.2)	-38 (7.3) ▼
Norway	465 (2.5)	457 (2.0)	8 (3.2) ▲	480 (2.6)	475 (2.4)	5 (3.6)
Ψ Oman	365 (3.0)	366 (3.7)	-1 (4.8)	360 (3.0)	365 (3.2)	-5 (4.3)
Ψ Palestinian Nat'l Auth.	406 (3.5)	359 (3.8)	48 (5.1) ▲	397 (3.5)	369 (3.7)	28 (5.0) ▲
Romania	460 (4.4)	464 (4.4)	-4 (6.3)	454 (3.9)	461 (4.1)	-7 (5.6)
Russian Federation	548 (3.6)	521 (4.4)	28 (5.7) ▲	538 (3.5)	510 (3.9)	28 (5.3) ▲
Singapore	617 (3.8)	592 (3.7)	25 (5.4) ▲	613 (3.9)	597 (3.8)	16 (5.5) ▲
Slovenia	508 (2.4)	501 (2.5)	7 (3.4) ▲	502 (2.1)	502 (2.1)	0 (2.9)
Sweden	478 (2.0)	480 (2.3)	-2 (3.0)	489 (2.2)	495 (2.1)	-6 (3.0)
Ψ Syrian Arab Republic	374 (4.4)	386 (4.5)	-12 (6.3)	379 (4.2)	398 (3.7)	-19 (5.6) ▼
Thailand	423 (4.7)	432 (5.2)	-8 (7.0)	428 (4.1)	444 (4.9)	-16 (6.3) ▼
Tunisia	425 (2.8)	414 (2.8)	11 (4.0) ▲	421 (2.9)	422 (2.6)	0 (3.9)
Ukraine	481 (4.4)	467 (3.8)	14 (5.8) ▲	480 (4.3)	462 (3.6)	18 (5.6) ▲
United States	519 (2.7)	517 (2.9)	2 (4.0)	503 (2.8)	502 (3.0)	1 (4.1)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Benchmarking Participants

Ontario, Canada	503 (2.6)	509 (3.6)	-6 (4.4)	510 (2.4)	518 (3.8)	-8 (4.5)
Quebec, Canada	528 (2.9)	524 (3.0)	4 (4.2)	536 (2.7)	529 (3.2)	6 (4.2)
Dubai, UAE	488 (2.3)	465 (2.6)	23 (3.5) ▲	465 (2.4)	454 (3.2)	11 (4.0) ▲
Massachusetts, US	569 (5.9)	554 (5.1)	14 (7.8)	555 (5.6)	543 (4.5)	12 (7.2)
Minnesota, US	556 (4.9)	539 (5.2)	17 (7.2) ▲	540 (5.5)	529 (5.1)	11 (7.5)

▲ 2011 average significantly higher

▼ 2011 average significantly lower

Ψ Reservations about reliability of average achievement in TIMSS 2011, because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 3.8: Trends in Achievement for Mathematics Cognitive Domains (Continued)

Country	Reasoning		
	2011 Average Scale Score	2007 Average Scale Score	Difference
Australia	506 (4.9)	503 (4.0)	3 (6.4)
Ψ Bahrain	415 (2.1)	406 (2.5)	9 (3.3) ▲
Chinese Taipei	609 (3.4)	602 (4.3)	7 (5.5)
England	510 (5.5)	518 (4.9)	-8 (7.4) ▼
Georgia	414 (4.2)	383 (5.9)	30 (7.2) ▲
Hong Kong SAR	580 (3.9)	567 (5.9)	13 (7.1)
Hungary	502 (3.7)	515 (3.6)	-13 (5.2) ▼
Ψ Indonesia	388 (3.8)	394 (3.5)	-7 (5.2)
Ψ Iran, Islamic Rep. of	428 (4.3)	417 (3.9)	11 (5.8)
Italy	496 (2.6)	482 (3.3)	14 (4.2) ▲
Japan	579 (3.0)	577 (2.6)	2 (4.0)
Ψ Jordan	416 (3.8)	434 (3.9)	-19 (5.5) ▼
Korea, Rep. of	612 (2.5)	592 (2.5)	20 (3.6) ▲
Lebanon	426 (4.7)	423 (4.4)	3 (6.4)
Lithuania	493 (2.5)	487 (2.8)	6 (3.7)
Malaysia	426 (5.5)	466 (4.6)	-40 (7.2) ▼
Norway	478 (2.9)	474 (2.6)	4 (3.9)
Ψ Oman	369 (2.8)	389 (3.3)	-20 (4.3) ▼
Ψ Palestinian Nat'l Auth.	404 (4.1)	371 (3.9)	34 (5.7) ▲
Romania	455 (4.0)	445 (4.9)	11 (6.3)
Russian Federation	531 (3.7)	499 (4.0)	32 (5.5) ▲
Singapore	604 (4.3)	589 (4.5)	15 (6.2) ▲
Slovenia	500 (2.7)	497 (2.9)	3 (3.9)
Sweden	478 (2.4)	493 (2.9)	-15 (3.8) ▼
Ψ Syrian Arab Republic	371 (5.4)	387 (3.8)	-16 (6.7) ▼
Thailand	429 (4.3)	452 (5.0)	-23 (6.6) ▼
Tunisia	423 (2.7)	419 (2.8)	4 (3.9)
Ukraine	467 (4.2)	441 (4.2)	27 (5.9) ▲
United States	503 (2.7)	506 (2.8)	-3 (3.9)
Benchmarking Participants			
Ontario, Canada	524 (2.8)	526 (3.6)	-1 (4.6)
Quebec, Canada	529 (2.7)	528 (3.3)	1 (4.2)
Dubai, UAE	470 (2.7)	460 (3.0)	10 (4.0) ▲
Massachusetts, US	562 (5.9)	548 (4.5)	14 (7.5)
Minnesota, US	536 (5.4)	528 (4.7)	8 (7.2)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

▲ 2011 average significantly higher

▼ 2011 average significantly lower

Exhibit 3.9: Achievement in Mathematics Content Domains by Gender

Country	Number		Geometric Shapes and Measures		Data Display	
	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	485 (3.3)	483 (3.6)	426 (4.4)	422 (5.0)	392 (6.2)	381 (5.2)
Australia	505 (3.6)	511 (4.1)	532 (3.5)	536 (4.1)	512 (4.0)	519 (3.8)
Austria	502 (2.7)	511 (3.1) ▲	507 (3.5)	516 (4.7) ▲	510 (3.0)	520 (4.1) ▲
² Azerbaijan	494 (5.8)	488 (5.4)	440 (7.7)	433 (7.8)	414 (6.6) ▲	402 (6.9)
Bahrain	440 (3.8)	438 (3.9)	426 (5.7)	417 (4.5)	448 (5.6)	436 (4.8)
Belgium (Flemish)	547 (2.5)	556 (2.4) ▲	549 (2.4)	555 (2.1) ▲	533 (4.0)	539 (4.0)
Chile	457 (3.4)	466 (3.3) ▲	449 (3.6)	462 (3.5) ▲	463 (3.6)	468 (3.9)
Chinese Taipei	599 (2.7)	600 (2.5)	576 (2.9)	570 (2.6)	605 (2.8) ▲	596 (3.8)
² Croatia	484 (2.0)	498 (2.7) ▲	487 (2.9)	493 (3.4)	485 (3.3)	491 (3.7)
Czech Republic	502 (3.0)	515 (3.0) ▲	511 (3.4)	515 (3.7)	512 (4.3)	526 (4.2) ▲
² Denmark	530 (2.7)	538 (2.9) ▲	546 (3.5)	550 (3.6)	530 (4.3)	533 (4.2)
England	536 (4.3)	542 (3.8)	544 (4.6)	547 (4.1)	551 (6.3)	547 (4.9)
Finland	538 (2.5)	552 (2.8) ▲	544 (3.5)	543 (3.7)	549 (4.7)	553 (4.7)
¹ Georgia	474 (2.9)	472 (3.9)	416 (4.7)	408 (5.2)	441 (4.1) ▲	425 (4.9)
Germany	514 (2.7)	526 (2.7) ▲	532 (3.1)	540 (2.9) ▲	546 (3.9)	545 (3.6)
² Hong Kong SAR	600 (3.2)	608 (4.0) ▲	600 (3.3)	609 (4.1) ▲	593 (3.5)	593 (4.8)
Hungary	513 (3.4)	517 (3.8)	521 (4.2)	520 (4.1)	510 (4.9)	510 (4.8)
Iran, Islamic Rep. of	439 (5.3)	440 (5.1)	434 (5.9)	435 (5.8)	397 (6.1)	398 (6.7)
Ireland	530 (3.8)	535 (3.3)	519 (4.4)	521 (3.8)	524 (3.6)	522 (5.0)
Italy	505 (3.1)	515 (3.0) ▲	508 (3.5)	517 (3.5) ▲	491 (3.1)	498 (4.1)
Japan	581 (2.0)	587 (2.2) ▲	588 (2.4)	591 (2.6)	591 (2.3)	588 (4.4)
² Kazakhstan	511 (4.5)	518 (4.3) ▲	486 (5.4)	496 (5.8) ▲	477 (6.6)	474 (6.2)
Korea, Rep. of	600 (2.3)	610 (2.2) ▲	606 (3.0)	608 (2.0)	607 (3.9)	599 (3.5)
¹ ✱ Kuwait	348 (4.5) ▲	315 (6.6)	340 (4.6) ▲	298 (7.5)	364 (4.3) ▲	327 (7.4)
^{1 2} Lithuania	536 (2.9)	539 (2.9)	531 (3.7)	530 (3.3)	528 (3.0)	524 (4.1)
Malta	493 (1.9)	502 (2.8) ▲	484 (2.1)	489 (2.0)	497 (2.5)	499 (3.6)
✱ Morocco	344 (3.8)	337 (4.7)	352 (4.7)	348 (5.3)	278 (5.7) ▲	264 (5.5)
† Netherlands	538 (2.3)	549 (2.1) ▲	523 (2.2)	525 (4.1)	557 (2.9)	562 (4.4)
New Zealand	481 (3.2)	485 (3.1)	482 (2.9)	484 (3.1)	496 (3.3) ▲	487 (3.6)
† Northern Ireland	566 (3.3)	567 (3.8)	561 (3.8)	559 (4.3)	558 (3.8)	552 (4.1)
‡ Norway	484 (3.2)	493 (4.0) ▲	505 (3.9)	508 (3.8)	496 (4.3)	492 (4.7)
ψ Oman	394 (3.4) ▲	373 (3.6)	390 (3.7) ▲	363 (3.6)	396 (3.4) ▲	366 (3.7)
Poland	474 (2.7)	486 (2.7) ▲	472 (2.9)	478 (3.4)	486 (5.4)	491 (3.7)
Portugal	519 (4.5)	525 (3.6)	546 (4.5)	550 (4.9)	544 (3.5)	552 (3.7)
² Qatar	421 (4.9)	413 (3.9)	411 (4.8) ▲	388 (4.7)	425 (5.3) ▲	409 (5.7)
Romania	496 (6.2)	498 (5.9)	468 (7.1)	469 (6.1)	460 (7.6)	453 (6.9)
Russian Federation	544 (3.4)	545 (3.5)	545 (4.1)	538 (4.9)	535 (5.3)	530 (4.6)
Saudi Arabia	413 (5.0)	408 (10.7)	418 (5.5) ▲	390 (11.9)	413 (6.8)	392 (9.9)
² Serbia	525 (3.7)	532 (3.5)	494 (4.7)	499 (4.2)	502 (4.3)	503 (4.3)
² Singapore	621 (3.7)	617 (3.8)	591 (3.9)	588 (4.0)	591 (4.1)	584 (4.4)
Slovak Republic	507 (4.1)	515 (3.7) ▲	494 (4.7)	506 (4.3) ▲	502 (5.6)	506 (4.2)
Slovenia	496 (2.6)	510 (3.4) ▲	524 (2.8)	528 (3.1)	530 (2.7)	535 (3.7)
Spain	479 (3.2)	494 (3.6) ▲	473 (3.2)	479 (3.7)	474 (3.9)	484 (4.3) ▲
Sweden	497 (2.8)	504 (2.7) ▲	497 (3.0)	502 (2.8)	525 (3.9)	522 (3.6)
Thailand	468 (4.6) ▲	460 (5.1)	444 (5.8) ▲	430 (6.4)	478 (5.6) ▲	456 (5.7)
ψ Tunisia	391 (4.1)	389 (4.1)	336 (4.9) ▲	324 (5.4)	305 (6.5) ▲	295 (5.6)
Turkey	475 (5.4)	478 (4.4)	451 (5.7)	443 (5.2)	481 (6.0)	475 (5.2)
United Arab Emirates	439 (2.9)	436 (3.7)	426 (3.3) ▲	410 (4.1)	444 (2.7) ▲	430 (3.4)
² United States	538 (2.1)	548 (2.2) ▲	531 (2.4)	539 (2.4) ▲	542 (2.2)	547 (1.8) ▲
✱ Yemen	270 (7.9) ▲	254 (7.0)	202 (7.5) ▲	186 (7.3)	209 (7.1)	200 (7.1)
International Avg.	493 (0.5)	496 (0.6) ▲	485 (0.6) ▲	483 (0.7)	486 (0.7) ▲	482 (0.7)

▲ Average significantly higher than other gender

✱ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes †, ‡, and §.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.9: Achievement in Mathematics Content Domains by Gender (Continued)

Country	Number		Geometric Shapes and Measures		Data Display	
	Girls	Boys	Girls	Boys	Girls	Boys
Sixth Grade Participants						
Botswana	431 (3.9) ▲	410 (4.5)	408 (4.3) ▲	399 (5.5)	437 (4.3) ▲	417 (4.6)
Ψ Honduras	410 (5.5)	425 (5.0) ▲	359 (7.2)	372 (6.7)	371 (7.9)	383 (7.4)
* Yemen	370 (7.3)	366 (6.1)	309 (7.8)	301 (7.3)	350 (7.6) ▲	328 (7.5)
Benchmarking Participants						
² Alberta, Canada	500 (3.4)	510 (3.2) ▲	491 (3.6)	500 (3.5)	521 (3.4)	527 (3.8)
Ontario, Canada	500 (3.6)	508 (3.9) ▲	533 (3.9)	538 (3.7)	536 (3.8)	536 (3.9)
Quebec, Canada	526 (3.0)	537 (3.1) ▲	530 (4.1)	542 (3.0) ▲	535 (3.8)	541 (4.5)
Abu Dhabi, UAE	425 (5.1)	415 (7.1)	413 (5.9) ▲	390 (7.6)	429 (4.6) ▲	408 (6.3)
Dubai, UAE	470 (3.5)	477 (3.8)	451 (3.8)	447 (4.8)	473 (4.4)	470 (4.6)
^{1 3} Florida, US	543 (3.6)	553 (4.2) ▲	543 (4.3)	548 (4.2)	541 (4.9)	542 (4.6)
^{1 2} North Carolina, US	558 (4.2)	570 (4.4) ▲	528 (5.0)	544 (5.9) ▲	557 (6.6)	560 (5.8)

▲ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study - TIMSS 2011

Exhibit 3.10: Achievement in Mathematics Content Domains by Gender

Country	Number		Algebra		Geometry		Data and Chance	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	475 (2.9)	473 (3.0)	503 (3.4) ▲	488 (3.5)	453 (4.3)	448 (3.6)	385 (4.7) ▲	368 (4.0)
Australia	505 (4.9)	521 (7.8) ▲	489 (5.1)	489 (7.5)	492 (5.0)	506 (7.6)	528 (5.3)	541 (8.7)
♯ Bahrain	414 (2.6) ▲	380 (3.1)	448 (2.4) ▲	402 (2.8)	416 (3.1) ▲	380 (3.9)	430 (3.2) ▲	385 (4.8)
Chile	402 (3.7)	425 (3.4) ▲	402 (4.1)	404 (4.3)	412 (3.6)	427 (4.4) ▲	417 (4.0)	435 (3.6) ▲
Chinese Taipei	597 (4.0)	599 (3.6)	636 (4.7) ▲	621 (4.3)	629 (4.8)	621 (4.0)	585 (3.5)	583 (4.4)
‡ England	510 (6.0)	515 (6.9)	495 (5.8)	485 (6.6)	501 (5.8)	495 (6.7)	542 (7.2)	544 (8.8)
Finland	522 (2.5)	531 (3.1) ▲	501 (3.1) ▲	484 (3.3)	505 (3.2)	499 (3.5)	544 (3.4)	541 (3.6)
¹ Georgia	431 (4.2)	439 (3.9)	453 (4.2)	448 (4.5)	405 (5.8)	408 (4.8)	393 (4.9)	391 (5.8)
✱ Ghana	307 (5.0)	333 (4.7) ▲	348 (4.4)	368 (4.2) ▲	303 (5.0)	327 (4.6) ▲	287 (4.9)	304 (5.2) ▲
Hong Kong SAR	588 (5.1)	588 (4.5)	586 (5.1)	579 (4.4)	604 (5.3) ▲	591 (5.3)	585 (5.2)	578 (4.7)
Hungary	503 (4.2)	516 (4.6) ▲	500 (4.3)	493 (4.7)	499 (4.4)	503 (4.9)	511 (4.3)	523 (5.5) ▲
♯ Indonesia	380 (5.2) ▲	370 (5.1)	402 (4.5) ▲	382 (3.8)	382 (5.6)	372 (5.9)	381 (5.1) ▲	371 (5.2)
♯ Iran, Islamic Rep. of	390 (6.5)	412 (6.4) ▲	426 (6.0)	419 (5.7)	435 (6.3)	439 (6.5)	387 (6.1)	398 (6.3)
³ Israel	516 (4.1)	519 (5.0)	529 (4.6) ▲	512 (5.8)	501 (5.2)	491 (5.9)	518 (5.1)	513 (5.7)
Italy	485 (3.6)	507 (2.9) ▲	489 (3.3)	493 (2.8)	510 (3.4)	513 (4.7)	492 (4.2)	506 (4.8) ▲
Japan	549 (3.6)	565 (3.7) ▲	568 (3.6)	572 (3.9)	582 (4.2)	589 (3.8)	576 (3.4)	583 (3.7) ▲
♯ Jordan	398 (4.4)	383 (6.7)	451 (4.2) ▲	413 (6.2)	417 (4.4) ▲	397 (5.9)	393 (4.1) ▲	367 (6.2)
Kazakhstan	476 (4.4)	482 (4.5)	509 (4.6)	503 (5.2)	489 (4.9)	493 (5.3)	442 (4.7)	446 (5.9)
Korea, Rep. of	610 (3.6)	626 (2.7) ▲	617 (4.2)	616 (3.5)	611 (3.3)	613 (3.8)	611 (3.1)	621 (3.1) ▲
Lebanon	443 (3.9)	462 (5.1) ▲	468 (4.3)	475 (4.7)	441 (4.3)	455 (4.9) ▲	390 (5.6)	397 (6.9)
¹ Lithuania	500 (3.3)	502 (2.9)	503 (3.4) ▲	482 (3.8)	506 (3.9) ▲	494 (3.6)	518 (3.6)	513 (3.6)
♯ Macedonia, Rep. of	416 (5.8)	421 (5.6)	457 (5.9) ▲	440 (5.8)	426 (6.7) ▲	413 (6.6)	390 (6.6)	388 (6.8)
Malaysia	460 (5.8) ▲	441 (6.8)	440 (5.1) ▲	419 (6.4)	438 (6.2) ▲	425 (7.4)	436 (5.3) ▲	422 (6.7)
✱ Morocco	378 (2.8)	381 (3.2)	360 (2.7) ▲	353 (3.5)	386 (2.1)	394 (3.7) ▲	332 (3.1)	333 (2.5)
New Zealand	478 (6.1)	505 (6.5) ▲	467 (5.5)	477 (6.2) ▲	471 (5.5)	494 (6.2) ▲	505 (7.4)	521 (7.1) ▲
Norway	491 (3.2)	494 (3.4)	435 (3.2) ▲	429 (3.1)	464 (3.8)	458 (4.6)	516 (4.2)	511 (4.8)
♯ Oman	371 (3.8) ▲	329 (3.9)	419 (3.1) ▲	346 (3.7)	404 (3.4) ▲	349 (3.6)	373 (3.9) ▲	309 (4.3)
♯ Palestinian Nat'l Auth.	406 (4.4)	393 (5.5)	431 (4.4) ▲	405 (5.4)	425 (4.9) ▲	406 (5.8)	379 (4.7) ▲	355 (5.6)
♯ Qatar	410 (6.1)	407 (5.4)	433 (5.7)	417 (5.8)	395 (6.1)	379 (5.4)	393 (6.1)	386 (5.9)
Romania	449 (4.9)	446 (4.3)	489 (5.1) ▲	466 (4.4)	457 (5.3)	450 (5.4)	431 (4.8)	427 (4.9)
² Russian Federation	528 (3.4)	540 (3.8) ▲	560 (4.1) ▲	552 (4.0)	532 (4.2)	534 (4.6)	510 (3.9)	512 (5.0)
♯ Saudi Arabia	398 (4.8)	388 (8.1)	412 (5.1) ▲	388 (8.5)	371 (5.1)	358 (9.4)	389 (5.0)	384 (8.1)
² Singapore	613 (3.6)	609 (4.6)	622 (4.0) ▲	607 (5.2)	612 (3.7)	607 (4.8)	609 (4.6)	605 (5.2)
Slovenia	502 (3.0)	519 (3.1) ▲	496 (3.2)	490 (3.1)	501 (3.5)	507 (3.7)	516 (3.3)	520 (4.1)
Sweden	502 (2.1)	505 (2.3)	464 (2.6) ▲	454 (2.7)	458 (2.9)	454 (3.4)	508 (3.5)	501 (3.1)
♯ Syrian Arab Republic	364 (4.5)	381 (5.1) ▲	389 (5.8)	394 (6.2)	379 (6.1)	395 (6.5) ▲	340 (5.8)	346 (5.9)
Thailand	430 (5.0) ▲	418 (5.6)	436 (4.8) ▲	412 (5.5)	418 (5.2)	411 (7.8)	438 (4.8) ▲	422 (5.0)
Tunisia	420 (3.7)	444 (3.0) ▲	417 (3.3)	421 (3.9)	418 (3.7)	435 (3.2) ▲	389 (4.3)	408 (3.5) ▲
Turkey	433 (4.1)	437 (4.6)	464 (4.2) ▲	446 (4.9)	461 (4.4) ▲	447 (4.9)	474 (4.3) ▲	461 (4.9)
Ukraine	466 (4.1)	479 (5.2) ▲	491 (4.4)	483 (5.6)	472 (4.6)	480 (6.0)	469 (4.5)	472 (5.1)
United Arab Emirates	462 (2.9)	456 (3.3)	478 (2.9) ▲	458 (3.2)	444 (3.2) ▲	418 (3.5)	450 (3.0) ▲	431 (3.6)
² United States	508 (3.3)	520 (3.1) ▲	513 (3.0)	510 (2.7)	482 (3.3)	487 (3.0)	525 (4.1)	530 (3.4)
International Avg.	464 (0.7)	468 (0.7) ▲	476 (0.7) ▲	464 (0.7)	464 (0.7) ▲	461 (0.8)	459 (0.7) ▲	456 (0.8)

▲ Average significantly higher than other gender

✱ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

♯ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.3 for target population coverage notes 1, 2, and 3. See Appendix C.9 for sampling guidelines and sampling participation notes †, ‡, and §.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.10: Achievement in Mathematics Content Domains by Gender (Continued)

Country	Number		Algebra		Geometry		Data and Chance	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Ninth Grade Participants								
^ψ Botswana	400 (4.0) ▲	383 (3.3)	415 (3.7) ▲	399 (3.3)	381 (4.7)	380 (3.9)	398 (4.3) ▲	383 (3.1)
² * Honduras	341 (3.8)	367 (4.4) ▲	320 (5.3)	335 (4.8) ▲	301 (5.2)	317 (4.8) ▲	307 (6.6)	334 (4.8) ▲
* South Africa	358 (3.1)	359 (3.3)	367 (2.8) ▲	356 (3.6)	310 (4.0)	320 (4.0)	336 (4.0)	329 (4.3)
Benchmarking Participants								
² Alberta, Canada	519 (3.6)	528 (3.2) ▲	489 (3.3) ▲	482 (2.7)	480 (3.3)	489 (3.1) ▲	529 (4.6)	529 (3.9)
² Ontario, Canada	515 (3.3)	523 (3.1) ▲	501 (2.6) ▲	492 (3.0)	512 (3.2)	511 (3.2)	529 (5.0)	532 (4.4)
Quebec, Canada	540 (3.0)	546 (2.8) ▲	519 (3.4)	512 (3.3)	527 (3.5)	530 (3.0)	548 (4.3)	549 (4.3)
Abu Dhabi, UAE	448 (4.1)	457 (5.6)	462 (3.9)	457 (5.9)	429 (4.8)	419 (6.5)	436 (4.6)	432 (6.4)
Dubai, UAE	482 (4.4)	477 (5.4)	498 (4.5) ▲	479 (5.2)	466 (5.4) ▲	441 (6.5)	477 (5.3)	459 (6.2)
¹ Alabama, US	459 (7.9)	467 (7.2)	475 (5.8) ▲	466 (5.6)	444 (6.0)	442 (7.3)	477 (8.7)	483 (8.3)
^{1 2} California, US	486 (6.2)	499 (5.2) ▲	512 (5.8)	506 (5.3)	452 (6.7)	457 (5.3)	488 (7.3)	501 (6.6)
¹ Colorado, US	515 (5.7)	527 (5.1) ▲	513 (5.8)	511 (5.1)	503 (5.9)	508 (6.7)	541 (6.5)	540 (6.2)
^{1 2} Connecticut, US	524 (5.2)	530 (5.6)	516 (5.9) ▲	505 (5.7)	490 (5.9)	491 (5.5)	551 (7.5)	542 (7.2)
^{1 2} Florida, US	509 (7.3)	525 (7.8) ▲	513 (6.7)	512 (7.0)	495 (6.9)	502 (7.8)	515 (9.5)	541 (10.3) ▲
^{1 2} Indiana, US	520 (5.3)	536 (6.3) ▲	519 (5.3)	521 (6.1)	498 (5.0)	499 (6.7)	538 (6.0)	552 (7.1) ▲
^{1 2} Massachusetts, US	560 (6.4)	575 (6.5) ▲	562 (6.3)	557 (6.0)	548 (5.9)	547 (6.0)	575 (8.8)	594 (7.7) ▲
¹ Minnesota, US	554 (5.7)	559 (6.0)	546 (5.1)	539 (5.6)	511 (6.4)	520 (7.2)	569 (7.1)	573 (7.8)
^{1 3} North Carolina, US	540 (6.7)	554 (8.8) ▲	538 (6.8)	536 (7.8)	510 (7.4)	521 (10.0)	543 (8.2)	553 (9.9)

▲ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.11: Achievement in Mathematics Cognitive Domains by Gender

Country	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	463 (4.2)	459 (4.3)	450 (4.5) ▲	443 (4.1)	444 (4.6)	441 (4.5)
Australia	513 (4.0)	520 (4.6)	517 (3.5)	521 (3.7)	509 (3.0)	518 (3.8) ▲
Austria	505 (2.6)	510 (3.1)	499 (2.9)	512 (3.3) ▲	505 (3.4)	521 (4.0) ▲
² Azerbaijan	476 (7.1)	470 (6.5)	461 (6.6)	454 (6.2)	449 (6.5)	441 (6.4)
Bahrain	440 (4.7)	436 (4.8)	436 (4.7)	426 (4.3)	439 (4.5)	440 (4.5)
Belgium (Flemish)	562 (2.1)	567 (2.5)	542 (2.6)	549 (2.4) ▲	527 (3.4)	537 (2.7) ▲
Chile	452 (3.2)	459 (2.9) ▲	459 (3.2)	467 (3.0) ▲	461 (3.0)	476 (3.3) ▲
Chinese Taipei	599 (3.0)	599 (2.5)	596 (2.6)	591 (2.3)	578 (3.8)	577 (2.5)
² Croatia	490 (3.0)	499 (2.5) ▲	477 (2.5)	491 (2.4) ▲	487 (2.9)	498 (4.1) ▲
Czech Republic	497 (3.0)	507 (3.2) ▲	505 (3.2)	519 (3.2) ▲	520 (3.1)	525 (3.3)
² Denmark	527 (3.1)	536 (3.2) ▲	537 (3.0)	541 (3.5)	541 (3.5)	544 (3.2)
England	550 (4.6)	554 (5.0)	540 (4.1)	544 (4.2)	529 (5.0)	533 (3.8)
Finland	543 (2.8)	553 (3.1) ▲	540 (3.0)	548 (3.1) ▲	543 (3.2)	548 (3.2)
¹ Georgia	452 (3.4)	447 (4.7)	452 (3.3) ▲	443 (4.5)	452 (3.6)	449 (4.4)
Germany	518 (2.5)	529 (2.9) ▲	525 (2.6)	531 (2.8)	526 (3.1)	538 (3.8) ▲
² Hong Kong SAR	618 (3.0)	620 (4.1)	594 (3.2)	600 (3.9) ▲	584 (3.7)	593 (4.3) ▲
Hungary	518 (4.0)	520 (4.2)	511 (3.3)	516 (4.0)	514 (4.0)	515 (4.3)
Iran, Islamic Rep. of	436 (5.6)	434 (5.9)	426 (5.7)	428 (5.5)	419 (4.7)	426 (4.8)
Ireland	539 (4.1)	540 (4.0)	528 (3.7)	530 (3.3)	507 (4.4)	512 (3.3)
Italy	505 (2.9)	514 (3.3) ▲	501 (3.4)	511 (3.2) ▲	501 (4.0)	510 (4.0) ▲
Japan	589 (2.0)	591 (2.6)	577 (1.8)	581 (2.2)	592 (2.1)	591 (2.9)
² Kazakhstan	498 (5.3)	507 (4.8) ▲	497 (4.9)	501 (5.6)	499 (5.0)	503 (5.1)
Korea, Rep. of	613 (2.4)	616 (2.2)	597 (2.1)	602 (2.7) ▲	597 (3.5)	608 (3.3) ▲
¹ ✱ Kuwait	362 (4.6) ▲	320 (6.0)	348 (4.1) ▲	310 (7.2)	341 (4.1) ▲	316 (5.5)
¹ ² Lithuania	524 (3.1)	526 (3.7)	539 (3.2)	541 (3.3)	537 (3.0)	536 (3.2)
Malta	500 (1.9)	508 (2.2) ▲	494 (2.0)	499 (2.8)	470 (2.5)	480 (2.5) ▲
✱ Morocco	323 (4.9)	318 (4.6)	334 (4.4)	330 (4.9)	350 (4.9)	344 (5.6)
† Netherlands	534 (2.8)	542 (1.8) ▲	536 (2.3)	546 (2.2) ▲	540 (2.9)	548 (3.1) ▲
New Zealand	475 (3.9)	477 (3.8)	491 (3.0)	489 (2.7)	489 (3.0)	491 (2.9)
† Northern Ireland	578 (4.0)	582 (4.5)	566 (3.2)	564 (3.8)	538 (4.0)	537 (4.1)
‡ Norway	483 (4.3)	491 (3.2)	496 (3.2)	503 (3.5) ▲	497 (3.1)	505 (4.7)
ψ Oman	397 (3.4) ▲	363 (3.9)	392 (3.0) ▲	371 (3.7)	401 (2.6) ▲	381 (3.3)
Poland	470 (3.2)	480 (2.8) ▲	475 (2.9)	484 (3.1) ▲	488 (3.6)	498 (3.0) ▲
Portugal	527 (4.0)	535 (4.0) ▲	532 (4.6)	536 (4.2)	528 (4.8)	533 (4.4)
² Qatar	418 (5.5) ▲	405 (4.4)	418 (4.7) ▲	405 (3.8)	423 (5.3) ▲	410 (4.9)
Romania	483 (7.1)	485 (6.6)	478 (6.8)	478 (5.9)	488 (6.8)	485 (5.8)
Russian Federation	541 (3.5)	541 (3.8)	540 (4.1)	539 (4.5)	550 (3.7)	546 (4.3)
Saudi Arabia	418 (5.7)	400 (11.5)	413 (5.6)	396 (10.6)	418 (5.4)	406 (10.4)
² Serbia	517 (3.8)	523 (3.5)	506 (4.0)	516 (3.5) ▲	515 (5.2)	514 (4.2)
² Singapore	631 (4.1)	627 (4.1)	603 (3.8)	600 (3.8)	591 (3.8)	585 (4.4)
Slovak Republic	503 (4.0)	509 (3.9) ▲	500 (4.3)	510 (4.4) ▲	507 (4.3)	514 (4.3) ▲
Slovenia	506 (3.0)	513 (3.7)	508 (2.7)	519 (3.5) ▲	507 (4.4)	524 (4.3) ▲
Spain	478 (3.5)	487 (3.7) ▲	478 (3.4)	488 (3.5) ▲	476 (3.7)	489 (3.4) ▲
Sweden	487 (2.8)	491 (3.0)	505 (2.7)	510 (2.6)	516 (4.0)	523 (2.9) ▲
Thailand	460 (5.2) ▲	446 (5.7)	465 (4.9) ▲	451 (5.7)	468 (4.6)	460 (5.9)
ψ Tunisia	376 (4.9) ▲	365 (4.0)	349 (5.0)	344 (4.8)	337 (5.5)	332 (6.2)
Turkey	476 (6.2)	474 (5.6)	468 (5.4)	469 (5.0)	463 (5.4)	460 (4.3)
United Arab Emirates	442 (3.1)	433 (3.8)	434 (2.8)	426 (3.6)	436 (3.0)	431 (3.5)
² United States	550 (2.3)	561 (2.2) ▲	534 (2.4)	543 (2.2) ▲	523 (2.4)	528 (2.2) ▲
✱ Yemen	227 (7.3)	210 (8.4)	243 (7.8)	232 (7.1)	251 (7.8)	239 (6.9)
International Avg.	492 (0.6)	492 (0.6)	488 (0.6)	489 (0.6)	487 (0.6)	489 (0.6) ▲

▲ Average significantly higher than other gender

✱ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.2 for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes †, ‡, and §.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.11: Achievement in Mathematics Cognitive Domains by Gender (Continued)

Country	Number		Geometric Shapes and Measures		Data Display	
	Girls	Boys	Girls	Boys	Girls	Boys
Sixth Grade Participants						
Botswana	434 (4.5) ▲	413 (5.4)	431 (4.3) ▲	410 (4.2)	407 (3.9) ▲	396 (4.6)
Ψ Honduras	379 (6.7)	391 (5.4) ▲	389 (6.5)	406 (5.7) ▲	396 (6.9)	410 (5.8) ▲
* Yemen	345 (7.9)	332 (7.1)	348 (7.7)	343 (6.9)	361 (8.8)	351 (6.6)
Benchmarking Participants						
² Alberta, Canada	495 (3.5)	501 (3.0) ▲	502 (3.1)	513 (3.4) ▲	511 (3.6)	517 (4.0)
Ontario, Canada	505 (3.8)	515 (3.9) ▲	519 (3.7)	523 (4.1)	521 (3.4)	522 (3.6)
Quebec, Canada	532 (3.4)	541 (3.0) ▲	524 (3.1)	534 (2.7) ▲	529 (3.1)	539 (3.0) ▲
Abu Dhabi, UAE	426 (5.3) ▲	410 (7.4)	421 (4.9)	405 (7.0)	424 (4.8)	413 (6.5)
Dubai, UAE	470 (4.1)	473 (4.9)	464 (3.9)	467 (4.3)	461 (3.4)	465 (4.2)
^{1 3} Florida, US	565 (3.6)	571 (5.0)	537 (3.4)	546 (4.7) ▲	520 (4.7)	526 (4.3)
^{1 2} North Carolina, US	567 (4.9)	580 (4.7) ▲	544 (5.0)	562 (5.5) ▲	531 (4.8)	535 (4.9)

▲ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.12: Achievement in Mathematics Cognitive Domains by Gender

Country	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	482 (3.3) ▲	470 (3.8)	462 (3.4) ▲	455 (3.6)	457 (4.1) ▲	446 (3.4)
Australia	502 (5.0)	506 (7.3)	500 (4.5)	512 (6.9)	501 (4.8)	511 (7.1)
Ψ Bahrain	434 (3.6) ▲	389 (3.7)	417 (2.7) ▲	384 (3.8)	435 (3.4) ▲	395 (2.8)
Chile	399 (3.7)	412 (3.2) ▲	416 (3.4)	435 (2.8) ▲	415 (3.8)	429 (3.2) ▲
Chinese Taipei	618 (5.0) ▲	605 (4.2)	616 (4.0)	613 (4.3)	612 (4.1)	606 (3.9)
‡ England	503 (5.4)	500 (6.5)	508 (5.6)	509 (6.5)	513 (5.8)	507 (6.5)
Finland	510 (2.9)	507 (2.7)	521 (2.9)	519 (2.9)	515 (3.0) ▲	508 (3.1)
¹ Georgia	439 (4.9)	436 (4.6)	421 (4.3)	428 (4.2)	414 (5.2)	414 (5.1)
⌘ Ghana	318 (5.0)	343 (4.7) ▲	302 (5.2)	328 (4.6) ▲	313 (5.8)	334 (5.3) ▲
Hong Kong SAR	597 (4.9) ▲	585 (4.6)	590 (4.6)	585 (4.4)	582 (5.0)	578 (4.8)
Hungary	507 (4.3)	507 (4.2)	501 (4.1)	509 (4.0) ▲	501 (4.1)	503 (4.3)
Ψ Indonesia	386 (5.4) ▲	370 (5.0)	389 (5.4) ▲	379 (4.7)	391 (4.2) ▲	384 (4.3)
Ψ Iran, Islamic Rep. of	409 (6.1)	411 (6.0)	404 (6.3)	418 (6.0)	423 (5.7)	433 (6.0)
³ Israel	522 (3.8) ▲	510 (5.4)	516 (4.4)	510 (5.4)	522 (3.8)	517 (5.1)
Italy	489 (3.3)	499 (3.0) ▲	496 (2.5)	509 (2.6) ▲	492 (3.4)	500 (3.0) ▲
Japan	557 (3.0)	559 (4.1)	569 (2.9)	579 (3.6) ▲	575 (3.3)	583 (4.4)
Ψ Jordan	422 (4.8) ▲	389 (7.0)	408 (4.2) ▲	388 (6.1)	427 (4.9) ▲	404 (5.9)
Kazakhstan	490 (4.6)	489 (5.1)	481 (4.4)	488 (4.9)	483 (5.0)	482 (5.4)
Korea, Rep. of	613 (3.6)	619 (3.1)	613 (3.6)	621 (3.3) ▲	610 (3.3)	615 (3.3)
Lebanon	459 (4.2)	470 (5.0) ▲	430 (4.6)	443 (5.0) ▲	419 (5.1)	434 (5.9) ▲
¹ Lithuania	508 (3.1) ▲	495 (3.2)	512 (2.8) ▲	503 (3.0)	495 (3.2)	490 (2.9)
Ψ Macedonia, Rep. of	434 (6.1)	427 (6.0)	420 (5.9)	415 (5.6)	425 (6.5)	422 (6.6)
Malaysia	456 (5.5) ▲	431 (6.6)	445 (5.1) ▲	432 (6.0)	432 (5.5) ▲	420 (6.5)
⌘ Morocco	365 (2.9)	361 (2.7)	377 (2.3)	379 (2.4)	354 (3.2)	359 (3.0)
New Zealand	471 (5.5)	490 (6.2) ▲	481 (5.0)	500 (5.6) ▲	486 (5.3)	500 (6.1) ▲
Norway	467 (2.6)	463 (3.1)	480 (3.4)	480 (3.0)	480 (3.4)	476 (3.4)
Ψ Oman	397 (3.5) ▲	331 (4.4)	386 (3.4) ▲	333 (4.5)	396 (3.2) ▲	341 (4.1)
Ψ Palestinian Nat'l Auth.	421 (4.2) ▲	392 (5.7)	405 (4.2) ▲	388 (5.5)	412 (4.6)	397 (6.6)
Ψ Qatar	426 (5.9)	410 (5.7)	401 (6.0)	392 (5.8)	409 (6.1)	404 (5.9)
Romania	468 (5.4) ▲	453 (4.5)	456 (5.0)	451 (4.1)	461 (4.8) ▲	450 (4.0)
² Russian Federation	550 (3.9)	547 (4.0)	536 (4.0)	541 (3.8)	532 (4.3)	530 (4.1)
Ψ Saudi Arabia	414 (4.2) ▲	391 (8.0)	374 (4.2)	375 (8.6)	396 (4.8)	379 (7.9)
² Singapore	624 (4.0) ▲	611 (4.5)	616 (3.9)	609 (4.7)	609 (4.1)	600 (5.7)
Slovenia	507 (3.0)	509 (3.2)	497 (2.5)	507 (2.8) ▲	500 (2.9)	500 (3.5)
Sweden	479 (2.5)	477 (2.2)	490 (2.2)	489 (2.8)	481 (2.6) ▲	474 (3.1)
Ψ Syrian Arab Republic	368 h(5.3)	381 (5.9)	369 (5.6)	389 (5.4) ▲	369 (5.9)	373 (7.4)
Thailand	432 (4.8) ▲	413 (5.7)	434 (4.3) ▲	422 (5.0)	435 (4.2) ▲	422 (5.5)
Tunisia	417 (3.2)	433 (3.6) ▲	412 (3.1)	432 (3.3) ▲	414 (3.1)	431 (3.1) ▲
Turkey	445 (4.1) ▲	436 (5.0)	462 (4.0)	456 (4.8)	469 (3.7) ▲	460 (4.1)
Ukraine	482 (4.7)	480 (5.6)	474 (4.8)	487 (5.1) ▲	466 (4.2)	469 (5.7)
United Arab Emirates	477 (2.8) ▲	457 (3.1)	449 (2.8) ▲	435 (3.3)	457 (2.7) ▲	440 (3.3)
² United States	519 (3.1)	519 (2.8)	500 (3.1)	506 (3.0) ▲	501 (3.0)	506 (2.8) ▲
International Avg.	471 (0.7) ▲	464 (0.7)	465 (0.6)	465 (0.7)	466 (0.7) ▲	463 (0.8)

▲ Average significantly higher than other gender

⌘ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

Ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.3 for target population coverage notes 1, 2, and 3. See Appendix C.9 for sampling guidelines and sampling participation notes †, ‡, and §.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 3.12: Achievement in Mathematics Cognitive Domains by Gender (Continued)

Country	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Ninth Grade Participants						
Ψ Botswana	412 (2.8) ⬆	395 (3.1)	387 (2.9) ⬆	379 (3.6)	402 (2.6) ⬆	393 (2.9)
² * Honduras	327 (5.3)	344 (4.8) ⬆	328 (4.2)	354 (3.7) ⬆	310 (5.7)	337 (5.2) ⬆
* South Africa	354 (3.0)	351 (3.2)	336 (3.5)	337 (3.3)	366 (2.9)	360 (3.5)
Benchmarking Participants						
² Alberta, Canada	501 (2.9)	499 (3.1)	502 (3.3)	508 (2.8) ⬆	509 (3.4)	515 (3.3)
² Ontario, Canada	505 (2.8)	501 (3.0)	509 (2.7)	511 (3.0)	523 (2.8)	525 (3.6)
Quebec, Canada	530 (3.5)	526 (3.0)	535 (3.4)	537 (3.0)	528 (3.6)	530 (2.7)
Abu Dhabi, UAE	461 (4.2)	458 (5.6)	433 (4.7)	436 (6.1)	443 (4.6)	441 (5.9)
Dubai, UAE	498 (4.3) ⬆	479 (5.4)	472 (4.6)	459 (5.7)	478 (4.6)	462 (5.5)
¹ Alabama, US	478 (6.6)	475 (6.5)	456 (7.3)	459 (6.8)	454 (7.2)	454 (7.9)
¹ California, US	508 (6.2)	507 (5.0)	477 (6.4)	483 (5.7)	478 (5.8)	488 (5.0) ⬆
¹ Colorado, US	518 (5.8)	520 (4.8)	513 (5.5)	517 (5.3)	516 (5.5)	519 (5.4)
¹ Connecticut, US	531 (5.3)	525 (6.5)	511 (5.2)	510 (5.6)	512 (5.5)	509 (6.0)
¹ Florida, US	522 (7.3)	525 (7.9)	498 (7.7)	510 (8.1) ⬆	500 (7.5)	509 (7.9)
¹ Indiana, US	530 (5.3)	537 (5.9)	512 (5.4)	520 (6.3) ⬆	507 (5.3)	515 (6.4) ⬆
¹ Massachusetts, US	567 (6.5)	570 (6.2)	549 (6.4)	560 (5.8) ⬆	561 (6.6)	562 (5.9)
¹ Minnesota, US	558 (5.2)	554 (5.9)	538 (6.0)	542 (6.2)	536 (6.2)	536 (5.6)
¹ North Carolina, US	548 (7.0)	549 (8.7)	526 (7.0)	536 (9.0)	529 (6.7)	533 (8.3)

⬆ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

