

Exhibit 3.15: Differences in Achievement for Mathematics Content Domains Across Assessment Years<sup>◇</sup>

Read across the row to determine if the performance in the row year is significantly higher (▲) or significantly lower (▽) than the performance in the column year.

Country	Number			Algebra			Geometry			Data and Probability								
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years				
		2015	2011	2007		2015	2011	2007		2015	2011	2007		2015	2011	2007		
<b>Australia</b>																		
2019	522 (3.9)	10 ▲	9	18 ▲	501 (4.1)	11 ▲	12	27 ▲	513 (4.0)	13 ▲	14 ▲	25 ▲	533 (3.9)	14 ▲	-2	7		
2015	511 (3.2)		-1	8	491 (3.4)		2	16 ▲	500 (3.1)		1	12 ▲	519 (3.1)		-16 ▽	-7		
2011	513 (5.5)			9	489 (5.3)			15 ▲	499 (5.3)			11	534 (6.0)				8	
2007	504 (4.0)				474 (4.2)				488 (4.0)				526 (4.4)					
<b>Bahrain</b>																		
2019	473 (2.2)	37 ▲	76 ▲	91 ▲	485 (2.1)	2	61 ▲	88 ▲	493 (2.3)	44 ▲	95 ▲	90 ▲	465 (2.0)	12 ▲	58 ▲	66 ▲		
2015	436 (2.0)		39 ▲	54 ▲	483 (2.1)		58 ▲	86 ▲	449 (2.5)		51 ▲	46 ▲	453 (2.2)		46 ▲	53 ▲		
ψ 2011	397 (1.7)			15 ▲	424 (1.7)			28 ▲	398 (2.5)			-5	407 (2.5)				8 ▲	
2007	381 (2.5)				397 (1.7)				403 (2.9)				400 (2.6)					
<b>Chile</b>																		
ψ 2019	442 (3.2)	15 ▲	29 ▲		439 (3.1)	25 ▲	36 ▲		434 (4.3)	7	15 ▲		434 (3.2)	5	9 ▲			
ψ 2015	427 (3.3)		15 ▲		413 (3.4)		11 ▲		428 (3.4)		9		429 (3.8)		4			
2011	413 (2.9)				403 (3.6)				419 (3.0)				426 (3.0)					
<b>Chinese Taipei</b>																		
2019	613 (2.7)	23 ▲	16 ▲	27 ▲	618 (2.6)	5	-10 ▽	-11	623 (2.7)	16 ▲	-2	18 ▲	593 (2.5)	5	9 ▲	15 ▲		
2015	590 (2.4)		-8	4	613 (2.8)		-15 ▽	-16 ▽	607 (2.6)		-18 ▽	2	588 (2.5)		4	9		
2011	598 (3.2)			12 ▲	628 (3.8)			-1	625 (3.7)			20 ▲	584 (2.9)			5		
2007	586 (4.3)				629 (5.9)				605 (5.7)				579 (4.6)					
<b>Cyprus</b>																		
2019	499 (2.2)			36 ▲	515 (2.6)			44 ▲	490 (2.3)			35 ▲	493 (2.7)				38 ▲	
2007	464 (2.2)				471 (2.3)				455 (3.1)				456 (2.1)					
<b>Egypt</b>																		
2 <sup>ψ</sup> 2019	414 (5.4)	20 ▲		28 ▲	413 (6.0)	-7		8	417 (5.3)	24 ▲		20 ▲	380 (5.4)	42 ▲		22 ▲		
ψ 2015	393 (3.7)			8	420 (4.3)			15 ▲	393 (4.1)			-4	338 (4.4)			-20 ▽		
2007	386 (3.6)				405 (3.5)				397 (3.7)				358 (3.9)					
<b>England</b>																		
2019	519 (5.4)	-8	7	8	504 (5.8)	11	14	7	509 (5.3)	-6	11	-5	523 (6.2)	-18 ▽	-20 ▽	-29 ▽		
2015	528 (4.5)		15 ▲	17 ▲	492 (4.7)		3	-4	514 (4.1)		16 ▲	1	541 (4.7)		-2	-11		
‡ 2011	512 (5.9)			1	489 (5.8)			-7	498 (5.9)			-15 ▽	543 (7.0)			-9		
† 2007	511 (5.4)				496 (5.1)				513 (5.2)				552 (6.2)					
<b>Finland</b>																		
2019	515 (2.6)		-12 ▽		489 (2.9)		-3		511 (3.2)		9 ▲		514 (3.6)		-28 ▽			
2011	527 (2.4)				492 (2.9)				502 (2.9)				542 (3.1)					
<b>Georgia</b>																		
<sup>1</sup> 2019	466 (4.7)	9	31 ▲	50 ▲	473 (4.3)	5	23 ▲	57 ▲	449 (4.4)	8	43 ▲	47 ▲	429 (5.1)	8	38 ▲	79 ▲		
<sup>1,2</sup> 2015	457 (3.4)		22 ▲	40 ▲	469 (3.8)		18 ▲	52 ▲	441 (3.9)		34 ▲	39 ▲	421 (3.7)		30 ▲	71 ▲		
<sup>1</sup> 2011	435 (3.5)			19 ▲	450 (3.9)			34 ▲	406 (4.3)			5	392 (4.5)			42 ▲		
<sup>1</sup> 2007	416 (5.9)				416 (7.6)				402 (7.1)				350 (5.1)					
<b>Hong Kong SAR</b>																		
† 2019	570 (4.2)	-25 ▽	-18 ▽	-5	584 (3.9)	-9	1	9	596 (4.6)	-6	-1	16 ▲	563 (5.6)	-34 ▽	-19 ▽	2		
2015	594 (4.9)		6	19 ▲	593 (4.7)		10	18 ▲	602 (5.1)		4	22 ▲	597 (5.9)		16 ▲	37 ▲		
2011	588 (3.7)			13	583 (4.0)			8	597 (4.4)			18 ▲	581 (4.1)			21 ▲		
† 2007	575 (6.0)				575 (6.1)				580 (6.1)				560 (5.9)					
<b>Hungary</b>																		
2019	515 (3.1)	-2	6	-5	509 (3.0)	6	12 ▲	1	521 (3.3)	3	20 ▲	11 ▲	521 (3.2)	2	4	-6		
2015	518 (4.0)		8	-3	503 (4.1)		6	-5	518 (4.2)		17 ▲	8	519 (3.9)		2	-8		
2011	510 (3.8)			-11	496 (4.0)			-11 ▽	501 (4.1)			-9	517 (4.2)			-10		
2007	520 (3.8)				508 (3.8)				510 (4.0)				527 (3.9)					
<b>Iran, Islamic Rep. of</b>																		
2019	442 (4.2)	10	40 ▲	54 ▲	450 (3.8)	13 ▲	28 ▲	46 ▲	442 (4.4)	-6	4	27 ▲	435 (4.0)	18 ▲	42 ▲	39 ▲		
ψ 2015	432 (4.7)		30 ▲	44 ▲	437 (5.1)		15 ▲	33 ▲	448 (4.7)		10	33 ▲	417 (5.0)		24 ▲	21 ▲		
ψ 2011	402 (5.0)			14 ▲	422 (4.4)			18 ▲	437 (4.7)			23 ▲	393 (4.9)			-3		
2007	388 (4.4)				405 (4.2)				414 (4.7)				396 (3.8)					
<b>Ireland</b>																		
2019	541 (3.0)	-4			505 (2.8)	4			506 (2.8)	3			541 (3.4)	7				
2015	544 (3.3)				501 (2.8)				503 (3.1)				534 (3.8)					
<b>Israel</b>																		
<sup>3</sup> 2019	519 (4.2)	1	1		528 (5.0)	11	7		506 (4.8)	19 ▲	10		511 (4.9)	8	-4			
<sup>3</sup> 2015	518 (4.0)		0		517 (4.7)		-4		487 (4.6)		-9		503 (4.9)		-12			
<sup>3</sup> 2011	518 (4.1)				521 (4.7)				496 (4.4)				515 (4.7)					

▲ Average from more recent year significantly higher  
 ▽ Average from more recent year significantly lower

◇ Trend reporting in content domains using current methodology began with TIMSS 2007.

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

See Appendix B.7 for target population coverage notes 1, 2, and 3. See Appendix B.10 for sampling guidelines and sampling participation notes †, ‡, and §.

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

Exhibit 3.15: Differences in Achievement for Mathematics Content Domains Across Assessment Years<sup>0</sup>

(Continued)

Country	Number			Algebra			Geometry			Data and Probability						
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years						
		2015	2011	2007		2015	2011	2007		2015	2011	2007	2015	2011	2007	
<b>Italy</b>																
2019	495 (2.4)	1	-1	14 ▲	491 (2.7)	10 ▲	0	31 ▲	510 (3.7)	6	-2	19 ▲	494 (3.3)	-2	-5	9
<sup>2</sup> 2015	494 (2.7)		-2	14 ▲	481 (3.0)		-10 ▽	21 ▲	504 (3.5)		-8	13 ▲	496 (2.7)		-3	12 ▲
2011	496 (2.8)			16 ▲	491 (2.6)			30 ▲	512 (3.5)			21 ▲	499 (3.1)			15 ▲
2007	480 (3.1)				460 (3.7)				491 (3.6)				485 (3.6)			
<b>Japan</b>																
2019	578 (3.5)	6	21 ▲	20 ▲	602 (3.2)	6	32 ▲	35 ▲	610 (3.4)	12 ▲	24 ▲	26 ▲	594 (2.5)	5	15 ▲	3
2015	572 (2.4)		15 ▲	14 ▲	596 (2.8)		26 ▲	29 ▲	598 (2.6)		12 ▲	14 ▲	589 (2.3)		10 ▲	-2
2011	557 (3.0)			-2	570 (3.1)			3	586 (3.6)			2	579 (3.1)			-11 ▽
2007	558 (2.4)				567 (2.9)				584 (2.5)				591 (2.7)			
<b>Jordan</b>																
<sup>ψ</sup> 2019	408 (4.5)	28 ▲	18 ▲	-4	442 (4.8)	24 ▲	10	-3	413 (4.6)	32 ▲	6	-16 ▽	396 (4.2)	50 ▲	17 ▲	-10
<sup>✱</sup> 2015	380 (3.2)		-10 ▽	-32 ▽	418 (3.5)		-14 ▽	-28 ▽	381 (3.4)		-26 ▽	-48 ▽	346 (4.0)		-33 ▽	-60 ▽
<sup>ψ</sup> 2011	390 (3.8)			-22 ▽	432 (3.9)			-14 ▽	407 (3.7)			-22 ▽	379 (3.9)			-27 ▽
2007	412 (4.8)				445 (4.3)				429 (4.2)				406 (4.3)			
<b>Kazakhstan</b>																
<sup>2</sup> 2019	482 (3.4)		3		504 (3.7)		-2		486 (3.8)		-5		463 (3.3)		18 ▲	
2011	479 (4.1)				506 (4.5)				491 (4.5)				444 (4.4)			
<b>Korea, Rep. of</b>																
2019	605 (2.6)	4	-13 ▽	13 ▲	609 (3.5)	-3	-7	1	617 (2.9)	5	5	17 ▲	598 (2.6)	-3	-18 ▽	-4
2015	601 (2.4)		-17 ▽	9 ▲	612 (2.9)		-4	4	612 (3.4)		0	12 ▲	600 (2.4)		-15 ▽	-1
2011	618 (2.7)			25 ▲	617 (3.3)			9	612 (2.8)			12 ▲	616 (2.6)			14 ▲
2007	592 (2.5)				608 (3.3)				600 (2.7)				602 (2.6)			
<b>Lebanon</b>																
2019	432 (2.7)	-8	-20 ▽	-21 ▽	452 (3.0)	-14 ▽	-19 ▽	-16 ▽	422 (3.2)	-21 ▽	-25 ▽	-33 ▽	383 (3.5)	-12 ▽	-10	-5
2015	440 (4.1)		-11 ▽	-13 ▽	466 (4.0)		-5	-2	444 (4.0)		-4	-12 ▽	395 (4.6)		2	7
2011	451 (3.8)			-1	471 (3.8)			3	447 (3.8)			-8	393 (5.2)			5
2007	453 (3.9)				468 (3.6)				455 (4.2)				388 (5.3)			
<b>Lithuania</b>																
2019	514 (3.0)	3	13 ▲	7	518 (2.9)	21 ▲	26 ▲	31 ▲	529 (3.0)	15 ▲	30 ▲	20 ▲	522 (3.1)	1	7	-3
<sup>2</sup> 2015	511 (2.8)		10 ▲	4	497 (3.3)		5	10 ▲	515 (3.1)		15 ▲	6	521 (2.7)		6	-4
<sup>1</sup> 2011	501 (2.5)			-6	492 (2.8)			5	500 (3.2)			-9 ▽	515 (2.8)			-10 ▽
<sup>1</sup> 2007	507 (2.8)				487 (2.9)				509 (3.1)				526 (2.9)			
<b>Malaysia</b>																
2019	458 (3.1)	-14 ▽	7	-36 ▽	456 (3.3)	-11 ▽	26 ▲	1	466 (3.7)	11 ▲	34 ▲	-8	457 (3.5)	5	27 ▲	-2
2015	472 (3.6)		21 ▲	-22 ▽	467 (3.4)		37 ▲	11	455 (3.9)		23 ▲	-19 ▽	451 (3.8)		22 ▲	-7
2011	451 (5.8)			-43 ▽	430 (5.2)			-26 ▽	432 (6.4)			-42 ▽	429 (5.4)			-30 ▽
2007	494 (5.5)				455 (4.9)				474 (6.3)				459 (5.0)			
<b>Morocco</b>																
<sup>ψ</sup> 2019	377 (2.7)	-5	-2		370 (3.1)	-2	14 ▲		413 (2.2)	3	23 ▲		372 (2.4)	19 ▲	40 ▲	
<sup>✱</sup> 2015	382 (2.1)		3		372 (2.3)		16 ▲		410 (3.0)		20 ▲		353 (2.9)		21 ▲	
<sup>✱</sup> 2011	379 (2.5)				357 (2.6)				390 (2.5)				332 (1.9)			
<b>New Zealand</b>																
<sup>†</sup> 2019	483 (3.6)	-16 ▽	-9		464 (3.5)	-11 ▽	-8		477 (3.4)	-11 ▽	-6		496 (3.7)	-13 ▽	-18 ▽	
<sup>†</sup> 2015	500 (3.5)		7		475 (3.5)		3		488 (3.2)		5		509 (3.7)		-5	
2011	492 (6.0)				472 (5.6)				483 (5.6)				513 (6.9)			
<b>Norway (9)</b>																
<sup>†</sup> 2019	507 (2.3)	-21 ▽			477 (3.0)	6			502 (2.3)	4			518 (3.0)	-24 ▽		
2015	529 (2.6)				471 (2.7)				498 (2.5)				542 (3.2)			
<b>Oman</b>																
<sup>ψ</sup> 2019	392 (3.0)	3	42 ▲	38 ▲	427 (3.0)	0	43 ▲	43 ▲	418 (3.2)	3	41 ▲	41 ▲	393 (2.9)	17 ▲	51 ▲	29 ▲
<sup>ψ</sup> 2015	389 (2.6)		38 ▲	35 ▲	426 (2.7)		43 ▲	43 ▲	415 (2.8)		38 ▲	38 ▲	376 (3.0)		34 ▲	11 ▲
<sup>ψ</sup> 2011	351 (2.9)			-4	383 (2.7)			0	377 (2.6)			0	342 (3.0)			-23 ▽
2007	354 (3.1)				384 (3.5)				377 (3.5)				365 (4.0)			
<b>Qatar</b>																
<sup>ψ</sup> 2019	441 (4.0)	6	33 ▲		454 (4.0)	1	29 ▲		435 (4.0)	2	48 ▲		423 (4.7)	6	34 ▲	
<sup>ψ</sup> 2015	435 (2.9)		27 ▲		452 (2.6)		27 ▲		433 (3.0)		45 ▲		417 (3.9)		27 ▲	
<sup>ψ</sup> 2011	408 (3.6)				425 (2.8)				387 (3.4)				390 (3.6)			
<b>Romania</b>																
2019	478 (4.5)		30 ▲	23 ▲	490 (4.6)		13 ▲	10	472 (4.7)		19 ▲	9	458 (4.5)		29 ▲	42 ▲
2011	448 (4.2)			-7	477 (4.3)			-3	453 (4.5)			-10	429 (4.0)			13 ▲
2007	455 (3.9)				480 (5.0)				463 (4.4)				415 (4.6)			

▲ Average from more recent year significantly higher  
 ▽ Average from more recent year significantly lower

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

Exhibit 3.15: Differences in Achievement for Mathematics Content Domains Across Assessment Years<sup>0</sup>

(Continued)

Country	Number			Algebra			Geometry			Data and Probability						
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007		2015	2011	2007
<b>Russian Federation</b>																
<sup>2</sup> 2019	541 (4.6)	8	7	32 ▲	560 (5.0)	2	4	35 ▲	540 (5.2)	5	7	30 ▲	517 (4.7)	10	6	34 ▲
2015	533 (4.5)		-1	23 ▲	558 (5.2)		2	33 ▲	536 (5.6)		3	25 ▲	507 (5.0)		-4	24 ▲
<sup>2</sup> 2011	534 (3.4)			25 ▲	556 (3.8)			31 ▲	533 (4.0)			23 ▲	511 (4.0)			28 ▲
2007	510 (4.1)				525 (4.6)				510 (4.8)				483 (4.5)			
<b>Singapore</b>																
<sup>2</sup> 2019	611 (4.1)	-18 ▽	0	6	619 (4.6)	-4	4	28 ▲	619 (3.9)	2	10	29 ▲	620 (4.9)	3	13 ▲	31 ▲
<sup>2</sup> 2015	629 (3.2)		18 ▲	24 ▲	623 (3.4)		8	31 ▲	617 (3.5)		8	27 ▲	617 (3.4)		10	28 ▲
<sup>2</sup> 2011	611 (3.7)			6	614 (4.1)			23 ▲	609 (4.0)			19 ▲	607 (4.4)			18 ▲
2007	605 (3.8)				591 (4.0)				590 (4.1)				589 (5.2)			
<b>Sweden</b>																
<sup>2</sup> 2019	502 (2.4)	-11 ▽	-2	-3	496 (2.9)	14 ▲	37 ▲	37 ▲	495 (3.1)	17 ▲	39 ▲	23 ▲	513 (3.7)	1	9	-13 ▽
2015	513 (2.9)		9 ▲	7 ▲	482 (3.2)		23 ▲	23 ▲	478 (3.4)		22 ▲	5	512 (3.7)		8	-14 ▽
2011	504 (1.8)			-2	459 (2.2)			0	456 (2.3)			-17 ▽	504 (2.8)			-22 ▽
2007	505 (1.9)				459 (2.7)				472 (2.8)				526 (3.9)			
<b>Turkey</b>																
2019	493 (4.3)	46 ▲	58 ▲		493 (4.6)	34 ▲	38 ▲		490 (4.2)	27 ▲	35 ▲		502 (4.3)	36 ▲	35 ▲	
2015	447 (4.6)		13 ▲		459 (4.6)		4		463 (4.9)		8		467 (5.2)		-1	
2011	435 (4.0)				455 (4.3)				454 (4.4)				467 (4.0)			
<b>United Arab Emirates</b>																
2019	474 (1.9)	11 ▲	15 ▲		486 (2.1)	1	18 ▲		462 (2.1)	14 ▲	31 ▲		451 (2.1)	2	11 ▲	
2015	464 (1.9)		5		485 (2.0)		17 ▲		447 (2.4)		17 ▲		449 (2.5)		9 ▲	
2011	459 (2.3)				468 (2.2)				431 (2.4)				440 (2.4)			
<b>United States</b>																
<sup>†</sup> 2019	520 (4.5)	0	6	6	520 (5.4)	-5	8	13 ▲	499 (4.8)	-1	14 ▲	19 ▲	509 (5.4)	-13	-18 ▽	-23 ▽
<sup>†</sup> 2015	520 (3.1)		6	6	525 (3.1)		13 ▲	18 ▲	500 (3.2)		15 ▲	20 ▲	522 (3.5)		-5	-11 ▽
<sup>2</sup> 2011	514 (3.0)			0	512 (2.6)			5	485 (2.7)			5	527 (3.3)			-5
<sup>2†</sup> 2007	514 (2.9)				507 (3.1)				480 (2.9)				533 (3.4)			
<b>Benchmarking Participants</b>																
<b>Ontario, Canada</b>																
2019	530 (4.3)	1	12 ▲	2	515 (4.4)	7	18 ▲	19 ▲	536 (4.8)	12 ▲	24 ▲	25 ▲	542 (5.2)	10	11	-6
2015	530 (3.0)		11 ▲	2	507 (3.0)		11 ▲	11 ▲	524 (3.5)		12 ▲	13 ▲	531 (3.9)		0	-16 ▽
<sup>2</sup> 2011	519 (2.8)			-9	497 (2.4)			1	512 (2.8)			1	531 (4.2)			-17 ▽
<sup>2</sup> 2007	528 (4.2)				496 (3.9)				510 (4.5)				547 (5.1)			
<b>Quebec, Canada</b>																
<sup>‡</sup> 2019	544 (3.9)	-13 ▽	1	6	531 (4.0)	0	15 ▲	19 ▲	549 (4.4)	9	21 ▲	22 ▲	554 (4.5)	8	6	14 ▲
<sup>‡</sup> 2015	557 (4.3)		14 ▲	19 ▲	530 (4.4)		15 ▲	18 ▲	540 (4.3)		12 ▲	13 ▲	546 (5.0)		-2	6
2011	543 (2.4)			5	516 (2.9)			4	529 (2.6)			1	549 (3.0)			8
<sup>3</sup> 2007	537 (3.7)				512 (3.6)				527 (3.5)				540 (3.8)			
<b>Abu Dhabi, UAE</b>																
<sup>ψ</sup> 2019	439 (3.0)	-3	-13 ▽		448 (3.2)	-14 ▽	-11 ▽		420 (3.4)	-6	-5		411 (3.1)	-15 ▽	-24 ▽	
2015	443 (4.4)		-10		462 (4.5)		3		425 (5.4)		1		426 (5.5)		-8	
2011	452 (4.0)				459 (3.9)				424 (4.5)				434 (4.3)			
<b>Dubai, UAE</b>																
<sup>2</sup> 2019	537 (2.1)	28 ▲	57 ▲	78 ▲	547 (2.4)	19 ▲	58 ▲	71 ▲	527 (2.6)	31 ▲	74 ▲	82 ▲	525 (2.7)	22 ▲	58 ▲	81 ▲
2015	509 (2.5)		29 ▲	50 ▲	528 (2.7)		40 ▲	53 ▲	496 (2.6)		44 ▲	51 ▲	504 (3.0)		36 ▲	59 ▲
2011	479 (2.4)			21 ▲	489 (2.4)			13 ▲	453 (3.1)			7	468 (2.9)			23 ▲
<sup>‡</sup> 2007	458 (3.3)				476 (2.6)				445 (3.6)				444 (3.5)			

▲ Average from more recent year significantly higher

▽ Average from more recent year significantly lower

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