

**COMPARING
INTERNATIONAL TEST DATA
SUB-SCALE DIFFERENCES
IN ADVANCED
MATH AND SCIENCE**

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TIMSS/07 Trends in International TM4-8 TS4-8 Math & Science Study

- 1995 1999 2003 2007
2011 (Pub. Feb. 2013)
- 2007 – **58 Countries**
- **Grades 4 & 8** (Age Variable)
- 150+ Schools
- 4,000 – 4,500 Students
- **MATH & SCIENCE**
- **90+% Percentile Score**
- International **Benchmarks %**
Advanced (625) High (550)
- IEA Intl. Assn. for Evaluation of Educational Achievement
- Multiple Choice 50-54%
- Constructed Response 46-50%
- **CONTENT & COGNITIVE** Domains
- Grade 8 – Math (Includes **Algebra**)
- **GENDER** Comparison
- Race/Ethnicity
Asian, White, Hispanic, Black
- School **POVERTY** Level
Related to Achievement
- TRENDS (Cohort 2007 Gr. 4, 2011 Gr. 8)
- TIMSS & PIRLS International Study Center
Lynch School of Educ. Boston College



PISA

Program for International Student Assessment

2000 Reading 2009

2003 Math 2012

2006 Science 2015

2006 – **57** Countries/
Jurisdictions

30 OECD & 27 Non-OECD Groups
OECD - Organization for Economic
Cooperation & Development

□ **15 Year-Olds**

□ Functional Skills At **End** of
Mandatory Schooling

- **APPLICATION** of Capabilities to problems with real-life context.
- Scores: Combined & **SUB-SCALES**
- **90th** Percentile Scores
- **PROFICIENCY LEVELS** 1 – 6
- **GENDER** Differences
- Race/Ethnicity
- **PISA “Effect”** Indirect but Influential Tool of Education
- <http://www.pisa.oecd.org>

Advanced Achievement Factors

- ❑ **Number of Tests Per Country** - 1 to 7
- ❑ **Years of Participation** in Testing
- ❑ **Country Comparisons** – Europe 50 – EU 27
- ❑ **CONTENT Domain** - Math, Science, Reading
- ❑ **COGNITIVE Domain**: Knowing, Applying, Reasoning
- ❑ **Grade 4, Grade 8, Age 15** (Application)
- ❑ **Gender, 90+ Percentile, Advanced Benchmarks**
- ❑ **Levels of Proficiency (1 – 6)**
- ❑ **Trends** over Multiple Years of Testing
- ❑ **AVERAGE Variance (Total Scores All Tests)**

RANK 1-20	Range	TIMMS 4	TIMMS 8	PISA 15
	MATH	500- 607	474- 598	492- 549
	SCIENCE	504- 587	470- 567	498- 563

TIMSS 4 – MATH HIGHER RANGE THAN SCIENCE
 TIMSS 8 - MATH HIGHER RANGE THAN SCIENCE

PISA 15 - SCIENCE
 HIGHER RANGE

COUNTRIES Rank 1-20

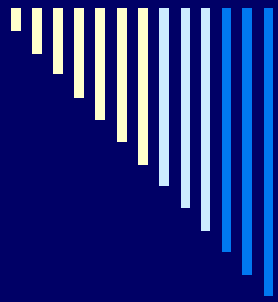
Combined Test Average

(Rank 1-6) Sig. Higher Avg. – 5/6 Asia

(Rank 9-19) All E or W Europe

Rank	Group	COUNTRY	Test	Avg.
1	AS	Singapore	5	581
2	AS	Hong Kong China	7	559
3	AS	Chinese Taipei	7	558
4	WE	Finland	2	556
5	AS	Korea, Rep. of	4	555
6	AS	Japan	6	549
7	EE	Kazakhstan	2	541
8	ENG	Canada	3	540
9	WE	Netherlands	5	532
10	ENG	England/U.K.	7	527

Rank	Group	COUNTRY	Test	Avg.
11	WE	Belgium	3	526
12 T	WE	Germany	5	524 T
12 T	WE	Liechtenstein	2	524 T
14	EE	Estonia	2	523
15	EE	Russian Federation	7	522
16 T	EE	Hungary	7	521 T
16 T	WE	Switzerland	2	521 T
18 T	EE	Latvia	5	519 T
18 T	WE	Denmark	5	519 T
20	AS	Macao-China	2	518



COUNTRIES Rank 21- 30

Combined 7 Test Average (Incl. PIRLS)

Rank	Group	COUNTRY	Tests	Avg.
21 T	WE	Austria	5	517 T
21 T	ENG	Australia	6	517 T
23	ENG	New Zealand	5	516
24	EE	Slovenia	7	515
25	ENG	United States	7	514
26	WE	Sweden	7	512
27 T	EE	Lithuania	7	511 T
27 T	EE	Czech Rep.	6	511 T
27 T	WE	Luxembourg	3	511 T
30	EE	Slovakia	5	507

LIMITATIONS in Combining Averages

Total Rank covers **ALL TESTS** Taken.

All Countries did not take all the tests.

TIMSS is **MATH & SCIENCE**

PIRLS is **READING**

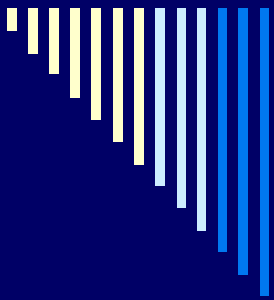
PISA is **SCIENCE** and **MATH**

FINLAND - #1 PISA – NO TIMSS Testing

SINGAPORE - #1 This List – NO PISA

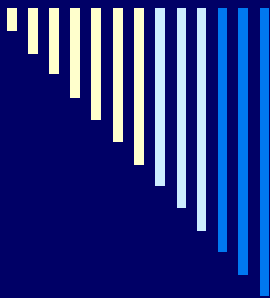
TIED = T Skipped next rank number

List helps to identify a high-scoring sample



MATH & SCIENCE Sample SELECTION OF COUNTRY GROUPS

TIMSS MATH – GR. 4	COUNTRY GROUPS (Had At Least One Rank 1-20)	
TIMSS MATH – GR. 8	ASIA	8
PISA MATH – AGE 15	EASTERN EUROPE	15
TIMSS SCIENCE – GR. 4	WESTERN EUROPE	14
TIMSS SCIENCE – GR. 8	ENGLISH-SPEAKING	7
PISA SCIENCE – AGE 15	MIDDLE EAST	1



MATH - ASIA (Rank 1-20)

ASIA All High Scores, Top Rankings & Percentages
TIMSS 4/8 High: **Chinese Taipei, Singapore, Korea Rep, Japan**
TIMSS 8 Strongest Evidence – 90% Scores Above 700
TIMSS 8 **TIMSS 8 Scores higher than PISA (Gr. 8 Importance)**
PISA Highest: **Chinese Taipei, China Hong Kong**
PISA High Rankings Yet **PISA scores lower than TIMSS**
90% Highest Scores = **Highest 90% + High Adv. Benchmark %**

ASIA (AS)	OE CD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
China Hong Kong		<u>607</u>	1	572	4	547	3	691	681	665	40%	31%
China Taipei		576	3	<u>598</u>	1	549	1	663	721	677	24%	45%
China Macao						527	7			632		
JAPAN G8	OE CD	568	4	<u>570</u>	5	523	8	663	677	638	23%	26%
Korea, Rep.	OE CD			<u>597</u>	2	522	9		711	664		40%
Malaysia				474	20				581			2%
Singapore		<u>599</u>	2	593	3			702	706		41%	40%
Thailand				<u>441</u>	29	421	41		578	524		3%

MATH – ENGLISH LANG. (Rank 1-20)

TIMSS 4 HIGHEST: England/UK 541 USA 529 Gr. 4 Math Highest
 TIMSS 8 HIGHEST: England/UK 513 USA 508 (Higher Than PISA)
 PISA HIGHEST: Canada 527, New Zealand 522, Australia 520
 90% Range (590-647) TIMSS 4 Highest 3/5 PISA Highest 2/5

ENGLISH LANG (ENG)	OE CD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625	
Australia PISA Highest	OE CD	516	14	496	14	520	10	620	600	633	9%	6%	
Canada Only PISA/High	OE CD					527	6			635			
England/UK Lower PISA	OE CD	541	7	513	7	495	19	647	618	612	16%	8%	
Ireland Only PISA	OE CD					501	18			608			
Scotland No PISA	OE CD	494	22	487	17			592	590			4%	4%
New Zealand PISA 90%	OE CD	492	23			522	9	598			643	5%	
U. S. Gr. 4 Higher PISA Low	OE CD	529	11	508	9	474	26	625	607	593	10%	6%	

MIDDLE EAST 1-20	OE CD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Jordan	No			427	31	384	42			556	489	1%

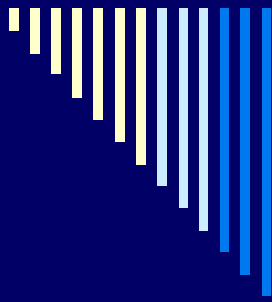
MATH – W. Europe (Rank 1-20)

TIMSS 4 – 7/14 - Netherlands in top 10 – 5/7 Higher than PISA

TIMSS 8 – Only 3/14 Tested: Italy, Norway, Sweden

PISA 14 - High: **Finland**, Netherlands, Liechtenstein, Switzerland

W. EUROPE	WE	OECD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Austria	Same T4/PISA	OECD	505	17			505	15	590		630	3%	
Belgium	90% Pisa #2	OECD					520	10			650		
Denmark	Similar Rank	OECD	523	13			513	12	611		621	7%	
Finland	HIGH PISA	OECD					548	2			652		
France	Only Pisa	OECD					495	19			617		
Germany	Higher T4	OECD	525	12			504	16	607		632	6%	
Iceland	Only Pisa	OECD					506	14			618		
Italy	Highest T4	OECD	507	16	480	19	462	29	601	574	584	6%	3%
Liechtenstein	#7 PISA	OECD					525	7			643		
Luxembourg	Only Pisa	OECD					490	22			610		
Netherlands	High T4/P	OECD	535	9			531	4	612		645	7%	
Norway	PISA Higher	OECD	473	25	469	21	490	22	566	552	609	2%	>1%
Sweden	Similar T4/Pisa	OECD	503	18	491	15	502	17	586	582	617	3%	2%
Switzerland	90% High	OECD					530	5			652		



MATH – E. EUROPE

(Rank 1-20)

TIMMS 4 Highest (6/10)

TIMSS 8 Highest (3/9)

PISA Lowest Score (7/11) Highest Score (1/11)

90% TIMMS 4 (Range 573-653) TIMSS 8 (Range 572-624) PISA (Range 543-644)

EE

	OECD	TM4	RK	TM8	RK	PISA 15	RK	TM4 90%	TM8 90%	PISA 90%	TM4 625	TM8 625
Armenia No PISA		<u>500</u>	20	499	13			617	601		9%	6%
Bulgaria T8/Pisa				<u>464</u>	23	413	37		586	543		4%
Czech Rep. 90% High	OECD	486	24	504	11	<u>510</u>	13	578	599	644	2%	6%
Estonia High Pisa						515	11			618		
Hungary High T8	OECD	510	15	<u>517</u>	6	491	21	620	624	609	9%	10%
Kazakhstan High T4		549	5					653			19%	
Latvia High T4		<u>537</u>	8			486	23	628		590	11%	
Lithuania High T4/T8		<u>530</u>	10	506	10	486	23	624	609	602	10%	6%
Malta Only T8				488	16				597			5%
Poland Only Pisa	OECD					495	19			610		
Russian Fed. High T		<u>544</u>	6	<u>512</u>	8	476	25	647	617	592	16%	8%
Serbia Higher T8				<u>486</u>	18	435	32		597	553		5%
Slovak Rep. No T8	OECD	<u>496</u>	21			492	20	597		611	5%	
Slovenia Pisa 90%		502	19	501	12	<u>504</u>	16	589	594	623	3%	4%
Ukraine Even T4/T8		<u>469</u>	26	462	25			573	572		2%	3%

TIMSS MATH — Grade 4 - Rank 1-10

90% Highest Singapore (702) China Hong Kong (691)

Highest Sub-Score: **Number (7/10)**, **Geometry (1/10)**, Data (3/10)

Lowest Sub-Score: Number (2/10), **Geometry (5/10)**, Data (3/10)

Number: (Range **533 - 611**) +78 Highest Low & High Score

Geometry: (Range **518 - 599**) +81 Lowest Score- Higher Variance

Data: (Range **522 - 585**) +63 Mid-Range Distribution

COG DOM Highest Sub-Score: **Know 5/10**, **Apply 5/10**, **Reasoning 0/10**

Rank	COUNTRY	TOT	90 %	NUMB 52%	GEOM 34%	DATA 15%	KNOW 39%	APPLY 41%	REAS 21%
1	China Hong Kong	607	691	<u>606</u>	599	585	599	<u>617</u>	589
2	Singapore	599	702	<u>611</u>	570	583	590	<u>620</u>	578
3	Chinese Taipei	576	663	<u>581</u>	556	567	<u>569</u>	534	566
4	JAPAN G8	568	663	561	566	<u>578</u>	566	<u>565</u>	563
5	Kazakhstan	549	653	<u>556</u>	542	522	547	<u>559</u>	539
6	RUSSIAN Fed G8	544	647	<u>546</u>	538	530	<u>547</u>	538	540
7	ENGLAND G8	541	647	531	<u>548</u>	547	540	<u>544</u>	537
8	Latvia	537	628	<u>536</u>	532	<u>536</u>	<u>540</u>	530	537
9	Netherlands	535	612	535	522	<u>543</u>	<u>540</u>	525	534
10	Lithuania	530	624	<u>533</u>	518	530	<u>539</u>	520	526

TIMSS MATH — Grade 8

Rank 1-10

90% 700+: Chinese Taipei, Korea, Singapore

Highest Sub-Score: **Number (1/10)**, **Algebra & Geo. (2/10)**, **Data (5/10)**

Number: (Range **506 - 597**) + 91 Highest Low Score, Lowest Range

Algebra: (Range **483 - 617**) +134 **Greatest Range – (Significant)**

Geometry: (Range **480 - 592**) +112 Greater Range

Data: (Range **487 - 580**) + 93 Mid-Range

COG DOM: (Range **486- 596**) +110 **KNOW 2/10, APPLY 6/10, REAS 2/10**

Rank	COUNTRY	TOT	90%	NUM 29%	ALG 30%	GEO 22%	DATA 19%	KNOW 39%	APPLY 41%	REAS 21%
1	Chinese Taipei	598	721	577	<u>617</u>	592	566	592	<u>594</u>	591
2	Korea, Rep.	597	711	583	<u>596</u>	587	580	595	<u>596</u>	579
3	Singapore	593	706	<u>597</u>	579	578	574	<u>593</u>	581	579
4	China Hong Kong	572	681	567	565	<u>570</u>	549	569	<u>574</u>	557
5	Japan	570	677	551	559	<u>573</u>	<u>573</u>	565	560	<u>568</u>
6	Hungary	517	624	517	503	508	<u>524</u>	513	<u>518</u>	513
7	England	513	618	510	492	510	<u>547</u>	514	503	<u>518</u>
8	Russian Fed.	512	617	507	<u>518</u>	510	487	510	<u>521</u>	497
9	Lithuania	508	609	506	483	507	<u>523</u>	<u>511</u>	508	486
10	U.S.A.	506	607	510	501	480	<u>531</u>	503	<u>514</u>	505

PISA MATH - Age 15 Rank 1-20

Asia (5) – English Lang. (5) - W. Europe (11) - E. Europe (5)

Rank 1-20: RANGE: TOT (492-549) - 90% (608-677) VAR. (+110)

Rank	COUNTRY	TOT	90%	DIF	Rank	COUNTRY	TOT	90%	DIF
1	Chinese Taipei	549	677	128	11	Estonia	515	618	103
2	Finland	548	652	104	12	Denmark	513	621	108
3T	China Hong Kong	547	665	118	13	Czech Republic	510	644	134
3T	Korea, Republic		664	117	14	Iceland	506	618	106
4	Netherlands	531	645	114	15	Austria	505	630	125
5	Switzerland	530	652	122	16T	Germany G8	504	632	128
6	Canada G8	527	635	108	16T	Slovenia	504	623	119
7T	China Macao	525	632	107	17	Sweden	502	617	115
7T	Liechtenstein		643	118	18	Ireland	501	608	107
8	Japan G8	523	638	115	19T	France G8	495	617	122
9	New Zealand	522	643	121	19T	Poland		610	115
10T	Australia	520	633	113	19T	U. K. G8		612	117
10T	Belgium	520	650	130	20	Slovak Republic	492	611	119



90TH PERCENTILE Differences

PISA MATH 2006 - AGE 15

90% = Significant G/T Indicator

- 57 JURISDICTIONS –
OECD (30) non-OECD (27)
- U.S. – 90th Percentile
Scored Lower (593) than
OECD Average (615)
- U.S. – 90th Percentile
29/57 Jurisdictions Higher
(23 OECD) (6 non-OECD)
- U.S. – 10th Percentile
26/57 Jurisdictions Higher
(18 OECD) (8 non-OECD)

- 90% Score can be used as DATA to support G/T Programming and Math and Science Advanced Curriculum.
- Increase in 90% Score can be a strong factor in raising the mean score for the country.
- 90% Score comparisons can be used as support for policy for Advanced Math & Science and CONTENT BALANCE in curriculum development.

SCIENCE - ASIA (Rank 1-20)

TIMSS 4 High Rank: Singapore, Chinese Taipei, China Hong Kong, Japan
TIMSS 8 High Rank: Singapore, Chinese Taipei, Japan, Korea Rep.
PISA High Rank: China Hong Kong, Chinese Taipei, Japan
TIMSS 4/8 Decrease Gr. 4 To Gr. 8 – China Hong Kong (-24), Singapore (- 20)
TIMSS 8/PISA Chinese Taipei (-29), Japan (-33), Korea (-31) - **PISA Lowest for All**
TIMSS Highest Advanced Benchmark % - Singapore, Chinese Taipei
90% Highest TIM4 1/4 & TIM8 3/7 (Singapore) PISA 2/6 – 625+ Taipei, Singapore

ASIA (AS)	OE CD	TS 4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
China Hong Kong		<u>554</u>	3	530	8	542	2	637	625	<u>655</u>	14%	10%	16%
Chinese Taipei		557	2	<u>561</u>	2	532	4	653	<u>665</u>	651	19%	25%	15%
China Macao						511	15			611			6%
JAPAN G8	OE CD	548	4	<u>554</u>	3	531	5	633	648	<u>654</u>	12%	17%	15%
Korea, Rep.	OE CD			<u>553</u>	4	522	9		<u>646</u>	635		17%	10%
Malaysia				471	19				581			3%	
Singapore		<u>587</u>	1	567	1			<u>701</u>	694		36%	32%	
Thailand				<u>471</u>	19	421	41		<u>578</u>	524		3%	0%

SCIENCE – ENGLISH LANG (Rank 1-20)

TIMSS 4 – Highest (4/5) Australia, England/UK, Scotland, U.S.A.

TIMSS 8 – Highest (2/5) England/UK, Jordan

TIMSS 8 to PISA – Decline: England/UK (-27), U.S.A. (-34), Jordan (-60)

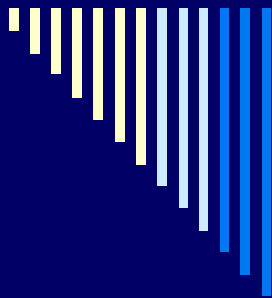
90% TIMSS 4 Highest: 1/5 U.S.A. Range (593 – 643) +50

90% TIMSS 8 Highest: 2/5 Scotland, Jordan Range (597 – 649) +52

90% PISA Highest: 3/7 Australia, England/UK, New Zealand Range (628 – 667) +39

ENGLISH LANG	OE CD	TS4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
Australia	OE CD	<u>527</u>	12	515	11	<u>527</u>	7	626	617	<u>653</u>	10%	8%	15%
Canada	OE CD					543	3			651			14%
England/UK	OE CD	<u>542</u>	6	<u>542</u>	5	515	12	641	649	<u>652</u>	14%	17%	14%
Ireland	OE CD					508	17			630			9%
New Zealand	OE CD	504	20			<u>530</u>	6	614		<u>667</u>	8%		18%
Scotland	OE CD	<u>500</u>	21	496	13			593	<u>597</u>		4%	17	
U.S.A.	OE CD	<u>539</u>	7	520	9	489	26	<u>643</u>	623	628	15%	10%	10%

Jordan	NO			<u>482</u>	18	422	40		<u>601</u>	537			5%	
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SCIENCE – W. Europe (Rank 1-20)

FINLAND – Rank 1 – PISA Only – Exceptional – (Most PISA Scores Less than TIMSS)

TIMSS 4 Highest Italy (1/7) TIMSS 8 (Limited) Highest Sweden (1/3)

PISA Higher Rank (N=14): Netherlands, Liechtenstein, Germany, Switzerland, Austria

90% - **PISA Higher Than TIMSS - 6/7 (TIMSS 4 = 7, TIMSS 8 = 3)**

W. EUR. WE	OECD	TS4	RK	TS 8	RK	PISA SC 15	RK	TS4 90%	TS8 90%	PISA SC 90%	TS4 625	TS8 625	PISA PL 5/6
Austria	OECD	<u>526</u>	13			<u>511</u>	15	620		<u>633</u>	9%		10%
Belgium	OECD					510	16			634			10%
Denmark	OECD	<u>517</u>	17			<u>496</u>	21	610		<u>615</u>	7%		7%
Finland	OECD					<u>563</u>	<u>1</u>			<u>673</u>			<u>21%</u>
France G8	OECD					495	22			623			8%
Germany G8	OECD	<u>528</u>	11			<u>516</u>	<u>11</u>	<u>623</u>		<u>642</u>	10%		<u>12%</u>
Iceland	OECD					491	24			614			7%
Italy G8	OECD	<u>535</u>	<u>9</u>	495	14	<u>475</u>	31	<u>636</u>	590	598	13%	4%	4%
Liechtenstein						<u>522</u>	<u>9</u>			<u>643</u>			<u>12%</u>
Luxembourg	OECD					486	29			609			6%
Netherlands	OECD	<u>523</u>	15			<u>525</u>	<u>8</u>	598		<u>646</u>	4%		<u>13%</u>
Norway	OECD	<u>477</u>	23	<u>487</u>	16	<u>487</u>	28	570	578	<u>610</u>	1%	2%	6%
Sweden	OECD	<u>525</u>	14	<u>511</u>	12	<u>503</u>	19	617	<u>608</u>	<u>622</u>	8%	6%	8%
Switzerland	OECD					<u>512</u>	14			<u>636</u>			10%

SCIENCE – E. Europe (Rank 1-20)

TIMSS Highest: Czech Rep., Hungary, Latvia, Russian Fed., Slovenia

BENCHMARK/PL HIGH: (2/3) Czech, Hungary, Russian Fed., Slovenia

PISA – Lower than TIMSS 7/15 – Estonia 5th - 90% High: Czech, Slovenia

EE	OECD	TS4	RK	TS 8	RK	PISA SC 15	R K	TS4 90%	TS8 90%	PISA 90%	TS4 625	TS8 625	PISA PL 5/6
Armenia		484	22	488	15			640	612		12%	8%	
Bulgaria				470	20	434	37	434	595	577		5%	3%
Czech Rep.	OECD	515	18	539	6	513	13	610	630	641	7%	11%	12%
Estonia						531	5			640			11%
Hungary	OECD	536	8	539	6	504	18	637	635	617	13%	13%	7%
Kazakhstan		533	10					623			10%		
Latvia	OECD	542	6			490	25	625		597	10%		4%
Lithuania	OECD	514	19	519	10	488	27	595	616	604	3%	8%	5%
Malta				457	26				595			5%	
Poland	OECD					498	20			615			7%
Russian Fed.	G8	546	5	530	8	479	30	646	627	596	16%	11%	5%
Serbia				470	20	436	36		571	548		2%	1%
Slovak Rep.	OECD	526	13			488	27	627		609	11%		6%
Slovenia		518	16	538	7	519	10	610	628	647	6%	11%	13%
Ukraine		474	24	485	17			576	588		2%	3%	

TIMSS SCIENCE Gr. 4 (Rank 1-10)

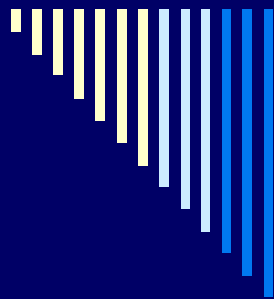
LIFE SCI: Singapore High – Italy, Hungary, Taipei, U.S. (3/10) – LOW: Japan, HK, UK

PHYS SCI: Singapore High – Japan, Taipei, HK (6/10) – LOW: Italy, Hungary

EARTH SCI: HIGH: HK, Singapore, Taipei (1/10) – LOW: Japan, Italy, Hungary

COGNITIVE DOMAIN Highest: Knowing 2/10 Apply 4/10 Reasoning 4/10

Rank	COUNTRY	TOT	90%	LIFE 43%	PHYS 37%	EARTH 21%	KNOW 39%	APPLY 41%	REAS 21%
1	Singapore	587	701	582	<u>585</u>	554	579	<u>587</u>	568
2	Chinese Taipei	557	653	<u>541</u>	<u>559</u>	553	556	536	<u>571</u>
3	China Hong Kong	554	637	532	558	<u>560</u>	549	546	<u>561</u>
4	JAPAN G8	548	633	530	<u>564</u>	529	542	528	<u>567</u>
5	RUSSIAN Fed G8	546	646	539	<u>547</u>	536	<u>546</u>	542	542
6 T	ENGLAND G8	542	641	532	<u>543</u>	538	536	<u>543</u>	537
6 T	Latvia	542	625	535	<u>544</u>	536	535	540	<u>551</u>
8	U.S.A. G8	539	643	<u>540</u>	534	533	533	<u>541</u>	535
9	Hungary	536	637	<u>548</u>	529	517	531	<u>540</u>	529
10	ITALY G8	535	636	<u>549</u>	521	526	<u>539</u>	530	526



TIMSS SCIENCE Gr. 8 (Rank 1-10)

HIGHEST: Singapore (90% ++), Chinese Taipei (90% +), Japan, Korea Rep.

BIOLOGY: Singapore Very High, **0/10** Highest Score - Range: **525** – **564**

CHEMISTRY: Chinese Taipei Very High, **2/10** Highest Score - Range: **517** – **573**

PHYSICS: Singapore, Korea Very High, **6/10** Highest Score – Range: **519** – **575**

EARTH SCI: No Extreme High – Range: **525** – **545**

COGNITIVE: Highest Score: KNOWING **3/10** APPLYING **2/10** **REASONING 5/10**

Rank	COUNTRY	TOT	90%	BIO 36%	CHEM 20%	PHYS 26%	EARTH 19%	KNOW 39%	APPLY 41%	REAS 21%
1	Singapore	567	694	564	560	575	541	567	554	564
2	Chinese Taipei	561	665	549	573	554	545	560	565	541
3	JAPAN G8	554	648	553	551	558	533	555	534	560
4	Korea, Rep.	553	646	548	536	571	538	547	543	558
5	England G8	542	649	541	534	545	529	538	530	547
6 T	Czech Repub.	539	630	531	535	537	534	539	533	534
6 T	Hungary	539	635	534	536	541	531	549	524	530
8	Slovenia	538	628	530	539	524	542	533	533	538
9 T	China Hong Kong	530	625	527	517	528	532	522	532	533
9 T	RUSSIAN Fed. G8	530	627	525	535	519	525	527	534	520



PISA SCIENCE Age 15 (Rank 1-25)

HIGHEST 90%: Finland, New Zealand, Hong Kong, Japan, Australia, U.K.,

RANGE: TOT (489 – 563) (+74) 90% (597 – 673) (+76) VAR. Average / 90% (+110)

Rank	COUNTRY	TOT	90%
1	Finland	563	673
2	China Hong Kong	542	655
3	CANADA G8	534	651
4	Chinese Taipei	532	651
5 T	Estonia	531	640
5 T	JAPAN G8		654
7	New Zealand	530	667
8	Australia	527	653
9	Netherlands	525	646
10 T	Korea, Rep.	522	635
10 T	Liechtenstein		643
12	Slovenia	519	647
13	GERMANY G8	516	642

Rank	COUNTRY	TOT	90%
14	ENGLAND/U.K. G8	515	652
15	Czech Republic	513	641
16	Switzerland	512	636
17 T	Austria	511	633
17 T	China Macao		611
19	Belgium	510	634
20	Ireland	508	630
21	Hungary	504	617
22	Sweden	503	622
23	Denmark	496	615
24	Latvia	490	597
25	U.S.A. G8	489	628

Note: TIMSS Advanced Intl Benchmark = 625

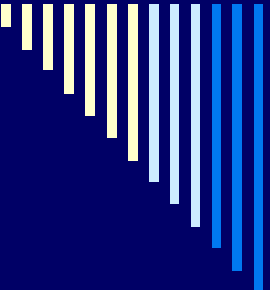


PISA SCIENCE – Sub-Scales

HIGHEST WITHIN COUNTRY:

IDENTIFYING 2/10 EXPLAINING 3/10 USING 5/10

	Combined Science Literacy	Identifying Scientific Issues	Explaining Phenomena Scientifically	Using Scientific Evidence
Finland	563	555	566	<u>567</u>
China Hong Kong	542	528	<u>549</u>	542
CANADA G8	534	532	531	<u>542</u>
Chinese Taipei	532	509	<u>545</u>	532
Estonia	531	516	<u>541</u>	531
JAPAN G8	531	522	527	<u>544</u>
New Zealand	531	536	522	<u>537</u>
Australia	527	<u>535</u>	520	531
Netherlands	525	<u>533</u>	522	526
Liechtenstein	522	522	516	<u>535</u>



GENDER Differences - GRADE 4 TIMSS 2007 – 35 Countries

MATH

- 20/35 Countries -Significant difference in average **MATH** scores of **MALES** and **FEMALES**.
- **MALE** Higher – 12 Countries
- **FEMALE** Higher – 8 Countries
- Difference in Average scores - **MALE / FEMALE**:
 - Kuwait – **FEMALE** +37
 - Colombia – **MALE** +17
 - U.S. – **MALE** +6 (**Number** Only)

SCIENCE

- 14/35 Countries -Significant difference in average **SCIENCE** scores of **MALES** and **FEMALES**.
- **MALE** Higher – 8 Countries
- **FEMALE** Higher – 6 Countries
- Difference in Average scores - **MALE / FEMALE**:
 - Kuwait – **FEMALE** +64
 - Colombia – **MALE** +15
 - U.S. – + **MALE** – **Earth Science**



GENDER Differences - GRADE 8 TIMSS 2007 – 47 Countries

MATH

- 24/47 Countries – Show significant difference in average MATH scores of **MALES** and **FEMALES**.
- **MALE** Higher – 8 Countries
- **FEMALE** Higher – 16 Countries
- Difference in Average scores - **MALE / FEMALE**:
 - Oman – **FEMALE** +54
 - Colombia – **MALE** +32
 - U.S. – NO Measurable Difference**MALES** Higher in: **Number, Geometry, Data & Chance**

SCIENCE

- 24/47 Countries – Show significant difference in average MATH scores of **MALES** and **FEMALES**.
- **MALE** Higher – 10 Countries
- **FEMALE** Higher – 14 Countries
- Difference in Average scores - **MALE / FEMALE**:
 - Qatar – **FEMALE** +70
 - Colombia, Germany – **MALE** +15
 - U.S. – **MALE** +12 (**Biology, Physics, Earth Science**, NOT **Chemistry**)**MALE: 2003 (536) 2007 (526)**



GENDER Differences

PISA **SCIENCE** 2006 - AGE 15

- 57 JURISDICTIONS –
OECD 30 non-OECD 27
- MALE Higher –
8 Jurisdictions (6 OECD)
OECD Average
Higher for MALES
- FEMALE Higher – 12
Jurisdictions (2 OECD)
- Across OECD –
FEMALES Higher:
Identifying Scientific Issues
Using Scientific Evidence
- Across OECD – MALES Higher:
Explaining Phenomena Scientifically
- U.S. – FEMALES Higher:
Identifying Scientific Issues
- U.S. – MALES Higher:
Explaining Phenomena Scientifically
- U.S. – NO Measurable Difference:
Using Scientific Evidence



G/T POLICY - Data As Evidence

MATH

TIMSS 1995 1999 2003 2007 2011

- GENDER
- 90th PERCENTILE
- ADVANCED INTERNATIONAL BENCHMARKS
- CONTENT Domains
- COGNITIVE Domains

PISA 2000R 2003M 2006S 2009R 2012M

- **MATH** Sub-Scales 2003, 2012
- GENDER – (Math Sub-Scales 2003)
- PROFICIENCY LEVELS 1-6

SCIENCE

TIMSS 1995 1999 2003 2007 2011

- GENDER
- 90th PERCENTILE
- ADVANCED INTERNATIONAL BENCHMARKS
- CONTENT Domains
- COGNITIVE Domains

PISA 2000R 2003M 2006S 2009R 2012M

- **SCIENCE** Sub-Scales 2006, 2015
- GENDER (Science Sub-Scales 2006)
- PROFICIENCY LEVELS 1-6



GENDER CONSIDERATIONS

MATH

- Focus on Motivation and Accelerated **MATH** Opportunities for FEMALES
- Policies to Decrease GENDER variance may increase **MATH** test scores.
- FEMALE or MALE **MATH** score differences support evidence for realistic goal of GENDER EQUITY.

SCIENCE

- Focus on Motivation and Advanced **SCIENCE** Opportunities for FEMALES
- Policies to Decrease GENDER variance may improve total scores in **SCIENCE**.
- FEMALE or MALE **SCIENCE** score differences support evidence for realistic goal of GENDER EQUITY.



TIMSS INTERNATIONAL BENCHMARKS

MATH 4

NUMBER, GEOMETRY, DATA

- **LOW (400)** “DEMONSTRATE”
- **INTERMEDIATE (475)** “EXTEND”
- **HIGH (550)** “SOLVE, INTERPRET, USE”

APPLY knowledge and understanding to **solve** problems.

- **ADVANCED (625)** “ORGANIZE”
APPLY understanding & knowledge in variety of relatively **complex** situations & **explain reasoning**.

MATH 8

NUMBER, ALGEBRA, GEOMETRY, DATA

- **LOW (400)** “SOME KNOWLEDGE”
- **INTERMEDIATE (475)** “DEMONSTRATE”
- **HIGH (550)** “APPLY, WORK, USE, SOLVE”

APPLY understanding & knowledge in variety of relatively **complex** situations.

- **ADVANCED (625)** “APPLY, SOLVE”
Organize & **draw conclusions** from information, make **generalizations**, & **SOLVE** non-routine problems



SCIENCE - PISA PROFICIENCY LEVELS

PROF LEV	SCORE RANGE	TASK DESCRIPTIONS
1	334.94 – 409.54	<ul style="list-style-type: none"> <input type="checkbox"/> Limited Scientific Knowledge applied to few familiar situations. <input type="checkbox"/> Able to present obvious scientific explanations from evidence.
2	409.54 – 484.14	<ul style="list-style-type: none"> <input type="checkbox"/> Adequate scientific knowledge for possible explanations in familiar context. <input type="checkbox"/> Direct reasoning & literal interpretation of scientific inquiry.
3	484.14 – 558.73	<ul style="list-style-type: none"> <input type="checkbox"/> Identify clearly described scientific issues in range of contexts. <input type="checkbox"/> Select facts & knowledge to explain phenomena & apply simple inquiry strategy. <input type="checkbox"/> Interpret, use scientific concepts & apply directly; develop short communications.
4	558.73 – 633.33	<ul style="list-style-type: none"> <input type="checkbox"/> Work with situations of explicit phenomena & make scientific inferences. <input type="checkbox"/> Select, integrate science explanations and link directly to life situations. <input type="checkbox"/> Reflect on actions & communicate decisions using scientific knowledge & evidence.
5	633.33 – 707.93	<ul style="list-style-type: none"> <input type="checkbox"/> Identify scientific components of many complex life situations & apply concepts. <input type="checkbox"/> Compare, select, evaluate scientific evidence with inquiry ability & critical insight. <input type="checkbox"/> Construct evidence-based explanations/arguments based on critical analysis.
6	707.93 +	<ul style="list-style-type: none"> <input type="checkbox"/> Consistently identify, explain, apply scientific knowledge in complex life situations. <input type="checkbox"/> Link sources, explanations, and use evidence to justify decisions.
		<ul style="list-style-type: none"> <input type="checkbox"/> Demonstrate advanced scientific reasoning in support of unfamiliar situations. <input type="checkbox"/> Develop arguments for recommendations on personal, social, global situations.



CONTENT DOMAINS - TIMSS

MATH

	<u>Gr. 4</u>	<u>Gr. 8</u>
□ NUMBER	50%	30%
□ ALGEBRA		30%
□ GEOMETRY	35%	20%
□ DATA/PROB.	15%	20%

- **Content Domain %** on test items can be a resource to **BALANCE** distribution in Standards.

SCIENCE

	<u>Gr. 4</u>	<u>Gr. 8</u>
□ LIFE/BIOL.	45%	35%
□ CHEMISTRY		20%
□ PHYSICS	35%	25%
□ EARTH SCI	20%	20%

- **Content Balance %** outlined in a Country's **Curriculum Standards** in Grades 4 and 8 may not correlate with **% of Content used in test items.**



COGNITIVE DOMAINS & LEARNING

MATH & SCIENCE

□ KNOWING (40%).....

Less Facts / More Application
Less content / More Process

□ APPLYING (40%).....

Concrete / Solve Problems
Laboratory / Experiments

□ REASONING (20%).....

Complex situations / Explain
Describe / Demonstrate

□ BRAIN-BASED

□ ENGAGED LEARNING

□ Addresses the facts, procedures,
And concepts needed to function
Mathematically and scientifically.

□ Focus on abilities to apply knowledge, and
conceptual understanding to solve
Problems or answer questions.

□ Goes beyond cognitive processes involved
in solving routine problems to include
unfamiliar situations, complex contexts,
multi-step problems & more complex tasks.

**More emphasis on higher
thinking skills in instruction!**

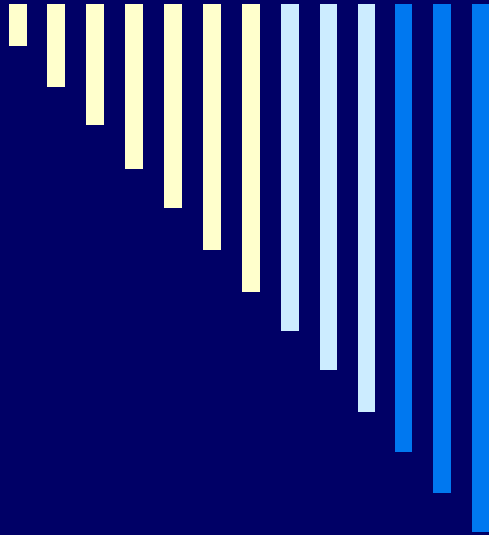


CONCLUSIONS

- There are a number of **VARIABLES** that can be used in analysis of International Test Scores
- Most comparisons of international test scores relate to **AVERAGE** scores of the country's test sample. Analysis of **Sub-Scores** provides excellent data relating to **ADVANCED** achievement.
- **GENDER** comparisons can provide support for policy and equal opportunity for advanced curriculum for males and females.
- PISA **PROFICIENCY LEVELS 1-6** are useful guides in development of curriculum for advanced students.
- **90 Percentile** – Important data for analyzing achievement of top 10%.
- **CONTENT DOMAIN** sub-scores support **CONTENT BALANCE** as significant variable related to high achievement in Math, Science and Reading Literacy
- **COGNITIVE DOMAIN** Sub-Scores provide valuable data related to higher order **REASONING**.
- **ADVANCED INTERNATIONAL BENCHMARKS** are an excellent resource for curriculum development for high ability.
- **YEARS OF SCHOOLING & PRE- PRIMARY EDUCATION** are variables related to achievement that support early advanced opportunities. (Includes “**Shadow Education.**”)

I.N.S.T.E.A.D. International

International Network Supporting Transnational Exchange & Diversity



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MATH

CONTINENT	COUNTRY	TIMSS GR 4 MATH 2007		TIMSS GR 8 MATH 2007		PISA MATH 2006		TIMSS 4 MATH 90%		TIMSS 8 MATH 90%		PISA MATH 90%		TIMSS 4 MATH ADV INTL BENCHMARK %		TIMSS 8 MATH ADV INTL BENCHMARK %		TIMSS 4 MATH DIFF GENDER
			RANK		RANK		RANK		RANK		RANK		RANK					
AS	China HongKong	607	1	572	4	547	3	691	2	681	4	665	2	40	31			M4
AS	China Taipei	576	3	598	1	549	1	663	3	721	1	677	1	24	45			M2
AS	China Macao					525	7					632	14					
AS	G8 Japan	568	4	570	5	523	8	663	3	677	5	638	11	23	26			0
AS	Korea, Rep.			597	2	547	3			711	2	664	3		40			
AS	Malaysia			474	20					578	20				2			
AS	Singapore	599	2	593	3			702	1	706	3			41	40			F6
AS	Thailand			441	29	417	35			562	23	524	36		3			
ASM	Jordan			427	31	384	42			556	24	489	37		1			
EE	Armenia	500	20	499	13			617	13	601	11			8	6			F9
EE	Bulgaria			464	23	413	37			586	18	543	35		4			
EE	Czech Rep.	486	24	504	11	510	13	578	24	599	13	644	8	2	6			M6
EE	Estonia					515	11					618	19					
EE	Hungary	510	15	517	6	491	21	620	11	624	6	609	27	9	10			M3
EE	Kazakhstan	549	5					653	5					19				F8
EE	Latvia	537	8			486	23	628	8			590	32	11				F3
EE	Lithuania	530	10	506	10	486	23	624	10	609	9	602	29	10	6			0
EE	Malta			488	16					597	14				5			
EE	Poland					495	19					610	25					
EE	G8 Russian Fed.	544	6	512	8	476	25	647	6	617	8	592	31	16	8			F7
EE	Serbia			486	18	415	36			587	17	553	34		5			
EE	Slovak Rep.	496	21			492	20	597	19			611	24	5				M6
EE	Slovenia	502	19	501	12	504	16	589	22	594	15	623	17	3	4			M5
EE	Ukraine	469	26	462	25			573	25	572	22			2	3			0

MATH

CONTINENT	COUNTRY	TIMSS GR 4 MATH 2007 RANK	TIMSS GR 8 MATH 2007 RANK	PISA MATH 2006 RANK	TIMSS 4 MATH 90% RANK	TIMSS 8 MATH 90% RANK	PISA MATH 90% RANK	TIMSS 4 MATH ADV INTL BENCHMARK %	TIMSS 8 MATH ADV INTL BENCHMARK %	TIMSS 4 MATH DIFF GENDER						
EN	Australia	516	14	496	14	520	10	620	11	600	12	633	13	9	6	M6
EN G8	Canada					527	6					635	12			
EN	Ireland					501	18					608	28			
EN	New Zealand	492	23			522	9	598	18			643	9	5		M1
EN	Scotland	494	22	487	17			592	20	590	16			4	4	M9
EN G8	England	541	7	513	7	495	19	647	6	618	7	612	23	16	8	0
EN G8	U.S.A.	529	11	508	9	474	26	625	9	607	10	593	30	10	6	M6
WE	Austria	505	17			505	15	590	21			630	16	3		M14
WE	Belgium					520	10					650	6			
WE	Denmark	523	13			513	12	611	15			621	18	7		M7
WE	Finland					548	2					652	4			
WE G8	France					495	19					617	21			
WE G8	Germany	525	12			504	16	607	16			632	14	6		M12
WE	Iceland					506	14					618	19			
WE G8	Italy	507	16	480	19	462	29	601	17	574	21	584	33	6	3	M15
WE	Liechtenstein					525	7					643	9			
WE	Luxembourg					490	22					610	25			
WE	Netherlands	535	9			531	4	612	14			645	7	7		M10
WE	Norway	473	25	469	21	490	22	566	26	552	25	609	27	2	0	M7
WE	Sweden	503	18	491	15	502	17	586	23	582	19	617	21	3	2	M6
WE	Switzerland					530	5					652	5			

FACTS

CONTINENT	COUNTRY	TIMSS GR 4 SCIENCE 2007		TIMSS GR 8 SCIENCE 2007		PISA AGE 15 SCIENCE 2006		TIMSS GR 4 SCIENCE 90TH %		TIMSS GR 8 SCIENCE 90TH %		PISA AGE 15 SCIENCE 90TH %		PISA 15 SCIENCE PROF LEVEL 5-6	
			RANK		RANK		RANK		RANK		RANK		RANK		RANK
AS	China HongKong	554	3	530	8	542	2	637	7	625	10	655	3	16	3
AS	China Macao					511	15					611	27	5	30
AS	China Taipei	557	2	561	2	532	4	653	2	665	2	651	7	15	4
AS	G8 Japan	548	4	554	3	531	5	633	10	648	4	654	4	15	4
AS	Korea, Rep.			553	4	522	9			646	5	635	16	10	15
AS	Malaysia			471	19					581	22				
AS	Singapore	587	1	567	1			701	1	694	1				
AS	Thailand			471	19	421	41			578	23	524	38	0	38
ASM	Jordan			482	18	422	40			601	16	537	37	1	36
EE	Armenia	484	22	488	15			640	6	612	14				
EE	Bulgaria			470	20			434	27	595	18	577	35	3	35
EE	Czech Rep.	515	18	539	6	513	13	610	19	630	7	641	13	12	11
EE	Estonia					531	5					640	14	11	14
EE	Hungary	536	8	539	6	504	18	637	7	635	6	617	23	7	23
EE	Kazakhstan	533	10					623	14						
EE	Latvia	542	6			490	25	625	13			597	33	4	33
EE	Lithuania	514	19	519	10	488	27	595	23	616	13	604	31	5	30
EE	Malta			457	26					595	18				
EE	Poland					498	20					615	24	7	23
EE	G8 Russian Fed.	546	5	530	8	479	30	646	3	627	9	596	34	5	30
EE	Serbia			470	20	436	36			571	25	548	36	1	36
EE	Slovak Rep	526	13			488	27	627	11			609	29	6	27
EE	Slovenia	518	16	538	7	519	10	610	19	628	8	647	9	13	9
EE	Ukraine	474	24	485	17			576	25	588	21				

E C O N O M I C S

CONTINENT	COUNTRY	TIMSS GR 4 SCIENCE 2007		TIMSS GR 8 SCIENCE 2007		PISA AGE 15 SCIENCE 2006		TIMSS GR 4 SCIENCE 90TH %		TIMSS GR 8 SCIENCE 90TH %		PISA AGE 15 SCIENCE 90TH %		PISA 15 SCIENCE PROF LEVEL 5-6	
		RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	RANK	
EN G8	Canada					534	3					651	7	14	7
EN	Ireland					508	17					630	19	9	20
EN	New Zealand	504	20			530	6	614	18			667	2	18	2
EN	Scotland	500	21	496	13			593	24	597	17				
EN G8	U. K.	542	6	542	5	515	12	641	5	649	3	652	6	14	7
EN G8	U.S.A.	539	7	520	9	489	26	643	4	623	11	628	20	10	15
EN	Australia	527	12	515	11	527	7	626	12	617	12	653	5	15	4
WE	Austria	526	13			511	15	620	16			633	18	10	15
WE	Belgium					510	16					634	17	10	15
WE	Denmark	517	17			496	21	610	19			615	24	7	23
WE	Finland					563	1					673	1	21	1
WE G8	France					495	22					623	21	8	21
WE G8	Germany	528	11			516	11	623	14			642	12	12	11
WE	Iceland					491	24					614	26	7	23
WE G8	Italy	535	9	495	14	475	31	636	9	590	20	598	32	4	33
WE	Liechtenstein					522	9					643	11	12	11
WE	Luxembourg					486	29					609	29	6	27
WE	Netherlands	523	15			525	8	598	22			646	10	13	9
WE	Norway	477	23	487	16	487	28	570	26	578	23	610	28	6	27
WE	Sweden	525	14	511	12	503	19	617	17	608	15	622	22	8	21
WE	Switzerland					512	14					636	15	10	15



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<http://www.oecd.org/dataoecd/34/60/46619703.pdf>

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http://www.oecd.org/document/61/0,3746,en_32252351_32235731_46567613_1_1_1_1,00.html

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