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Latvian 4th Grade Students' Competence of Mathematics in International Comparison

Ph.D. Mihno L., *Mg.sc.admin.* Mālere A.,
Mg.sc.edu. Mitenberga L., *Mg.sc.admin.* Rimša M.

The **aim** of this article **is to identify the weaknesses** of Latvian students in **mathematics competences** in TIMSS 2019, as well as to find out **what could improve the mathematics competences** of Latvian students and their chances to become better mathematicians.

Mathematical competence

Mathematical competence is the ability to develop and apply mathematical thinking and insight in order to solve a range of problems **in everyday situations**.

Necessary knowledge in mathematics includes a sound **knowledge of numbers**, **measures and structures**, **basic operations** and **basic mathematical presentations**, **an understanding of mathematical terms and concepts**, and an awareness of the **questions to which mathematics can offer answers** (The Council of the European Union, 2018).

Possessing mathematical competence means having knowledge of, understanding, doing and using mathematics and having a well-founded opinion about it, in a variety of situations and contexts where mathematics plays or can play a role (Niss, Højgaard, 2003: 183).

Mathematical competencies (Turner,2010)

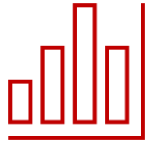
Fourth Grade Content Domains

Measurement and Geometry 30%

- Measurement (15%)
- Geometry (15%)

Number (50%)

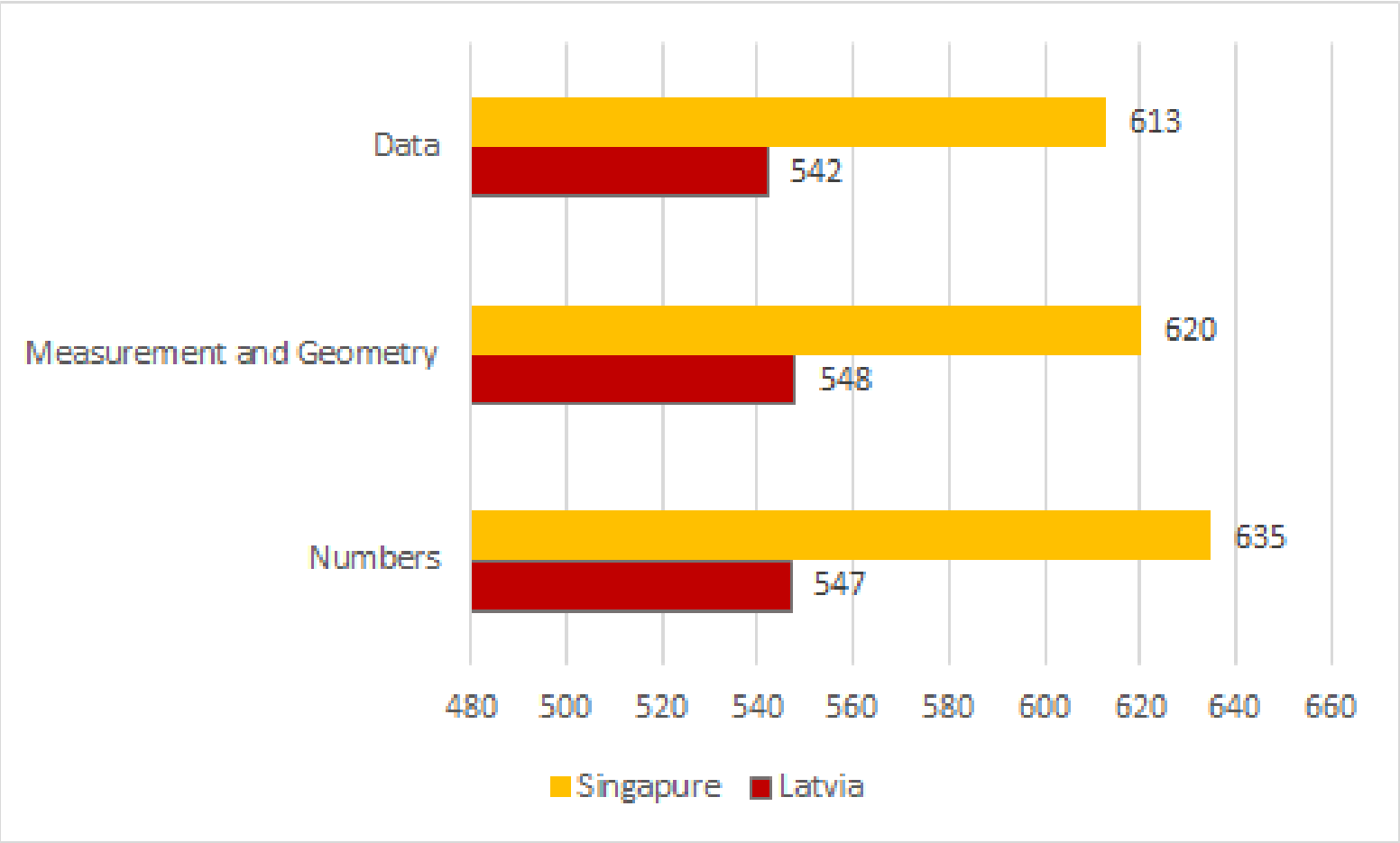
- Whole numbers (25%)
- Expressions, simple equations, and relationships (15%)
- Fractions and decimals (10%)



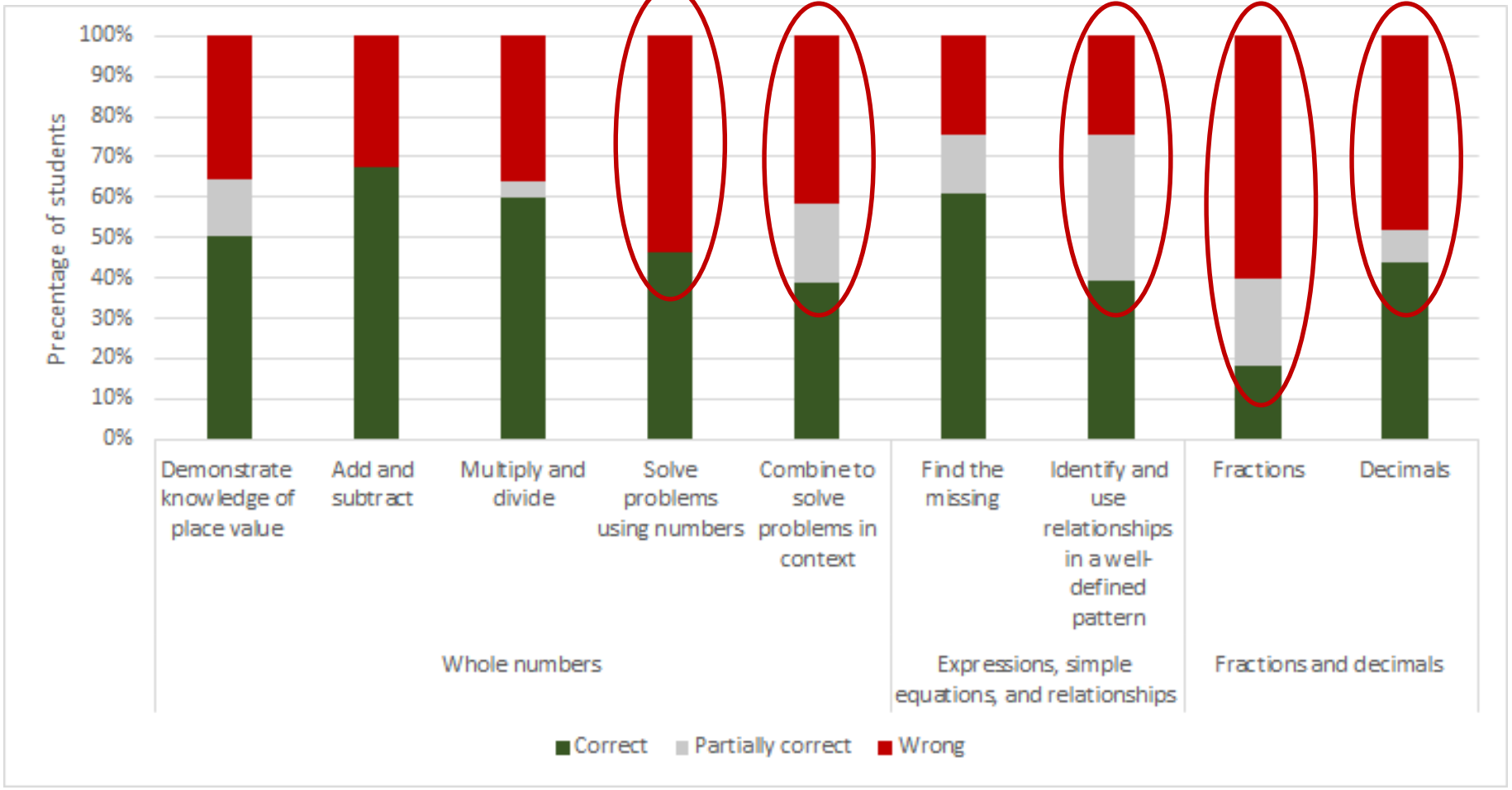
Data 20%

- Reading, interpreting, and representing data (15%)
- Using data to solve problems (5%)

Results of each scale in TIMSS 2019



Numbers


Precentage of students
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Demonstrate knowledge of place value
Add and subtract
Multiply and divide
Solve problems using numbers
Combine to solve problems in context
Find the missing
Identify and use relationships in a well-defined pattern
Fractions
Decimals
Whole numbers
Expressions, simple equations, and relationships
Fractions and decimals
Correct
Partially correct
Wrong

LVA – 33%
TIMSS AVR – 47%

Content Domain: Number

Cognitive Domain: Applying

Description: Solves a word problem involving subtraction of a non-unit fraction from 1

Anna is cycling to her grandmother's house. She has cycled $\frac{3}{8}$ of the way.

What fraction of the distance does Anna have left to cycle?

Answer: $\frac{5}{8}$

The answer shown illustrates the type of response that would receive full credit (1 point).

Data: IEA TIMSS 2019

Country	Percent Full Credit	
3 Singapore	55 (2.4)	▲
† Northern Ireland	42 (2.7)	▲
Korea, Rep. of	39 (2.5)	▲
Chinese Taipei	38 (2.4)	▲
† Hong Kong SAR	35 (2.9)	▲
2 Latvia	35 (2.1)	▲
2 England	34 (2.6)	▲
Poland	32 (2.1)	▲
2 Russian Federation	31 (1.9)	▲
Czech Republic	29 (2.1)	▲
† Denmark	29 (2.5)	
Cyprus	27 (2.3)	
† Norway (5)	27 (2.3)	
2† United States	27 (1.4)	
† Belgium (Flemish)	26 (2.1)	
Ireland	26 (2.5)	
2 Slovak Republic	26 (2.3)	
2 Portugal	26 (2.4)	
≡ Netherlands	25 (2.2)	
Germany	25 (2.1)	
Sweden	25 (1.5)	
Japan	25 (2.0)	
Australia	25 (2.0)	
International Average	**24 (0.3)**	
2 Serbia	24 (2.1)	

Content Domain: Number

Cognitive Domain: Reasoning

Description: Devises two ways of grouping objects that satisfy two conditions (2 of 2 points)

A teacher wants to put 30 students in groups so that

- each group has the same number of students, **and**
- each group has an odd number of students.

Show two different ways the teacher could make the groups.

Way 1

Number of groups: 6

Number of students in each group: 5

Way 2

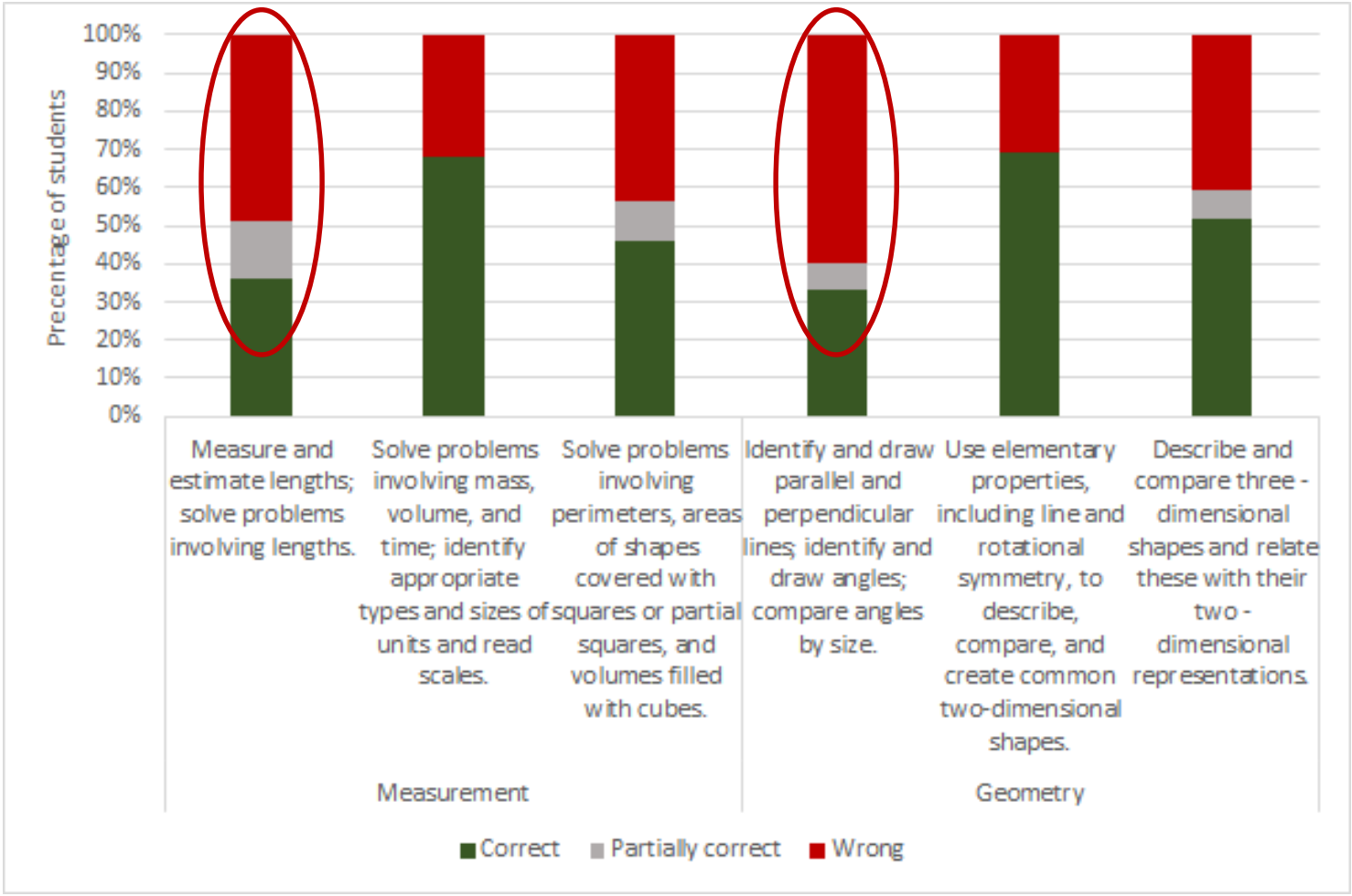
Number of groups: 10

Number of students in each group: 3

The answer shown illustrates the type of response that would receive full credit (2 points).

Data: IEA TIMSS 2019

Measurement and Geometry



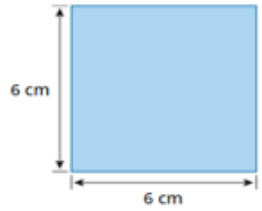
Country	Percent Full Credit	
Korea, Rep. of	54 (2.0)	▲
† Hong Kong SAR	53 (3.2)	▲
2 Russian Federation	47 (2.3)	▲
3 Singapore	45 (2.1)	▲
Japan	41 (2.3)	▲
Chinese Taipei	40 (2.6)	▲
≡ Netherlands	36 (2.3)	▲
Czech Republic	35 (2.2)	▲
Finland	34 (2.1)	▲
Poland	34 (1.9)	▲
Hungary	31 (2.4)	▲
2 Lithuania	31 (2.2)	▲
2 Latvia	31 (2.1)	▲
Azerbaijan	30 (1.6)	▲
Armenia	28 (2.3)	▲
† Norway (5)	27 (2.7)	▲
Bulgaria	27 (2.7)	▲
† Denmark	26 (2.0)	▲
Sweden	26 (2.1)	▲
† Northern Ireland	26 (2.2)	▲
Albania	25 (2.6)	
Ireland	24 (2.1)	
2 England	24 (2.1)	
† Belgium (Flemish)	24 (1.9)	
Austria	24 (1.8)	
Australia	23 (1.7)	
Italy	22 (1.9)	
2 Portugal	21 (1.8)	
Germany	21 (2.2)	
International Average	**21 (0.2)**	
Cyprus	21 (2.3)	
2 Serbia	20 (2.3)	
1 2 Canada	19 (1.9)	
2 Kazakhstan	19 (2.2)	
2† United States	17 (1.4)	▽
2 New Zealand	16 (1.5)	▽
2 Turkey (5)	16 (1.6)	▽
2 Slovak Republic	16 (1.8)	▽
France	15 (1.5)	▽
United Arab Emirates	14 (0.7)	▽

2019

Content Domain: Measurement and Geometry

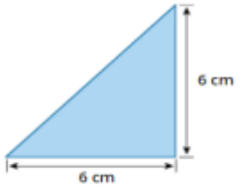
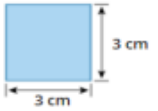
Cognitive Domain: Applying

Description: Determines the number of three different shapes that cover the area of a square (2 of 2 points)



The square above can be made by putting together smaller shapes.

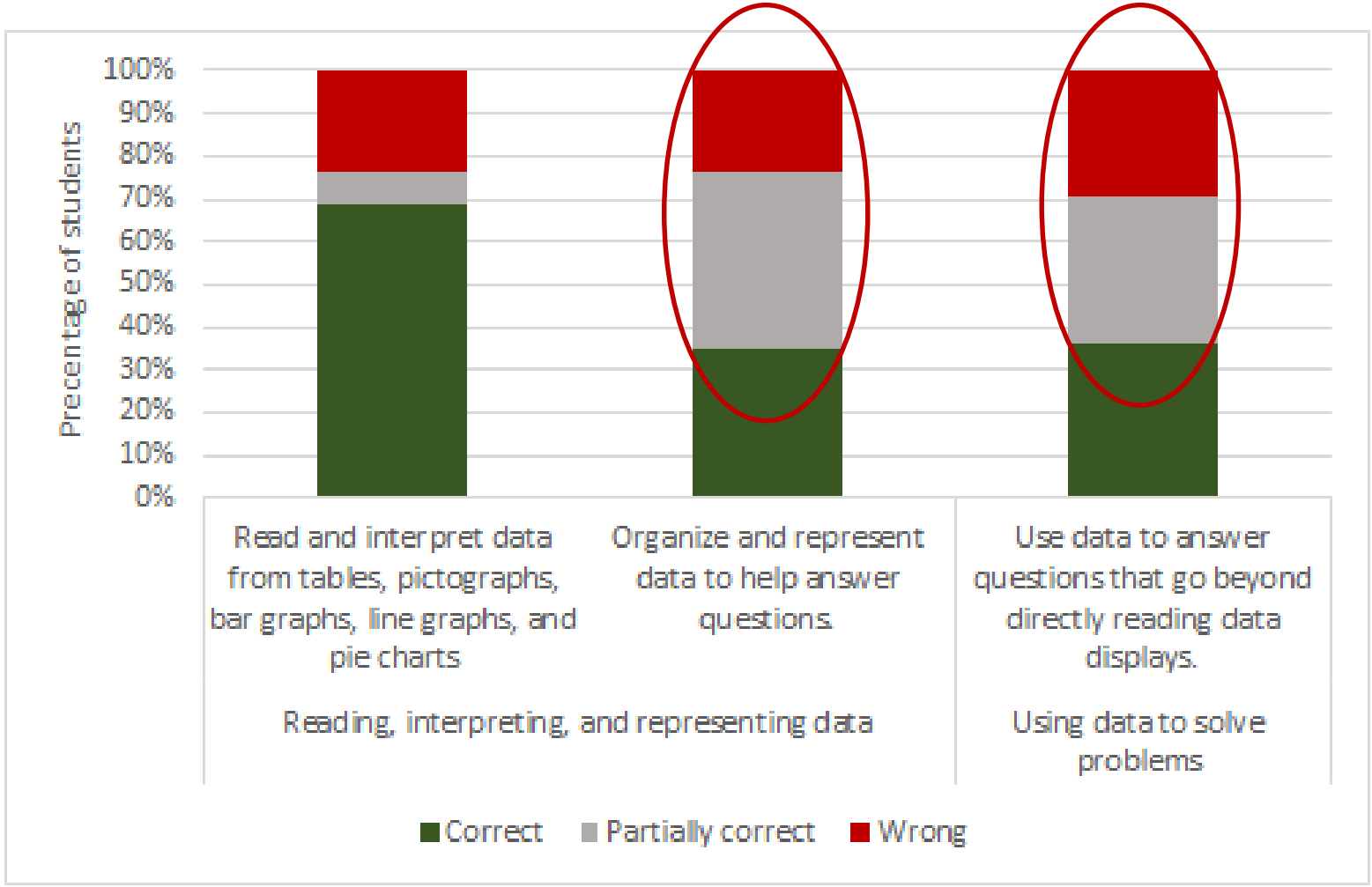
Complete the table with the number of each shape that are needed to cover the whole square.

Shape	Number Needed to Cover the Square Above
	3
	2
	4

The answer shown illustrates the type of response that would receive full credit (2 points).

Data: IEA TIMSS 2019

Data


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Precentage of students
Read and interpret data from tables, pictographs, bar graphs, line graphs, and pie charts
Organize and represent data to help answer questions.
Use data to answer questions that go beyond directly reading data displays.
Reading, interpreting, and representing data
Using data to solve problems
Correct
Partially correct
Wrong

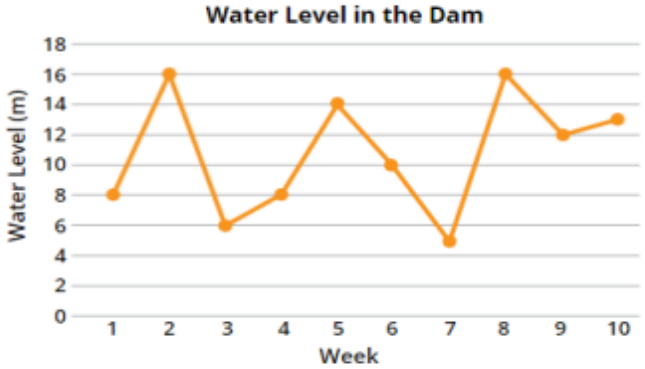
Country	Percent Full Credit	
Japan	95 (0.9)	▲
3 Singapore	92 (0.9)	▲
Chinese Taipei	92 (1.3)	▲
Korea, Rep. of	91 (1.3)	▲
2 England	91 (1.5)	▲
≡ Netherlands	91 (1.4)	▲
† Hong Kong SAR	91 (1.5)	▲
† Norway (5)	88 (1.7)	▲
† Northern Ireland	87 (1.8)	▲
2 Russian Federation	87 (1.5)	▲
Sweden	86 (1.9)	▲
Finland	86 (1.6)	▲
† Belgium (Flemish)	86 (1.6)	▲
2 Lithuania	84 (1.7)	▲
† Denmark	84 (1.7)	▲
Australia	84 (1.6)	▲
2 Portugal	82 (1.6)	▲
2 Latvia	81 (2.0)	▲
Ireland	80 (1.6)	▲
Azerbaijan	79 (2.0)	▲
2† United States	79 (1.4)	▲
Spain	78 (2.5)	▲
2 New Zealand	77 (1.7)	▲
Hungary	76 (1.9)	▲
1 2 Canada	76 (1.3)	▲
Cyprus	75 (1.7)	▲
Malta	74 (2.0)	▲
Czech Republic	73 (2.2)	▲
Germany	71 (2.0)	
Austria	70 (2.4)	
2 Slovak Republic	70 (2.2)	
Italy	69 (2.5)	
2 Turkey (5)	69 (2.4)	
France	68 (2.6)	
International Average	**68 (0.3)**	
Albania	68 (2.2)	

Content Domain: Data

Cognitive Domain: Knowing

Description: Reads data from a line graph

The graph shows the water level in a dam for 10 weeks.



What was the water level for week 8?

Answer: 16 m

The answer shown illustrates the type of response that would receive full credit (1 point).

Data: IEA TIMSS 2019

Conclusion

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